ICV 2016: 86.13
SJIF Impact Factor 6.683

ISSN:2320-7817(p)
ISSN : 2320964X(o)

International Journal of

Life Sciences

An International Peer Reviewed Open Access Journal

Special Issue A 13 December 2019

National Conference on

Challenges in Life Sciences and Agrobased Industries for Rural Development (CLSAIRD-2019)

21st December 2019

Organisized by

Department of Botany and Zoology

Arts, Commerce and Science College, Bodwad, Dist-Jalgaon, Maharashtra

Sponsored by

Indian Science Congress Association Amravati Chapter

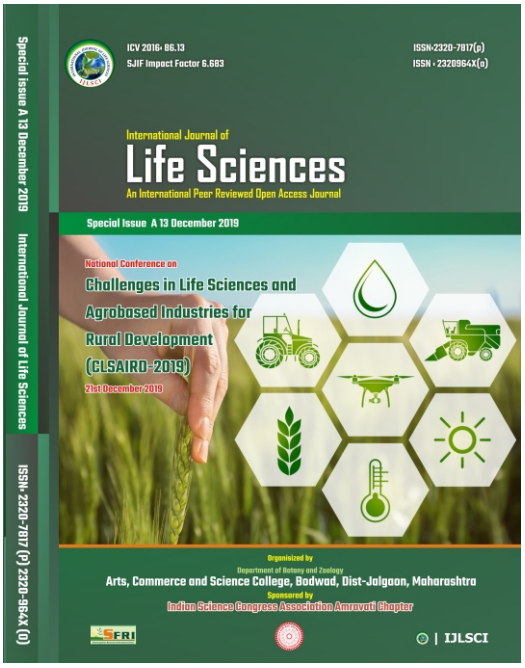
IJLSCI

ICV 2016: 86.55
SJIF Impact Factor 6.683

ISSN:2320-7817 | eISSN:2320-964X
Special Issue A 13 December 2019

INTERNATIONAL JOURNAL OF Life Sciences

AN INTERNATIONAL PEER REVIEWED OPEN ACCESS JOURNAL



National Conference on

Challenges in Life Sciences and Agrobased Industries for Rural Development (CLSAIRD-2019)

21 December 2019

STATUTORY WARNING

Articles, data, figures, scientific contets and its interpretation and authenticity reported by author(s) and published in IJLSCI are the exclusive views of author(s). The editorial board IJLSCI is not responsible for any controversies arising out of them. In case of any plagiarism found, author(s) will have to face its consequences.

Organized by

Department of Zoology and Botany

Arts, Commerce and Science College, Badwad, Dist-Jalgaon, Maharashtra

Sponsored by

Indian Science Congress Association, Amravati Chapter

| IJLSCI

About IJLSCI

International Journal of Life Sciences (IJLSCI) is a peer-reviewed, UGC approved open access journal, it publishes original articles in all areas of Biology and Life Sciences. Authors are encouraged to submit complete unpublished and original works, which are not under review in any other journals. The scopes of the journal include, but limited to the following topic areas: Biology, Life Science, Anatomy, Botany, Cytology, Genetics, Microbiology, Physiology, Zoology, Ecology, Environmental Science, Hydrobiology, Neurobiology, Developmental Biology, Immunology, Molecular Biology, Biochemistry, Biophysics, and Biotechnology, Genomics and Proteomics. It is an open access journal, which publishes original research articles, reviews and short communication in all areas of life sciences and at the interface of related disciplines.

TYPES OF RESEARCH PAPER

Original Articles:
These should describe new and carefully confirmed findings, and experimental methods should be given in sufficient detail for others to verify the work. The length of an original article is the minimum required to describe and interpret the work clearly.

Short Communications:
Short communication also contain abstract. The list of references should not exceed 15. The presentation of Short Communications should contain headings such as Introduction, Materials and Methods, Results and Discussion, etc.

Reviews Articles:
Submissions of review articles and perspectives covering topics of current interest are welcome and encouraged

The journal is published in print as well as online version which is free access and download.

This Journal is circulated / Distributed Through Subscription only

Submission of Paper: Submission of paper is encouraged by email to editorijlsci@gmail.com
Subscription Plan: Rs. 3500 /- or 250 US$ (Individual Annual); Rs. 4500/- or 350 US$ (Institutional)
Life Membership: Rs. 15000/- or 550 US$ (Individual) Rs. 25000/- or 850 US$ (Institutional)
Fellow Membership: Rs. 25000/- or 850 US$ (Individual) Rs. 35000/- or 1700 US$ (Institutional)

Publisher and Owner: **Dr. Arvind Chavhan,** Published from IJLSCI, 46, Guruvandan, Jawahar Nagar, VMV Road Amravati -444604, India

Printed at IJLSCI, 46, Guruvandan, Jawahar Nagar, VMV Road Amravati -444604, India

Managing Editor: Dr.Arvind Chavhan, Assistant Professor & Head, Department of Zoology, D.B. College, Bhokar, Nanded, India

Indexing:

Index Copernicus, Google Scholar, OCLC WorldCat, INNOSPACE (SJIF), CiteFactor, ROAD, OAJI, AcademicKeys, J-index.net, ScholarSteer, ResearchBible, DRIJ, DIIF, SIS, SIS, ASI, Directory of Science

All the published articles including special issue of the conferences are freely accessible on the website http://www.ijlsci.in | As well as some of the indexing agencies website, via. Cite factors, Index Copernicus, Oaji.net, Research Bible, ISI,etc.

IJLSCI

ISSN:2320-7817(p) | 2320-964X(o)

INTERNATIONAL JOURNAL OF LIFE SCIENCES

EDITORIAL BOARD

Indian Science Congress Association, Amravati Chapter Sponsored

National Conference

on

Challenges in Life Sciences and Agrobased Industries for Rural Development (CLSAIRD)

Date :- 21st December 2019

Organized by

Department of Zoology and Botany

Arts, Commerce and Science College, Bodwad Dist. Jalgaon

Organizing Secretaries

Dr. Chetankumar Sharma
Head, Dept. of Zoology
Mob.9860340262

Dr. Geeta Patil
Head, Dept. of Botany
Mob.9420106409

Conference Chairman

Professor Arvind Chaudhari
Principal

Invitation

Dear Friends, It gives us immense pleasure to cordially invite you to participate in National Conference on "**Challenges in Life Sciences and Agrobased Industries for Rural Development (CLSAIRD)",** to be held on **21st December 2019.**

About College

Arts, Commerce and Science college, Bodwad is established in 1986 which is the pioneering educational institute which is affiliated to K.B.C.North Maharashtra University, Jalgaon. The college is located in rural area and dedicated to cause of spread of knowledge. Apart from degree courses the college has recognized guides for Commerce, Botany, Zoology, Physics, Hindi, English, Physical Education and Library science.

How to Reach

Bodwad is Located on Bhusawal - Nagpur Railway Line. By Bus - 32 km. away from Bhusawal. 55 km. away from Jalgaon. 70 km.away from Burhanpur. 150 km. away from Aurangabad via Jamner. 120 km. away from Akola via Malkapur.

Indian Science Congress Association

The Indian Science Congress Association (ISCA) owes its origin to the foresight and initiative of 2 british chemist Prof.J.L.Simonsen and Prof.Macmahon. It occurred to them that scientific research in India might be stimulated if an annual meeting of research workers somewhat on the lines of the British Association for the advancement of Science could be arranged.

Motives of ISC

1. To advance and promote the cause of science in India.
2. To hold an annual congress at suitable place in India.
3. To publish such proceedings, journals, transactionsand other publications as may be considered desirable.
4. To secure and manage funds and endowments for the promotion of science including rights of disposing of or selling all or any portion of the properties of the association.
5. To do and perform any or all other acts, matters and things as areconductive to, or incidental to, or necessary for the above objects.

Objectives of the Conference

The primary goal of the conference is to promote research and developmental activities in science and technology for rural development. Also to promote and interchange scientific information among researchers, developers, entrepreneurs, academicians, students and peoples working in related field. This conference is to bring together academicians and industrial experts in the field of Agriculture and Life sciences to a common forum.

Topics to be covered

1. Applied aspects of soil and Agricultural Microbiology.
2. Challanges in agriculture, agrobased industries and allied fields.
3. Recent advances in horticulture and allied science.
4. Current trends in applied zoology.
5. Applied aspects of microbiology in food.
6. Soil health management and water salinity Problems.
7. Plant and Animal health- their disease management.
8. Emmerging challenges of environmental issues.
9. Bioenergy and Nano-Biotechnology.
10. Genetics, Cell and Molecular Biology.
11. Industrial and Agricultural Development.
12. Any other relevant topics related with main theme.

Chief Patron

Dr. A.B.Chaudhari
Dean, Science and Technology, KBCNMU, Jalgaon

Patron

Hon. Shri.Mithulalji Agrawal
President, The Bodwad Sarv. Co-Op. Edu. Society Ltd. Bodwad

Guest of Honour

Dr. Atul Bodakhe
Convener & Associate Professor, Daryapur College

Chief Guest

Dr. S.P.Zambare
Ex.BCUD Director
Dr.B.A.M.University, Aurangabad

Dr. S.P.Rothe
Principal,
Smt.Maherbanu Science & Commerce College,Akola

Dr. K.B.Patil
Vice Chairman,
Jain Irrigation System Ltd. Jalgaon

Key Note Address

Dr. Vishwas Chavan
Scientist & Science Diplomate, Denmark

Invited Speaker

Dr. G.D.Muratkar
Head,
Envt.Science Arts,Commerce & Science College,Chikhaldara

Dr. B.B.Waykar
Dean, Science & Technology
Dr.B.A.M.University, Aurangabad

National Advisory Committee

Dr. Soham Trivedi, Head, School of Life Science Rai University, Ahmedabad
Dr. Ashutosh Sharma, Director, GGSSIP University, New Delhi
Dr. Yashpal Singh, Head, Government College Udhampur, Jammu
Dr. N.K. Dubey, Head, Department of Botany, Varanasi
Dr. P.S.Lohar, BOS Chairman, Zoology KBCNMU, Jalgaon
Dr. D.A. Kumawat, BOS Chairman, Botany KBCNMU, Jalgaon
Dr. Sarita Kumar, Acharya N.D. College, New Delhi
Dr. Sudip Ray, PMB Gujarathi College, Indore
Dr. Anil Kurhe, ACS College Satral Tal. Rahuri
Dr. D.K.Kakavipure, BNN College, Bhiwandi
Dr. D.P. Gogale, RTM University, Nagpur
Dr. Mayuri Rathod, Veer Narmad South Gujarat University, Surat

Local Advisory Committee

Dr. Sandhya Sonawane
Principal, Nutan Maratha College, Yawal

Dr. B.D.Mangale
BOS Member Botany, KBCNMU, Jalgaon

Dr. A.G.Jaiswal
Principal, A.C.S.College,Navapur

Dr. P.S.Baviskar
Associate Professor, A.C.S.College,Chalisgaon

Dr. A.T.Kalse
RRC Member Zoology, KBCNMU, Jalgaon

Dr. Gauri Rane
BOS Member Botany, KBCNMU, Jalgaon

Dr. S.A.Patil
BOS Member Botany, KBCNMU, Jalgaon

Dr. H.P.Nandurkar
Head,Dept.of Zoology Amravati University

Dr. Sandhya Patil
BOS Member Botany, KBCNMU, Jalgaon

Dr. S.S.Patole
ACS College,Sakri

Dr. S.R.Magare
ACS College,Taloda

Dr. M.B.Patil
Jijamata College,Nandurbar

Dr. B.C.More
ACS College,Pimpalner

Dr. S.K.Tayade
BOS Member Botany, KBCNMU, Jalgaon

Dr. C.M.Pawara
BOS Member Botany, KBCNMU, Jalgaon

Office Bearers of ISCA, Amravati Chapter

Dr. Omraj Deshmukh
Treasurer, Warud College

Dr. Vilas R. Deshmukh
Ex.Member, Vidyabharati College, Amravati

Dr. Mahesh Chikhale
Rajashree Shahu Science College,Chandur Rly.

Dr. Sawan Deshmukh
Bharatiya Mahavidyalaya, Morshi

Organizing Committee

Dr. A.J.Patil,Amalner
Dr. A.G.Patil,Raver
Dr. R.T.Chaudhari,Muktainagar
Dr. N.S.Sharma,Jamner
Dr. V.A.Patil,Bhusawal
Dr. P.R.Mahajan,Ainpur
Dr. D.P.Jaiswal,Navapur
Dr. C.R.Patil,Parola
Dr. Y.M.Bhosale,Chalisgaon
Dr. J.G.Magar,Jalgaon
Dr. K.H.Mali,Talasari
Dr. Y.D.Yeole,Muktainagar
Dr. V.P.Pawar,Bhalod
Dr. Nilima Patil,Dhule
Dr. H.M.Pawar,Dhadgaon
Dr. T.A.Khan,Jalgaon
Dr. D.A.Dhale,Dhule
Dr. D.R.Tayade,Faizpur
Dr. S.M.Shinde,Dhule
Dr. D.L.Phand,Dhule
Dr. V.V.Bhadane,Amalner
Dr. R.D.Patil,Navapur
Dr. M.Z.Chopda,Jalgaon
Dr. V.R.Borane,Nandurbar
Smt. S.A.Deshmukh,Muktainagar
Smt. U.G.Gavit,Jamner

Local Organizing Committee

Shri. D.S.Patil	Mr. N.S.Joshi	Shri. V.A.Joshi	Smt. B.M.Jadhav
Dr. R.T.More	Dr. I.D.Mhasalekar	Mr. S.R.Bhate	Miss. K.M.Patil
Dr. A.R.Bari	Mr. N.P.Savdekar	Mr. S.P.Pardeshi	Miss. P.A.Dhangar
Dr. R.G.Tayade	Mr. S.T.Barde	Miss. S.P.Agrawal	Miss. S.S.Dodani
Smt. K.R.Damade	Shri. N.A.Mahajan	Miss. S.P.Rane	Smt. S.A.Deshmukh

Call for Paper / Abstract

Abstracts are invited for oral/poster Presentation. Full length paper will be published in online reputed peer reviewed with impact factor life science journal. Abstract should be not more than 300 words containing title, name of author(s), name and address of institution, email id, contact number and keywords. Typed in MS-Word with font size of 12, Times New Roman font with Line spacing of 1.5 and A-4 size print paper. Details regarding author(s) for full length paper will be mailed after acceptance of abstracts. Abstracts and full-length papers should be sent to

Email :- clsaird2019@gmail.com

Important Dates

Last Date of Abstract Submission : **10th Dec. 2019**
Final Paper Submission : **15th Dec. 2019**
Last Date of online Regestration : **18th Dec. 2019**

Registration Details

	Before Deadline	Spot Registration
Delegates	1000	1200
Research Scholar	500	600
P.G. Student	300	350

Note : Publication Charges will be convey after the acceptance of abstract and according to journal.

Online Registration

Registration fees by cash or RTGS or NEFT.

Name of Account	Principal, Arts,commerce & Science College,Bodwad
Name of Bank	Central Bank of India
Branch	Bodwad
Account No	2306782758
IFSC Code	CBIN0280712

For more information visit our Website : **www.acsbodwadcollege.org**

Chairman Message

I am extremely happy to know that Department of Botany and Zoology of our Arts, Commerce and Science college is Organising Indian Science Congress Association Amravati Chapter sponsored one day National Conference on Challenges in life Sciences and Agrobased Industries for Rural Development (CLSAIRD-2019) On 21st December 2019. The theme of the conference is noteworthy and beneficial for rural development in general.

The Bodwad Sarvajanik Co-op. Society's Arts, Commerce and Science College, Bodwad is a Premier Institute of education in Kavayitri Bahinabai Chaudhari North Maharashtra
University, Jalgaon.

Being a chairman of the Institution, Iextend my best wishes and greetings to the Conference organized by Department of Botany and Zoology. I welcome all the dignitaries, researchers and students for their participation in thisNational conference.

Shri Mithulalji Agrawal
Chairman

Principal Message

With immense pleasure I extend my warm welcome on behalf of Arts, Commerce and Science College, Bodwad to all the eminent scientists, researchers and academicians who are part of the Indian Science Congress association Amaravati chapter sponsored National Conference on **Challenges in Life Sciences and Agro Based industries for Rural Development(CLSAIRD-2019)**. The college is re-acredited with B grade by the National Accreditation and Assessment Council, Bengaluru. The college has successfully organized many conferences, seminars and workshops in the past.

Today's conference is organizing by Department of Botany and Zoology. This conference aims at bringing together the research fraternity working in the field of science and technology to discuss and share the current trends from the rural point of view.

I am very much optimistic that the conference will prove meaningful to all the participants from various regions of the India. It is a sincere attempt to provide forum of all those interested in life sciences and agricultural sciences. It is delighted that Galaxy of representatives are present from various research institutions, universities, academic bodies etc. besides young research workers and students. Special thanks to Indian Science Congress Association Amaravati Chapter for financial support. We are confident that this event will induces all participants to cover broad range of topics related to life sciences and agriculture it would not only be useful for researchers rather it would be beneficial to find out the solution which has been faced by the rural people.

Professor Arvind Chaudhari
Principal

Message from Organizing Secretaries

The goals of this National Conference are the progress of the nation which depends on its sustained growth of education and research in science and technology. The government can take several steps to encourage research and innovations in science and technology. The government needs to increase its allocations for R & D activities at the institutional level, there is a need to link teaching with research through invest in faculty development and provide incentives for research, promote collaborative efforts between institutions in research.

On the other hand, family farmers have historically experimented and accumulated knowledge to adapt their farming systems to local conditions. However, this experience is often ignored in academic literature on innovation, which tends to focus on innovation in new technologies and the applied sciences, while ignoring problems specific to developing countries. However, family farming plays an important role in reducing rural poverty, fighting food insecurity and malnutrition,and promoting a sustainable food system.

Dr. Chetankumar Sharma
Dr. Geeta Patil
Organizing Secretaries

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A13 | December 2019

National Conference on Challenges in Life Sciences and Agrobased Industries for Rural Development (CLSAIRD-2019)

21 December 2019

CONTENTS

IJLSCI CALL FOR CONFERENCE SPECIAL ISSUE

IJLSCI welcomes conferences to publish their proceedings with IJLSCI.

The conference organizers are requested to provide the manuscripts in .doc format to the editor of IJLSCI. The conference organizers are also requested to submit the review comments and the list of reviewers to IJLSCI along with the set of manuscripts. The manuscripts must be categorized according to the topics addressed by them. Conferences interested to publish their selected manuscripts with International Journal of LIFE SCIENCES are requested to use the copyright forms provided in the download section. Compliance with the documents is a necessity for publication in IJLSCI.

All correspondence concerning publication should be addressed to the
Managing Editor
Dr. Arvind Chavhan
46, Guruvandan, Jawahar Nagar, Amravati- 444604
Email: specialissueijlsci@gmail.com
Cell : (+91) 9970559438 | 9420775527

CALL FOR RESEARCH ARTICLES FOR IJLSCI FORTHCOMING ISSUE

IJLSCI welcomes Authors to publish their Valuable research with IJLSCI.
Authors are encouraged to submit complete unpublished and original works, which are not under review in any other journals. The scopes of the journal include, but limited to the following topic areas: Biology, Life Science, Anatomy, Botany, Cytology, Genetics, Microbiology, Physiology, Zoology, Ecology, Environmental Science, Hydrobiology, Neurobiology, Developmental Biology, Immunology, Molecular Biology, Biochemistry, Biophysics, and Biotechnology, Genomics and Proteomics. It is an open access journal, which publishes original research articles, reviews and short communication in all areas of life sciences and at the interface of related disciplines.
Type of articles: Original Research, Review articles, Shorts Communication, Research Reports, Case studies, Letter to editors on recent trends in life sciences.

Email your valuable research via
Email: editorijlsci@gmail.com OR editor@ijlsci.in

OUR OTHER UGC APPROVED JOURNAL

ISSN: 2322-0015

INTERNATIONAL RESEARCH JOURNAL OF
SCIENCE & ENGINEERING
An International Peer Reviewed Open Access Bi-Monthly Online Journal
http://www.irjse.in

UGC Approved Journal No. 63628)
SJIF Impact Factor-4.115
Cosmos Impact Factor-3.662

Published in: February, April, June, August, October & December

EDITOR-IN-CHIEF:
Dr. Arvind Chavhan
Email: editorirjse@gmail.com
Cell : (+91) 9970559438 | 9420775527

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Biochemical efficacy of *Ircinia fusca* marine sponge of Ratnagiri Coast (MS) India

Lakwal VR*[1], Shaikh SA[2], Kharate DS[3], Kalse AT[4] and Mokashe SS[5]

*[1,4] P.G.Department of Zoology, Nanasaheb Yashwantrao Narayanrao Chavan Arts, Science and Commerce College, Chalisgaon, Jalgaon (MS) - 424101
[2]Department of Zoology, Sundarrao Solanke Mahavidhyalay Majalgaon, Beed – 431131
[3]Department of Zoology, Vinayakrao Patil College, Vaijapur, Auranagabd – 423701
[5]Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad - 431001
*Corresponding Author: vijaylakwal02@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Lakwal VR, Shaikh SA, Kharate DS, Kalse AT and Mokashe SS (2019) Biochemical efficacy of *Ircinia fusca* marine sponge of Ratnagiri Coast (MS) India, *Int. J. of. Life Sciences*, Special Issue, A13: 1-8.

ABSTRACT

The present investigation was made to understand biochemical efficacy (antimicrobial properties and biochemical profile) of *Ircinia fusca* marine sponge collected from Ratnagiri coast. Extraction was done using Hexane, Chloroform, Acetone and Methanol. The crude extracts were tested against known microbial strain by using agar well diffusion method. Acetone showed strong positive antibacterial activity against *Escherichia coli, Staphylococcus aureus, Salmonella typhi, Bacillus subtilis*, whereas, positive against methanol, chloroform and hexane. The methanol and acetone extracts showing strong positive antifungal activity against *Penicillium sp., and Fusarium sp.,* and weak positive activity against *Aspergillus sp., and Alternaria sp,.* Biochemical screening of hexane and chloroform extract revealed the presence of protein and amino acids, steroids, carbohydrates, fats and fixed oil and absence of alkaloids, glycosides, tannins and flavonoids. The acetone and methanol extract contain alkaloids, glycosides, tannins, flavonoids, proteins and amino acids, steroids, carbohydrates, fats and fixed oils.

Key words: *Ircinia fusca,* biochemical screening, antimicrobial activity, Hexane, Chloroform, Acetone, Methanol.

INTRODUCTION

Sponges are simple, multicellular, sessile animals with no true tissue layers or organs (Bergquist 1938). This rocky shore area is directly exposed to sea and inhabited by diverse flora and fauna. Sponges are the most primitive multicellular animals that have existed for more than 800 million years. The sponges (Porifera), being evolutionarily ancient inhabit every type of marine benthic environment (Radjasa, *et al.,* 2007). They inhabit from polar sea (Dayton *et al*., 1974) to temperate and tropical waters (Reiswig, 1973; Wenner *et al.,* 1983) and are often more abundant and diverse in the tropics than stony and soft corals (Targett and Schmahl, 1984).

Ircinia fusca (Carter 1880) is a jet black, thick encrusting to massive, sometimes irregular sponge found commonly on the intertidal rock pools of Ratnagiri, west coast of India. They have presence novel bioactive compounds with more than 200 new metabolites reported on each year. The compounds derived from has a wide range of chemical classes (alkaloids, peptides, terpenoids, and polyketides) with an equally wide ranges of biotechnologically relevant properties e.g., anticancer, antibacterial, antifungal, antiviral, anti-inflammatory and antifoulings (Blunt, *et al.,* 2005, Blunt, *et al.,* 2006). Sponges have been considered as a gold mine for the chemists. Bioactive compounds have been isolated from some sponge and a first compounds was made available on market in 2004, the secondary metabolites of marine sponges are rich source of pharmacologically active compounds that can potentially be used as medicines to cure human diseases (Azevedo, *et al*., 2008).

The sponges known to produce the largest number and diversity of secondary metabolites as compare to other marine invertebrates. Although the functions of these secondary metabolites are largely unknown, there is some evidence that they provide chemical defence against predators (Chanas *et al.*, 1997). The first report of antimicrobial activity of sponge extracts was by Nigrelli (Nigrelli, 1959). The antimicrobial activity of two marine sponge species such as *Psammaplysilla purpurea* and *Ircinia ramose,* which were collected from the Gulf of Mannar, India was analysed their antibacterial, antifouling activities against various pathogenic bacteria (Kanagasabhapathy *et al.,* 2004). The sponge *Ircinia ramosa* has also been shown to possess antiviral, CNS stimulatory (Parulekar and Shirvoikar, 1991), and antialgal properties (Mokashe *et al.,* 1994).The present study describes the biochemical efficacy (antimicrobial properties and biochemical profile) of the crude extract of *Ircinia fusca* against the pathogenic microbes.

MATERIAL METHODS

Collection of Sponges, Sample Preparation and Extraction

The sponge *Ircinia fusca* were collected from intertidal pools of Ratnagiri Coast (16º59'N 73º16'E), (MS) India. The sponge collection was not harmful to an ecosystem. Identified sponge tissues samples were incised out and washed with sea water, air dried and chopped into small size and extracted with 200 ml hexane, chloroform, acetone and methanol for about 15 days. After 15 days the extract was filtered through Whatmann filter paper (No: 2) and Solvents were removed by rotary vacuum evaporator (Buchi type Superfit, Bangalore)) under reduced pressure so as to get the crude sponge extract. Then desalting process and make it pure extract. The concentrated crude extract was used for antimicrobial study.

Antimicrobial activity

For the antimicrobial activity 4 species of bacterial and 4 species of fungi were selected. The bacterial and fungal strains were obtained from Government Institute of Science, Aurangabad, (MS) India. *Escherichia coli, Salmonella typhi,* (Gram negative bacteria) *Bacillus subtilis, Staphylococcus aureus,* (Gram positive bacteria) strains were used. *Aspergillus sp., Penicillium sp., Alternaria sp. and Fusarium sp.,* were used as fungal test microorganisms.

Antibacterial activity by well assay method

Assays were performed according to the standard guidelines of the National Committee for Clinical Laboratory Standards (NCCL, 1990) using a modified Kirby–Bauer well assay method. All bacteria were stored at −20°Cuntil use. Cells were grown in Muller Hinton broth and were transfer to Muller Hinton agar. Broth cultures were swabbed onto agar medium to achieve a lawn of confluent bacterial growth separately for each strain. Stainless steel borer use to make well. Five wells were bored in each plate. 100 µg/ml extracts loaded on the well and find out inhibitory effect. Discs of Streptomycin (25µg/ml) were used as positive control. The plates were incubated at 37°Cfor 24 hrs. The growth of bacterias around each well was observed carefully and the zone of inhibition around each well was measured using a Hi-media zone reader triplicate plates were maintained for each test.

Antifungal activity by well assay method

Assays were performed according to the standard guidelines of the National Committee for Clinical Laboratory Standards (NCCL, 1990) using a modified Kirby–Bauer well assay method. All fungi were stored at −20°C until use. Cells were transfer to Sabouraud dextrose. The fungal cultures were maintained in 0.2% Sabouraud dextrose medium. Each fungal inoculum was applied on plate and evenly spread on Sabouraud dextrose agar using a sterile cotton swab. A sterile stainless-steel borer (6 mm) used to make well in the medium. Five wells were bored in each plate. The

sponge extract 100 µg/ml was loaded into the well and check the inhibitory potential. Discs of the Fluconazole were used as the positive control. The plates were incubated at 28°Cfor 48 hrs. The growth of fungi around each well was observed carefully and the diameter of the zone of inhibition around each well was measured using a Hi-media zone reader Triplicate plates were maintained for each test.

Preliminary screening of sponges for chemical constituents

It involves testing of different extracts of *Ircinia fusca* for their contents of different classes of compounds. The qualitative chemical tests for various bioconstituents were carried out for all the extracts of *Ircinia fusca* described by (Harborne, 1998).The sponge extracts were analysed for the presence of various compounds as described by Okawori *et al.,* 2008.

1. Detection of alkaloids

Mayer's Test: Extracts were treated with Mayer's reagent (Potassium Mercuric Iodide). Yellow coloured precipitation indicates the presence of alkaloids.

Wagner's Test: Extracts were treated with Wagner's reagent (Iodine in Potassium Iodide). Brown/reddish precipitation indicates the presence of alkaloid.

Dragendroff's Test: Extracts were treated with Dragendroff's reagent (solution of Potassium Bismuth Iodide). Red precipitate indicates the presence of alkaloid.

Hager's Test: Extracts were treated with Hager's reagent (saturated picric acid solution). Yellow coloured precipitate showed presence of alkaloids.

2. Detection of glycosides

Legal's Test: Extracts treated with sodium nitroprusside and sodium hydroxide. Pink to blood red colours indicate the presence of cardiac glycosides.

3. Detection of tannins

Gelatin Test: Extract with 1% gelatin solution containing sodium chloride was added. White precipitate indicate the presence of tannins.

Ferric Chloride Test*:* With 1% ferric chloride solution the extract gives blue, green, or brownish green colour indicating the presence of tannins.

4. Detection of flavonoids

Alkaline Reagent Test: Extracts were treated with few drops of sodium hydroxide solution. Intense yellow colour, which becomes colourless on addition of dilute acids, indicates the presence of flavonoid.

Lead acetate Test: Extracts were treated with few drops of lead acetate solution. Yellow colour precipitations indicate the presence of flavonoid.

Shinoda Test: 2-3 ml of extract, a piece of magnesium ribbon and 1 ml of conc. hydrochloric acid was added. Pink or red coloration of the solution indicates the presence of flavonoids.

Zinc Hydrochloride Test: To the test solution, add a mixture of zinc dust and conc. Hydrochloric acid. It gives red colour after few minutes.

5. Detection of proteins and amino acids

Xanthoproteic Test: The extracts were treated with few drops of conc. Nitric acid. Yellow colour indicate the presence of protein.

Ninhydrin Test: In the extract 0.25% w/v ninhydrin reagent was added and boiled for few minutes. Blue colours indicate the presence of amino acids.

Detection of saponins

Foam Test: Small amount of extract was shaking with 2 ml of water. If foam formation persists for ten minutes it indicates the presence of saponin.

Sterols and Terpenoids

Salkowski's Test: Extracts were treated with few drops of Conc. Sulphuric acid, Red colour at the lower layer indicate presence of steroids and formation of yellow colour at the lower layer indicates the presence of terpenoid.

6. Detection of carbohydrates

Molisch's Test*:* Extracts were treated with 2 drop of alcoholic α-naphthol solution in a test tube. Violet ring at the junction indications the presence of Carbohydrate.

Benedict's Test: Filtrates were treated with Benedict's reagent and heated gently. The formation of orange red precipitation indicate the presence of reducing sugar.

Fehling's Test: Filtrates were hydrolysed with dil. HCl, neutralize alkali and heated with Fehling's A and B

solution. Red precipitations indicate the presence of reducing sugar.

Selwanoffs Test: One half ml of a sample solution is placed in a test tube. 2 ml of selwinoffs reagent (a solution of resorcinol and HCL) is added. The solution is heated with boiling water bath for two minutes. A positive test is indications by the formation of a red product.

Camnelisation Test: 1 ml extract were treated with strong sulphuric acid gives a burning sugar smell. This indicates the presence of carbohydrates.

7. Fats and Fixed Oils

Stain Test: Small amount extract was pressed between two filter papers. Oily stain appears on filter paper indicates the presence of fixed oil.

Saponification test:- Add a few drops of 0.5N of alcoholic potassium hydroxide to small quantities of extracts along with a drop of Phenolphthalein separately and heat on a water bath for 1-2 hrs. Soap indications the presence of fixed oils and Fat.

RESULTS & DISCUSSION

The antibacterial activity of *Ircinia fusca* in the agar well diffusion method is given in Fig. 1. The acetone extracts of *Ircinia fusca* exhibited strong positive inhibitory activity towards human pathogenic bacteria such as *E. coli, Salmonella typhi,* (Gram negative bacteria) *Bacillus subtilis, Staphylococcus aureus,* (Gram positive bacteria), Whereas in methanol, chloroform and hexane shows the positive inhibitory activity against all pathogens depicted in table 1., Fig. 2 showing the antifungal activity of *Ircinia fusca* by agar well diffusion method. The hexane and chloroform depicted weak activity against all pathogenic fungus. The methanol and acetone extracts of *Ircinia fusca* showing strong inhibitory effects against pathogenic fungus such as *Penicillium sp., and Fusarium sp.,* and weak activity was seen in *Aspergillus sp., and Alternaria sp.* Showed in table 2.

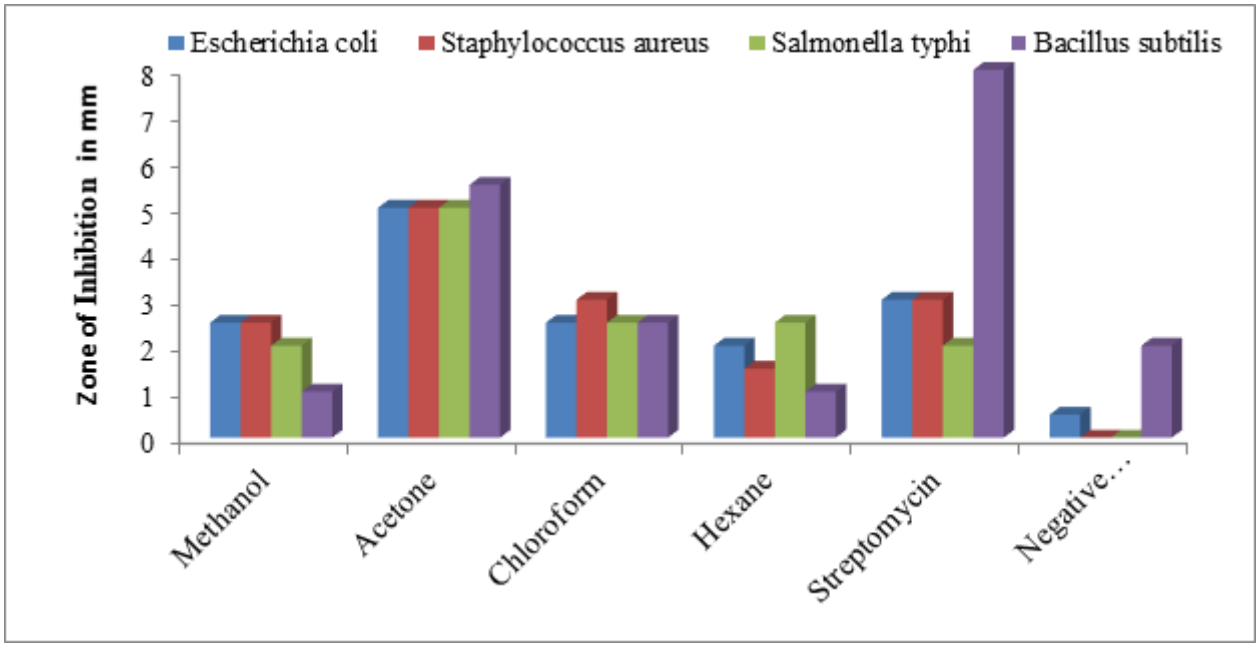


Table 1: **Antibacterial activity of marine sponge *Ircinia fusca* extract against bacteria**

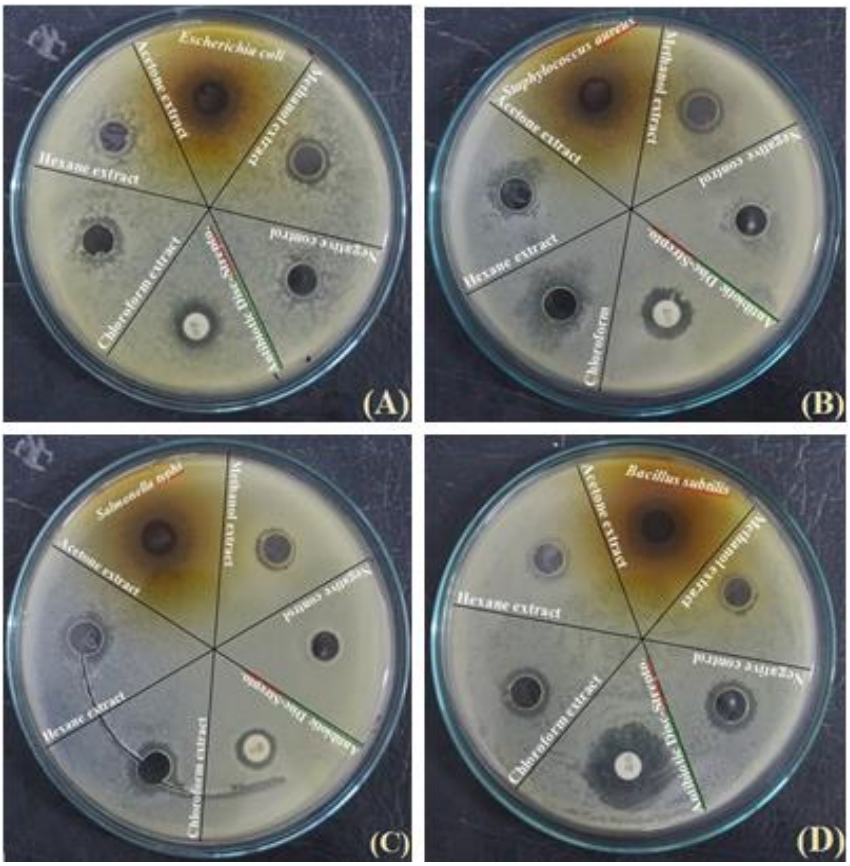


Fig.1. Antibacterial activity *A) Escherichia coli, B) Staphylococcus aureus,C) Salmonella typhi, and D) Bacillus subtilis*

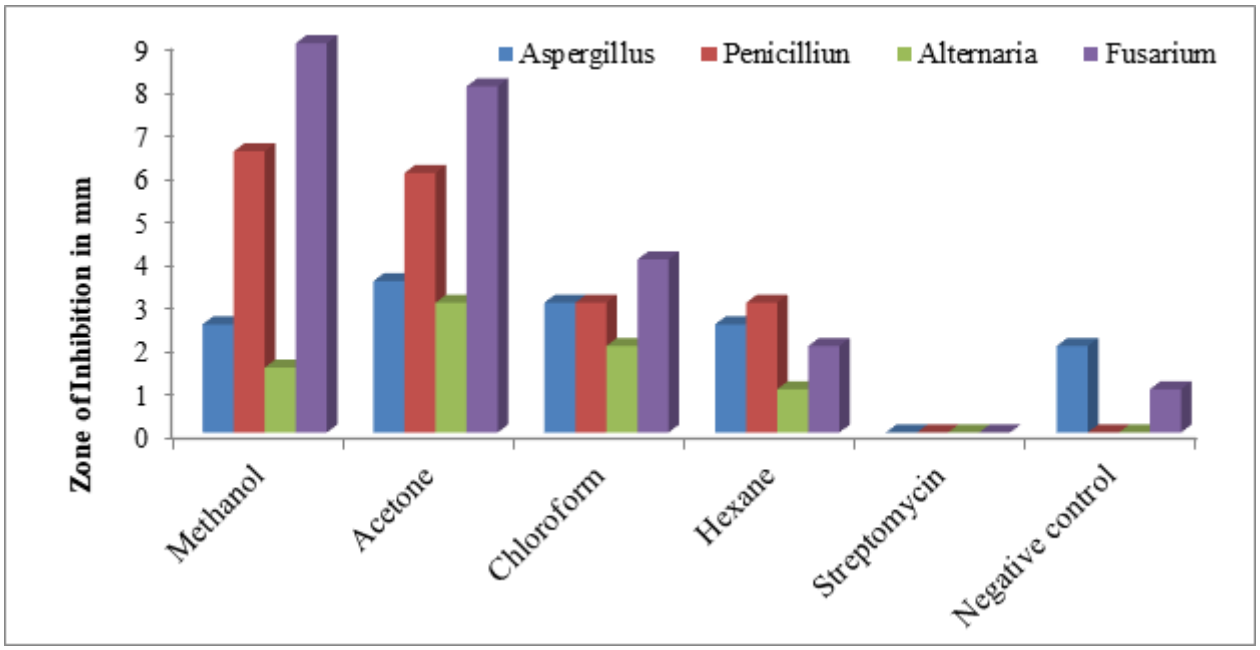


Table 2: **Antifungal activity of marine sponge *Ircinia fusca* extract against fungus**

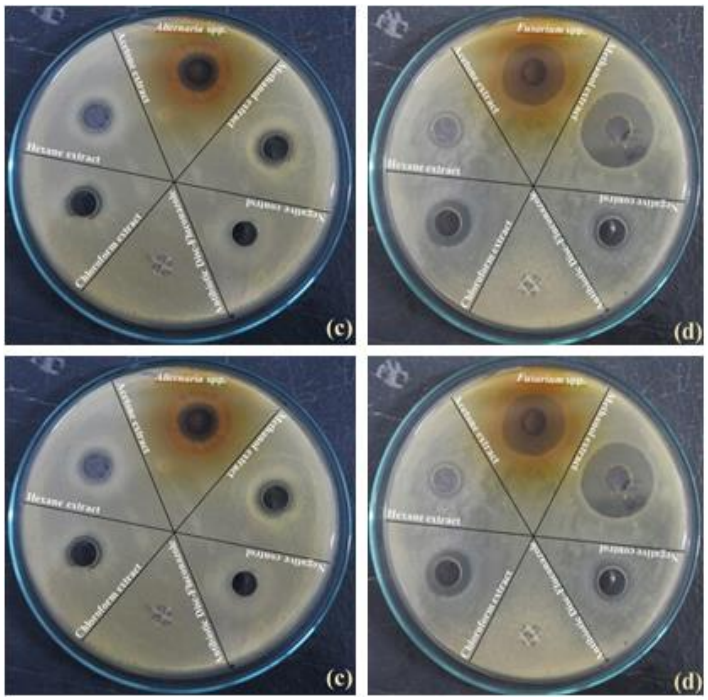


Fig.2. Antifungal activity: *a) Aspergillus sp., b) Penicillium sp., c) Alternaria sp., and d) Fusarium sp.*

Table 3: Showing biochemical tests for various extracts

Biochemicals		Hexane	Chloroform	Acetone	Methanol
Alkaloids	Mayer's Test	-	-	+	-
	Dragendorff's Test	-	-	++	+
	Wagner's Test	+	+	+	+
	Hager's Test	-	-	+	++
Glycosides	Kedde Test	-	-	++	-
	Legal's Test	-	-	-	-
Tannins	Gelatin Test	-	-	-	+
	Ferric Chloride Test	-	-	+	+
Flavonoids	Shinoda Test	-	-	-	-
	Zinc Hydrochloride Reduction Test	+	-	-	-
	Lead Acetate Test	-	+	++	+
	Alkaline Reagent Test	+	-	+	+
Proteins and Amino Acids	Xanthoproteic Test	+	+	+	+
	Millon's Test	-	-	-	-
	Ninhydrin Test	-	+	-	++
Sterol and Terpenoids	Salkowski test	+	+	+	++
Carbohydrates	Molisch's test	++	++	++	++
	Benedict's test	-	-	-	-
	Camnelisation	+	+	+	+
	Selwinoff's test	-	-	+	-
	Fehling's test	-	++	++	-
Fats & Fixed Oils	Stain test	+	+	+	+
	Saponification test	+	+	++	+

(-) No activity, (+) Positive, (++) Strongly Positive

Table 3 depicted the various biochemical present in different extracts. The hexane and chloroform extract contain alkaloids, flavonoids, protein and amino acids, steroids, carbohydrates, fats and fixed oil. The acetone and methanol extract contain alkaloids, glycosides, tannins, flavonoids, proteins and amino acids, steroids, carbohydrates, fats and fixed oils.

In the present study the extracts of the sponge *Ircinia fusca* showed antimicrobial action against the bacteria and fungi. Crude extracts of the *Ircinia fusca* demonstrated good antimicrobial activity against eight microbes (Sharad, *et al.,* 2015). *Ircinia fusca* also possessed an important antimicrobial compound such as 2-Methoxy-1, 4-Benzenediol identified through a GC-MS analysis (Sujatha, *et al.,* 2014). *Ircinia fusca* report one new pyrrole derivative and also exhibits anti-mycobacterial activity (Srinu, *et al.,* 2017). The sponges shows wide spectrum of antibacterial efficacy and exhibited the growth of all the test bacteria. The reports on antibacterial activity of sponges revealed their activity on gram positive bacteria. Various studies have confirmed the predominance of gram negative producers in the marine environment (Sakemi, *et al.,* 1988).

Marine sponge *Aplysina cavernicola* produces the aeroplysinin, aerthionin derivatives, with some antibiotic activity against *Bacillus subtilis* and *Proteus vulgaris* (Thakur and Anil, 2000). They have also confirmed that the sponge species of the southern Eastern Peninsular Indian Coast are the ideal candidates for the production of various antimicrobial (bacterial and fungal) and antifouling drugs (Selvin and Lipton, 2004, Kanagasabhapathy *et al.,* 2004). Hence, the present results profounded the promising antimicrobial activity of *Ircinia fusca* against eight active pathogenic strains. The study shows that *Ircinia fusca* possessed excellent source of antimicrobial properties and secondary metabolites.

CONCLUSION

The present investigation reveals that the marine sponges *Ircinia fusca* shows the potential source for the antimicrobial and biochemical properties. The methanol and acetone depicted strong positive antimicrobial activity. It may be due to the presence of alkaloids, glycosides, tannins, flavonoids, proteins and amino acids, steroids, carbohydrate, fats and fixed oil. The hexane and chloroform showed weak positive antimicrobial activity because absence of alkaloids, glycosides, tannins and flavonoids. The investigation indicated that *Ircinia fusca* remain an interesting source for antimicrobial activity and also suggest that could be a good source of the secondary metabolite. However it required further investigation for isolation of pure compound.

Acknowledgement:
The authors are grateful to the DST/SERB project for financial assessment and the Head, Department of Zoology, Dr.Babasaheb Ambedkar Marathwada University, Aurangabad for providing necessary laboratory facility.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Azevedo LG, Peraza GG, Lerner C, Soares A, Murcia N and Muccillo BA (2008) Investigation of the anti-inflammatory and analgesic effects from an extract of *Aplisina caissara*, a marine sponge fundament. *Clinical Pharmacology,* 52(5), 935-937.

Bergquist RP (1978) Sponges, *University of California Press,* Berkeley.

Blunt JW, Copp BR, Munro MH, Northcote PT and Prinsep MR (2005) Marine natural products, *Natural Product Reports,* 22, 15-61.

Blunt JW, Copp BR, Munro MH, Northcote PT and Prinsep MR (2006) Marine natural products, *Natural Product Reports,* 23, 26-78.

Chanas B, Pawlik JR, Lindel T and Fenical, W (1997) Chemical defence of the Caribbean sponge *Agelas clathrodes* (Schmidt). *Journal of Experimental Marine Biology and Ecology,* 208(1-2), 185-196.

Dayton PK, Robilliard GA, Paine RT and Dayton LB (1974) Biological accommodation in the benthic community at McMurdo Sound, Antarctic. *Ecological Monographs,* 44, 105-128.

Harborne JB (1998) Phytochemical methods. London: *Chapman and Hall*, 117–119.

Kanagasabhapathy M, Nagata K, Fujita Y, Tamura T, Okamura H and Nagata S (2004) Antibacterial activity of the marine sponge *Psammaplysilla purpurea*: Importance of its surface-associated bacteria. Proceedings of Oceans. *Techno-Ocean,* 4, 1323-1329.

Mokashe SS, Garg A, Anil AC and Wagh AB (1994) Growth inhibition of periphytic diatoms by

methanol extract of sponge and holothurians. *Indian Journal of Marine Sciences,* 23, 57–58.

National Committee for Clinical Laboratory Standerds (1990) Performance standards for antimicrobial disk susceptibility tests. *Approved Standard* M2-M4.

National Committee for Clinical Labotatory Standards (1990) Methods for dilution antimicrobial susceptibility tests for bacteria that grow aerobically. *Approved Standard* M7-M2.

Nigrelli, (1959) Ecology of toxicity in marine sponges. *Journal of Marine Biology.* 1432 – 1793.

Parulekar AH and Shirvoikar P (1991) Bioactivity and chemical ecology of some intertidal animals, pp. 29–35, *in* Bioactive Compounds from Marine Organisms. M. F. Thompson, R. Sarojani, R. Nagabhushanam (eds.). O*xford & IBH Publishing,* New Delhi.

Radjasa OK, Kencana DS, Sabdono A, Hutagalung RA and Lestari ES (2007) Antibacterial activity of marine bacteria associated with sponge Aaptos sp. against Multi drug resistant (MDR) strains. *Journal Matematika dan Sains,* 12, 147-152.

Reiswig HM (1973) Population dynamics of three Jamaician Demospongiae. *Bulletin of Marine Science,* 23, 191-226.

Sakemi S, Ichiba T, Kohmoto S and Saucy G (1988) Isolation and structure elucidation of onnamide A a new bioactive metabolite of a marine sponge *Theonella* sp. *Journal of American Chemical Society,* 110, 4851- 4853.

Selvin J and Lipton AP (2004) Antimicrobial activities of marine sponges collected off the coast of Santa Catarina – Biopotentials of secondary metabolites. *Hydrobiologia,* 513, 231-238.

Subugade S, Mokashe SS, Gupta SG, Lakwal VR and Kharate DS (2015) Antimicrobial potential of the marine intertidal sponge, *Ircinia fusca* from west coast of India. *Indian Journal of Pharmacology and Biological. Research,* 3(3), 12-14

Meesala S, Singh R and Watve MG (2017) Anti-*Mycobacterium* Metabolite from Marine Sponge. *Iricinia fusca. British Journal of Pharmaceutical Research, 15(4), 1-6.*

Sujatha S, Prakash GV and Jobi MD (2014) Marine sponge and its potential bioactive spectrum against CSF affected bacterial organisms. *The Pharma Innovation Journal* 3(6), 81-86.

Targett NM and Schmahl GP (1984) Chemical ecology and distribution of sponges in the Salt River Canyon, St Croix, U.S.V.I. NOAA Technical Memorandum OAR NURP-1, *Roxkville,* MD, 361-369.

Thakur NL and Anil AC (2000) Antibacterial activity of the sponge Ircinia ramose: importance of its surface- associated bacteria. *Journal of Chemical Ecology,* 26, 57-71.

Wenner EL, Knott DM, Van Dolah RF and Burrell VG (1983) Invertebrates communities associated with hard bottom habitats in south Atlantic Bight. *Estuariane, Coastal and Shelf Science,* 17, 143-158.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Effect of Anticancer Drug, Cisplatin on the Nucleolar Changes in the Developing Oocytes of Fresh Water bivalve, *Corbicula Striatella* (Deshayes1854).

Bhosale PA

Department of Zoology Sundarrao More Arts, Commerce, and Science (Sr.) College, Poladpur.Tal- Poladpur Dist-Raigad,Maarashtra ,India. 402 303.
Email : Bhosale_popat@rediffmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Bhosale PA (2019) Effect of Anticancer Drug, Cisplatin on the Nucleolar Changes in the Developing Oocytes of Fresh Water bivalve, *Corbicula Striatella* (Deshayes1854). *Int. J. of. Life Sciences*, Special Issue, A13: 9-13.

ABSTRACT

Cisplatin drug has a anticancer properties for chemotherapy against solid tumors. This drug exhibits effective chemoprevention in cancer therapy and most active cytotoxic agents in the treatment of cancer and also leads to several manipulations and cytotoxicity. In present toxicity studies, sub-lethal dose of cisplatin (LC50/10 for 96 hours) was given to an experimental model, the fresh water bivalve Corbicula striatella for 45 days. The nucleolar changes of developing oocytes from female gonads ovary were observed from control and treated bivalves by using Methyl green and Pyronin-Y stains. It was found that the chronic exposure of anticancer drug, Cisplatin (2.009 ppm) induced alterations in the structure of nucleolus and hence the nucleolus of developing oocytes showed condensation of the chromatin, aggregation of the nucleic acid such as DNA and RNA at certain locations, Overall result high dose of cisplatin the in corbicula Striatella production of multiple or overgrowth and induction of increased number of nucleoli. Extra nucleoli were more prominent in cisplatin treated bivalves after 45 days of exposure.

Keywords: Cisplatin, Anticancer drug, Developing Oocytes, Nucleolus, NOR, Corbicula Striatella.

INTRODUCTION

The important process and strategy to control the malignancies in the cancers to develop the anticancer drug that could inhibit the DNA replication. Since the expression of all the genes through the process of replication, transcription and translation several inhibitors also developed as the anticancer drugs. In cell nucleus, nucleolus is the site of the fast replication of DNA to form tandem repeats of DNA and the site for the transcription of the rRNA. The nucleolar activities are multiplied many fold in the developing oocytes. And hence this can act as the best suitable marker to screen the anticancer drugs. Lodish et al. (2000) reported that approximately 80 % of the total RNA in rapidly growing mammalian cells is rRNA and 15 % is tRNA; protein encoding mRNA is thus constitutes very small quantity of the total RNA. During embry-onic development i. e. cleavage, large quantity and number of proteins are needed.

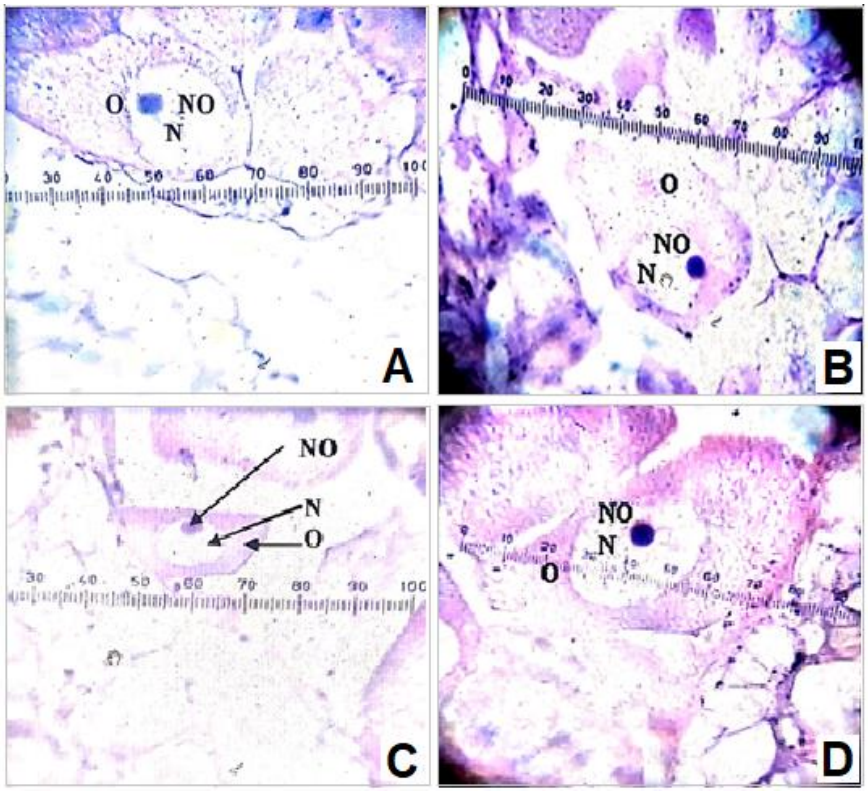
Since the DNA contents are actively involved in the process of replication for its rapid multiplication, most of the rRNA, mRNA and ribosomes required during the cleavage are synthesized during oogenesis and are stored in the ooplasm. When the developing oocytes are exposed to replication inhibitors and the transcription inhibitors, they will show varied effects on the nucleolus. Thus, by applying single anticancer drug test, one can determine whether the drug is replication inhibitor or transcription inhibitor. The nucleolus is the most important and definitely differentiated nuclear sub component. It is very important nuclear structure, where the biosynthesis of ribosome takes place. It is also clear that the nucleolus also performs non ribosomal functions. The antitumor activities of cisplatin involves induction of inter and intra crosslinks that severely leads to distortion of the DNA helix and blocks its duplication. Repair of cisplatin-DNA adducts by mammalian excision nuclease (Raska et al., 2006).

MATERIAL METHODS

The fresh water bivalves, Corbicula Striatella (D) were collected from Girna lake area near Jamda (Latitude 200 33'N, Longitude 75010'E, 352 m MSL) which is 14 km away from Chalisgaon, District Jalgaon of Maharashtra State. Bivalves were collected and brought to laboratory in aerated container. They were maintained in a glass aquarium containing dechlorinated water for 3- 4 days at 23 ^{0}C to 28 ^{0}C temperature. The PH of water was in the range of 7.0- 7.5 and well acclimatized at laboratory conditions. The water in aquarium was changed regularly after every 24 hours. After acclimatization, healthy full size bivalves of 2.8-3.00 cm height X 4.8- 5.5 cm length were selected from the aquarium and used for the experiments. The well acclimatized bivalves, Corbicula Striatella were divided into two groups with equal number of animals. They were kept in separate aquarium for 30 days. Bivalves from one group were maintained as a control and one group was treated by chronic concentration (LC50/10 value of 96 hours) of Cisplatin (2.009 ppm). 45th day of exposure, bivalves from control group and experimental group were sacrificed and their gonads were removed and fixed in Carnoy's fluid for 25 to 30 minutes only, as it is a rapid nuclear fixative. Then gonads were dehydrated in alcohol grades, cleared in xylene and embedded in paraffin wax (56 to58^{0}C). Then, prepared blocks of the gonads, trimmed and attached to microtome pegs and were then cut with the thickness of 07 µ (micron), arranged ribbons of the section on the glass slides smeared with thin film of egg albumen and affixed for 24 hours, and stained with Methyl Green Pyronin-Y stain. So as to observe the DNA and RNA specific areas in the nucleolus, the sections were also stained by Methyl Green and Pyronin-Y stains. Among sections some oocytes were without nucleus or nucleolus on the basis of path through which the sections of oocytes were taken. The oocytes in section with prominent nucleus and nucleolus were selected for the study. The characteristic features of the nucleolus and their number were counted, measured and photographed. The photographs are presented in the plates.

RESULTS & DISCUSSION

Fresh water bivalve, *Corbicula Striatella* is hermaphrodite animal. The gonads are composed of different follicles such as male and female, Ovarian follicles with four to six developing oocytes with size measures from 225 µm to 345 µm in diameter.and in the follicles, the female follicles shows developing ova of varying sizes. The size of the oocytes measures from 40 µm to 230 µm in diameter, the size of the nucleus varies from 20 µm to 64 µm in diameter while the size of the nucleolus varies from 05 µm to 28 µm in diameter. Majority of the ooctes were between 60 µm to 180 µm in diameter. The oocytes of different stages of development such as oogonia, primary oocytes, vitellogenic oocytes, mature oocytes and degenerative oocytes are also found among female gonads. The 6 micron thick sections were stained by Methyl green-Pyronin Y stain to study the changes in nucleolar structure. But, due to high rate of transcription of rRNA copies on each gene, the staining of DNA by methyl green become poor and methyl green pyronin Y stain could not differentiate the DNA and rRNA rich areas in the nucleolus. Different photomicrographs of control and treated bivalve's oocytes are given in the Photomicrograph plates -I fig a,b,c,and d shows the normal oocytes from control bivalves, stained by Methyl green-Pyronin Y stain; Mehyl green stain and Pyronin Y stain respectively. Micrometer scale measures 16 µm per ocular division at 100x magnification and 04 µm per ocular division at 400x magnifications. Each oocyte shows large nucleus and a single large nucleolus. shows the oocyte containing nucleus with single nucleolus and nucleus. Photomicrograph plates -II fig a,b,c,and d shows the oocytes stained by Methyl green-Pyronin Y stain from the bivalves exposed to chronic dose of cisplatin (2.009 ppm) for 45 days.



Figures 1: Photomicrographs of Normal histological structure of Oocytes of *Corbicula Striatella* stained by methyl green pyronin (Magnification a to d =400X). (N=Nucleus, NO-II=Nucleolus, O=Oocytes).

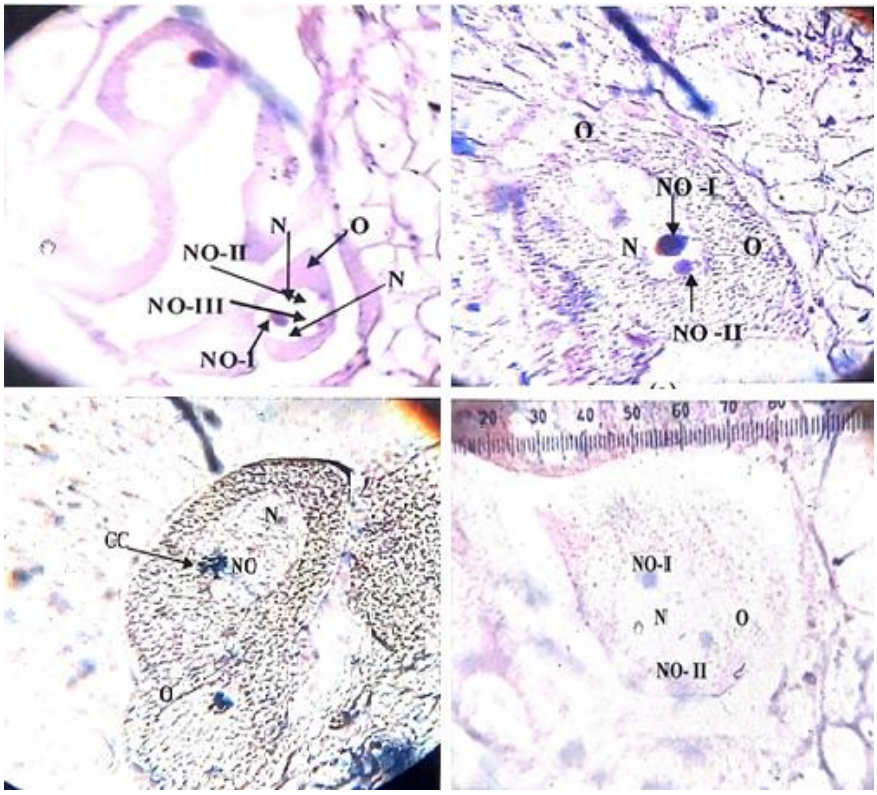


Figure 2: Photomicrographs of histological structure of Oocytes stained by Methyl green pyronin after exposure of *Corbicula Striatella* to Cisplatin for 45 days. (N=Nucleus, O=Oocytes, NO-I =Nucleus, NO-II=Nucleolus, CC=Condensed chromatin)

Plate II shows two, three and four nucleoli with extra outgrowhs and condensed chromatin. shows the oocytes stained by Methyl green-Pyronin Y stain from the bivalves exposed to chronic dose of cisplatin (2.009 ppm) Most of the oocytes are large, spherical, and subspherical in shape, and their size measures from 48 µm to 224 µm in diameter, the size of the nucleus varies from 24 µm to 64 µm in diameter while the size of the nucleolus varies from 04 µm to 24 µm in diameter. Majority of the ooctes were between 56 µm to 160 µm in diameter. The present investigation study clearly indicates that the nucleolus can be used as a biomarker for the primary screening of the DNA replication and transcription inhibitors for development of new anticancer drugs. Due to high amount of nucleic acids (i.e. DNA and RNA), nucleolus is stained darkly as per the stain used.

DISCUSSION

There may not be more NOR regions in a cell or chromosomes, but the number of nucleoli is specific to the cell type and species. However, when is demand more NOR may be involved in the formation of additional nucleoli. At the time of replication and transcription inhibition in the nucleolus, due to increased need of ribosomes, additional nucleoli can be derived from other NOR, and it can thus act as a biomarker for the indication of toxicant, if it is transcription or replication inhibitor. The present work is concerned with the nucleolar changes in the vitellogenic oocytes. Since the nucleolus is the site of speedy replication and transcription, any blockage or inhibition of these mechanisms reflects on its size, as there is single large nucleolusin the oocytes of the Corbicula Striatella. Nucleolar organizer region of the chromosomes are responsible for the development of nucleolus after mitotic phase of cell division, since nucleolus disappears during cell division. (Zambare, 1991) reported his primary studies during the reproductive cycle in Corbicula striatella and revealed that single nucleolus grows in size from 2.27 microns to 18.16 microns and showed differential staining, thus it is the best study material to show the intra-nucleolar rganization and its interaction with the growing oocytes. It can thus act as the best biomarker for the screening of the anticancer drugs (Jordan and Carmo-Fonseca, 1998). The results shown that binding of cisplatin with the DNA molecule and inhibits the replication of the DNA from their binding sites. The results of histopathological studies to study nucleolar changes in developing oocytes of Corbicula Striatella shows the condensation of chromatin material in nucleus, condensation of nucleoli, change in the shape of nucleoli, extra growth of the nucleoli, induction and formation of the supernumerary nucleoli after the exposure to the anticancer drugs, Cisplatin indicates the biomarker capacity of nucleolus. (Rozeneweig et al. 1977). Effect of cisplatin after chronic exposure of Corbicula Striatella for 45 days, has showed increased number of nucleoli in developing oocytes. The results shows that the binding of cisplatin with the DNA molecule, which can inhibit the replication of the DNA from their binding sites. Since the oocytes are highly active in the process of protein, ribosome synthesis because most of the ribosomes required during cleavage, are synthesized and stored in the ooplasm. As cleavage involves repeated process of cell division, there is no time for the synthesis of required protein synthesis machinery. Increased demand of more ribosomal rRNA may leads to increased number of the tandem repeats from the nucleolus organizer region seems to be increased and hence an extra growth on some sides of the nucleoli were found. This can also be the reason for the induction and formation of the supernumerary nucleoli. It is an effective antitumor agent used in the treatment of wide variety of human cancers (Prestayko et al., 1979), Cisplatin is very effective anticancer drug widely used in the treatment of the bladder, testis, ovary and other solid tumors (Borch,1987). The present study wills beuseful to develop the simple model for the screening of the anticancer drugs and their effects at the primary level. This study can also help us to compare effectiveness and side effects of various anticancer drugs.

CONCLUSION

The chronic exposure of Cisplatin (2.009 ppm) induced alterations in the structure of nucleolus and hence the nucleolus of developing oocytes showed condensation of the chromatin, aggregation of the RNA at certain locations, overgrowth of the nucleolus and induction of increased number of nucleoli. Extra nucleoli were more prominent in cisplatin treated bivalves after 45 days of exposure. The results also indicates that nucleolus of developing oocytes is the best biomarker, as it shows the changes on exposure to replication and transcription inhibitors. The nucleolus thus can be used as biomarker for the primary screening of anticancer drugs reacting at replication and transcription level. There may be signals from the ooplasm to the nucleus, more specifically to the NOR regions to replicate the rDNA genes for the formation of the nucleolus.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Lodish H, Berk A, Zipursky SW, Matsudaira P, Baltmore D, Darnell (2000) International journal of Molecular and cell Biology, *Fourth Edition, W. H. Freeman and Company, New York,.*

Raska IP, Shaw J, Cmarko D (2006) New insights into nucleolar architecture and activity, *International Review of Cytology. 2006;255:177-135.*

Zambare SP (1991) Reproductive physiology of the fresh water bivalve, Corbicula striatella. *Ph.D. Thesis, Marathwada University, Aurangabad (M.S.), India, 1991.*

Jorden P, Carmo-Fontseca M (1998) Cisplatin and 5-fluorouracil inhibits ribosomal RNA in vivo, Nucleic acid Research, *Copyright, 1998 by Oxford University Press. 1998; 26(12):2831- 2836.*

Rozeneweig M, Von Hoff DD, Slavik M, Mugalo FM. (1977) Ann. *International Journal of Medical. 1977;86:803.*

Prestayko AW, Daoust JC, Isselli BF, Crooke ST. (1979) Cancer Threat Rev. 1979;6:17. *Review.Br, journal of Cancer,1993;67:1171-1176.*

Borch RF. (1987):The platinum antitumor drugs: Metabolism and action of anticancer drugs, *First edition Taylar and Francis, London, 1987, 163-193.*

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Biochemical changes of fresh water fish, *Channa marulius* (Ham Buch) exposed to 3/4th Sub lethal Concentration of Cypermethrin and Fenvalerate.

[1]Bhoi SS and [2]Patole SS

[1]Department of Zoology, Uttamrao Patil Arts and Science College Dahiwel. (M. S.) 424304. India
[2]Department of Zoology, V.V.M's S.G. Patil Arts, Science and Commerce College Sakri (M. S.). India
Email: bhoiss16@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Bhoi SS and Patole SS (2019) Biochemical changes of fresh water fish, *Channa marulius* (Ham Buch) exposed to 3/4th Sub lethal Concentration of Cypermethrin and Fenvalerate., *Int. J. of. Life Sciences*, Special Issue, A13: 14-18.

ABSTRACT

The present study is aimed to evaluate the changes in total protein, total cholesterol content and the glucose in muscle of *Channa marulius* after exposure to 3/4th sub lethal concentration of Cypermethrin and Fenvalerate. It was found that as compared to control the total proteins were reduced on other hand total cholesterol and glucose was increased with increased period of exposure to both pesticides. This study will reflect the role of these biochemical parameters for assessment of aquatic pollution as far as the natural pesticides are concerned.

Keywords: *Channa marulius*, Cypermethrin, Fenvalerate, Biochemical, Protein.

INTRODUCTION

Cypermethrin and Fenvalerate are widely used as pesticide all over the world to increase the production of food grains and other agricultural-products (Bhoi *et al*., 2016) and there is increased risk of food being contaminated with the insecticide, which may harm humans and domesticated animals. Cypermethrin and Fenvalerate produce drastic effects in fishes (Patole *et al*., 2016). Biochemical and physiological biomarkers are frequently used for detecting or diagnosing sub lethal effects in fish exposed to different toxic substances (Monali and Deepronil, 2017). The pesticides can severely affects the physiological and health status of the fish (Bhoi and Patole, 2018). The most toxicants exert their effects at basic level of the organism by reacting with enzymes or metabolites and other functional components of the cell. The present study aimed to determine the sub lethal effects of Cypermethrin and Fenvalerate on some selected biochemical parameters of *Channa marulius.*

MATERIAL AND METHODS

The fresh water fish *Channa marulius* weighing (15±5 g) and length (10±3 cm) were collected from Kan and Panzara river of Sakri Tahsil (Dhule). Live fishes were brought to the laboratory and thoroughly washed under tap water and acclimatized in laboratory conditions for 15 days. They were fed

with standard fish diet (Tokyu grow certified company). Water in the tank was changes after 2 days of interval. Technical grade Cypermethrin (25%) and Fenvalerate (ISAGRO ASIA), 20% (EC) were purchased from Sushil Agricultural pesticide and fertilizer Agency.

The fishes were divided into a 4 group, each group of 10 healthy fishes were transferred to plastic tough having capacity of 10 litres and they exposed separately to 3/4th sub lethal concentrations of Cypermethrin (0.18 ppm) and Fenvalerate (0.25 ppm). One group was kept as control. At the end of exposure period, fish were randomly selected for biochemical study. Tissue like muscles was dissected out from control and experimental fishes. Estimation of total glucose was done by Phenol-Sulphuric acid method (Barham and Trinder, 1972), total cholesterol (%) with the method (Zlatkis, 1953) and total proteins (g/100g) was estimated by Lowry *et al*. (1951).

RESULTS & DISCUSSION

Glucose, Cholesterol and Protein of fresh water fish *Channa marulius* exposed to 3/4th sub lethal concentrations of Cypermethrin and Fenvalerate shown in table 1 and 2 as well as figure 1 and 2 respectively.

Table- 1: Glucose, cholesterol and protein of fish *Channa marulius* exposed to sub lethal concentrations 3/4th (0.18ppm) of Cypermethrin.

Parameters	Control	3/4th dose concentration of Cypermethrin			
		24 h	48 h	72 h	96 h
Glucose (mg/dL) (Muscle)	42.33±1.8	50.53±1.1 (8.96) *	53.34±1.6 (13.76)**	56.86±1.4 (19.09)**	59.90±1.8 (23.20)**
Cholesterol (mg/dL) (Muscle)	123.00±2.7	133.03±2.5 (7.31)*	140.7±3.0 (12.36)**	143.73±3.2 (14.21)**	152.42±3.6 (19.10)**
Protein(mg/dL) (Muscle)	10.37±0.57	8.34±0.45 (-24.34)**	7.50± 0.41 (-38.26) ***	7.27±0.10 (-42.64) ***	6.56± 0.30 (-58.07) ***

Table- 2: Glucose, cholesterol and protein of fish *Channa marulius* exposed to sub lethal concentrations 3/4th (0.25 ppm) of Fenvalerate.

Parameters	Control	3/4th dose concentration of Fenvalerate			
		24 h	48 h	72 h	96 h
Glucose mg/dL) (Muscle)	42.33±1.8	46.50±1.5 (8.96) *	49.34±1.2 (14.20) **	58.86±1.6 (28.08)**	61.90±1.5 (31.61)**
Cholesterol (mg/dL) (Muscle)	146.00±2.7	149.03±2.4 (0.020) NS	150.7±2.3 (1.12) NS	152.43±3.6 (2.25)*	154.73±3.1 (3.70)*
Protein (mg/dL) (Muscle)	10.36±0.57	10.03±0.46 (-3.29) NS	8.09± 0.42 (-28.05) **	8.01±0.10 (-29.33)* *	7.53± 0.31 (-37.58) ***

Mean ± S.D. values differ significantly (p<0.05) within same column.*Significant value: p<0.05, ** p<0.01, *** p<0.001. NS = Non-Significant (p>0.05). Values in the parenthesis are percentage change over control treated as 100 per cent.

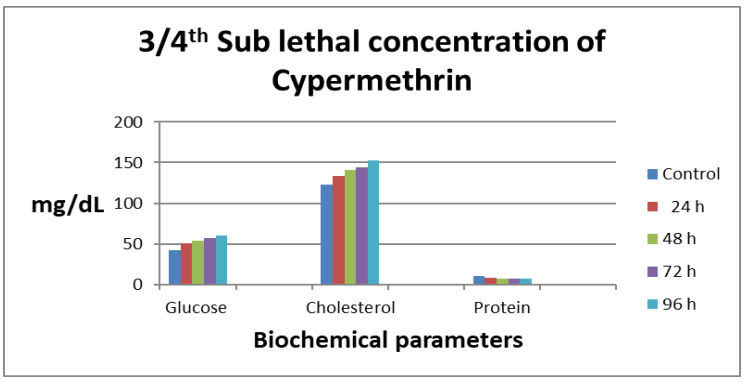


Figure 1: Glucose, cholesterol and protein content of fish *Channa marulius* exposed to sub lethal concentrations 3/4th (0.18 ppm) of Cypermethrin.

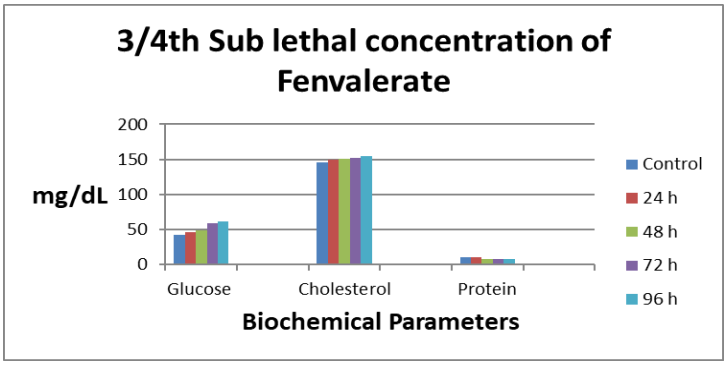


Figure 2: Glucose, cholesterol and protein content of fish *Channa marulius* exposed to sub lethal concentrations 3/4th (0.25 ppm) of Fenvalerate.

Cypermethrin

The amount of glucose in the fish exposed to 3/4th sub lethal concentration of Cypermethrin recorded as 42.33, 50.53, 53.34, 56.86 and 59.90 mg/dL in control, 24 h, 48 h, 72 h and 96 h of exposure respectively. It was found that the glucose levels were increased significantly as compared to control groups. Similarly the amount of cholesterol for control, 24 h, 48 h, 72 h and 96 h was found to contai123.0, 133.03, 140.7, 143.73, and 152.42. These figures show the level of cholesterol was found to be increased. On other hand, the protein content in the fish after exposed to 3/4th Cypermethrin was found to contain 10.37, 8.34, 7.50, 7.27 and 6.56 mg/dL of protein in control, 24 h, 48 h, 72 h and 96 h respectively. Protein content was decreased significantly than control groups.

Fenvalerate

The glucose level in 24 h, 48 h, 72 h and 96 h exposure was found to contain 46.50, 49.34, 58.86, 61.90 mg/dL and in control it was found to be 42.33 mg/dL.

Glucose content was increased significantly when compared to control groups. Whereas the amount of cholesterol in the fish after exposed to 3/4th Fenvalerate was found to contain 149.03, 150.7, 152.43 and 154.73 and mean control was 146.00 mg/dL for 24 h, 48 h, 72 h 96 h and control respectively. The Cholesterol was found to be slightly increased. The amounts of total protein were found to be as 10.36, 10.03, 8.09, 8.01 and 7.53 mg/dL in control, 24 h, 48 h, 72 h and 96 h respectively. It means the values of total protein were decreased significantly.

Biochemical parameters are sensitive index to change due to pesticide toxicity and can constitute important tools in toxicological studies (Balarko *et al*., 2012). Hence, the purpose of this work is to evaluate the 3/4th sub lethal effect of Cypermethrin and Fenvalerate on some selected biochemical parameters. Result showed that glucose and cholesterol increased significantly as the concentration of the toxicant increases. Similar result was recorded by Ojutiku *et al* (2013). They revealed that a significant increase in glucose and cholesterol level in the *Channa marulius* exposed to 3/4th sub lethal concentration of Cypermethrin and Fenvalerate insecticide. This result was also corroborated by the findings of Vishal (2012); Pallavi *et al* (2016); Sharmila and Kavitha, (2017). The decrease in protein during Cadmium chloride and Rogar exposure may be due to increased catabolism and decreased anabolism of proteins in *Oreochromis niloticus* and *Channa striatus* (Al-asgah *et al*., 2015; Bhandare *et al*., 2016)). Mohamad *et al* (2016) reported that cholesterol and glucose were increased significantly and total protein were decline in common carp, *Cyprinus carpio* exposed to Cadmium and Lead. The decreased of protein under the Cypermethrin and Fenvalerate stress noticed in the present study may be due to the utilization of amino acids in the various catabolic reactions. Decrease in protein content may be due to increased proteolysis (Chandra *et al* 2017; Subburaj *et al*., 2018)) or it may be due to metabolic utilization of the ketoacids to glucogenesis pathway for synthesis of glucose (Mehra and Singh, 2018 and Naji *et al*., 2018). Alaa *et al* (2018) found that the levels of glucose and cholesterol were increased in Nile tilapia, *Oreochromis niloticus* and African fish *Clarias gariepinus*. Al-Otaibi *et al* (2019) showed that elevated level of glucose in cat fish, *Clarias gariepinus* exposed to diazinon. The level of blood glucose and cholesterol were significantly increased while proteins were decreased significantly observed by earlier workers viz; Sehzad *et al* (2019); Mari *et al* (2019) and Okey, (2019).

CONCLUSION

Cypermethrin and Fenvalerate are important insecticides in agriculture; their toxicity to aquatic fish has been ascertained as a result of flow from agricultural land near aquatic rivers or lake because of irrigational farming. The evidence of effect on some biochemical parameter in the blood and organs of the fish should make us reduce it incidences into aquatic bodies.

Acknolwedgement

The authors are grateful to the principal, V. V. M'S S.G. Patil Arts, Science and Commerce College, Sakri Dist. Dhule (M.S.) for providing necessary laboratory facilities. Also thankful to Zoological Survey of India, Western Regional Station, Akurdi, Pune (M.S.) for the identification of fish.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Alaa, GM, Osman, KY, Abouel, F, Abdel, BM, Abdel, R, Usama, M, Mahmoud, WK and Mohsen, AM (2018).Blood Biomarkers in Nile tilapia *Oreochromis niloticus* and African Catfish *Clarias gariepinus* to Evaluate Water Quality of the River Nile. *J. Fisher. Sci.com.* 12(1): 001-015.

Al-asgah, NA, Abdel-Warith, AWA, Younis, EM and Allam, HY (2015) Haematological and biochemical parameters and tissue accumulations of Cadmium in *Oreochromis niloticus* exposed to various concentrations of Cadmium chloride. *Saudi J. Biol. Sci.* 22(5) 543-550.

Al-Otaibia, AM, Al-Balawia, HFA, Ahmada, Z and Sulimana, EM (2019) Toxicity bioassay and sub-lethal effects of diazinon on blood profile and histology of liver, gills and kidney of catfish, *Clarias gariepinus*. *Braz. J. Biol.* 79(2):326-336.

Balarko, C, Rakhi, D, Manisha, K and Ranu, N (2012) Primary and secondary stress response of *Channa punctatus* exposed to sub lethal Aluminum toxicity. *J. Appl. Sci. Environ. Sanita.* 7 (2): 125-130.

Barham, D and Trinder, P (1972) An improved colour reagent for the determination of blood glucose by the oxidase system. Analyst. 97:142-145.

Bhoi, SS, Patil, MU and Patole, SS (2016) Impact of 3/4th sub lethal concentration of Cypermethrin on haematological parameters of fish, C*hanna marulius* (Ham Buch). *Uttar Pradesh J. Zool.* 36(2): 155-160.

Bhoi, SS and Patole, SS (2018) Effect of sub lethal concentrations of Fenvalerate on histopathological changes in the gill of fresh water fish species *Channa marulius* (Ham Buch). *J. Res. and Dev*. 08(03): 170-174.

Ojutiku, RO, Asuwaju, FP, Ayanda, IO, Obande, RA and Agbelege, OO (2013) Effect of acute toxicity of Cypermethrin on some biochemical parameters of juveniles of *Claria gariepinus* (Burchell, 1822), *Int. J. Engi. Sci. Inven. 2*(3): 1-7.

Bhandare, RY, Sonawane, DL, More, PR. and Paikro, SM (2016) Effect of Organophosphate insecticide (Rogar) on protein content of *Channa striatus* from Sukhana River, Aurangabad (M. S.) Abst. Proc. 103rd Ind. Sci. Cong. Asso. Mysore.

Chandra JS, Neelima, P and Govinda, K (2017) A review on the toxicity and other effects of Dichlorvos, an organophosphate pesticide to the freshwater fish. *Biosci. Discov*. 8(3): 402-415.

Lowry, OH, Rosebrough, NJ, Farr, AL and Randall, RJ (1951). Protein measurement with the Folin phenol reagent. *J. Biol. Chem.* 193: 265-275.

Mari, SM, Parvathibai, C, Ramesh, U, Sudhakaran, MR, Raju, G, Parvathiraj, P and Sevakumar, S (2019) Effect of pH on plasma cholesterol and glucose levels of fresh water fish, *Cyprinus carpio*. *Res. J. Life Sci. Bioinform. Pharmaceut. And Chem. Sci.* 5(1):332-340.

Mehra, J and Singh, SK (2018) Furadan induced histopathological and histochemical changes in the stomach of *Macrognathus aculeatus* (Bloch). *Proc. Zool. Soc. India.* 17(1): 57-60.

Mohammad M, Seiedeh, SB, Fatemeh, M, Nahid, M, Mahbuheh, M and Nurish M (2016) Biochemical alteration induced by Cadmium and Lead in common carp via an experimental food chain. *Iran. J. Toxicol*. 10(4):25-32.

Monal, C and Deepronil R (2017) Genomic and biochemical changes in fishes due to pesticide pollution. *J. Environ. Sci. Toxicol. and Food Techn*. 11(5):06-11. www.iosrjournals.org.

Naji M, Yousef JY and Hosseinzadesh, SH (2018) Impact of Atrazine on some blood and biochemical indices in farmed *Acipenser nudiventris*. *Int. J. Ornament. Aqua. Res.* 1(1): 31-39.

Okey, IB (2019) Effect of Clove (*Eugenia corophyta*) powder anaestheic on some haematological and biochemical parameters of *Heterobranchus bidorsalis juveniles*. *J. Agri. And Aqua.* 1(1)

Pallavi, S, Ajay, S and Pandey, AK (2016) Pesticides Toxicity in fishes: Biochemical, Physiological and Genotoxic aspects. *Biochem. Cell. Arch.* 16 (2):199-218.

Patole, SS, Patil, MU and Bhoi, SS (2016) Effect of Fenvalerate Synthetic pyrethroid on a certain haematological parameters of fresh water fish, *Channa marulius*. *Int. J. Life. Sci. Scienti. Res.* 2(3):269-272.

Sharmila, G and Kavitha, AV (2017) Alterations in biochemical parameters of *Cyprinus carpio* (Linn. 1758) Induced by chronic exposure to organophosphorus pesticide, monocrotophos. *Int. J. Appl. Res.* 3(9):399-403.

Shehzad, G, Sadia, T, Munawar, SA, Naveed, A and Muhammad, FK (2019) Effect of Chlorpyrifos on haematological and seral biochemical components of fish *Oreochromis mossambicus. Pakistan J. Zool.* 51(3): 1047-1052.

Subburaj, A, Jawahar, P, Jayakumar, N, Srinivasan, A and Ahilan, B. (2018) Acute toxicity of bioassay of Malathion (EC 50%) on fish, *Oreochromis mossambicus* (Tilapia) an associated histological alteration in gills. *J. Ento. Zool. Stud.* 6(1): 103-107.

Vishal R, Santosh KS, Arpita, Kirti and Abhishek (2012) Comparative toxicity of Butachlor, Imidacloprid and Sodium fluoride on protein profile of the walking catfish *Clarias batrachus*, *J. Appl. Pharm. Sci.* 02 (06): 121-124.

Zlatkis, A and Boyle, AJ (1953) A new method for direct determination of serum cholesterol. *J. Lab. Clin. Med*. 41:481-492.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Seasonal Variations in Life Cycle Of Forensically Important Calliphoridae Fly *Lucilia Cuprina* In Nandurbar (MS) India

Mali KH[1] and Zambare SP[2]

[1]Assistant Professor, Department of Zoology, ACS College, Talasari.
[2]Prof. and Head, Department of Zoology, Dr. B. A. M. University, Aurangabad, 431 004.
E-mail:- kamleshmali28@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Mali KH and Zambare SP (2019) Seasonal Variations In Life Cycle Of Forensically Important Calliphoridae Fly *Lucilia Cuprina* In Nandurbar (MS) India, *Int. J. of Life Sciences*, Special Issue, A13: 19-23.

ABSTRACT

Forensic entomology is one of the important branch of the forensic science. It is developed over the years. It was useful for the finding post mortem interval (PMI) with the help of season of death, geographical location of death, movement or storage of remains after death etc. Insects are greatly provides valuable information from their life cycle and there developmental stages. The age of the most developed blow fly larvae (Calliphoridae) can indicate a minimum post-mortem interval (PMI) since blow flies are usually the first colonizers on remains. To calculate the age of blow fly larvae develop on a corpse, their development has to be determined as correctly as possible. This is important for solving crime. Proposed work done on the Calliphoridae fly, *Lucilia cuprina* which is common in Nandurbar district of Maharashtra state in India. The objective of this research work was to prepare preliminary database of fly present in this geographic area and environmental conditions.

Key words: Forensic entomology, PMI, Calliphoridae, *Lucilia cuprina,* Nandurbar.

INTRODUCTION

Forensic entomology as a science and most important ecological tool used for crime investigation. The analysis of insect evidence for forensic and legal purposes used within judicial systems throughout the world. A body after death is occasionally subject to destruction by different types of animals amongst which insects can have a major role in the breakdown of the cadaver. There are two primary ways to estimate the postmortem interval (PMI) of human remains using entomological evidence. Insect successions of arthropod species found on a body provide one method of determining the PMI (Schoenly and Reid, 1987). Insects arrive at decomposing remains in predictable, successive waves based on the stage of decomposition (Reed 1958; Payne, 1965). The other method utilizes the degree of development of the oldest maggots feeding on the corpse, from which one can determine a close approximation of the time since death. Insects often lay eggs within minutes or hours after death (Catts and Goff, 1992), thus providing a developmental reference. Although the amount of research increased in the

field, but there was no great popularity of this branch of forensic science in India. Information gained from forensic entomology typically is used to determine time of death, place of death and other issues of medical or legal importance (Gordh and Headrick, 2001).

Flies have been recognised as providing significant entomological evidence in the medico-legal field. The principal methodology used in medico-criminal entomology is application of the temperature dependent development of insects, especially flies, for estimating a decedent's PMI (Hall, 2001). Work conducted on the life cycle of the Calliphoridae and Sarcophagidae, the two families most likely be found on a decomposing corpse was used to figure out the time of death.

Identifying an insect specimen is an important step in a forensic entomological analysis. Several experimental studies using animal models has been investigated the intrusion of the insect community in the cadavers decomposition process. Thus, to understand the knowledge of course of cadaver breakdown and factors inhibiting or favouring colonization and development is necessary for estimating the PMI in any death by using entomological data. Therefore, the objective of the present research work was to determine the potential use of insects that are of importance in estimating the time of death for the study area.

MATERIAL METHODS

Collect the accidental dead body of dog and place to it safe in open field. After some minutes flies arise on body, they laid eggs on them. The developing stages were collected on each day (hrs). The regular observations were done and were recorded. The stages were photographed and weighed on the electronic balance. Measurements of these stages were made by means of the microscope whose least count is 0.001. At the same time the temperature and humidity (maximum, minimum and at the time of observation and collection) were recorded. Measurements of five maggots were done at each time and their average and the standard deviation was recorded in the tables. The work was carried out in three seasons, rainy, winter and summer to find out the variations in the duration of life cycle and other data with respect to the temperature. The data obtained is tabulated in the tables for different seasons. The maggots before pupation find the concealing places and usually borrow in the soil.

RESULTS & DISCUSSION

The life cycle of *Lucilia cuprina* flies in summer, winter and rainy season was completed in 226, 251 and 298 hours respectively. The details of length, width and weight variations are given in Table A, Table B and Table C in summer, winter and rainy season respectively. The details of the temperature and relative humidity variations during the development in summer, winter and rainy season are given in table D, E and F respectively.

There is no work in Nandurbar region on forensic entomology. This is the first report and attempt of insect succession on carrion carried out in the studied area. In present work we studied the seasonal variation in the life cycle of fly, *Lucilia cuprina* as it is important to study in forensic entomology. The data were collected in three different seasons i.e. summer, winter and rainy during the study period (2008 to 2009) and also mentioned some database on morphometric and environmental conditions like temperature and humidity.

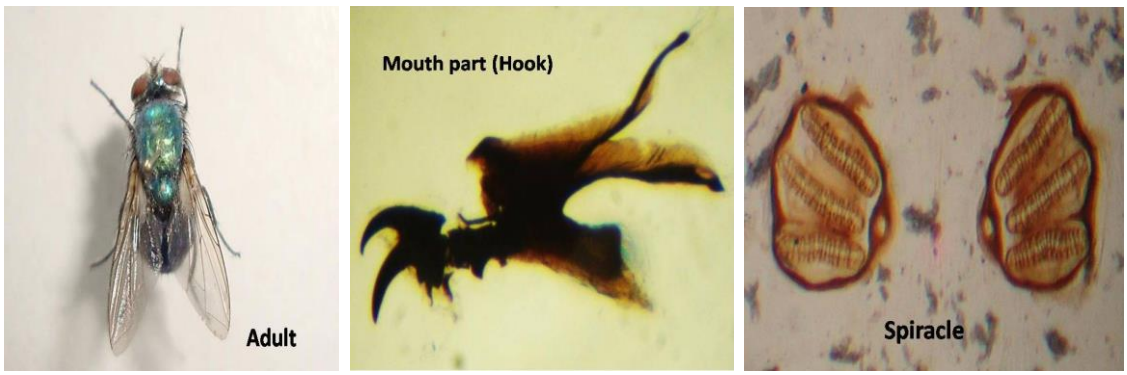


Figure 1. Shows the adult fly *Lucilia cuprina,* mouth part and posterior spiracle of larvae.

Table 1: Morphological parameters of the developing stages of *Lucilia cuprina* in summer season

Period since egg laying in Hours	Duration in hours	Development (stages)	Avg.length (mm)	Avg.width (mm)	Avg.weight (mg)
00-18±16min.	18	Eggs	1.8±0.002	0.4±0.004	0.49±0.00
18-39±26min	21	1st Instar	4.2±0.017	1±0.009	3±0.024
39 -64±29min	25	2nd Instar	8.8±0.029	1.9±0.03	21±0.54
64 -98±36min	34	3rd Instar	12.7±0.081	3±0.31	49±1.19
98 -127±1.22hrs	29	Prepupa	10.7±0.14	3±0.039	41±1.68
127-141±5.21hrs	99	Pupa	7±0.12	3±0.028	35±1.73

(±) shows standard deviation of five values

Table 2: Morphological parameters of the developing stages of *Lucilia cuprina* in winter season

Period since egg laying in Hours	Duration in hours	Development (stages)	Avg. length (mm)	Avg. width (mm)	Avg. weight (mg)
00 - 20 ± 19 min.	20	Eggs	1.8±0.04	0.4±0.006	0.48±0.002
20 - 42 ± 29 min.	22	1st Instar	4.5±0.16	1±0.003	3±0.073
42 - 65 ± 32 min.	23	2nd Instar	9±0.37	2±0.03	24±0.59
65 -104 ± 41 min.	39	3rd Instar	13±0.41	3±0.029	48±0.98
104-135±1.52hrs.	31	Prepupa	12.2±0.71	3±0.2	43 ±0.48
135-159±8.12hrs.	134	Pupa	7±0.51	3±0.14	35±1.09

(±) shows standard deviation of five values

Table 3: Morphological parameters of the developing stages of *Lucilia cuprina* in rainy Season

Period since egg laying in Hours	Duration in hours	Development (stages)	Avg.length (mm)	Avg.width (mm)	Avg.weight (mg)
00 - 21 ± 19 min.	21	Eggs	1.8±0.04	0.4±0.007	0.49±0.002
21 - 43 ± 31 min.	23	1st Instar	4±0.10	0.9±0.00	3 ± 0.03
43 - 70 ± 39 min.	27	2nd Instar	8.7±0.26	1.9±0.011	23 ± 0.59
70 -112 ± 47 min.	42	3rd Instar	12.5±0.34	3±0.09	48±1.44
112-36 ±2.23 hrs.	46	Prepupa	12±0.36	3±0.06	42±1.19
136 -182±8.2 hrs.	139	Pupa	7±0.69	3±0.07	36±1.68

(±) shows standard deviation of five values

Table: 4 : *Lucilia cuprina:* life cycle in summer season

Hours	Developed stage	Temperature (oC)			Humidity (%)		
		Recorded	Max.	Min.	Recorded	Max.	Min.
00 – 18	Eggs	34.5	37.6	28.5	30	38	19
18 – 39	1st Instar	32.8	38.3	28.8	27	35	18
39 – 64	2nd Instar	33.1	39.1	29.2	23	36	18
64 – 88	3rd Instar	34.7	40.2	29.5	22	35	19
88 – 98	3rd Instar	34.2	39.2	28.3	25	37	19
98 – 122	Prepupa	34.5	38.6	29.4	26	34	20
122 – 127	Prepupa	33.3	37.4	28.1	25	35	22
127 – 141	Pupa	33.9	37.7	28.5	24	32	21
141 – 165	Pupa	32.2	38.1	28.1	27	33	17
165 – 189	Pupa	34.9	37.4	28	26	31	19
189 – 213	Pupa	32.7	38.3	28.5	27	35	17
213 – 226	Adult	31.2	37.8	29.8	23	34	19

Table: 5: *Lucilia cuprina:* life cycle in winter season

Hours	Developed stage	Temperature (^{0}C)			Humidity (%)		
		Recorded	Max.	Min.	Recorded	Max.	Min.
00 – 20	Eggs	29.9	33	23.5	55	64	49
20 – 42	1st Instar	30.8	33.4	22.8	57	65	48
42 – 65	2nd Instar	30.1	32.1	23.2	53	66	50
65 – 89	3rd Instar	30.7	32.8	24.5	52	65	43
89 – 104	3rd Instar	29.9	32.4	22.7	54	68	46
104 – 128	Prepupa	30.2	33.1	21.8	51	71	47
128 – 135	Prepupa	29.6	32.9	22.6	56	68	45
135 – 159	Pupa	30.1	32.8	23.5	57	67	47
159 – 183	Pupa	29.7	31.9	21.3	53	69	49
183 – 207	Pupa	30.3	32.8	24.5	52	66	45
207 – 231	Pupa	29.8	32.6	22.8	57	70	47
231 – 251	Adult	30.2	32.4	23.4	56	68	48

Table: 6: *Lucilia cuprina*: life cycle in rainy season

Hours	Developed stage	Temperature (^{0}C)			Humidity (%)		
		Recorded	Max.	Min.	Recorded	Max.	Min.
00 - 21	Eggs	28.5	29	23.5	65	88	59
21 – 43	1st Instar	27.8	29.6	22.8	67	82	58
43 – 70	2nd Instar	28.1	28.1	21.2	63	76	57
70 – 99	3rd Instar	29.7	30.2	21.5	70	77	61
99 – 112	3rd Instar	28.8	29.9	23.4	71	76	59
112 – 136	Prepupa	29.3	29.8	22.7	69	78	56
136 – 158	Prepupa	28.6	30.1	21.8	71	80	57
158 – 182	Pupa	29.9	30.2	22.6	66	81	65
182 – 206	Pupa	29.7	30.6	23.5	67	76	57
206 – 230	Pupa	29.2	30.2	21.3	68	75	59
230 – 254	Pupa	29.7	30.8	23.5	72	81	65
254 – 278	Pupa	29.8	30.6	22.8	67	78	57
78 – 298	Adult	29.3	30.4	20.4	66	72	58

In general climatic conditions, mostly temperatures, play an important role in the insect activity and carrion decomposition. Variations in climatic conditions lead to differences in the decomposition speed, insect development rate and succession pattern in different habitats, seasons and geographic locations (Anderson, 2009). Insect development has been studied under various temperatures to determine development rates, thresholds, and effect on mortality.

The effect of temperature on the development of *C. macellaria* (Byrd and Butler, 1996) and on *C. rufifacies* (Byrd and Butler, 1997) was studied under various temperature regimes. Development curves for the eggs, larvae, and pupae were developed under both cyclic and constant temperatures. Anderson (2000) obtained minimum and maximum development rates of five forensically important Calliphoridae species at several temperatures, including *Phormia regina*, *Lucilia sericata*, *Calliphora vicina*, *Eucalliphora latifrons*, and *Lucilia illustris*.

The rates of insect development and their pattern of succession on the carrion differ from country to country

and even from area to area within the same country, mainly because of the variation in the topography and climate or weather. Thus, it is not possible to use the data available in one country and apply it to the crime entomology in another country.

In recent years, several mathematical models have been developed based upon observations on development times for stages and instars in experimental conditions and interpolating these data against on-site conditions to estimate PMI (Zuben, 1998).

Some forensic entomologists use the maggot's weight to pin point its age. Using the spiracles and length is the most effective way to determine age of a maggot, but in some cases the maggots are not preserved correctly and the exact length cannot be recorded and the spiracles can be difficult to identify. Most techniques used today by uninformed individuals to preserve maggots can lead to shrinkage and deformation. The most appropriate way to preserve these specimens is to fix their internal protein by placing them in boiling water for approximately 10 seconds (Tantawi and Greenberg, 1993). To use the weight of the maggot for age determination, a statistical model relating distributions of weights to age must be formulated and fit to the data.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Anderson G (2009) Forensic Entomology: The Utility of Arthropods in Legal Investigations 2nd ed., chapter Factors that influence insect succession on carrion. CRC Press, pp. 201–250.

Anderson GS (2000) Minimum and maximum development rates of some forensically important Calliphoridae (Diptera). Journal of Forensic Sciences, 45: 824-832.

Byrd JH and Butler JF (1996) Effects of temperature on Cochliomyia macellaria (Diptera: Calliphoridae) development. Journal of Medical Entomology, 33: 901-905.

Byrd JH and Butler JF (1997) Effects of temperature on Sarcophaga haemorrhoidalis (Diptera: Sarcophagidae) development. Journal of Medical Entomology, 35: 694-698.

Catts EP and Goff ML (1992) Forensic entomology in criminal investigations. Annual Review of Entomology, 37: 253-272.

Gordh G and Headrick D (2001) A Dictionary of Entomology. New York, CABI Publishing.

Hall RD (2001) Introduction: perceptions and status of forensic entomology (1-15), in Forensic Entomology: The Utility of Arthropods in Legal Investigations, J. H Byrd and J. L. Castner, Eds., CRC Press, Boca Raton, FL.

Payne JA (1965) A summer carrion study of the baby pig *Sus scrofa* Linnaeus. Ecology, 46: 592-602.

Reed HB (1958) A study of dog carcass communities in Tennessee with special reference to the insects. The American Midland Naturalist, 59: 213-245.

Shoenly K and Reid W (1987) Dynamics of heterotrophic succession in carrion arthropod assemblages: discrete series or a continuum of change? Oecologia, 73: 102-202.

Tantawi TI and Greenberg B (1993) The effects of killing and preserving solutions on estimates of larval age in forensic cases. Journal of Forensic Sciences 38: 303–309.

Zuben CJ **V**on, Bassanezi RC and Zuben FJ **V**on(1998) Theoretical approaches to forensic entomology: II. Mathematical model of larval development**.** J Appl Entomol,122**:** 275–278.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Histopathological alterations in gills of freshwater bivalve, *Lamellidens marginalis* (Lamarck) after acute exposure to Thiamethoxam and Triazophos

Rane MS[1] and Kolhe BG[2]

[1]Department of Zoology, Arts and Science College, Bhalod, Tal. Yawal, Dist. Jalgaon- 425304 (MS) India
[2]Department of Zoology, GES H.P.T. Arts and R.Y.K. Science College, Nashik - 422005 (MS) India
Email: *minakshirane1@gmail.com, drbharatikolhe23@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Rane MS and Kolhe BG (2019) Histopathological alterations in gills of freshwater bivalve, *Lamellidens marginalis* (Lamarck) after acute exposure to Thiamethoxam and Triazophos, *Int. J. of. Life Sciences*, Special Issue, A13: 24-28.

ABSTRACT

Present study was carried out to study gills histopathology in the freshwater bivalve, *Lamellidens marginalis* after acute exposure to Thiamethoxam and Triazophos. Several histopathological changes were observed in the gills of bivalves after exposure to the pesticides. Histopathological changes observed microscopically showed damages in the gills of bivalves exposed to Thiamethoxam and Triazophos, while gills of bivalves of control groups exhibited normal architecture. Increasing degrees of damage in the gills was observed in the bivalves exposed to Triazophos as compared to Thiamethoxam.

Key words: Histopathology, acute, gills, *Lamellidens marginalis*, Thiamethoxam, Triazophos.

INTRODUCTION

Contamination of aquatic systems has become a serious ecological problem all over the world from the last few decades. Contaminants like heavy metals, pesticides and persistent organic pollutants (PAHs, PCBs, etc) are the most common anthropogenic pollutants that enter the aquatic systems and increased alarmingly. Due their toxicity, genotoxicity, persistence, bioaccumulation and biomagnification in the food chain (Sunjog *et al.* 2016) they attract increasing attention in environmental studies. The occurrence of contaminants has the potential to affect the quality of aquatic ecosystem. Pesticides are widely used in agriculture for pest control (Monteiro *et al.* 2006). The aquatic ecosystem is facing the threat of biodiversity loss due to indiscriminate use of pesticides (Rahman *et al.* 2002) in order to improve the agricultural productivity to match the explosive population growth rate is a global phenomenon. Evaluation of the impacts of contaminants on the wellbeing of aquatic organisms and ecosystems is important to prevent harmful impacts of contamination on their structure and function.

Biomarkers are biological indicators from an exposure to a stressor responding in various ways (van der Oost *et al.* 2003).

They have been used extensively as a tool for detection of exposure and to provide the connection between external levels of contaminant exposure, internal levels of tissue contamination and early adverse effects of pollution in organisms (van der Oost *et al.* 2003, Hook *et al.* 2014). Study of biomarkers is necessary to conduct ecological risk assessments.

Histopathological changes are considered as fast and efficient for detection of acute and chronic adverse effects and therefore have been widely used as biomarkers in the assessment of the health of organisms exposed to contaminants. Histopathological methods can be used as an early warning system for the survival of species and ecosystem protection (Fatima *et al.* 2014). The advantage of using histopathological biomarkers in environmental monitoring allows examining specific target organs which perform significant functions and they are a reflection of the overall health of the entire population in the studied ecosystem (Braunbeck, 1993).

Bivalves have been used as bioindicators for the assessment of the quality of aquatic ecosystems worldwide. They are widespread, sedentary, filter feeders, easy to collect and accumulate toxicants according to bioavailable levels in the environment (Bervoets *et al.* 2005).

Bivalve molluscs reflect immediate responses to toxic substances present in surrounding water by change in histological arrangement (Kumar *et al.* 2011; Kamble *et al.* 2012). Morphological changes in gills are use to evaluate acute or chronic exposure to chemical present in water and sediment (Winkaler *et al.* 2001; Tkatcheva *et al.* 2004).

Several researchers studied histopathological changes in gills of the freshwater bivalve after exposure to pesticides (Lomte and Waykar, 1998; Phirke, 2008; Patil, 2010; Patnaik *et al.* 2011; Kumar *et al.* 2012c). The present study aimed to investigate histopathological alterations in gills of freshwater bivalve, *Lamellidens marginalis* (L) after acute exposure to thiamethoxam and triazophos.

MATERIAL METHODS

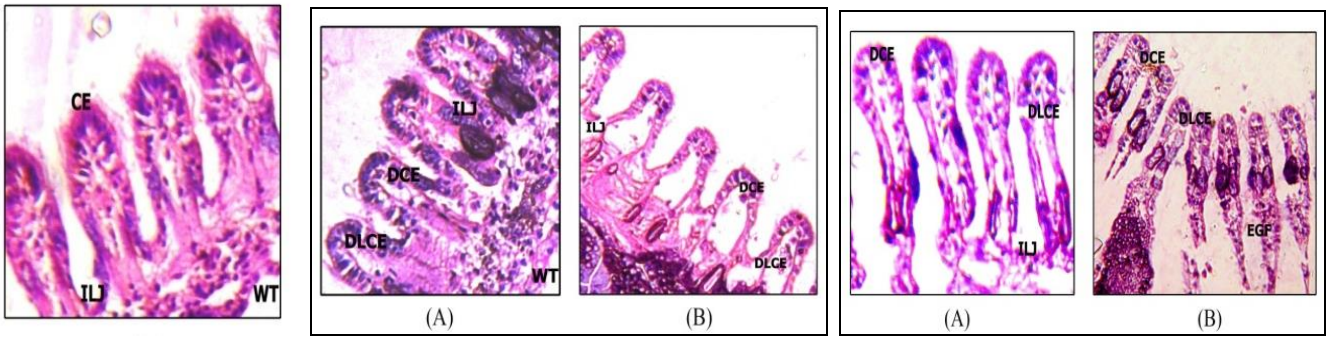
Fresh water bivalves, *Lamellidens marginalis* were collected from Hatnur dam situated on Tapi River near about 35 km away from Bhusawal city. They were cleaned and washed in a tap water and acclimatized to laboratory conditions for 5 to 6 days. During acclimatization period water in the troughs was changed every day. After the acclimatization, healthy medium sized bivalves were selected from the troughs and used for experiments. To study the effect of pesticides at cellular level, fresh water bivalves, *Lamellidens marginalis*, were exposed to the acute dose of thiamethoxam and triazophos. The acclimatized bivalves were divided into two groups with equal numbers of animals. One group was considered as control and remaining was exposed to acute concentration (LC 50/2 value of 96 hrs) of thiamethoxam (12.895 ppm) and triazophos (3.67 ppm) for 24, 48, 72 and 96 hrs.

The bivalves in each experimental group were sacrificed and their gills were fixed in aqueous Bouin's fluid after 24 and 96 hours from acute exposure. They were washed in running tap water for about six hours so as to remove the Bouin's fluid from tissues. The washed tissues were dehydrated through grades of alcohol (from 30% to 100% alcohol) and were dealcoholized and cleared in toluene. The cleared tissues were embedded in paraffin wax (58-60^{0}C) and blocks were prepared. Blocks of the tissues were trimmed and serial sections of 6 µ thickness were cut with the help of microtome. Cut sections were spread properly on the slides and were stained with Hematoxyline-Eosin. The stained sections were examined under light microscope for histopathological effect of pesticides.

RESULTS & DISCUSSION

The obtained results (Figure 1) showed histopathological changes in structural design of gills in bivalve, *Lamellidens marginalis* after exposure to acute dose of Thiamethoxam and Triazophos as compared to the bivalves maintained as control. The damages in the architecture of gills were less severe in the bivalves exposed to thiamethoxam than that of triazophos.

In bivalves maintained as control, gill lamellae consist of large number of closely set, thin, vertical, gill filaments, contain porous like structure perforated by minute opening bound by filaments. The gill filaments connected by horizontal bars, gill filaments are composed of connective tissue. Gills covered by ciliated epithelium and supported by chitanous rods.



(i) **(ii)** **(iii)**

Figure 1: Photomicrograph of sections of freshwater bivalve, *Lamellidens marginalis*,
(i) control, **(ii)** after acute exposure to Thiamethoxam (A - 24hrs, B - 96hrs) and **(iii)** after acute exposure to Triazophos (A - 24hrs, B - 96hrs).
(CE - Ciliated epithelium, ILJ - Interlamellar junction, WT - Water tube, DCE - Damaged ciliated epithelium, DLCE - Delaminated ciliated epithelium, EGF - Elongated gill filament)

Effect of Thiamethoxam on gills

Histopathological change in the architecture was characterized by degeneration of epithelial cells, swelling, vacuolated and necrotic epithelium. The secondary gill lamellae were united and the bases of the gill filaments became broader. Acute exposure to thiamethoxam for 96 hrs duration, the gill filament showed irregular shape [Figure 1: ii-B]. The severity of necrotic effects was found to be increased. The ciliary lining was damaged along with epithelium. Cells were scattered in the gill lamellae.

Effect of Triazophos on gills

Respiratory epithelium was enlarged with increased abnormality in cells and hyperplasia. Disconnection of gill filament was observed. Gill lamellae showed effects such as enlarged and swollen gill lamellae with abnormal shape with broad and bent tip. Acute exposure to triazophos for 96 hrs showed that, the gill epithelium was ruptured with damaged ciliary lining [Figure 1: iii-B]. Enlargement of gill filament and bent tips of gill lamellae were also observed. Detached secondary gill lamellae were seen. The gill filaments were severely damaged.

Histopathological changes after exposure to pesticides are defensive in nature. These abnormalities which occur at the tissue and cellular level are the result of complex physiological dysfunctions, since the gills are multifunctional organs involved in respiration, osmoregulation and filter feeding (Gosling, 2003). Gills remain in close contact with the external environment and main route of toxicants penetration into the bivalves and significant potential for accumulation of heavy metals and other pollutants (Chakraborty *et al.* 2010). Gills are primarily susceptible to changes in the quality of the water and considered as the primary target of the contaminants (Fernandes and Mazon, 2003) for identifying the effects of water toxicants.

Musthafa and Amanulla (2011) reported bulging of primary and curling of secondary gill lamellae, degeneration and necrosis of epithelial cells, distortion of secondary gill lamellae, destruction of epithelial cells and irregular appearance of gill lamellae in *L. marginalis* exposed to chloropyrifos. Pandey *et al.* (2016) reported remarkable changes in gill histopathology of *L. marginalis* exposed to mercury chloride. Ahire *et al.* (2017) revealed the changes in gill epithelium like pycnotic nuclei of epithelial cells and necrosis of connective tissue, reduction in intrallamilar space of freshwater mussel *L. marginalis* after exposure to lamda-chylothrin.

CONCLUSION

Gill tissues of freshwater bivalve, *L. marginalis* showed apparent evidence that, pesticides Thiamethoxam and Triazophos accountable for changes in normal cell architecture of gills. Hence, the changes in the histopathological structure of the gill can be use as biomarkers of exposure in the aquatic environment and the freshwater bivalve *L. marginalis* can be considered as a bioindicator organism to assess the water quality.

Acknowledgement:
Authors are thankful to the Principal of D. N. College, Faizpur for providing laboratory facilities, Prof. Dr.S.P.Zambare for his support in every phase of this research work, Prof, Dr. B.B.Waykar for his kind Support.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Ahire P, Bhamre P and Desai A (2017) Effect of lamda-chylothrin on gill and digestive gland of freshwater mussel *Lamellidens marginalis*. Trends in fisheries research, 6(2): 9-13.

Bervoets L, Voets J, Covaci A, Chu SG, Qadah D, Smolders R, Schepens P and Blust R (2005) Use of transplanted zebra mussels (*Dreissena polymorpha*) to assess the bioavailability of micro contaminants in Flemish surface waters. Environ Sci Technol, 39: 1492-1505.

Braunbeck T (1993) Cytological alterations in isolated hepatocytes from rainbow trout (*Oncorhynchus mykiss*) exposed in vitro to 4-chloroaniline. Aquatic Toxicolology, 25: 83-110.

Chakraborty S, Ray M and Ray S (2010) Toxicity of sodium arsenite in the gill of an economically important mollusc of India. Fish and Shellfish Immunology. 29: 136-146.

Fatima M, Usmani N, Hossain MM (2014) Heavy metal in aquatic ecosystem emphasizing its effect on tissue bioaccumulation and histopathology: a review J Environ Sci Technol, 7 (1), pp. 1-15.

Fernandes, MN and Mazon, AF (2003) Environmental Pollution and Fish Gill Morphology. In: Val AL and Kapoor BG, Eds., Fish Adaptation, Science Publishers, Enfield, 203-231.

Gosling E (2003) Bivalve molluscs: biology, ecology and culture. Blackwell, New York. p. 443.

Hook SE, Gallagher EP, Batley GE (2014) The role of biomarkers in the assessment of aquatic ecosystem health. Integr Environ Assess Manage, 10: 327–41.

Kamble VS, Gavhane UV and Kamble AB (2012) Effect of sub lethal treatment of organophosphorous pesticide Ekalux (Quinolphos 25% Ec) on histopathology of gonad in freshwater lamellibranch mollusc *Lamellidens corrianus* during monsoon season found near sangola, Dist. Solapur. Research Link, 96 XI (1): 28-30

Kumar S, Pandey RK, Das S and Das VK (2011) Pathological changes in hepatopancreas of freshwater mussel, *Lamellidens marginalis* (Lamarck) exposed to sub-lethal concentration of dimethoate. GERF Bulletin of Biosciences, 2(2): 18-23.

Kumar S, Pandey RK, Das S and Das VK (2012c) Dimethoate alters respiratory rate and gill histopathology in freshwater mussel, *Lamellidens marginalis* (Lamarck). J Appl Biosci, 38(2): 154-158.

Lomte VS and Waykar BB (1998) Effect of carbaryl and cypermethrin on the oxygen consumption of the freshwater bivalve, *Parreysia cylindrica*. Him. J. Env. Zool., 12 (2): 157-162.

Monteiro DA, de Almeida JA, Rantin FT, Kalinin AL (2006) Oxidative stress biomarkers in the freshwater characid fish, Brycon cephalus, exposed to organophosphorus insecticide Folisuper 600 (methyl parathion).Comp Biochem Physiol C Toxicol Pharmacol, 143(2):141-9.

Musthafa MS and Amanullah (2011) Histological alternation in the gill of freshwater mussel Lamellidensmarginalis exposed to sublethal concentration of an organophosphorus insecticide, chlopyropifos. Asian J. Microbiol. Biotech Environ Sci, 13 (1): 125-128.

Pandey Abhed, Shanthanagouda, AH, Pathak Devendra and Singh Avtar (2016) Histopathological effects in gills of freshwater mussels, *Lamellidens marginalis* exposed to mercury chloride. The Bioscan, 11(4): 2277-2280, 2016

Patil AG (2010) Impact of pesticides on certain physiological aspects of freshwater bivalve, *Parreysia cylindrica*. Ph.D. Thesis submitted to North Maharashtra University, Jalgaon, India.

Patnaik BB, Hongray HJ, Mathews T and Selvanayagam M (2011) Histopathology of gill, liver, muscle and brain of *Cyprinus carpio communis* L. exposed to sub lethal concentration of lead and cadmium. Afr J Biotechnol, 10(57): 12218-12223.

Phirke, P. P. (2008): Effect of thiodan and quinalphos on some physiological parameters of the freshwater bivalve, *Parreysia corrugata.* Ph. D. Thesis submitted to Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, India.

Rahman MZ, Hossain ZM, Ellah MFR and Ahmed GU (2002) Effect of diazinon 60 EC on *Anabas testudineus*, *Channa punctatus* and *Barbades gomonus* Naga. The ICLARM quarterly, 25, 8-11.

Sunjog K, Kolarević S, Kračun-Kolarević M, Višnjić-Jeftić Z, Skorić S, Gačić Z, Lenhardt M, Vasić N, Vuković-Gačić B (2016) Assessment of status of three water bodies in Serbia based on tissue metal and metalloid concentration (ICP-OES) and genotoxicity (comet assay) Environ Pollut, 213, pp. 600-607.

Tkatcheva V, Hyvarinen H, Kukkonen J, Ryzhkov LP and Holopainen IJ (2004) Toxic effects of mining effluents on fish gills in a subarctic lake system in NW Russia. Ecotoxicol Environ Saf, 57: 278-289. http://dx.doi. org/10.1016/S0147-6513, (03)00079-4.

van der Oost R, Beyer J, Vermeulen NPE (2003) Fish bioaccumulation and biomarkers in environmental risk assessment: A review. Environmental Toxicology and Pharmacology, 13: 57-149.

Winkaler EU, Silva AG, Galindo HC and Martinez CBR (2001) Biomarcadores histológicos e fisiológicos para o monitoramento da saúde de peixes de ribeirões de Londrina, Estado do Paraná. Acta Sci, 23(2): 507-514.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Effect of leaf extract of *Annona squamosa* on *Tribolium castaneum*

[1]Chetankumar Sharma, [2]Manoj Patil, [2]Shubhangi Naiknaware and [3]Geeta Patil

[1]Assistant Professor, Department of Zoology, Arts, Commerce & Science college, Bodwad Dist.- Jalgaon
[2]Department of Zoology, Arts, Commerce & Science college, Bodwad Dist.- Jalgaon
[3]Assistant Professor, Department of Botany, Arts, Commerce & Science college, Bodwad Dist.- Jalgaon
Email: cssharmachetan@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Sharma Chetankumar, Patil, Manoj, Naiknaware Shubhangi and Patil Geeta (2019) Effect of leaf extract of *Annona squamosa* on *Tribolium castaneum*, *Int. J. of. Life Sciences*, Special Issue, A13: 29-32.

ABSTRACT

Store grain pests are damaging our economy by infecting agriculture stored product. Present investigations evaluated the mortality of *Tribolium castaneum* (Herbst) after the treatment of Leaves extract of *Annona squamosa* in aqueous solvent. After treatment of 96 hrs. leaf extract of *Annona squamosa* show the insecticidal effect in aqueous extract show LD_{10} and LD_{50} Values at 1.416 and 3,951 ml/kg respectively.

Key words: Agriculture, *Tribolium castaneum*, Aqueous, *Annona squamosa,* Insecticidal.

INTRODUCTION

Tribolium castaneum (Herbst) is a most serious pest of stored products and also known as Red flour beetle. It included in the family Tenebrionidae i.e. darkling beetles. Both the adults and grubs cause serious damage to some kinds of grains including broken grains, stored and dried fruits. This pest generally found in granaries, mills, warehouse etc. and attacks stored grain and other food product including flour, cereals, etc. (Kota and Pulin, 2017). Their damage to stored grains and grain products may amount of 5-10% in the temperate zone and 20-30% in the tropical zone (Nakakita, 1998). Insect pests cause damage to stored grains and processed products by reducing their dry weight and nutritional value (Sinha and Watters, 1985).

Chemical pesticides are largely used as pesticides in crop protection could be environmental pollutants and have undesirable effects on animals and human beings. Therefore, the development of bioinsecticides has been focused as a viable pest control strategy in recent years (Khambay *et al*., 2002; Gonzalez *et al*., 1999; Meena *et al*., 2006; Hashim and Devi, 2003). Biopesticides play a vital role in grain protection due to its insecticidal properties. The plant kingdom can be rich source of a variety of chemicals with the potential for development as successful pest control agents (Arnason *et al*., 1989 and Rahman *et al*., 1999). Many plants have been reported due to their insecticidal properties and attack on its target pests without damaging other useful insects. The seed of *Annona squamosa* contain 42-45% fat, annonain and skuamosin (belonging to the asetogenin groups) which are toxic (Contact or stomach poison) to insects (Londershausen *et al*., 1991; Kardinan 2000; Leatemia and Isman, 2004).

MATERIAL METHODS

Research is carried out at Department of Zoology. Insect were collected from grains godown near local market. The insect was tested in glass beaker under the laboratory condition. A beaker is closed with muslin cloth and tied with rubber band to avoid the discharge of insect.

Preparation of Plant Extract:
The fresh leaves of *Annona squamosa* were collected from the field near Bodwad and were dried in the shade and then in the oven. The dried leaves were powder in the grinder and stored in polyethylene bags. The powder was packed in filter paper and extract was extracted in soxhlet apparatus at the ratio of 1:10 in water i.e. aqueous solvent. After eight hours of extraction extract was kept in evaporate for 48 hrs. Prepare various concentration of extract for testing the biopesticidal properties. Recorded, mortality rate at various concentration and it compared with the control.

RESULTS & DISCUSSION

A toxic effect of leaf extract *Annona squamosa* in aqueous solvent was evaluated against *Tribolium castaneum*. Therefore, lethal and subletahal doses were calculated for the extract. The range of statistical calculations and determination of LD_{10}, and LD_{50} values are done as per Finney's (1971).

Table 1. shows comparison of LD_{10} and LD_{50} value of the aqueous extract of Leaves of *Annona squamosa* after calculating regression equation i.e. LD_{10}=1.416mg/ml and LD_{50}=3.951mg/ml.

The Figure 2. shows the empirical and Improved expected probit against the log of concentration, given in figure for Regression and Provisional lines for LD_{10}, and LD_{50} values after exposure of 96 hours.

Photographs Show the experimental setup of the present investigation at various concentration is seen at photo A. Photo B. Observation of the results and obtaining result is compared with control. Evaporation of solvent into the extract at room temperature is seen at photo C. Photo D. Show the Extraction of plant by using Soxhlet apparatus at 1:10 ratio in aqueous solvent.

Present investigation shows that, the aqueous extract of leaves of *Annona squamosa* were effective to control the *Tribolium castaneum*. 40% repellency was reported by Khin (2019) after the treatment of aqueous extract of Annona squamosa on *Tribolium castaneum* at 96 hrs.

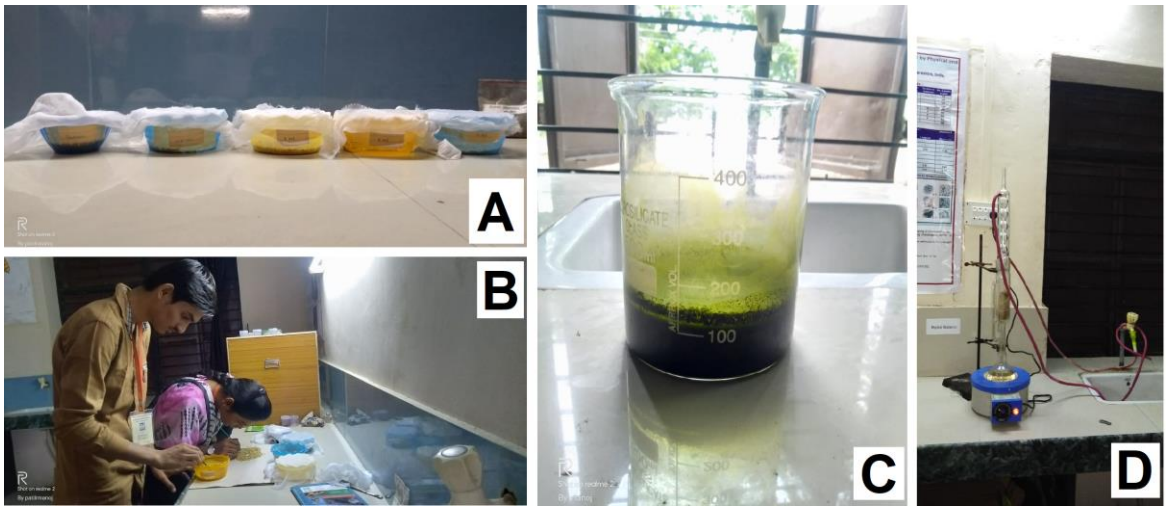


Figure 1: A. Experimental setup, **B.** Observation of the experiment, **C.** Evaporation of Extract, **D.** Extraction of Plant

Table 1. Comparision of LD_{10} and LD_{50} value of leaf extract of *Annona squamosa* to *Tribolium castaneum*.

Sr.No.	Plant Name	Time of exposure	Regression equation Y = a + b (x−x̄)	LD_{10} value in ml/kg	LD_{50} value in ml/kg
1	Annona squamosa in Aqueous	96 Hrs	Y=2.8750x + 3.2843	1.416	3.951

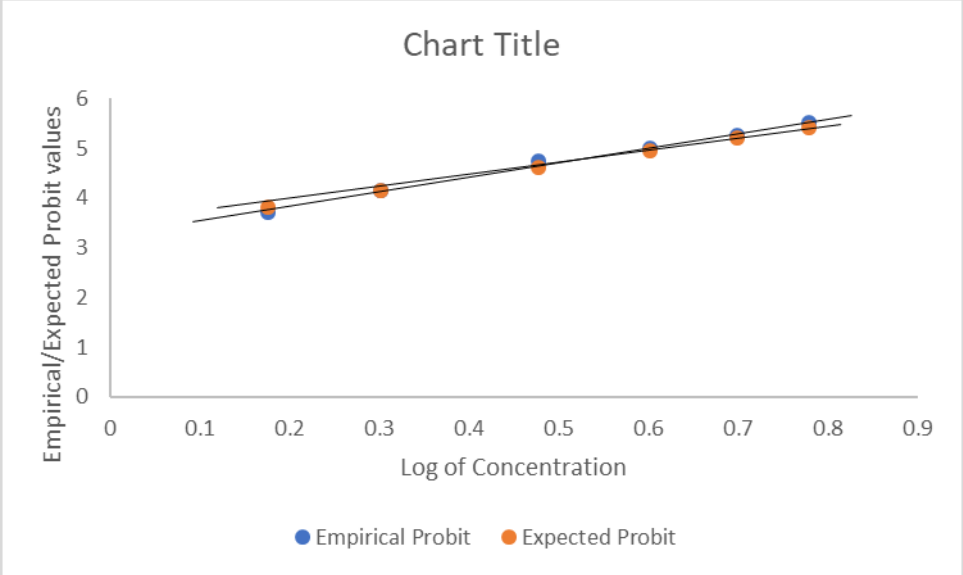


Figure 2: shows Provisional lines of Empirical and Improved expected probit against log of concentration.

Sonkamble *et al*., (2000) recorded seed extract at 1.5 % concentration show highest mortality in *H. armigera* (43.33%) and 36.66% mortality at 1% Concentration in *S. litura*.

The insecticidal properties of leaves and seeds of sugar apple (Annona species), demonstrated by the alkaloid group of linear fatty acids of the C-32 and C-34 which called acetogenin (Dharmasena *et al*., 2001), which acts as an insecticide, an inhibitor of eating and a rejection of a number of major pests of agriculture both in the field and in storage/warehouse (Prakash & Rao 1997). These compounds have been reported as insecticides, acaricides, antiparasitic and bactericidal (Guadano *et al*., 2000). Mohiuddin *et al*., (1987) who obsevered 75% repellency of *Momordica charantia* against *Tribolium castaneum*.

CONCLUSION

In present investigation insecticidal properties of leaves extract in aqueous solvent of *Annona squamosa* was studied to control *Tribolium castaneum* (Herbst). LD_{10} and LD_{50} values are also calculated at 96 hrs. of exposure and it show 1.416 and 3.951 respectively.

Acknowledgement:
Authors are highly grateful to the Management and Principal of the institution of respective college to carry out the present investigation.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Arnason JT, Philogene BJR and Morand P (1989) Insecticides of plant origin. American chemical society, Washington, D.C.387.

Dharmasena CMD, Blaney WM, Simmonds MSJ (2001) Effect of storage on the efficacy of powdered leaves of *Annona squamosa* for the control of *Callosobruchus maculatuson* cowpeas (Vigna unguiculata). *Phytoparasitica* 29:36.

Finney DJ (1971) Probit analysis. Cambridge university. Press, London, England.

Gonzalez, CA, Gutierrez C, Hubuer H, Terrero D, Fraga BMJ (1999) Agricultural Food Chemistry, 47(10): 4419.

Guadano A, Gutierrez C, Delapena E, Cortez D, Coloma GA (2000) Insecticidal and mutagenic evaluation of two annonaceous acetogenins. *J. of Natural Products*, 63: 773-776.

Ha shim MS and Devi KS (2003) Insecticidal action of the polyphenolic rich fractions from the stem bark of Streblus asper on Dysdercus cingulalus, 74, *Fitoterapia* (7-8): 670-676.

Kardinan A (2000) Botanical Pesticides, concoction and applications. Penebar Swadaya, Jakarta. 80pp.

Khambay SPS, Beddie DG, Simmonds MSJ (2002) *Phytochemistry*, 59- 69.

Khin Myint Mar (2019) Insecticidal and repellant activities of Sugar Apple Leave extract against stored grain pest, *Tribolioum castaneum* (Herbst 1797) (Coleoptera: Tenebrionidae). *Int. J. of Agriculture and Agribusiness* ISSN: 2391-3991, Volume 3 Issue 1 PP. 53-60.

Kota Sathish and Pulin Patgiri (2017) Laboratory evaluation of some indigenous plant extracts against red flour beetle, *Tribolium castaneum* Herbst. J. of Entomology and Zoology Studies JEZS 2017;5(4): 1600-1606.

Leatemia JA and Isman MB (2004) Efficacy of crude seed extracts of *Annona squamosa* against diamondback moth, *Plutella xylostella* L. in the greenhouse. Int. J. of Pest Management 50: 129-133.

Londershausen M, Leicht W, Lieb F, Moeschler H, Weiss H (1991) Molecular mode of action of Annonins. Journal Insect Physiology 39:903-924.

Meena R, Suhag P, Prates HT (2006) Evaluation of ethanolic extract of *Baccharis genistelloides* against stored grain pests. Journal of Stored Products Research, 34(4): 243-249.

Mohiuddin S, Qureshi RA, Khan MA, Nasir MKA, Khatri LM and Qureshi SA (1987) Laboratory investigations on the repellency of some plant oils to red flour beetle. *Tribolium castaneum*.

Nakakita H (1998) Stored rice and stored product insects. In: Rice inspection Technology. Tokyo: A.C.E. Corporation, P. 49-65.

Prakash A and Rao J (1997) Botanical pesticides in agriculture. CRC Lewis publishers. Boca Raton, USA 481.

Rahman MM and Scmidt GH (1999) Effect of Acorus calamus (L.) (Araceae) essential oil vapours from various origins on C*allosobruchus phaseoli* (Gyllenhal) (Coleoptera: Bruchidae) J. Stored Prod. Res 35:285-295.

Sinha RN and Watters FL (1985) Insect pests of flour mills, grain elevators and feed mills and their control. Agriculture Canada. Publication 1776, Ottawa, ON, Canada.

Sonkamble MM, Dhanorkar BK, Das BC and Mohanty S (2001) Efficacy of indigenous plant extracts against *Helicoverpa armigera* (Hubner) and *Spodoptera litura* (Fabricius) under laboratory conditions. J. Soils Crops 10: 236-239.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Preliminary survey of Wild Edible Plant Resources in Rajgarh (M.P.)

Hemant Kumar Nahar

Research Scholar, Dept. of Botany,Barkatullah University, Bhopal (M.P.)
Email: Hemantnahar19@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Hemant Kumar Nahar (2019) Preliminary survey of Wild Edible Plant Resources in Rajgarh (M.P.), *Int. J. of. Life Sciences*, Special Issue, A13: 33-38.

ABSTRACT

The present study was carried out in the Rajgarh district of Madhya Pradesh, India to document the diversity, indigenous uses and availability status of wild edible plants. Tribals are mainly depending on it and preserve this plant. The inhabitants of the region are dependent up to a large extent on wild resources for their food and other daily needs. The region is rich in wild edible plant resources. Plant parts such as leaves, shoots, young twigs, roots, rhizomes, tubers, flowers, fruits, seeds, etc. are used for food by the local people. The study will be helpful in developing a comprehensive data base on wild plant resources, strengthening the food security in area and in conserving the traditional knowledge for the prosperity of the remote areas. Plant survey was conducted in the year 2018-2019 in eight villages of Rajgarh district of Madhya Pradesh. A total of 25 species belonging to 18 genera and 16 families was reported with further emphasis on their vernacular names, along with habitat which are used in their daily life in Rajgarh district of Madhya Pradesh, India. Out of the recorded species 12 were herbs, 6 shrubs, 6 trees and the rest one species were climbers. These plant species were arranged alphabetically by their families. Among the documented plants, 8 were abundant, 12 common and 5 uncommon to this area. This wisdom available with the tribes is transmitted only through oral communication therefore needs conservation.

Key words: wild edible plants, Rajgarh, food security

INTRODUCTION

Rajgarh district of Madhya Pradesh is known to have a rich flora of medicinal plants as well as wild edible plants. The scant knowledge concerning medicinal plants prompted investigation on intensive search of systematic study to better understanding of traditional healing. The present study aims to create awareness about Wild Edible Plant Resources in Rajgarh (M.P.) to draw the attention of taxonomist and other research workers. In rural areas majority of people are still depend on wild plants for their various requirements. The variety of plants has been used by tribals and people residing in the remote areas of Rajgarh district. They are well familiar with the local flora occurring in their surroundings. Wild edible plants have played an important role in human life since time immemorial. Throughout the history, wild edible plants have sustained human populations in each of the

inhabited continents (Khyade *et al*. 2009). Plants are natural industries, which provide high quality food and raw material for pharmaceutical, cosmetic and perfumery industries without causing environmental degradation. Medicinal plants as a group comprise approximate 8000 species and account for around 50% of all the higher flowering plant species of India (Jain *et al*.2006).

MATERIAL METHODS

Systematic plant survey was carried out during 2018-2019. Plant collection was carried out by Standard method (Jain and Rao 1977). The current survey was conducted among 10 different regions of Rajgarh District Area. The choice of the individual informant to be interviewed was of fundamental importance to the reliability of the gathered information. I only selected who utilized wild edible plants as part or all of their activity, and who were regarded as professional. Questions addressed to the informants were mainly focused on wild edible plant resources. Botanical specimens of recorded plants were collected and materials were mounted on herbarium sheet. Plant specimen was identified with the help of Flora (Verma *et al*.1993; Khanna *et al*.2001, Mudgal *et al*.1977) and available literature.

Study area

Rajgarh District is located in the Northern part of Malwa Plateau. It forms the North Western part of Division of Bhopal Commissioner. Rajgarh District extends between the parallels of Latitude 23 27′ 12″ North and 24 17′ 20″ North and between the meridians of Longitude 76 11′ 15″ and 77 14′ East. It has a Quadrangular shape with the Northern and Western sides longer than the Southern and Eastern sides respectively. The zigzag boundaries of the District resemble a pear. Rajgarh District is bounded by Shajapur District in the South as well as west. The District of Sehore, Bhopal, Guna and Jhalawar (Rajasthan) enclose it from the South-East, East, North-East, and North directions respectively. The total Geographical area of the District is 6,154 sq. km. according to census 2011 population of Rajgarh is 15, 45,814. Total Villages is 1728 in the district. It is one of the small districts of Madhya Pradesh both in respect of area and population. It is 145 KMs from the State capital Bhopal (Figure 1)

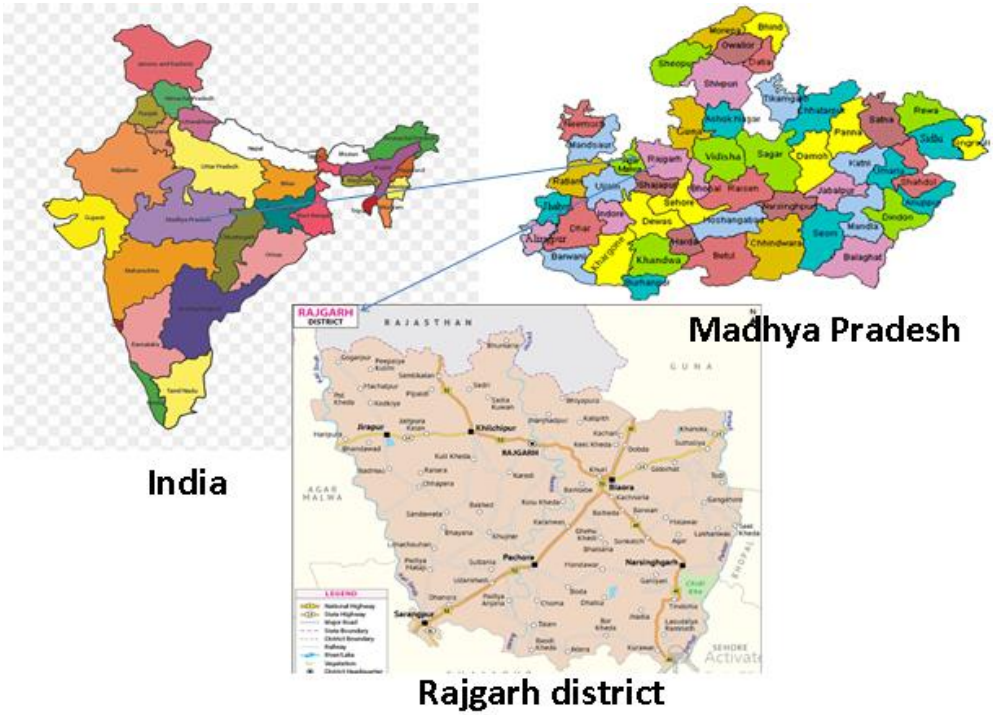


Figure 1 study area

RESULTS & DISCUSSION

During present study it was noted that the inhabitants especially of farming communities in rural Parts consume certain wild plants in raw or cooked form. Plant survey was conducted in the year 2018-2019 in eight villages of Rajgarh district of Madhya Pradesh. These are the main ingredients in their diets. Usually during famine it is used as complementary to main food stuff. Tribals are mainly depending on it and preserve this plant. The inhabitants of the region are dependent up to a large extent on wild resources for their food and other daily needs. The region is rich in wild edible plant resources. Plant parts such as leaves, shoots, young twigs, roots, rhizomes, tubers, flowers, fruits, seeds, etc. are used for food by the local people. The study will be helpful in developing a comprehensive data base on wild plant resources, strengthening the food security in area and in conserving the traditional knowledge for the prosperity of the remote areas. A total of 25 species belonging to 18 genera and 16 families was reported with further emphasis on their vernacular names, along with habitat which are used in their daily life in Rajgarh district of Madhya Pradesh, India. Out of the recorded species 12 were herbs, 6 shrubs, 6 trees and the rest one species were climbers. These plant species were arranged alphabetically by their families. Among the documented plants, 8 were abundant, 12 common and 5 uncommon to this area. This wisdom available with the tribes is transmitted only through oral communication therefore needs conservation.

Table 1: Medicinal plants used in Rajgarh District

SN	Botanical name	Family	Life form	Plant part used	Availability
1.	*Adhatoda zeylanica Med.*	Acanthaceae	S	Leaves	$
2.	*Amaranthus caudatus L.*	Amaranthaceae	H	Shoot	$$
3.	*Amaranthus cruentus L.*	Amaranthaceae	H	Leaves	$$
4.	*Amaranthus spinosus L.*	Amaranthaceae	H	Leaves	$$
5.	*Amaranthus spinosus L.*	Amaranthaceae	H	Leaves	$$$
6.	*Amaranthus tricolor L.*	Amaranthaceae	H	Shoot	$$
7.	*Amaranthus tricolor L.*	Amaranthaceae	H	Leaves	$$
8.	*Amaranthus viridis L.,*	Amaranthaceae	H	Leaves	$$
9.	Bauhinia purpurea L.	Caesalpiniaceae	T	Flowers	$$
10.	Bauhinia racemosa Lam.	Caesalpiniaceae	T	Flowers	$$
11.	*Bombax ceiba L.*	Bombacaceae	T	Flowers	$$
12.	Chenopodium album L.	Chenopodiaceae	H	Leaves	$$$
13.	*Cleome viscosa L.*	Cleomaceae	H	Seeds	$
14.	*Cucumis prophetarum L.*	Cucurbitaceae	C	Fruits	$
15.	*Dendrocalamus strictus (Roxb.) Nees*	Poaceae	S	Rhizome	$$
16.	*Grewia oppositifolia Buch.-Ham. Ex Don*	Tiliaceae	T	Fruits	$
17.	*Mangifera indica L.*	Anacardicaeae	T	Fruits	$$$
18.	*Mentha arvensis L.*	Lamiaceae	H	Leaves	$$$
19.	Murraya koenigii (L.) Sprengel	Rutaceae	S	Leaves	$$$
20.	Oxalis corniculata L.	Oxalidaceae	H	Leaves	$
21.	*Phyllanthus emblica L.*	Euphorbiaceae	T	Fruits	$$$
22.	*Senna tora (L.) Roxb*	Caesalpiniaceae	S	Fruits	$$
23.	*Solanum nigrum L.*	Solanacae	H	Fruits	$$$
24.	*Woodfordia fruticosa (L.) Kurz.*	Caesalpiniaceae	S	Flowers	$$
25.	*Ziziphus oxyphylla Edgew.*	Rhamnaceae	S	Fruits	$$$

Abbreviations: H = herb, S = shrub, T = tree, Cl = climber, +++ = abundant, ++ = common, + = uncommon

Table 2: Floristic spectrum of plants used in Rajgarh District

Sn	Plant part used	No. of Species
1.	Flower	4
2.	Fruit	7
3.	Leaves	10
4.	Rhizome	1
5.	Seed	1
6.	Shoot	2

Table 3: Distribution of medicinal plants in Rajgarh District

Botanical name	Ko	Kar	Kh	Sul	Ud	Dh	Pad	Kar
Adhatoda zeylanica Med.	✓	✓		✓	✓	✓		✓
Amaranthus caudatus L.		✓			✓	✓		✓
Amaranthus cruentus L.	✓		✓	✓	✓		✓	
Amaranthus spinosus L.		✓	✓		✓		✓	
Amaranthus spinosus L.	✓	✓	✓	✓				
Amaranthus tricolor L.				✓	✓	✓		
Amaranthus tricolor L.	✓	✓	✓		✓	✓		
Amaranthus viridis L.,		✓	✓	✓		✓	✓	✓
Bauhinia purpurea L.	✓		✓	✓	✓		✓	✓
Bauhinia racemosa Lam.	✓	✓			✓		✓	✓
Bombax ceiba L.		✓	✓	✓			✓	
Chenopodium album L.	✓		✓	✓	✓	✓		
Cleome viscosa L.	✓	✓			✓	✓		✓
Cucumis prophetarum L.	✓	✓	✓	✓		✓		✓
Dendrocalamus strictus (Roxb.) Nees	✓		✓	✓	✓	✓	✓	✓
Grewia oppositifolia Buch.-Ham. Ex Don		✓	✓		✓		✓	
Mangifera indica L.	✓	✓	✓	✓				
Mentha arvensis L.				✓	✓	✓		
Murraya koenigii (L.) Sprengel	✓	✓	✓		✓	✓		
Oxalis corniculata L.		✓	✓	✓		✓	✓	✓
Phyllanthus emblica L.	✓		✓	✓	✓		✓	✓
Senna tora (L.) Roxb	✓	✓			✓		✓	✓
Solanum nigrum L.		✓	✓	✓			✓	
Woodfordia fruticosa (L.) Kurz.	✓		✓	✓	✓	✓		
Ziziphus oxyphylla Edgew.	✓	✓			✓	✓		✓

Abs.=Ko=Kolukheda,kar=Karanwas;kh=Khujner;sul=Sultania;Ud=Udankhedi;Dh=Dhanora;Pad=Padlya mataji; Kare=Karedi

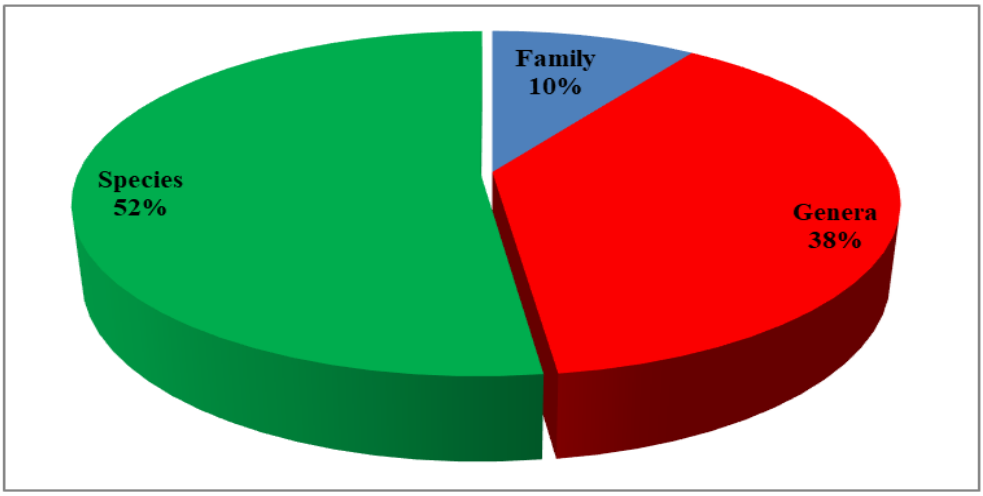


Figure 2: statistical analysis of taxa

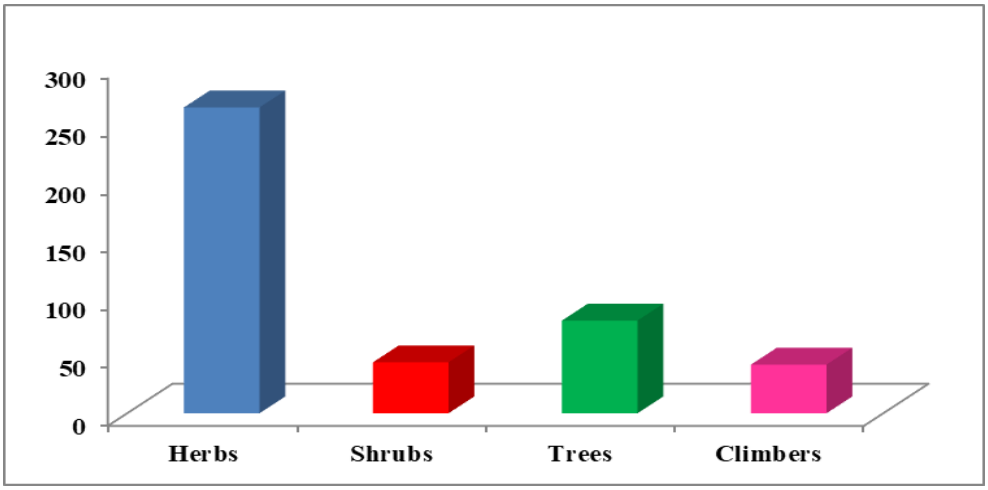


Figure 3: Distribution of medicinal plants in Rajgarh District

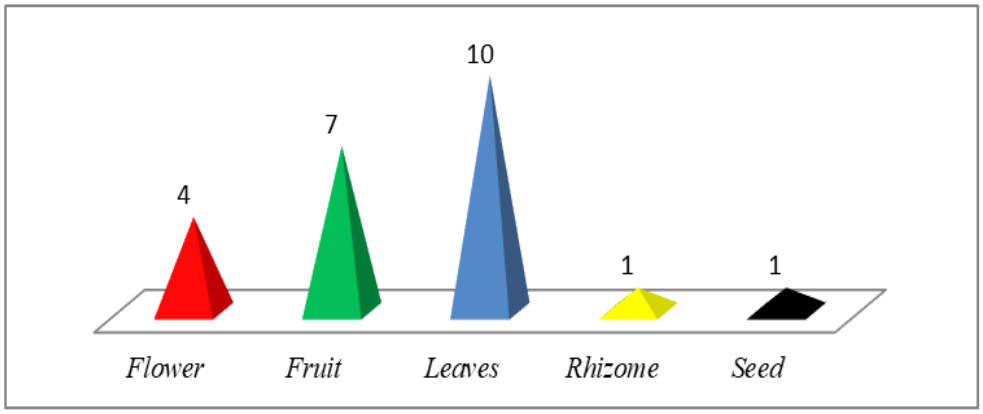


Figure 4: Floristic spectrum of the plants used in Rajgarh District

CONCLUSION

The present study provides comprehensive information on diversity, availability status and indigenous uses of wild edible plant resources. Based on the results, it can be concluded that The area has high potential of wild edible plant species. Therefore, there is a need to develop adequate strategy and action plan for the conservation and management of wild edible plants, so that sustainable utilization of these species could be ensured. As Rajgarh District traditional medical knowledge is orally passed down via lifestyle, it is important to exhaustively document and publicize medicinal plant knowledge within the young generation

to raise awareness of and appreciation for their traditional values and for the conservation and sustainable use of the plants as well as to keep the traditional medical knowledge left in their community alive.

Acknowledgement
Author are also thank full to tribal, local men for corporation in providing information about the plant.

Conflicts of interest: The authors stated that no conflicts of interest.

References

Jain SK and Rao RR (1977) A handbook of field and herbarium method, today and tomorrows. Printers and publisher New Delhi, India.

Jain JB. Kumane CS, Bhattacharya S (2009) Medicinal flora of Madhya Pradesh & Chhattisgarh –a Review.IJTK.5:2.237-242.

Khanna KK, Kumar A, Dixit RD and Singh NP (2001) Supplementary flora of M. P. BSI Pub., India

Khyade MS, Kolhe SR and Deshmukh BS (2009) Wild Edible Plants Used By the Tribes of Akole Tahasil of Ahmednagar District (Ms), India, Ethnobotanical Leaflets, 13, 1328- 1336.

Mudgal V,Khanna KK and Hajara PK (1997) Flora of Madhaya Pradesh.2.

Verma DM, Balakrishnan NP and Dixit RD (1993) Flora of M. P..BSI, Calcutta, India 1.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Preliminary Ethno- botanical survey of some medicinal plants in Rajgarh (M.P.), India

Hemant Kumar Nahar

Research Scholar, Department of Botany, Barkatullah University, Bhopal (M.P.), India
Email: Hemantnahar19@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Hemant Kumar Nahar (2019) Preliminary Ethno- botanical survey of some medicinal plants in Rajgarh (M.P.), India *Int. J. of. Life Sciences*, Special Issue, A13: 39-43.

ABSTRACT

The aim of the present study was primarily to evaluate the medicinal uses of the plants known to some Rajgarh district of Madhya Pradesh, India tribes and to encourage preservation of their culture, conservation and sustainable utilization of the plant wealth. The present study revealed a record of 15 plant species belong to 13 families and 15 genera was reported with further emphasis on their vernacular names, popular uses, parts used along with habitat which are used in the folk medicine of Rajgarh district of Madhya Pradesh, India. These plant species were arranged alphabetically by their families and Plant part & Disease. Ethono- medicinal plant survey was conducted in the year 2018-2019 in eight villages of Rajgarh district of Madhya Pradesh which are used in different disease. Floristic spectrum of the Ethno medicinal plants used in Rajgarh District are shown in Table 2. life forms are shown in Fig-3. tree species is maximum used for ethono-medicine. It is believed to be a form of healthcare in many Aspects of curing practices. The plants were arranged alphabetically by their Botanical name followed by Family name, Plant parts used and medicinal uses. This wisdom available with the tribes is transmitted only through oral communication therefore needs conservation.

Key words: Medicinal plants; Ethnobotany; Rajgarh.

INTRODUCTION

Rajgarh District is located in the Northern part of Malwa Plateau. It forms the North Western part of Division of Bhopal Commissioner. Rajgarh District extends between the parallels of Latitude 23 27′ 12″ North and 24 17′ 20″ North and between the meridians of Longitude 76 11′ 15″ and 77 14′ East. It has a Quadrangular shape with the Northern and Western sides longer than the Southern and Eastern sides respectively. The zigzag boundaries of the District resemble a pear. Rajgarh District is bounded by Shajapur District in the South as well as west. The District of Sehore, Bhopal, Guna and Jhalawar (Rajasthan) enclose it from the South-East, East, North-East, and North directions respectively. The total Geographical area of the District is 6,154 sq. km. With a population of 15, 45,814 according to census 2011. Total Villages is 1728 in the district. It is one of the small districts of Madhya Pradesh both in respect of area and population. It is 145 KMs from the State capital Bhopal.

The purpose of the present study was to document the indigenous medicinal plants used by the locals of Rajgarh District with emphasis on those have never been described in the ethno- botanical literature of Rajgarh District or with new therapeutic uses. The scant knowledge concerning medicinal plants prompted investigation on intensive search of systematic study to better understanding of traditional healing.

MATERIAL METHODS

The current ethnopharmacological survey was conducted among 21 local practitioners in different regions of Rajgarh District Area (Fig.1). The choice of the individual informant to be interviewed was of fundamental importance to the reliability of the gathered information. I only selected practitioners who utilized medicinal plants as part or all of their therapeutic activity, and who were regarded as professional. Questions addressed to the informants were mainly focused on ailments and diseases treated, therapeutic part(s) of plants. A therapeutically efficacious effect was accepted if use is mentioned by at least three different informants. Botanical specimens of recorded plants were collected and materials were mounted on herbarium sheet. Plant collection was carried out by standard method (Jain, and Rao, 1977). Plant specimen was identified with the help of Flora (Verma *et al*., 1993; Khanna *et al*., 2001, Mudgal *et al*., 1977) and available literature.

RESULTS & DISCUSSION

Information obtained from the analysis including the folk therapeutically data was compared with those of the atlas of medicinal plants used in Rajgarh District folk medicine. 15 plant species belong to 13 families and 15 genera was reported with further emphasis on their vernacular names, popular uses, parts used along with habitat (Table 1 & Figure 2). These plant species were arranged alphabetically by their families and Plant part & Disease. Ethono- medicinal plant survey was conducted in the year 2018-2019 in eight villages of Rajgarh district of Madhya Pradesh which are used in different disease (table-3). Floristic spectrum of the Ethno medicinal plants used in Rajgarh District are shown in Table 2.life forms are shown in Fig-3.tree species is maximum used for ethono-medicine. Floristic spectrum of the Ethno-medicinal plants used in Rajgarh District is shown in Fig:4.

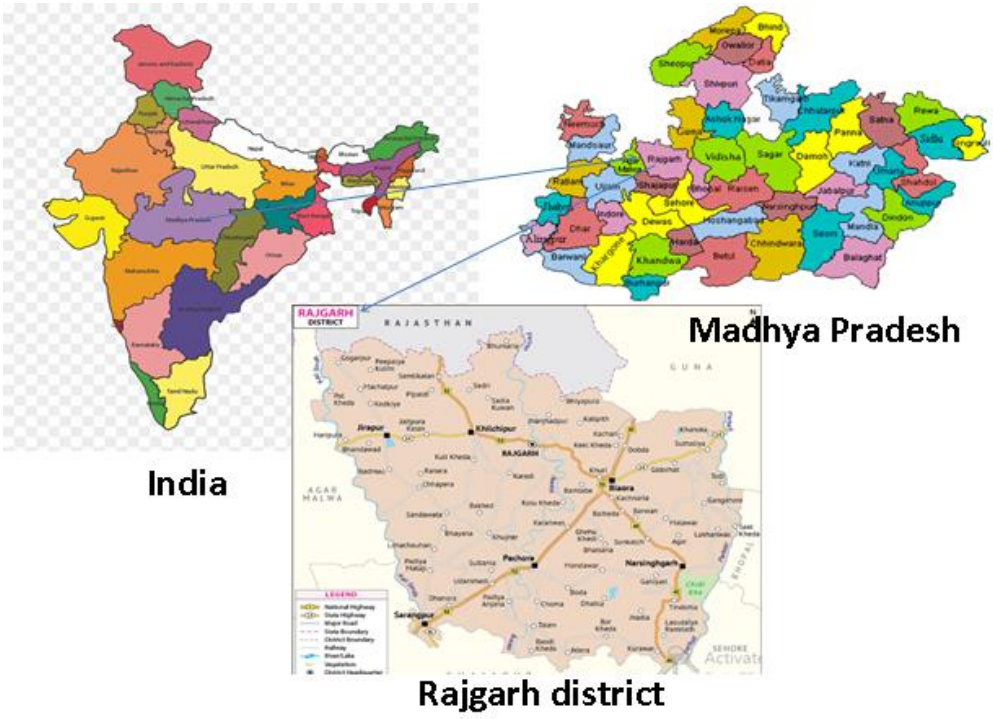


Figure 1 study area

Table 1: Medicinal plants used in Rajgarh District

SN	Botanical name	Family	Plant part	Disease	Habitat
1.	*Acacia leucophloea, Willd.*	Leguminoaceae	Flower	Asthma	Tree
2.	*Aegle marmelos Correa*	Rutaceae	Leaves	Fever	Tree
3.	*Argemone mexicana L.*	Berberidaceae	Root	Skin disease	Herb
4.	*Azadirachta indica Juss.*	Melicaeae	Seed	Skin disease	Tree
5.	*Balanites aegyptiaca* (L.) Del.	Balanitaceae	Leaves	Malaria	Tree
6.	*Calotropis procera* (Ait.) Ait. f.	Asclepiadaceae	Stem	Scorpion bite	Shrub
7.	*Cassia fistula L.*	Leguminoaceae	Root	Fever	Tree
8.	*Cissus quadrangularis* L.	Ampelidaceae	Stem	Snake bite	Climber
9.	*Ficus religiosa L.*	Moraceae	Bark	Brain tonic	Tree
10.	*Hygrophila spinosa L.*	Acanthaceae	Leaves	Forehead	Herbs
11.	*Opuntia dillenii Hair.*	Cactaceae	Root	Mind Pain	herbs
12.	*Phyllanthus emblica Linn.*	Euphorbiaceae	Fruit	Cough	Tree
13.	*Senna occidentalis* (L.) Link	Caesalpinaceae	Seed	Diabetes	Shrub
14.	*Tamarindus indica* L.	Caesalpinaceae	Gum	Toothache	Tree
15.	*Terminalia belarica Roxb.*	Combritaceae	Fruit	Stomachic	Tree

Table 2: Floristic spectrum of the Ethnomedicinal plants used in Rajgarh District

Sn	Plant part used	No. of Species
1.	Flower	1
2.	Fruit	2
3.	Gum	1
4.	Leaves	3
5.	Root	3
6.	Seed	2
7.	Stem	2

Table 3: Distribution of medicinal plants in Rajgarh District

Botanical name	Common name	Ko	Kar	Kh	Sul	Ud	Dh	Pad	Kare
Ficus religiosa L.	Papal	✓	✓		✓	✓	✓		✓
Acacia leucophloea, Willd.	Subabul		✓			✓	✓		✓
Phyllanthus emblica Linn.	Awala	✓		✓	✓	✓		✓	
Terminalia belarica Roxb.	Baheda		✓	✓		✓		✓	
Tamarindus indica L.	Emali	✓	✓	✓	✓				
Balanites aegyptiaca (L.) Del.	Hingot				✓	✓	✓		
Aegle marmelos Correa	Bilpatra	✓	✓	✓		✓	✓		
Hygrophila spinosa L.	Talmakhana		✓	✓	✓		✓	✓	✓
Cassia fistula L.	Amaltash	✓		✓	✓	✓		✓	✓
Opuntia dillenii Hair.	Nagphani	✓	✓			✓		✓	✓
Argemone mexicana L.	Pilikateli		✓	✓	✓			✓	
Senna occidentalis (L.) Link	Awalai	✓		✓	✓	✓	✓		
Azadirachta indica Juss.	Neem	✓	✓			✓	✓		✓
Calotropis procera (Ait.) Ait. f.	Akda	✓	✓	✓	✓		✓		✓
Cissus quadrangularis L.	Hadjod	✓		✓	✓	✓	✓	✓	✓

Abs.=Ko=Kolukheda,kar=Karanwas;kh=Khujner;sul=Sultania;Ud=Udankhedi;Dh=Dhanora;Pad=Padlyamataji; Kare=Karedi

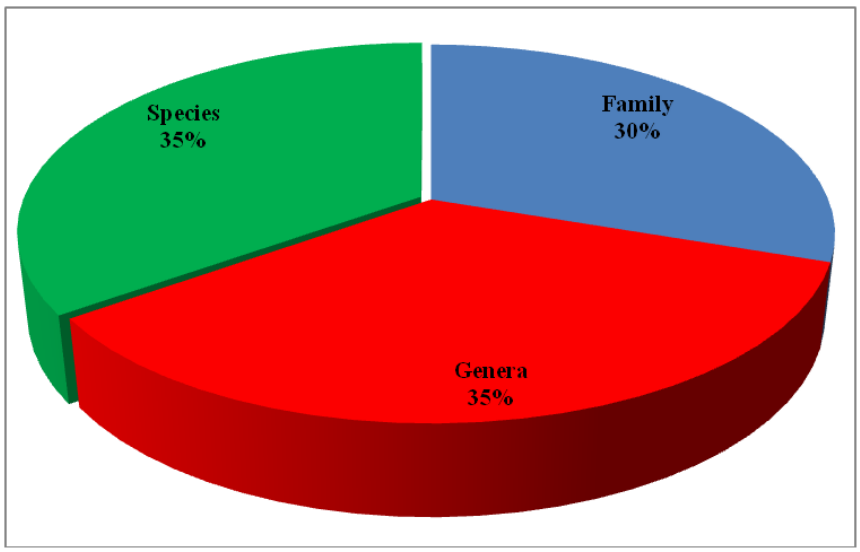


Figure 2: statistical analysis of taxa

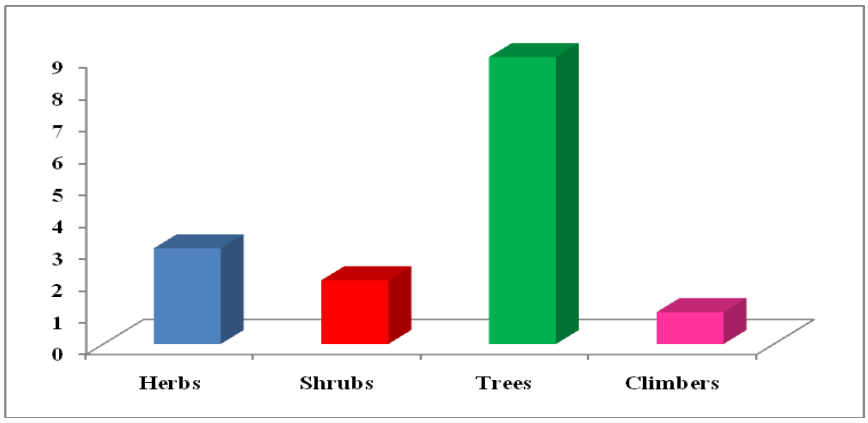


Figure 3: Distribution of taxa in Rajgarh District

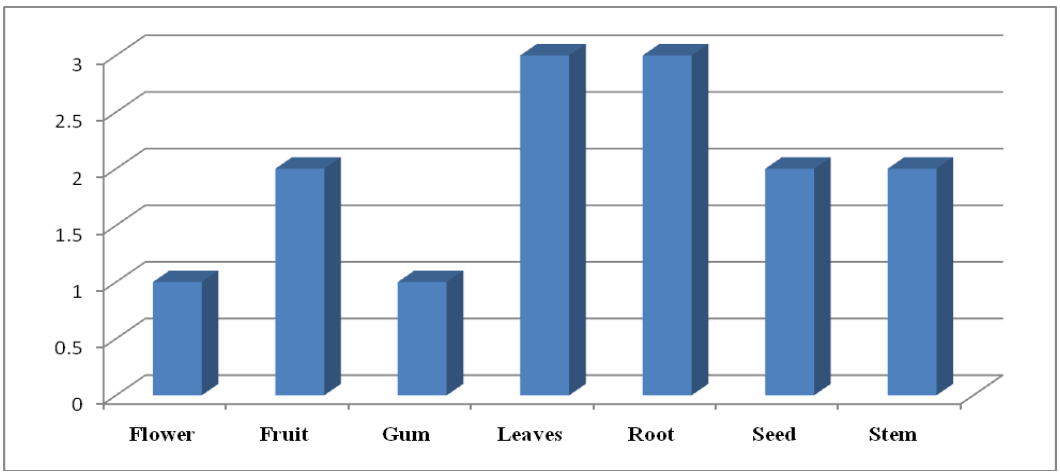


Figure 4: Floristic spectrum of the Ethnomedicinal plants used in Rajgarh District

CONCLUSION

I observed that, knowledge of medicinal plant use among the young was less well developed and negatively correlated with the level of informant education. Our observation suggests that the educated, usually younger people tend to migrate to more lucrative jobs away from the villages. As Rajgarh District traditional medical knowledge is orally passed down via lifestyle, it is important to exhaustively document and publicize medicinal plant knowledge within the young generation to raise awareness of and appreciation for

their traditional values and for the conservation and sustainable use of the plants as well as to keep the traditional medical knowledge left in their community alive. In this context, it may be important that personal contacts with natural areas not only provide learning opportunities but also motivate people to protect their environment; thus, the natural setting seems to be central to the acquisition of traditional plant knowledge. In conclusion, folklore medicine in Rajgarh District may constitute an important component of the health care system.

Acknowledgement
Author are also thankfull to tribal, local men for corporation in providing information about the plant.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Jain SK and Rao RR (1977) A handbook of field and herbarium method, today and tomorrows. Printers and publisher New Delhi, India.

Khanna KK, Kumar A, Dixit RD and Singh NP (2001) Supplementary flora of M. P. BSI Pub., India

Mudgal V, Khanna KK and Hajara PK (1997) Flora of Madhaya Pradesh.2.

Verma DM, Balakrishnan NP and Dixit RD (1993) Flora of M. P..BSI, Calcutta, India 1.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Effect of some parts of plant powders to control *Sitophilus granarius* in store wheat grains.

[1]Geeta Patil, [2]Chetankumar Sharma, [2]Vaishali Maliand and [1]Kajal Patil

[1]Assistant Professor in Botany, [2]Assistant Professor in Zoology, Arts, Commerce & Science college, Bodwad Dist.-Jalgaon, MS, India | Email: geetadarange@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Patil Geeta, Sharma Chetankumar, Maliand Vaishali and Patil Kajal (2019) Effect of some parts of plant powders to control *Sitophilus granarius* in store wheat grains, *Int. J. of. Life Sciences*, Special Issue, A13: 44-46.

ABSTRACT

Present study evaluated the efficacy on mortality of 3 plants powder i.e. leaf powder of *Annona squamosa* and *Zizipus xylopyrus* and seed powder of *Annona squamosa* against *Sitophilus granarius*. Losses of stored grain due to infestation by storage pest are the most serious problem and reducing nutritional value in food. current study shows that seed powder of Annona squamosa is more effective to control Sitophilus granarius than leaf powder of Annona squamosa and Zizipus xylopyrus.

Keywords: *Annona squamosa, Zizipus xylopyrus, Sitophilus granaries.*

INTRODUCTION

Sithophilus granarius is the major pest which causes significant damage to harvested stored wheat grains and decrease the crop yield. Loss of Food grain due to this insect infestation during storage is a serious problem. They not only consume food grains but also accumulate exuviae, webbing, and cadavers. This result in grain unfit for human consumption. It also decreases quantity and quality of the food grain by affecting nutritional value. It is estimated that more than 20,000 species of field and storage pests destroy approximately one third of the world's food production, among which the highest losses (43%) occurring in the developing world. (Jacobson, 1982; Ahmed and Grainge, 1986).

Chemical pesticides are effective but due to their repetitive use resistance will be developed in pests and also it creates environmental pollution and an adverse effect on food besides side effect on humans. Park *et al.*, 2003 reported that continuous usage of synthetic insecticides as preservatives is being discouraged due to various adverse environmental, biological and economic consequences associated with its usage (Park *et al.*, 2003). Previous research indicated that some plant powder and extracts have strong effect on stored grain insects such as toxicity and the inhibition of reproduction (Regnault-Roger and Hamraoui, 1991; Talukder and Howse, 1995). Hence to overcome this problem we have to use some Botanical insecticides. In this study we used some parts of plant products i.e. leaves and seeds of *Annona squamosa* and Leaves of *Zizipus xylopyrus* to control the pest *Sithophilus granarius* in stored wheat grains.

MATERIAL METHODS

Present investigation was carried out at department of Botany, Arts, Commerce and Science College, Bodwad. Insects was collected from infested wheat storage godown from local area. The insects were maintained on uninfected wheat grains at laboratory in plastic jar.

The fresh leaves of *Annona squamosa* and *Zizipus xylopyrus* were collected from the field near Bodwad and seeds of *Annona squamosa* were dried in the shade and then in the oven. The dried leaves and seeds were powder in the grinder and stored in polyethylene bags.

To test the effect of plant and seed powder, the grains of wheat is sterilized in an oven for 24 hrs. at 45^{0}C to disinfect. Take 100 gm. of wheat grain and add to it 10 gm. of leaves and seeds powder of testing plants. Released 10 adults of *Sitophilus granaries* to each testing jars and control is maintained simultaneously. Experimental setup is maintained in Plastic jar under the laboratory condition. There are 3 replications is done simultaneously for better and accurate result, mean mortality is recorded for the observed mortality. A plastic jar is closed with muslin cloth and tied with rubber band to avoid the discharge of insect.

To calculate the mortality at 7,14,21 and 28 day after treatment, counted the number of dead insects in each plastic jar. Percentage of corrected mortality was assessed as per the given formula (Abbott's 1925).

$$\text{\% corrected mortality} = \frac{\text{Observed mortality - Control mortality}}{\text{100 - Control mortality}} \text{X100}$$

RESULTS & DISCUSSION

Table A. shows the effect of leaves and seeds powder of Annona squamosa and leaves powder of *Zizipus xylopyrus* was evaluated and it seen that the seeds powder of Annona squamosa having more effective to show the highest percentage of mortality as compare to leaf powder of A. squamosa and Z. xylopyrus. comparatively leaves powder of *Z.xylopyrus* show less effective than others. Leaf and seeds powder of A. squamosa shows mortality of 44.82% and 65.51% respectively at 28 days while, Leaf powder of *Z.xylopyrus* show mortality of 10.34% which is greater than control i.e. 3.33%.

Photograph A and B Show the collection and drying the seeds of A. squamosa in laboratory and collection of leaves of Z. xylopyrus in the field respectively.
Experimental setup of the present investigation at different parts of plant powder is seen at photo C. Photo D. Observation of the results and obtaining result is compared with control. The result obtained from the present investigation evaluate that Annona *squamosa* is more effective than *Zizipus xylopyrus*. Mortality rate of Seeds of *Annona squamosa* is greater than leaves of A. squamosa and Z. xylopyrus. This indicates that seeds contain more pesticidal property than Leaf of two plants.

Figure 1: A- Seeds of Annona squamosa, **B.** Collection of Leaves of *Zizipus xylopyrus* **C-** Experimental Setup, **D-** Observation of experiment

Table 1: Effect of different parts of plants powder against Sitophilus granaries in store wheat grains.

Sr. No.	Name of Used Plant Parts	Mean Mortality in Days			
		07	14	21	28
1.	Leaf of Annona squamosa	13.33	36.66	41.38	44.82
2.	Seed of Annona squamosa	6.66	43.33	55.00	65.51
3.	Leaf of *Zizipus xylopyrus*	00	6.66	10.34	10.34
4.	Control	00	00	3.33	3.33

Present study shows that different parts of plants i.e. leaf and seeds having capability to control the selected pest. (Asawalam *et al*. 2012) reported that the plant powders can lead to suffocation and death of storage insect pest. The antifeedent activity of an extract of senescent leaves of *M.azedarach* on nine insect species, including *S.oryzae* was examined by (Valladares *et al*. 2003). These finding supported the finding of (Achiano *et al*,1999) who showed the effectiveness of neem leaf powder and ash from various sources against different stored grain pest. The high mortality may not be due to contact toxicity of these phytochemicals due to thick exoskeleton of *S. oryzae* which is expected to have conferred on them some level of resistance to these powders. The high weevil mortality could therefore be possibly linked to stomach poison by these bioactive compounds (Olajire *et al.*, 2015). The high pungent smell of powder of *E. aromatica* and *P. guineense* could also be responsible for high mortality observed in weevils exposed to them when compared to their counterpart exposed to *Z. officinales*. The toxic effect of any insecticide depends on the point of entry of the toxins (Franz *et al.*, 2011).

CONCLUSION

The pesticidal property is higher in Seeds of *Annona squamosa* than leaf of *Annona squamosa* and lower in leaf of *Zizipus xylopyrus.*

Acknowledgement:
Authors are highly grateful to the Management and Principal of the institution of respective college to carry out the present investigation.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Abbott WS (1925) A method of computing the effectiveness of an Insecticide, *Journal of economic entomology,* Vol.18, pp. 265-267.

Achiano KA, Giliomee JH and Pringle KL (1999) The use of ash from aloe marlothii or control of maize weevil, *Sitrophilus zeamis* in stored maize. *African Entomol*, , 7(1):pp.

Asawalam EF, Ebere UE and Emeasor KC (2012) Effect of some plant products on the control of rice weevil *sitophilus oryzea* (L.) Coleoptera: Curculionidae. *Journal of Medicinal Plants Research*, 6(33), 4811-4814.

Talukder FA (2006) Plant products as potential stored product insect management agents- a mini review," Emirates Journal of Agriculture Science, vol. 18, pp. 17-32, 2006.

Franz AR, Knaak N, Fiuza LM (2011) Toxic effects of essential plant oils in adult Sitophilus oryzae (Linnaeus) (Coleoptera, Curculionidae). *Revista Brasileira de Entomologia*. 55(1), 116-120.

Jacobson M (1982) Plants, insects, and man- their interrelationships," Economic Botany, vol.36, no.3, pp.346-354, 1982.

Olajire Ayodele Gbaye, Emmanuel Ayobami Oyeniyi, Folashade Adekanmbi (2015) The Efficacy of Three Plant Powders as an Entomocide against *Sitophilus Oryzae* (Linnaeus) Infesting Rice Grains in Nigeria. International Journal of Research Studies in Zoology (IJRSZ) Volume 1, Issue 1, June 2015, PP 30-35.

Park C, Kim S, Ahn YJ (2003) Insecticidal activity of asarones identified in Acorus gramineus rhizome against three coleopteran stored-product insects. *J. Stor. Prod. Res*., 39, 333-342.

Regnault- Roger C and Hamraoui A (1991) Efficiency of plants from the south of France used as traditional protectants of *Phaseolus vulgaris* L. Against its bruchid *Acanthoscelides obtectus* (say.). *J.stored Prod .Res.*27 (2): 121-127.

Ahmed S and Grainge M (1986) Potential of the Neem Tree (*Azadiracta indica*) for pest control and rural development," Economic Botany, vol.40;2, pp.201-209, 1986.

Rajendran Sand Sriranjini V (2008) Plant products as fumigants for stored product insect Control," Journal of stored products Research, vol. 44, no. 2, pp 126-135, 2008.

Talukder FA and Howse PE (1995) Evaluation of *Aphanamixis polystachya* as a source of repellents, antifeedents, toxicants and protectants in Storage against *Tribolium castaneum*(Herbst). *J. Stored Prod. Res*. 31(1): 55-61.

Valladares G, Garbin L, Defago MT, Carpinella C and Palacios S (2003) Actividad antialimentaria e insecticida de un extractor de hojas senescentes de *Melia azedarach* (Meliaceae). *Rev. Soc. Entomol. Arg* .62: 53-61.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Spectroscopical view and application of Naphthol Coupled Azo Compounds in complexing and sensing of Fe (II) ions in tap water.

Damade Kanchan R[1], Savdekar Nitesh P[2] and Chaudhary Rakesh[3]

[1]Assistant Professor, Dept. of Chemistry, Arts, Commerce and Science college Bodwad
[2]Assistant Professor, Department of Physics, Arts, Commerce and Science college Bodwad
[3]Assistant Professor, Department of Chemistry, Arts and Science college , Bhalod
E-mail- Kanchan_Damade@rediffmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Damade Kanchan R, Savdekar Nitesh P and Chaudhary Rakesh (2019) Spectroscopical view and application of Naphthol Coupled Azo Compounds in complexing and sensing of Fe (II) ions in tap water, *Int. J. of. Life Sciences*, Special Issue, A13: 47-52.

ABSTRACT

Four aromatic azo dyes with hydroxyl groups (I-IV) were selected and synthesized by diazo coupling reactions. The relationships between structures of the compounds and their Fe-complexes were done through UV-VIS spectroscopical method. The excellent solubility in green mixture of ethanol-water and simple synthetic process make the compounds potential chromogenic sensor for detecting and complexing Fe^{+2} ions presents in tap water without using any catalyst and complicated analytical procedures, which can be visualize even through naked eye. Compounds I-IV could impart proper UV-VIS responses upon addition of Fe (II) metal ions presented 150mg/lit in tap water.

Keywords: Azo compounds, Sensors, Naphthols, substituted amines, Fe-complex, tap-water.

INTRODUCTION

The most studied area under supramolecular chemistry is the recognition of metal ions and neutral species through host –guest interaction theory of non-covalent bonds to form host-guest complexes (Lehn, 1993; 1995). The colorimetric sensing technique provides a favourable and assured detection of medically and environmentally beneficial ions in a very complex state of matter. These sensing agents can be utilized as a detecting kit for onsite testing of harmful or useful species into the environment. On studying the spectroscopical view of the host-guest interaction, researchers has put-forth a theory of increased conjugation or electron density led UV-VIS absorbance of studied molecule results in to red shift of UV-band while when decreased conjugation or electron density the absorbance shifted towards blue wavelength with accordingly changes in colorimetric view which enables molecules to be acts as chromogenic sensors. Taking into accounts of these principles of chromogenic sensing we studied the spectroscopical data of Azo compounds having ∝ or β- naphthol moiety I-IV and their Fe-complex compounds C-1 to C-4 follows the similar trend of absorbtion bands in UV spectrum. As per the WHO data, Iron (as Fe^{+2}) concentrations of 40 µg/litre can be detected by taste in distilled water. In a mineralized water the taste threshold value was 0.12 mg/litre and in well-water, iron concentrations is

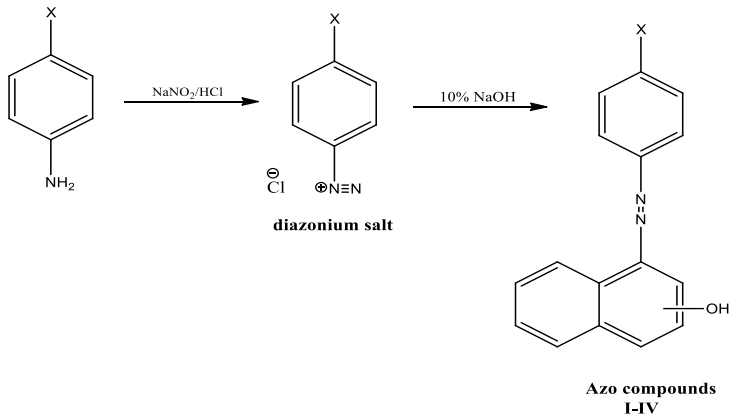
below 0.3 mg/litre which is not identifiable, however Fe^{+2} content between 0.3–3 mg/litre were acceptable. Concentrations of iron in drinking-water are normally less than 0.3 mg/litre but may be higher in countries where various iron salts are used as coagulating agents in water-treatment plants and where cast iron, steel, and galvanized iron pipes are used for water distribution (National Research Council 1979).

As we knows iron is the most abundant d-block element in cellular system which plays an important role in many of the biological processes such as oxygen transportation and DNA synthesis (Que *et al.* (2008), Domaille *et al.* (2008), Haas and Franz, 2009) and Chereddy *et al.* (2013) its deficiency or excess can disturb cellular homeostasis , biochemical metabolism and can cause many diseases like atherosclerosis, cancer and neurological disorder (Fakih *et al.* (2008), Merea *et al.* (2009), Zecca *et al.* (2004), Lipinski (2011), Choi *et al.* (2014 and Vinod kumar *et al.* (2015). An intake of 0.4–1 mg/kg of body weight per day can cause harmful effects on human health the average lethal dose of iron is 200–250 mg/kg of body weight, but death has occurred following the ingestion of doses as low as 40 mg/kg of body weight (WHO 1996). Hence, on this account efforts should be developed to determine the presence of iron content in domestic water. Our study has developed a relationship between all four Azo compounds and there spectroscopical data on binding with Fe (II) ions which can contribute towards the further preparation of new Azo compounds in the field of Fe (II) recognition in water samples.

Our aim is to explore simply synthesized azo compounds employing easier, one step synthetic route producing expected high yield and utilize them for onsite selective detection of iron in tap water. On this account, we used p-amino toluidine and p-amino acetanalide azo derivatives as a probing unit which can interact differentially with various cations, and apparently become cost effective and sensitive colorimetric probe with high response rates. In the present work, we simply utilized Azo derivatives of substituted amines in complexing with Fe^{+2} cation over other examined cations dissolved in tap water. The details study about their spectroscopical characterisation before and after formation of Fe-Complex is investigated and discussed thoroughly.

MATERIAL METHODS

The Azo compounds **I-IV** was synthesized through given scheme by following literature in which it was reported (Xu 2017). Performed compounds **I-IV** was identified by, FT-IR, (C, H, N) analysis and UV-Vis spectral mechanisms which has been exactly in tune with the reported work. An aqueous- Ethanol solutions were performed to make I-IV soluble and incorporate them for studying interaction of the metal ions Fe (II) in tap water.



Scheme for synthesis of Azo compounds I-IV

Molecular representations	X-substituent on amines	Coupling Phenols
I	$-CH_3$	∝-naphthol
II	$-CH_3$	β-naphthol
III	$-NHCOCH_3$	β-naphthol
IV	$-NHCOCH_3$	∝-naphthol

The solid complexes is formed by immediate interaction of the 1M aqueous ethanolic solution of **I-IV** and the 0.01 Fe(II) ions solution dissolved in water (tap water) (which is 150 mg/lit) at perfect pH. The colour of the solid product is visualized at Zero time (T=0) and after 12 hrs (T=12).

RESULTS & DISCUSSION

On immediate addition of Fe (II) ion solution in **I-IV** we observe at t=0 the change in colour of solution from light yellow to dirty yellow while after T=12 hrs there was a formation of dirty to blackish yellow coloured solid compound (C-1, C-2, C-3 and C-4) respectively (shown in Fig-1). The UV-VIS absorbance data for **I-IV** and their respective Fe-complexes are shown in fig-2

The Spectroscopical view for 1-4 and complexes:

The UV spectrum of the free Azo compounds **I-IV** (given in Table-1) shows a strong bands at 204 nm , 227nm ,228nm and 213nm respectively, which is attributed to $\pi \rightarrow \pi^*$ transition. Another bands were also observed at 260,334,276 and 303 nm due to $\pi \rightarrow \pi^*$ and $n \rightarrow \pi^*$ transitions respectively (Wolfgang *et al.* (2003) and Emel Y and Hamit B (2002). These values for $\pi \rightarrow \pi^*$ transition do not change more between free compounds and their complexes except value for $n \rightarrow \pi^*$ (260 and 334 nm) which shifted to lower wavelength for C-1 and C-2, and (276 and 303nm) shifted to higher wavelength for C-3 and C-4 complexes this mean corporation of the pair of electrons of azo group in binding with metal.

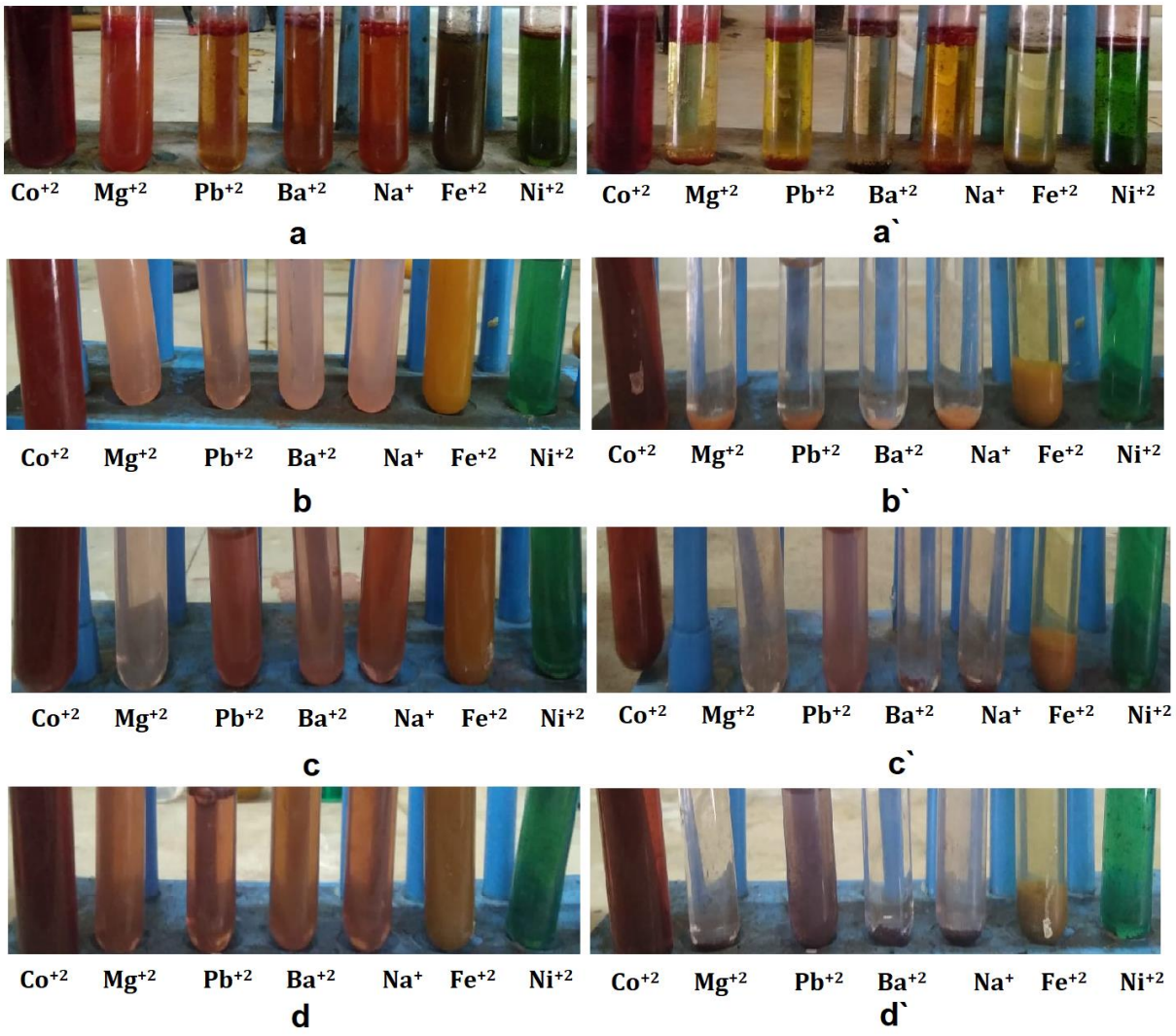


Fig-1 -The photographical view

(i) images **a, b, c ,d** and **a', b', c' , d'** - for addition of **I-IV** in Co^{+2},Mg^{+2},Pb^{+2} ,Ba^{+2} , Na^{+} ,Fe^{+2}, Ni^{+2} solution at time =0 and time=12 hrs respectively.

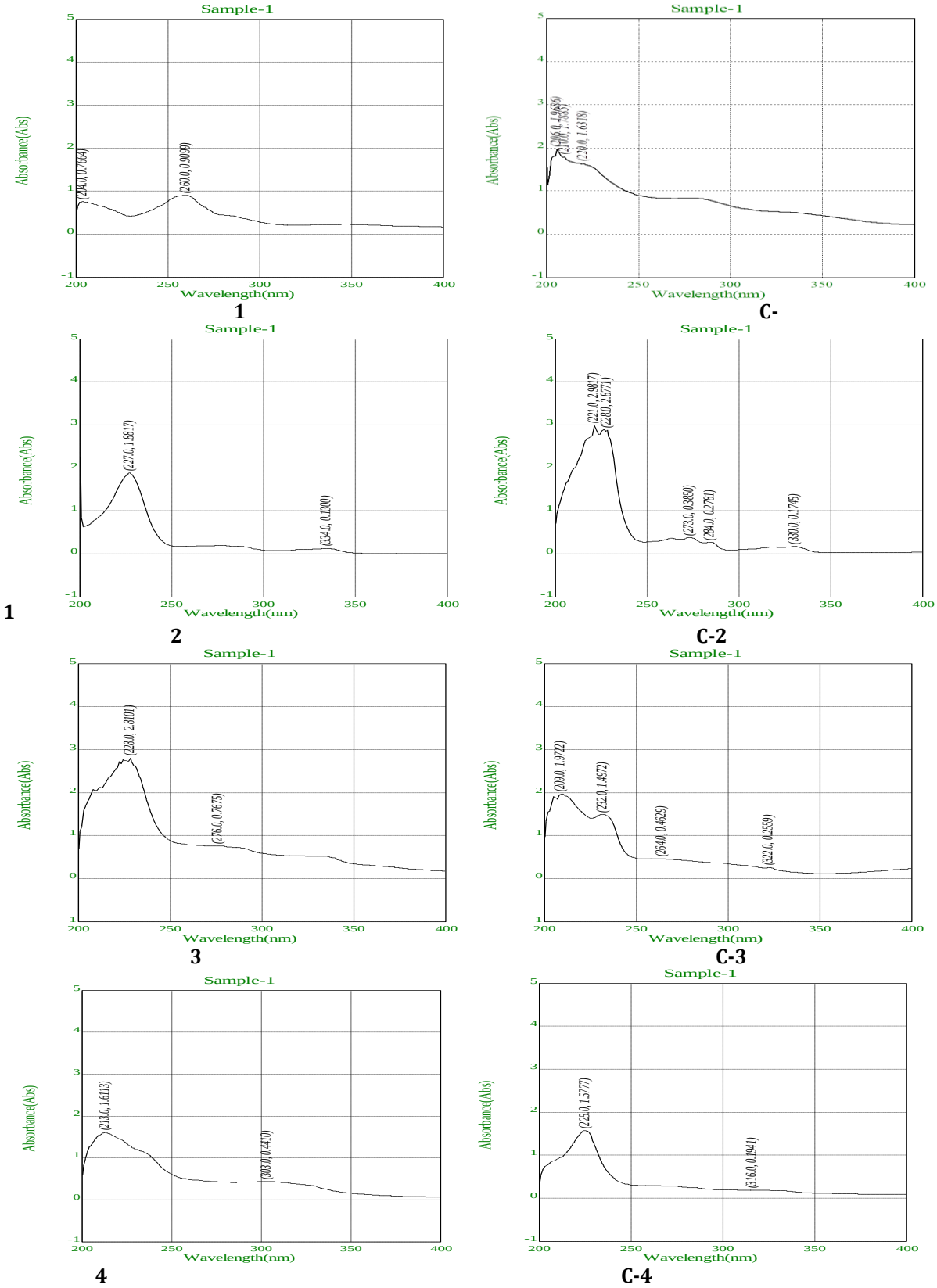
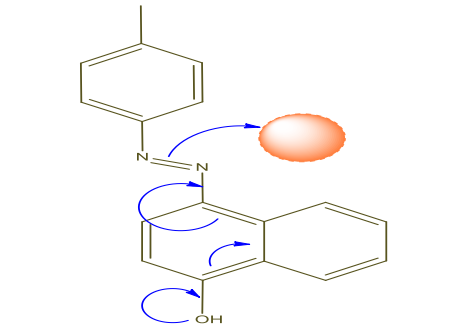


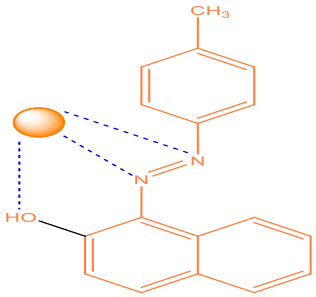
Fig-2 –A UV-VIS spectra i) 1, 2, 3 and 4 for azo compounds I-IV in Free State
ii) C-1, C-2, C-3 and C-4 for Fe-complex of I-IV

Table-1: Showing UV bands for I-IV and new bands for their Fe-complexes due to π→ π* and n→ π* transition

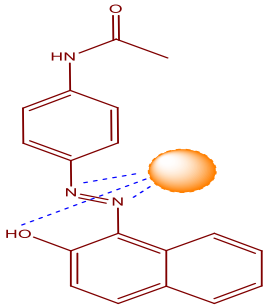
Azo compounds	UV absorbance in nm			
	π→ π*	Fe-complex π→ π*	n→ π*	Fe-complex n→ π*
I	204	206	260	220
II	227	228	334	330,228,273
III	228	209,232	276	322,264
IV	213	225	303	316



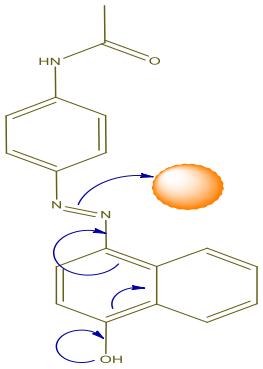
(*E*)-4-(*p*-tolyldiazenyl)naphthalen-1-ol and Fe (II) complex
C-1



(*E*)-1-(*p*-tolyldiazenyl)naphthalen-2-ol and Fe(II) complex
C-2



(*E*)-*N*-(4-((2-hydroxynaphthalen-1-yl)diazenyl)phenyl)acetamide and Fe(II) complex
C-3



(*E*)-4-(*p*-tolyldiazenyl)naphthalen-1-ol and Fe(II) complex
C-4

Mechanistic Pathways for Fe-complexation

We observed an enhancement in the absorption peaks of azo compounds upon addition of Fe^{+2} solution with formation of solid product along with simultaneous change in color from light yellow to yellowish brown. This suggests that, the azo compounds III and IV can serve as a potential candidate for "naked eye" Fe^{+2} detectors and led to form a complex compound. While there was a decrease of absorption peaks in azo complex C-1 and C-2 after addition of Fe^{+2} solution which also results into formation of blackish yellow and dark yellow solid products respectively. In ∝-naphthol coupled azo compounds there was an appearance of split of bands in C-2 and C-3 , the reason is probably that the interaction between Fe^{+2} ion and the detector II and III, weakens the conjugated properties of the molecule or may be enlarging of the conjugation length of the systems (Wang *et al.* 2013).

For β-Napthol coupled azo compounds complex C-1 shows a blue shift of 40nm from 260nm to 220nm due to increase in HOMO- LUMO gap[16], while the complex C-4 shows a red shift by 13nm from 303nm to 316nm due to longer conjugation because of presence of acetamide group on p-position.

For C-2 and C-3 which are ∝-naphthol coupled azo compound complex show splitting in there UV absorbance bands due to shortening of conjugation in both of the complex and also they exhibit blue shift in n → π* by 4nm (i.e. 334 to 330 nm) and 12nm (276 to 264nm) respectively due to engaging of -OH lone pairs in binding of Fe^{+2} ion during complexation (Ogawa *et al.* (2009) and Manas FS and Chen LX (2000) which results into decrease in electron density and HOMO-LUMO gap. However , there is a red shift in absorption band for π →

π* in C-2 and C-3 by 45 nm (from 228 to 273 nm) and for n → π* by 46 nm (from 276 to 322 nm) respectively, this is probably due to donating Inductive effects of $-CH_3$ and donating resonance effect of acetamide group on para to –N=N- linkage. Here it is also assumes that the red shift is appears in n → π* transitions in C-3 rather than π → π* transitions in C-2, this is may be due to involvement of acetamide group nitrogen lone pair in delocalization inside the benzene ring which is not possible in C-2 as there is a presence of $-CH_3$ group.

CONCLUSION

The azo dyes were synthesized by simple synthetic process with high yield and preparing its aqueous ethanolic solution we investigated there binding application for Fe^{+2} ions in tap-water, the investigation of relationship between structures of all four reported azo compounds and spectroscopic properties were concludes about compounds I-IV which could afford proper UV-VIS responses upon addition of Fe(II) metal ions presented as 150mg/lit in tap water. Excellent water-ethanol solubility and simple synthetic process make all four applicable for sensing Fe(II) in domestic water. These results may contribute to the development of a new azo compounds for the sequential recognition of Fe (II) in water samples below 150 mg/lit concentration.

Acknowledgement

Author are also thankfull to tribal, local men for corporation in providing information about the plant.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Chereddy NR, Thennarasu S and Mandal AB (2013) A highly selective and efficient single molecular FRET based sensor for ratiometric detection of Fe3+ ions, Analyst 138:1334–7.

Choi YW, Park GJ, Na YJ, Jo HY, Lee SA and G.R. You C. Kim (2014) A single Schiff base molecule for recognizing multiple metal ions: A fluorescence sensor for Zn(II) and Al(III) and colorimetric sensor for Fe(II) and Fe(III), Sens Actuators, B, 194:343–352.

Domaille DW, Que EL, Chang CJ (2008) Synthetic fluorescent sensors for studying the cell biology of metals, *Nat. Chem. Biol*. 4:168–75

Emel Y and Hamit B (2002) Synthesis of Novel Acidic Mono Azo Dyes and an Investigation of Their Use in the Textile Industry, Turk. J. Chem., 26, 897-903.

Fakih S, Podinovskaia M, Kong X, Collins HL, Schaible UE and Hider RC (2008) Targeting the lysosome: fluorescent iron (III) chelators to selectively monitor endosomal/lysosomal labile iron pools, *J. Med. Chem.* 51:4539–52.

Haas KL and Franz KJ (2009) Application of metal coordination chemistry to explore and manipulate cell biology, Chem. Rev. 109:4921–60.

Lehn JM (1993) Science 260 1762–1763.

Lehn JM (1995) Supramolecular Chemistry- Concepts and Perspectives, Wiley-VCH.

Lipinski B (2011) Hydroxyl radical and its scavengers in health and disease, Oxid. Med. Cell. Longev. 2011:809696–809705.

Manas FS and Chen LX (2000) Chem. Phys. Lett. 331, 299–307.

Mcrea R, Bagchi P, Sumalekshmy S and Fahrni CJ (2009) In situ imaging of metals in cells and tissues, Chem. Rev. 109:4780–827.

National Research Council (1979) Iron. Baltimore, MD, University Park Press.

Ogawa K, Guo F and Schanze KS (2009) *J. Photochem. Photobiol.* A. 207, 79–85 (2009)

Que EL, Domaille DW and Chang CJ (2008) Metals in neurobiology: probing their chemistry and biology with molecular imaging, Chem. Rev. 108:1517–49.

Vinod Kumar V, Thenmozhi MK, Ganesan A, Ganesan SS, Anthony SP (2015) Hyperbranched polyethylenimine-based sensor of multiple metal ions (Cu2+ , Co2+ and Fe2+): colorimetric sensing via coordination or AgNP formation, RSC Adv. 5:88125–88132

Wang H, Li J, Yao D, Gao Q, Guo F and Xie, P. (2013). A highly selective colorimetric sensor to Fe 3+ and Co 2+ in aqueous solutions. *Research on Chemical Intermediates*, *39*(6), 2723-2734.

Wolfgang K, Natasa D, and Stephanie F (2003) Azo compounds as electron acceptor or radical ligands in transition metal species: spectroelectrochemistry and high-field EPR studies of ruthenium, rhodium and copper complexes of 2, 2-azobis (5- chloropyrimidine), *J. Molec.Stru,* 656, 183–194.

World Health Organization, Geneva (1996) Guidelines for drinking-water quality, 2nd ed. Vol. 2. Health criteria and other supporting information.

Xu J, Zheng W, Huang X, Cheng Y and Shen P (2017) Selective fluorescent probe based on Schiff base derived from hydroxymethyl coumarin and aminated Sudan I dye for Mg2+ detection. *Arabian Journal of Chemistry*, *10*, S2729-S2735.

Zecca L, Youdim MBH, Riederer P, Connor JR, Crichton RR (2004) Iron, brain ageing and neurodegenerative disorders, Nat. Rev. Neurosci. 5 (2004) 863–873.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Phytochemical screening of Rhizome extract of *Curcuma zedoaria* (Christm) Roscoe by HRLC-MS technique

Jadhao Anand S [1] and Bhuktar Anil S [2]

[1]Department of Botany, B. S. Patel Arts, Commerce and Science College, Pimpalgoan Kale, Ta. Jalgoan (Jamod), Dist. Buldhana Maharashtra (India).
[2]Department of Botany, Vivekanand Arts, Sardar Dalipsingh Commerce and Science College, Samarth Nagar, Aurangabad, Maharashtra - 431 001 (India)
Email: anand.jadhao14@gmail.com / asbhuktar@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Jadhao Anand S and Bhauktar Anil S (2019) Phytochemical screening of Rhizome extract of *Curcuma zedoaria* (Christm) Roscoe by HRLC-MS technique, *Int. J. of. Life Sciences*, Special Issue, A13: 53-57.

ABSTRACT

Phytochemical investigation of methanol extracts of *Curcuma zedoaria* (Christm) Roscoe rhizome (Zingiberaceae) yielded 9 major phytoconstituents by using High Resolution Liquid Chromatography - Mass Spectroscopy (HRLC-MS) technique. The mass spectra of compounds found in extract was matched with Metlin database library, results confirmed the presence of therapeutically potent chemical compounds. Metabolites analysis by ESI-Q-TOF-MS revealed presence of 9 major abundant compounds namely Glycopyrrolate, Cucurbitacin I, Flurandrenolide, 26,26,26,27,27,27-hexafluoro-1alpha, 24-dihydroxyvitaminD3 / 26,26,26,27,27,27 - hexafluoro-1alpha, Proto porphyrinogen IX, Phenylbutazone glucuronide, Methyl Gamboginate, Propofol, Ibuprofen. This report is the first of its kind to analyze chemical constituents of *Curcuma zedoaria* using HR-MS. In addition to this, the results of HRMS profile can be used as pharmacognostical tool for identification of plant.

Key words: *Curcuma zedoaria,* Phytochemical, HRLC-MS, Cucurbitacin I, Flurandrenolide.

INTRODUCTION

Curcuma zedoaria (Christm) Roscoe belongs to Zingiberaceae, and commonly known as 'Zedoary', 'White turmeric' (English), 'Jangli haldi' (Hindi), 'Shati' (Sanskrit), 'Kachora' (Kannada), 'Karppurakkilangku' (Tamil), 'Meitei yaingang' (Manipuri), 'Aam aadaa' (Bengali).The essential oils of *C. zedoaria* possess the efficient cyto-toxic effects on non-small cell lung carcinoma cells (NSCLC) and causes apoptosis *in vitro* and *in vivo* (Chen *et al.,* 2013). (Tholkappiyavathi, *et al,* 2013) Reviewed the analgesic activity, anti-inflammatory, anti-hyperlipidemic, anti-arthritic, anticancer, antidiabetic activity, anti-oxidant and *In-vitro* antibacterial activities of *C. zedoaria.* Curdione a chemical compound obtained from *C. zedoaria* significantly suppress tumour growth in a xenograft nude mouse breast tumour (MCF-7

cells) in a dose dependant manner and inhibits cell proliferation and induced cell apoptosis (Li, *et al*., 2014). Petroleum ether extracts of *C. zedoaria* inhibits the proliferation of human triple negative breast cancer cell line MDA-MB- 231 (Gao *et al*., 2014). Active compound isocurcumenol isolated from the rhizomes of *C. zedoaria* inhibits the proliferation of cancer cells without inducing the significant toxicity to normal cells and *in vivo* doses of 37.7 mg/kg body weight significantly reduce the ascetic tumor in DLA-challenged mice and increase the life span compare to untreated control mice (Lakshmi, 2011).

Herbs, root tubers many; sessile tubers small, cylindrical, branched 2-2.5 x 1-1.5cm long white inside. Rhizome, pale yellow, bluish at center and white towards periphery, 2.5-5 x 2-2.7 cm. Leafy shoot 2-3 feet tall or more in length; leaves 4-6, 25-65 x 10-15cm long, oblong lanciolate with acuminate apex, narrowed to the base, purple colored strip on the entire midrib on upper surface of the leaves; petiole shorter than leaf lamina. Inflorescence central, 10-15 x 3-4 cm; spike 10-15 x 2-3.5 cm; flowers yellow shorter than bracts, 2.5-3.5cm; comma bract dark pink or shade of others 4.5-5.0 x 1-2 cm; fertile bract ovate, green, slightly twinged with red 3-4 x 1.5-2 cm; calyx obtusely toothed, whitish; corolla tube funnel shape, 3 cm long; capsule 3-gonous, smooth, thin, ovoid, dehiscing irregularly; seeds oblong or ellipsoid, with lanceolate, white aril.

MATERIAL METHODS

The plant material of *Curcuma zedoaria* (Christm) Roscoe was collected from Amgoan, district Gondia of Maharashtra and identified by using authentic floristic literature (Sharma, *et al.,* 1996; Pradhan, *et al*., 2005). The voucher herbarium specimen (ASJ 7624) is deposited in VH Herbarium, department of Botany, Vivekanand Arts, Sardar Dalipsingh Commerce and Science College, Samarth Nagar, Aurangabad.

Extract preparation

The collected rhizomes was washed with water and shade dried, rhizome powder was prepared with the help of mortal and pestle and extracted through Soxhlet using methanol as solvent and heated at 65^0C for 18-24 hours, extract was kept for evaporation and sample was stored in amber coloured bottle for further phytochemical screening which was carried out using

Fig. 1: HRLC-MS spectrum of *Curcuma zedoaria* rhizome extract

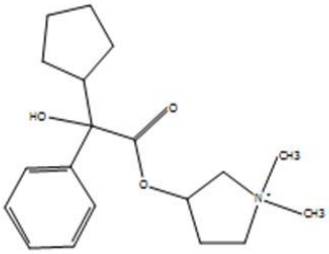
HRLC- MS technique.

Instruments and chromatographic conditions

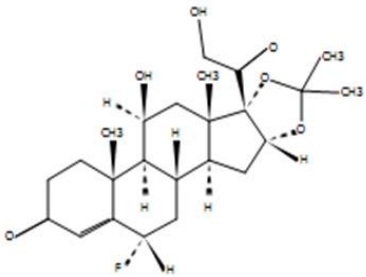
Equipment and conditions for identification of metabolites from an active sub-fraction of methanol extract was carried out at SAIF, IIT Bombay. Samples were analyzed on a LC- ESI-Q-TOF-MS (Agilent Technologies 6550 i-Funnel) system equipped with a G4220B pump, G4226A auto sampler and G1316C, and a diode array detector (DAD). The elution solvent consisted of a gradient system of 0.1% formic acid in water (A) and acetonitrile (B) at a flow rate of 0.3 ml/min. The gradient system started with 95% A: 5% B reaching 5% A: 95% B in 50 min., then back to initial composition 95% A: 5% B in 10 min which was held at same composition for 5 min. The MS analysis was carried out by ESI positive ionization mode. MS source conditions were as follows: capillary voltage 3500 V, Gas temperature 250 C, drying gas flow 13 L/min, sheath Gas temp 300, sheath Gas Flow 11, nebulizing gas pressure 35 (psig), fragmentor 175 V, Skimmer 65 V, Octopole RF Peak 750 V, and mass range m/z 50–1000. The resolution was 40,000 FWHM. Metlin database was used to structure confirmation.

RESULTS & DISCUSSION

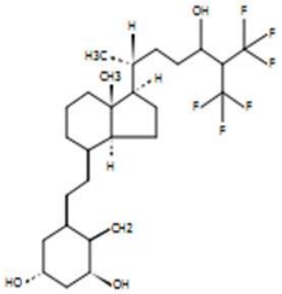
In the present study we characterized chemical profile of *Curcuma zedoaria* (Christm) Roscoe using HRMS spectra. The chromatogram showed relative concentrations of various compounds getting eluted as a function of retention time. The heights of peak indicate relative concentrations of components present in plant extract. The mass spectrometer analyzes compounds eluted at different times to identify nature and structure of the compounds. The large compound fragments into small compounds giving rise to appearance of peaks at different m/z ratios. These mass spectra are fingerprint of that compound which can be identified from the data library. Compound prediction is based on Dr. Duke's Phytochemical and Ethnobotanical Databases.



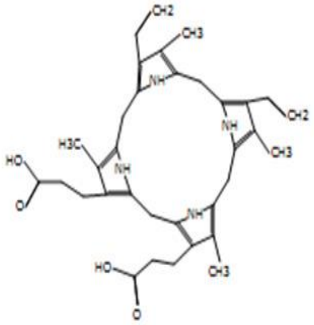
1



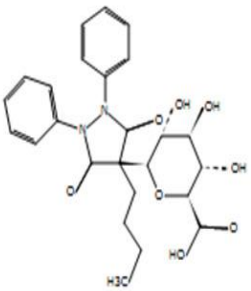
2



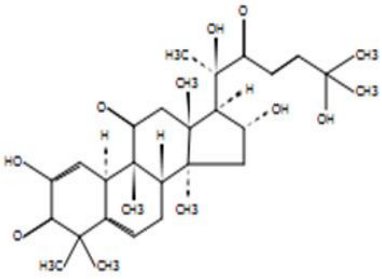
3



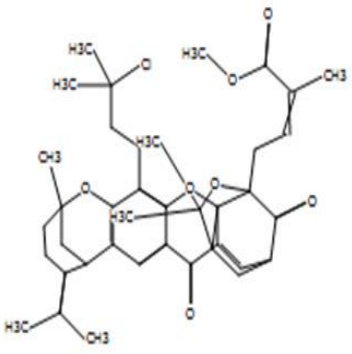
4



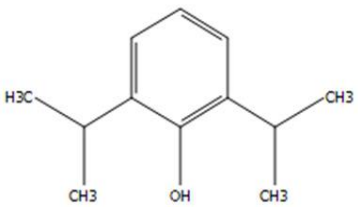
5



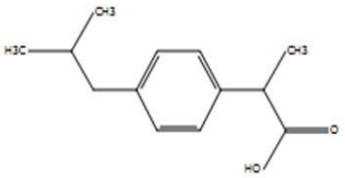
6



7



8



9

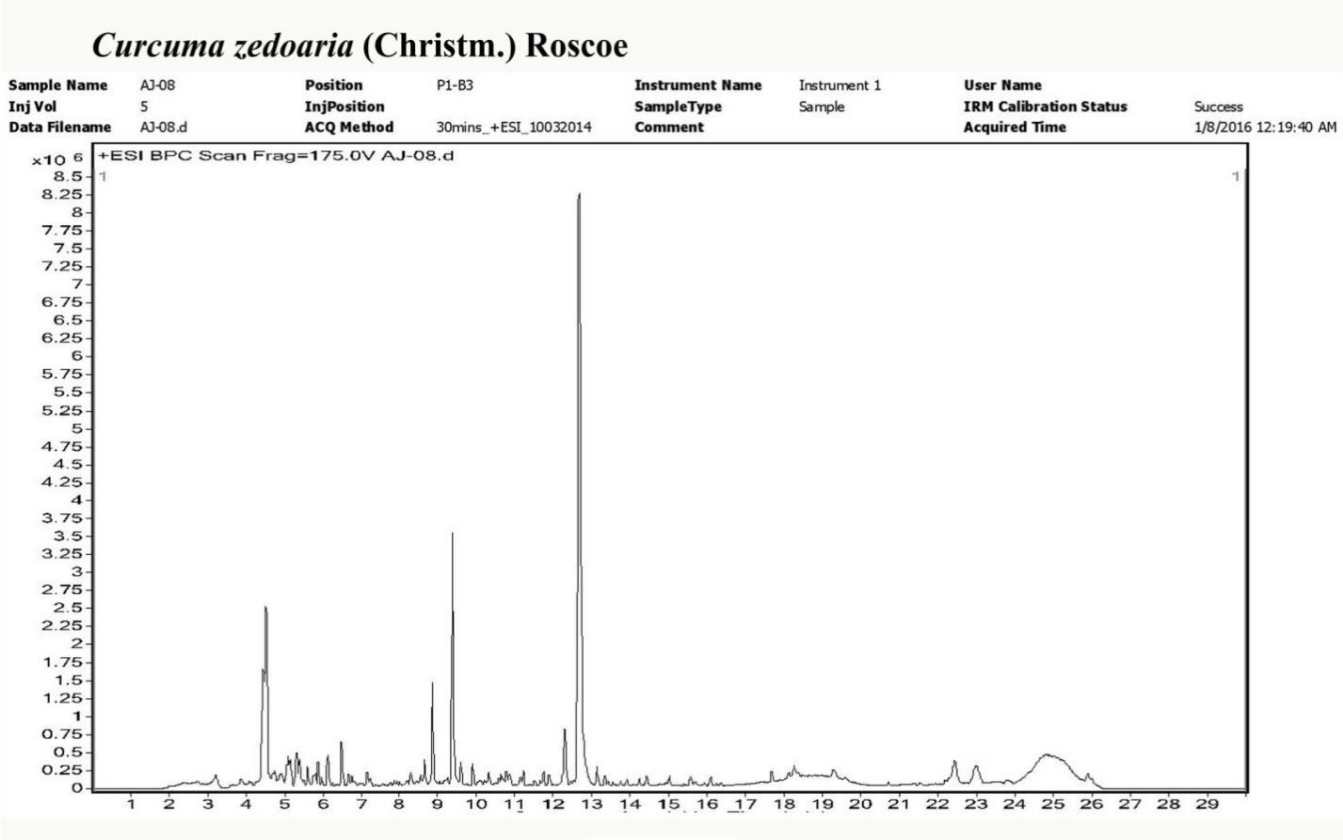


Table A: Major abundant metabolites from *Curcuma zedoaria* (Christm) Roscoe rhizome

Sr. no	Name of Compound	RT	Mass	Formula	M/Z
1	Glycopyrrolate	5.094	318.2051	$C_{19}H_{28}NO_3$	318.2047
2	flurandrenolide	5.147	436.2256	$C_{24}H_{33}F_6O_3$	437.2327
3	26,26,26,27,27,27-hexafluoro-1alpha,24-dihydroxyvitaminD3	5.616	524.2758	$C_{27}H_{38}F_6O_3$	525.2834
4	Protoporphyrinogen IX	5.809	568.3017	$C_{34}H_{40}N_4O_4$	569.3093
5	Phenylbutazone glucuronide	6.137	484.1885	$C_{25}H_{28}N_2O_8$	485.1956
6	Cucurbitacin I	8.858	514.2882	$C_{30}H_{42}O_7$	537.2373
7	Methyl Gamboginate	9.59	662.3011	$C_{39}H_{47}ClO_7$	663.3081
8	Propofol	12.67	178.1368	$C_{12}H_{18}O$	201.1261
9	Ibuprofen	12.671	206.1317	$C_{13}H_{18}O_2$	229.1209

Results revealed that presence of major abundant metabolites identified in *Curcuma zedoaria* (Christm) Roscoe methanolic rhizome extract fraction by ESI-QTOF-MS analysis were Glycopyrrolate, Flurandrenolide, 26,26,26,27,27,27-hexafluoro-1alpha, 24- dihydroxyvitaminD3 / 26,26,26,27,27,27 - hexafluoro- 1alpha, Proto porphyrinogen IX, Phenylbutazone glucuronide, Cucurbitacin I, Methyl Gamboginate, Propofol, Ibuprofen (spectra 1-9). The retention time, m/z value, mass, molecular formula and the DB difference (ppm) of the major 9 abundant metabolites are shown in table, the spectra showed counts versus mass to charge (m/z) ratio (Table 1).

CONCLUSION

The results revealed that presence of major abundant metabolites identified in the *Curcuma zedoaria* (Christm) Roscoe methanolic rhizome extract fraction by ESI-QTOF-MS analysis were Glycopyrrolate, Flurandrenolide, 26,26,26,27,27,27-hexafluoro-1alpha,24-dihydroxyvitaminD3 / 26,26,26,27,27,27 -hexafluoro-1alpha, Proto porphyrinogen IX, Phenylbutazone glucuronide, Cucurbitacin I, Methyl Gamboginate, Propofol, Ibuprofen. HRMS analysis showed the existence of various compounds with different chemical structures. The presence of various bioactive compounds confirms the application of *Curcuma zedoaria* (Christm) Roscoe for various ailments by traditional practitioners. However, isolation of individual phytochemical constituents may proceed to find a novel drug.

Acknowledgement:
Authors are grateful to principal of Vivekanand Arts, Sardar Dalipsingh Commerce and Science College, Samarth Nagar, Aurangabad for providing laboratory facilities for the present research work.

Conflicts of interest: The authors stated that no conflicts of interest.

References

Chen C, Chen Y, Hsi YT, Chang CS, Huang LF, Ho CT, Way TD and Kao JY (2013) Chemical constituents and anticancer activity of *Curcuma zedoaria* Roscoe essential oil against non-small cell lung carcinoma cells *in vitro* and *in vivo. Journal of Agriculture and Food Chemistry,* 61: 11418-11427.

Gao X, Li Q, Li H, Zhang H, Su J, Wang B, Liu P and Zhang A (2014) Extracts from *Curcuma zedoaria* inhibit proliferation of Human Breast Cancer cell MDA-MB-231 *in vitro*. *Evidence-Based Complementary and Alternative Medicine,* Vol. 2014: 1-9.

Lakshmi S, Padmaja G and Remani P (2011) Antitumor effects of Isocurcumenol isolated from *Curcuma zedoaria* rhizomes on human and Murine Cancer Cells. *International Journal of Medicinal Chemistry,* Vol. 2011: 1-13.

Li J, Bain HE, Wan J, Zhou J, Lin Y, Wang JR, Wang ZX, Sen Q and Wang KM (2014) Curdione inhibits proliferation of MCF-7 cells by inducing apoptosis. *Asian Pacific Journal of Cancer Prevention,* Vol. 15: 9997-10001.

Pradhan SG, Singh BD and Singh NP (2005) Flora of India - series – 3. *B.S.I*., Culcatta.

Sharma BD, Karthikeyan S, Singh NP and Lakshminarsimhan P (1996) Flora of Maharashtra state Monocotyledons. *B.S.I.,* pp. 72-77.

Tholkappiyavathi K, Selvan KM, Neyanila SK, Yoganandam GP and Gopal V (2013) A concise review on *Curcuma zedoaria: International Journal of Phytotherapy,* Vol. 3(1): 1- 4.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Studies on fungal and bacterial diseases of *Azadirachta indica*. A.Juss (neem) in Jalgaon district

Firdousi SA

Asst. Professor, Department of Botany, H. J. Thim College of Arts and Science Mehrun, Jalgaon. MS, India
Email: shakeel.talk@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Dr. Firdousi SA (2019) Studies on fungal and bacterial diseases of *Azadirachta indica.* A.juss (neem) in Jalgaon district, *Int. J. of. Life Sciences*, Special Issue, A13:58-60.

ABSTRACT

During the extensive and intensive survey of the forest fungal and bacterial disease of *Azadirachta indica* (Neem) growing in the road side, field, scrub forest near natural forest, plantations and nurseries, about nine type of fungal and bacterial disease were recorded during 2017-2019. The disease was damping off, leaf web blight, leaf spot, leaf blight, powder mildew, bacterial leaf spot, seedling blight were recorded in different study sites in the different season. The causal organism (pathogen) were identified as Pseudosercospora, Alternaria, Oidium, Xanthomonas, Colletotrichum, Pythium, Phytophthora, Fusarium and Rhizoctonia.

Keywords: P*seudosercospora, Alternaria, Oidium, Xanthomonas, Pythium, Phytopthora, Fusarium, Rhizoctonia*.

INTRODUCTION

Azadirachta indica is an indigenous moderate size, deciduous tree with 12-15 feet height. On account of its habit, it is being planted under the social forestry programme in the barren land and in the road side. It is very common in the natural deciduous forest. It is also grown in the garden for its beautiful yellow flower which appear during April-June. The plant is very important for its fuels, timber and medicinal importance. The bark of this plant is used for tanning in the leather industry. The root, bark, seeds and leaves are known to posse's laxative property. Attack of various fungal and bacterial diseases are found in this plant (Firdousi and Khan, 2015).

MATERIAL METHODS

In order to collect phytopathogenic fungi and associated disease on Neem, a frequent survey was coducted in the forest and other places of Jalgaon. The symptology and other information such as place of collection, locality, local names of the plant and date of collections were noted. The sample was kept in the polythene bag and brought in the laboratory. In the laboratory, host name was confirmed with the help of herbarium, Dept of Botany, Jalgaon (Maharashtra).

Fungi which are saprophytic was isolated in PDA medium after surface sterilization with .1% mercuric chloride and sterilized water.

Tentative identification was done with the help of monographs and, reference books and confirmed by experts Bakshi BK(1976), Jamaluddin, Rizvi and Bilgrami (2008), Ellis MB (1976).

RESULTS & DISCUSSION

Table 1 :

Sr.N0.	Diseases	Place	Symptom	Control measure
1	Leaf Spot disease by Pseudocercospora sagarensis	Jalgaon	The infection spots are brown in colour interspersed with white patches. The fungus sporulates on the under surface appear grayish in mass. The heavily infected leaves turn pale and are shed prematurely.	Application of Mancozeb in combination with Brestan is found effective in controlling the disease.
2	Leaf Spot disease by Pseudocercospora subsessilis	Jalgaon	.shot hole and brown spot	Application of Mancozeb in combination with Brestan is found effective in controlling the disease
3	Leaf Spot and blight by Alternaria alternata		It appears late in the growing season in the last week. It attacks the leaves when the leaves become old	Application of Biltox fungicide (0.2%)
4	Leaf web blight by Rhizoctonia solani	Jalgaon	Development of grayish brown blotches which increase in side with the advancing fungal hyphae and ultimately adjoining leaves get joined together by the fungal hypae as if caught in a spider's web.	Application of Bavistin 0.1% a.i)
5	Leaf spot and blight by Colletotrichum gloeosporiodes	Jalgaon	The fungus causes leaf spots which increase rapidly in size covering large leaf areas. The infected leaves preserve. Severely infected seedlings show premature defoliation.	Application of Biltox fungicide (0.2% a.i)
6	Bacterial spot by Xanthomponas azadirachtatii	Jalgaon	Brown spot on the leaf causing early defolliation.	Use of antibiotics.
7	Damping off by Pythium, Phytophthora, Fusarium	Jalgaon	Among the nursery diseases, damping off is the most prevalent and highly destructive disease and cause heavy disease namely pre-emergence and post-emergence damping off depending on the state of growth of seedling	Formalin and Bavistin
8	Stem and basal rot by Ganoderma sp.	Jalgaon	Stem and basal rot by Ganoderma. Complete tree wilted, dried and killed.	
9	Powdery mildew	Jalgaon	White patches seen on the surface of the leaves. The patches coalesced and covered the whole leaf lamina giving leaves and leaflets defoliated prematurely.	Bavistin fungicidal solution (0.01%)

CONCLUSION

A frequent surey was made to study the disease of *Azadirachta indica* in the differtent study site. The disease were damping off, leaf web blight, leaf spot, leaf blight, powdery mildew, bacterial leaf spot, seedling blight were recorded in different study sites in the different season. The causal organ is (pathogen) were identified as *pseudosercospora, Alternaria, Oidium, Xanthomonas, Colletotrichum, Pythium, Phtophthora, Fusarium* and *Rhizoctonia*. Control measures were suggested.

Acknowledgement:
Author is grateful to Principal of H.J. Thim college of Arts and science Jalgaon for providing laboratory facilities and deptt of botany Sagar university for identification and confirmation of the fungi .

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Bakshi BK(1976) Forest Pathology Principal and Practice I Forestry,Controller of Publication

Delhi.

Ellis MB (1976) More Dematiceous Hypomycetes CMI Kew England

Firdousi SA and Khan TA (2015)Two new fungal disease of trees of manudevi forest of Jalgaon Flora and Fauna 21(2);158-160

Jamaluddin, Rizvi and Bilgrami (2008) Fungi of India host Index and Addenda, Bisen Pal Singh Publication, Dehradun

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Phytochemical Screening and Antimicrobial activity of *Cassia fistula* Linn.

Dhale DA

PG-Department of Botany, SSVPS's, L.K. Dr. P. R. Ghogrey Science College, Dhule-424005. (Maharashtra) India
E-mail: datta.dhale@yahoo.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Dhale DA (2019) Phytochemical Screening and Antimicrobial activity of *Cassia fistula* Linn, *Int. J. of. Life Sciences*, Special Issue, A13: 61-66.

ABSTRACT

The present communication deals with the Phytochemical Screening and Antimicrobial activity on the different parts of *Cassia fistula* Linn. Family-Caesalpiniaceae. Physiochemical values such as the Moisture contents, percentage of total ash, acid insoluble ash, acid soluble ash, water soluble ash, extractive values as petroleum ether-soluble extractives, ethanol-soluble extractives, methanol-soluble extractives and water-soluble extractives were calculated as well as colour reactions of powder and extract with different chemicals were performed to observe fluorescence analysis. The extracts were subjected to qualitative screening test for various constituents. This revealed the presence protein, glycosides, alkaloids, tannins and phenolic compound, steroid reducing sugars and saponin glycosides. Antimicrobial activity of different parts extract was evaluated on microbial strains like Gram positive species *Staphylococcus aureus* and *Bacillus subtilis* and Gram negative species *Escherichia coli* and *Pseudomonas aeruginosa.* These observations will help in the Pharmacognostical identification and standardization of the drug in the crude form and also to distinguish the drug from its adulteration.

Key words: Antimicrobial, *Cassia fistula*, Caesalpiniaceae, Phytochemistry, Pharmacognosy.

INTRODUCTION

Botanical Name : *Cassia fistula* Linn.
Family : Caesalpiniaceae
Common Name : Bahava.
Parts Used : Root, Leaves, flower and Fruit.

Cassia fistula is a medium sized deciduous tree, 10 m tall with a straight trunk to 5 m, 1 m diameter and spreading branches. Stem bark pale grey, smooth and slender when young and dark brown and rough when old. Leaves alternate, pinnate, 30-40 cm long, with 4-8 pairs of ovate leaflets, 7.5-15 cm long, 2-5 cm broad, entire, the petiolules 2-6 mm long. Flowers bright yellow in terminal, drooping racemes, 30-60 cm long; calyx oblong, obtuse, pubescent; corolla with five subequal, obovate, shortly clawed petals, to 3.5 cm across; stamens 10, upper three with erect filaments to 0.7 cm long and with basifixed anthers; lower three curved and filaments with dorsifixed anthers and the median four stamens with erect filaments, to 1 cm long and with versatile, curved anthers; pistil sessile or stalked, ovary pubescent, style to 0.5

cm long and with terminal stigma. Fruit an indehiscent pod, 40-60 cm long by 1-2 cm diameter, cylindrical, pendulous and terete, containing 25-100 seeds. The pod develops numerous transverse septa between the seeds. When fresh the pods contain a black pulp which on drying adheres to the septa (Orwa, *et al*,. 2009).

Fig.1: Plant habit *Cassia fistula*

Medicinal Properties and Uses:
Root useful in skin diseases, leprosy, tuberculosis gland, syphilis, cures burning sensation. Leaves antiperiodic, heal ulcer, used in rheumatism, juice given in erysipdas. Flower improves taste, laxative, antipyretic; cure "kapha" biliousness; cooling astringent, cause flatulence. Fruit digestible, cooling purgative, cure disease of heart and abdominal pains. Seeds- oily, carminative, improves appetite. Root is generally given as tonic and febrifuge. It has been found to act as strong purgative. In Konkan juice of young leaves is used to cure ring worm. In Hindu medicine fruit pulp is used as cathartic. It is mild laxative. Safe for children and pregnant women (Agharkar, 1991).

Cassia fistula is no exception it is often used as a highly effective moderate laxative that is safe even for children. However, in large doses, the leaves and bark can cause vomiting, nausea, abdominal pain and cramps. *C. fistula* is also employed as a remedy for tumors of the abdomen, glands, liver, stomach, and throat, for burns, cancer, constipation, convulsions, delirium, diarrhea, dysuria, epilepsy, gravel, hematuria, pimples, and glandular tumors. In Ayurvedic medicine systems, the seeds are attributed with antibilious, aperitif, carminative, and laxative properties while the the root is used for adenopathy, burning sensations, leprosy, skin diseases, syphilis, and tubercular glands. The leaves are employed there for erysipelas, malaria, rheumatism, and ulcers. In Brazilian herbal medicine, the seeds are used as a laxative and the leaves and/or bark is used for pain and inflammation.

Distribution:
Cassia fistula is native to India, the Amazon and Sri Lanka, and is now widely cultivated worldwide as an ornamental tree for its beautiful showy yellow flowers.

MATERIAL METHODS

Sample collection and Authentication: The fresh, healthy, mature plants were collected from farm Dhule (M.S., India) away from pollution. The plant materials were identified using the Flora of Dhule and Nandurbar District (Patil, 2003) at Post–graduate Department of Botany, SSVP Sansthas, L.K.Dr.P.R. Ghogrey Science College, Deopur, Dhule-(M.S) India and herbarium were also preserved. The leaves, stem and fruits were washed and used for the present study. The dried plant materials were pulverized into fine powder using a grinder (mixer). About 1 kg of powdered material was prepared. After that powder were kept into air tight bags. Physiochemical values such as the percentage of total ash, acid insoluble ash, acid soluble ash, extractive values as petroleum ether-soluble extractives, etahnol-soluble extractives, methanol-soluble extractive, and water-soluble extractives were calculated according to the methods described in the Indian pharmacopoeia (Anonymous 1966; 1985).

Preparation of extract:
The dried plant material was pulverized into fine powder using a grinder (mixer). Phytochemical studies such as qualitative examination were done on the dried powdered material. About 5 g of powdered material was extracted in soxhlet extraction apparatus with 250 ml of each of the following solvents; petroleum ether, chloroform, and alcohol[9]. The extracts obtained with each solvent were filtered through Whatman filter paper No. 1 and the respected solvents were evaporated (at 40ºC) with the help of heating mantle. The sticky greenish-brown substances were obtained and stored in refrigerator for prior to use[10]. Some of the extracts of each solvent were used for the qualitative phytochemical screening for the identification of the various classes of active chemical constituents, using standard prescribed methods (Harborne, 1984; Trease and Evans,1987; Ajaiyeoba, 2000; Edeoga, *et al*., 2005). The positive tests were noted as present (+++) appreciable amount, (++) moderate amount, (+) trace amount and (-) completely absent.

Preparation of microorganism:
Isolation of bacterial species of Gram positive (*Staphylococcus aureus* and *Bacillus subtilis*) and Gram negative (*Echerichia coli* and *Pseudomonas aeruginosa*) takes place. The cultures of these bacteria were checked for purity by doing gram staining and biochemical test and they were grown in nutrient broth at 37°C and maintained in nutrient agar slants at 2-8°C. Nutrient agar medium was used as bacterial culture medium in the antibacterial assays.

Selection of Reference antibiotic:
Reference antibiotic Amphicillin was obtained from authorized medical shop Dhule (M.S.). The purity of the antibiotic is 99.8%.

Dilutions and Inoculum preparations:
The dried plant extracts of *C.fistula* and antibiotic Amphicillin were weighed and dissolved in sterile distilled water to prepare appropriate dilution to get required concentration of 10, 20 mg/ml. The inoculums of *S. aureus*, *B. subtilis*, *E. coli* and *P. aeruginosa* were prepared in nutrient broth medium and kept incubation at 37°C for 8 hours. After growth was observed, the cultures are stored in the refrigerator at 2-8°C for analysis.

Procedure for performing the Disc Diffusion test:
The required amount of Petri plates is prepared and autoclaved at 121°C for 15 minutes. They were allowed to cool under Laminar air flow. Aseptically transfer about 20 ml of media into each sterile Petri dishes and allowed to solidify. 1 ml inoculum suspension was spread uniformly over the agar medium using sterile glass rod to get uniform distribution of bacteria. The readily prepared sterile discs were loaded with different concentrations of about 10, 20 mg/ml of plant extract of *C. fistula* and antibiotic Amphicillin into each separate disc of about 40 µg/ml. The paper diffuse discs were placed on the medium suitably apart and the plate were incubated at 5°C for 1 hour to permit good diffusion and then transferred to an incubator at 37°C for 24 hours. The antibacterial activity was recorded by measuring the width of the clear inhibition zone around the disc using zone reader (mm) (Bayer, 1966).

RESULTS & DISCUSSION

The first step towards ensuring quality of starting material is authentication. Thus, in recent years there has been a rapid increase in the standardization of selected medicinal plants of potential therapeutic significance. Despite the modern techniques, identification of plant drugs by pharmacognostic studies is more reliable. The result of this study as follows:

Qualitative Phytochemical screening
The microchemical screening for the phytoconstituets shows the presences of protein, glycosides, alkaloids, tannins, phenolic compound, steroid reducing sugars and saponin glycosides (Table 1).

Fluorescence analysis
The fluorescence analysis is sensitive and enables the precise and accurate determination over a satisfactory concentration. The fluorescence colour is specific for each compound. A non fluorescent compound may fluorescence if mixed with impurities that are fluorescent. The colour of the extract from organic and inorganic solvents was observed under ordinary light (Table 2).

Physical constants
Results of moisture contents, ash analysis and extractive values of the dried leaves, stem and fruit have been presented in Table 3.

Table 1: Qualitative Phytochemical of *Cassia fistula*

Sr. No.	Test	Fruit Ex. In ethanol	Stem Ex. In ethanol	Leaves Ex.in ethanol
1	Protein	++	+++	+++
2	Glycosides	+++	+	++
3	Alkaloids	+	+	+
4	Tannins and Phenolic compd.	++	++	++
5	Steroid	+++	++	+
6	Saponin glycosides	+++	++	++
7	Reducing sugar	+++	+++	++

Abbreviation: Ex. = Extract; (+++) appreciable amount; (++) moderate amount; (+) trace amount and (-) completely absent

Table 2: Flourusence Analysis of *Cassia fistula*

Sr.No.	TEST	STEM	LEAF	FRUIT
1	Powder	Light green	Green	Dark brown
2	Pd+Iodine	Reddish brown	Reddish brown	Orange red
3	Pd+5%$FeCl_3$	Greenish orange	Greenish yellow	Yellowish orange
4	Pd+1N NaOH	Yellowish brown	Light brown	Red
5	Pd+Acetic acid	Yellow	Yellowish green	Whitish yellow
6	Ext+A.A+50%H_2SO_4	Brown	Buff green	Pinkish red
7	Pd+50%H_2SO_4	Brown	Light brown	Brown
8	Pd+50%conc HCl	Yellowish brown	Greenish yellow	yellow
9	Pd+Ammonia	Brown	Brown	Light orange
10	Ext+4%NaOH+1%$CuSO_4$	Greenish brown	Green	Dirty green
11	Ext+40%NaOH+1%Lead acetate	Dark orange	Dark green	Faint orange
12	Pd+50%HNO_3+Picric acid	Yellow	Dark yellow	Yellow
13	Pd+Satu.Picric acid	Yellow	Dark yellow	Yellow

Abbreviations: Pd= Powder A.A=Acetic Acid, Ext=Extract

Table 3: Physical Evaluation (% W/W) of *Cassia fistula*

Sr. No.	Parameter	Value (%w/w)			
		Leaves		**Stem**	**Fruit**
1.	Moisture content	10.10		9.50	7.30
2.	Extractive values				
	a) Petroleum Ether	15.08		20.00	8.20
	b) Ethanol	35.80		26.66	34.60
	c) Methanol	30.56		23.65	26.20
	d) Water	33.38		25.50	28.85

Table 4: Antibacterial efficacy of different solvent extracts of *Cassia fistula* leaf

Sr. No.	Microorganism	Strain +/-	Concentration (mg/ml)	Zone of inhibition (mm)			
				Petroleum ether	Chloroform	Alcohol	Amphicillin (40 µg/ml)
1	*Escherichia coli*	-ve	10	2	5	6	15
			20	4	7	11	
2	*Pseudomonas aeruginosa*	-ve	10	3	4	6	18
			20	6	8	15	
3	*Staphylococcus aureus*	+ve	10	5	5	7	22
			20	8	11	16	
4	*Bacillus subtilis*	+ve	10	3	3	5	13
			20	5	8	10	

Table 5: Antibacterial efficacy of different solvent extracts of *C. fistula* Stem

Sr. No.	Microorganism	Strain +/-	Concentration (mg/ml)	Zone of inhibition (mm)			
				Petroleum ether	Chloroform	Alcohol	Amphicillin (40 µg/ml)
1	*Escherichia coli*	-ve	10	2	4	7	14
			20	4	8	12	
2	*Pseudomonas aeruginosa*	-ve	10	2	4	5	18
			20	7	9	13	
3	*Staphylococcus aureus*	+ve	10	4	5	8	23
			20	8	10	14	
4	*Bacillus subtilis*	+ve	10	3	4	6	14
			20	5	7	10	

Table 6: Antibacterial efficacy of different solvent extracts of *C. fistula* fruits

Sr. No.	Microorganism	Strain +/-	Concentration (mg/ml)	Zone of inhibition (mm)			
				Petroleum ether	Chloroform	Alcohol	Amphicillin (40 µg/ml)
1	*Escherichia coli*	-ve	10	3	6	9	15
			20	4	7	11	
2	*Pseudomonas aeruginosa*	-ve	10	3	5	7	17
			20	6	8	15	
3	*Staphylococcus aureus*	+ve	10	5	6	9	20
			20	7	9	17	
4	*Bacillus subtilis*	+ve	10	3	3	7	14

Antibacterial study

Petroleum ether, chloroform and alcohol extracts of *C. fistula* leaves and stem were tested against various Gram-negative and Gram-positive bacteria (Table 4). Among the extracts assayed, the alcohol leaf extracts of *C. fistula* exhibited good activity against *S. aureus* at 20 mg/ml for example, 16 mm was recorded as diameter zone of inhibition. This was followed by 15 mm *P. aeruginosa*, 11 mm *E. coli* and *B. subtilis* 10 mm respectively. The least activity of leaf is 2 mm against *E. coli*, whereas *S. aureus* and *S. aureus* shows 3 mm at 10 mg/ml was recorded by petroleum ether extracts.

The stem extracts (Table 5) of *C. fistula* exhibited good activity against *S. aureus* at 20 mg/ml for example, 14 mm was recorded as diameter zone of inhibition. This was followed by 13 mm *P. aeruginosa*, 12 mm *E. coli* and *B. subtilis* 10 mm respectively. The least activity of bark is 2 mm against *E. coli* and *P. aeruginosa*, whereas 3 mm *B. subtilis* at 10mg/ml was recorded by petroleum ether extracts. Activities of the various extracts were comparable to those of standard antibacterial agent Ampicillin.

The fruit extracts (Table 6) of *C. fistula* exhibited good activity against *S. aureus* at 20 mg/ml for example, 17 mm was recorded as diameter zone of inhibition. This was followed by 15 mm *P. aeruginosa*, 12 mm *E. coli* and *B. subtilis* 11 mm respectively. The least activity of bark is 3 mm against *E. coli* and *P. aeruginosa*, whereas 3 mm *B. subtilis* at 10mg/ml was recorded by petroleum ether extracts. Activities of the various extracts were comparable to those of standard antibacterial agent Ampicillin.

CONCLUSION

The physicochemical characters and antimicrobial efficiency reported in this work can serve as a valuable source of information for botanical study, quality control and provide suitable diagnostic tool for the authentication of the original drug, standardization as well as identification of adulterants from the drug. In the present investigation we observed the high extractive values in ethanol compared to other solvents used. The fluorescence colour is specific for each compound. Alcoholic extract of *C. fistula* fruit showed the most remarkable activity. The polarity of the solvent seems to play an important role in exhibiting potential antibacterial activity. It is used as enrichment for Ayurvedic pharmacopoeia and photographs can serve as standard reference material. Further phytochemical studies for identification and elucidation of active constituent in plant material tested in expected to serve as lead in the development of novel bioactive antimicrobial compound.

Acknowledgements:

Authors like to thanks Principal and Head, Department of Botany, SSVPS's, L.K.Dr.P.R. Ghogrey Science College, Dhule for providing necessary research facility.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Agharkar SP (1991) Medicinal plants of Bombay Presidency, Scientific Publication, Jodhpur.

Ajaiyeoba EO (2000) Phytochemical and antimicrobial studies of *Gynandropeis gynandra* and *Buchholzia coriaceae* extracts. *Afr. J. Biomed. Res*. 3(3): 161-165.

Anonymous (1966) *Indian Pharmacopoeia*. vol. 2.3rd Ed. Govt. of India, Ministry of Health, Controller of Publications, New Delhi, India.

Anonymous (1985) *Indian Pharmacopoeia*. vol. 2.3rd Ed. Govt. of India, Ministry of Health, Controller of Publications, New Delhi, India. pp. A74 - A75.

Bayer AW, Kirby MDK, Sherris. JC, Turck M (1966) Antibiotic susceptibility testing by standard single disc diffusion method. *Am. J. Clinical pathol.,* 493-496.

Edeoga HO, Okwu DE and Mbacbie BO (2005) Phytochemical constituents of some Nigerian medicinal plants*. Afri J Biotech*, *Vol.* 4(7): 685-688.

Harborne JB (1984) Phytochemical methods, Chapman Hall, London, pp 100 - 101.

Orwa C, Mutua A, Kindt R, Jamnadass R, Simons A (2009) Agroforestree Database:a tree reference and selection guide version 4.0: 2-5.

Patil DA (2003) Flora of Dhule and Nandurbar District, Bishen Singh Mahendrapal singh, Dehra Dun (India).

Trease E, and Evans WC (1987) Pharmacognosy, Billiare Tindall, London.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Soil health management and water salinity problems

Khanduri Preeti

Department of Botany, Government Post Graduate College, Kotdwar, Garhwal
Email: khanduripreeti23@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Khanduri Preeti (2019) Soil health management and water salinity problems, *Int. J. of. Life Sciences*, Special Issue, A13: 67-70.

ABSTRACT

Management of agricultural soils include the structural, biological and mineral health of the soil, besides N, P and K to produce nutritionally-dense food. The 11th five-year plan (2007-2012) for the first time acknowledged the importance of proper soil management in agriculture. Soil health cannot be determined by measuring only crop yield and water quality but by the evaluation of indicators, which are physical, chemical and biological. The degradation and loss of soil is a problem seriously affecting the production of the world's food crops. Soil disturbance can be the result of physical, chemical or biological activities. Salinity is another major abiotic factor which limits the growth and productivity of plants due to the use of poor quality water for irrigation and soil salinization. The higher the salinity of irrigation water, the higher is its salinity hazard for the crops if the soil and climatic conditions and the cultural practices remain the same. Salt stress is considered as an alarming condition for the ill health of the plant. Proper soil management includes crop rotation, fertilizer applications and irrigation methods which help to decrease the soil exhaustion. Soil Health Card (SHC), a Government of India's scheme is being implemented through the Department of Agriculture of all the State and Union Territory Governments which contains the status of the soil with respect to different parameters. The SHC indicates fertilizer recommendations and soil amendment required for the farm. Scientists in the field of biotechnology are developing hybrid plants that may provide greater yields even in exhausted soil by the use of recombinant DNA technology. Different initiatives are being taken up by the Governments and individuals for solutions to soil loss and exhaustion.

Key words: Soil health, soil disturbance, soil management, soil health card, salt stress

INTRODUCTION

Soil is the network of interacting living organisms within the earth's surface layer which support life above ground. Living organisms in soil ultimately control water infiltration, mineral density and nutrient cycling. Fungi and bacteria help break down organic matter in the soil and earthworms digest organic matter, recycle nutrients, and make the surface soil richer. Management of agricultural soils should consider the structural, biological and mineral health of the soil, besides N, P and K to produce nutritionally-dense food.

The 11th five-year plan (2007-2012) for the first time since India's independence acknowledged the importance of proper soil management in agriculture (Patel, 2016). The concept of soil quality (Doran & Jones, 1996; Karlen *et al*., 1997) is useful to assess the condition and sustainability of soil and to guide soil research, planning, and conservation policy. Soil health cannot be determined by measuring only crop yield and water quality but by the evaluation of indicators. Indicators can be physical (bulk density, infiltration, soil structure, soil depth, porosity and water holding capacity, retention and transport of water and nutrients, habitat for soil microbes, crop productivity potential) , chemical (electrical conductivity, soil nitrate, soil pH, plant and microbial activity thresholds; and available nutrients for plant) and biological (particulate organic matter, soil enzymes, soil respiration, and total organic carbon and microbial activity measure) properties, processes, or characteristics of soils, which can be assessed by qualitative or quantitative techniques. Assessments of soil health are used to support the management of sustainable soils and functions, encompassing both a soil's inherent and dynamic qualities, which impact, are impacted by the surrounding ecosystem, and are subjected to human influence (Hannah *et al*., 2018). Soil-quality assessment, based on inherent soil factors and focusing on dynamic aspects of soil system, is an effective method for evaluating the environmental sustainability of land use and management activities (Nortcliff, 2002).Over a long period of time, no soil can continue to give desired yields without replenishment of the removed nutrients (Patil and Durgude, 2016). Humus is one of the organic soil conditioner which serves as a reservoir for nutrients, improves soil structure, drainage aeration, cation exchange capacity and water holding capacity and provides a source of food for microorganisms (Naik et.al.,2015). Other soil conditioners include vermicompost, crop residues, sewage, sludge, green manure crops and saw dust. Salinity is another major abiotic factor limiting growth and productivity of plants in many areas of the world which is due to increase in the use of poor quality water for irrigation and soil salinization. Plant adaptation or tolerance to salinity stress involves complex physiological traits, metabolic pathways, and molecular or gene networks (Gupta and Huang, 2014). The higher the salinity of irrigation water, the higher is its salinity hazard for the crops if the soil and climatic conditions and the cultural practices remain the same. The Soil gets exhausted when poorly managed soils are no longer able to support crops or other plant life. Soil exhaustion, besides leading to limited food production, also increases risk of soil erosion. Single-crop agriculture depletes soil nutrients because the same nutrients are required year after year and the soil has no time to replenish its stores. Under the Soil Health Card Scheme, a scheme launched by the Government of India in 19 February 2015, the government has planned to issue soil cards to farmers which will carry crop-wise recommendations of nutrients and fertilisers required for the individual farms to help farmers to improve productivity through judicious use of inputs. After testing the soil samples, the experts analyse the strength and weaknesses (micro-nutrients deficiency) of the soil and suggest measures to deal with it. The present paper deals with some discussion regarding the consequences of soil exhaustion and water salinity on plant health and the management of soil health- the role of public and the strategies adopted by the government.

MATERIAL METHODS

An agro ecological approach for soil-quality evaluation and monitoring was proposed by De la Rosa (2005). The assessment was done by evaluating inherent soil quality and dynamic soil quality- the two soil indicators. USDA (2006) has selected seven physical, three chemical, and two biological indicators, which represent a minimal dataset to characterize soil quality.The concept of leaching requirement (LR) was given by Richards in 1954. LR,by definition, is the fraction of total water applied that must drain below the root zone to restrict salinity to a specified level according to the level of tolerance of the crop.

$$LR = \frac{Ddw}{Diw},$$ where D is the depth of water,

;dw and iw refer respectively to the drainage and irrigation water. Assuming strict salt balance conditions in the soil-water system:

Diw x Ciw = Ddw x Cdw where C refers to the concentration of salts.

Therefore,

$$LR = \frac{Ciw}{Cdw} \text{ or } \frac{ECiw}{ECdw}$$

Table 1: Soil attributes which may be used as indicators of soil quality USDA (2006).

Grouping type	Soil indicators
Physical attributes	Soil texture
	Stoniness
	Soil structure
	Bulk density
	Porosity
	Aggregate strength and stability
	Soil crusting
	Soil compaction
	Drainage Water retention
	Infiltration
	Hydraulic conductivity
	Topsoil depth
Chemical attributes	Colour
	Reaction (pH)
	Carbonate content
	Salinity
	Sodium saturation
	Cation exchange capacity
	Plant nutrients
	Toxic elements
Biological attributes	Organic matter content
	Populations of organisms
	Fractions of organic matter
	Microbial biomass
	Respiration rate
	Mycorrhizal associations
	Nematode communities
	Enzyme activities
	Fatty acid profiles

RESULTS & DISCUSSION

According to the LR concept, the excess amount of irrigation water of a known Electrical Conductivity (EC) that must be applied is determined by the maximum permissible EC of the drainage water specified for a particular crop. The values of ECdw represent the maximum salinity tolerated by the species grown under particular conditions. To prevent excessive salt accumulation in the soil, it is necessary to remove salts periodically by application of water in excess of the consumptive use. The excess water applied will remove salts from the root zone provided the soil has adequate internal drainage. Salinity stress involves changes in various physiological and metabolic processes, depending on severity and duration of the stress, and ultimately inhibits crop production (Munns, 2005). Salt stress is considered to hamper the agricultural productivity of soil.

CONCLUSION

Soil isn't an inert growing medium, but rather is teaming with billions of bacteria, fungi, and other microbes that are the foundation of an elegant symbiotic ecosystem. Increasing the diversity of a crop rotation and cover crops increases soil health and soil function, reduces input costs, and increases profitability. Physical soil disturbance, such as tillage, results in bare and/or compacted soil that is destructive and disruptive to soil microbes, and it creates a hostile environment for them to live. Overgrazing, a form of biological disturbance, reduces root mass, increases runoff, and increases soil temperature. All forms of soil disturbance diminish habitat for soil microbes and result in a diminished soil food web. Our intensive industrial agricultural practices - narrow spectrum fertilizers, herbicides, pesticides, large scale monoculture planting and tilling lead to decreasing mineralization, and lowering of humus levels. The produce grown on these soils though looks normal, but is hollow because the mineral content is steadily declining. Thus, proper soil management including crop rotation, fertilizer applications and irrigation methods help in decreasing the potential for soil exhaustion. Rotation of crops not only prevents soil exhaustion but also limits crop diseases and insect infestations.

Governments and individuals are looking for solutions to soil loss and exhaustion. Instead of using pesticides, many farmers now use benign pest-control measures, such as crop rotation, pest traps, and integrated pest management. Conservation tillage or residue management is a conservation practice that gives efficient, effective control to erosion and can improve soil properties and soil quality. Scientists in the field of biotechnology are developing hybrid plants that may provide greater yields even in exhausted soil by the use of recombinant DNA technology.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

De la Rosa D (2005) Soil quality evaluation and monitoring based on land evaluation. Land Degradation & Development, 16: 551–559.

Doran J W and Jones A J (1996) Methods for assessing soil quality. SSSA Special Publication 49. Madison, WI: Soil Science Society of America.

Gupta B and Huang B (2014) Mechanism of Salinity Tolerance in Plants: Physiological, Biochemical, and Molecular Characterization, Article ID 701596.

Hannah L, Hubanks, Jonathan L, Deeenik, Crow ES (2018) Earth systems and environmental sciences. Getting the Dirt on Soil Health and Management,Elsevier .

Karlen DL, Mausbach M J, Doran J W, Cline RG, Harris RF and Schuman GE (1997) Soil quality: A concept, definition and framework for evaluation. Soil Science Society of America Journal, 61: 4–10.

Munns R (2005) Genes and salt tolerance: bringing them together, New Phytologist, 167(3): 645–663, 2005.

Naik K, kulkarni S, Raghavendra and Desai A (2015) Uses of soil conditioners for improving soil health. Agrobios Newsletter, XIV (03): 52-53.

Nortcliff S (2002). Standardization of soil quality attributes. Agriculture, Ecosystems & Environment, 88: 161–168.

Patel A (2016) Addressing soil health management issues in India , International Journal of Research - Granthaalayah, 4(12): 110-123.

Patil AA and Durgude AG (2016) Fertilizer use and soil quality. Agrobios Newsletter, XIV(08): 31-33.

Richards LA (1954) Diagnosis and improvements of saline and alkali soils. USDA. Agriculture Handbook 60, pp:160.

United States department of Agriculture (USDA), (2006). National Agricultural Statistics Service.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Assessment of physical parameters of Amravati Dam, Malpur, Dist. Dhule, (M.S.), India.

Patil Jitendra C[1], Badgujar Sandip R[1], Jaiswal Deepchand P[2] and Balde Govind H[1]

[1]P.G. Department of Zoology, G.T.Patil College, Nandurbar.(M.S.), India
[2]P.G. Department of Zoology, Arts, Science and Commerce College, Navapur Dist. Nandurbar (M.S), India
E-mail: jittcpatil@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Patil Jitendra C, Badgujar Sandip R, Jaiswal Deepchand P and Balde Govind H (2019) Assessment of physical parameters of Amravati Dam, Malpur, Dist. Dhule, (M.S.), India., *Int. J. of. Life Sciences*, Special Issue, A13: 71-77.

ABSTRACT

Water is one of the most fundamental elements in the environment. It is considered as an essence of life. The use of water for various purposes including domestic, industrial and agricultural has no doubt increased in our life, which is vitally important abiotic component of the environment. Water exists in various forms in nature such as cloud, rain, snow, ice and fog. However; strictly speaking chemically pure water does not exist for any appreciable length of time in nature. By the time, it gets polluted severely and easily as it reaches us. It cannot escape pure while raining. It picks up small amount of gases, ions, dust and particular matter from the atmosphere. It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purpose. Water must be tested with different physicochemical parameters. Water is an important constituent for all the living beings. The water quality guidelines provide a limit value for each parameter for drinking water. It is necessary that the quality of drinking water should be checked at regular time interval, because due to use of contaminated drinking water, human population suffers from varied of water borne diseases. The availability of good quality water is a necessary feature for preventing diseases and improving quality of life. Present communication deals with the investigation of physico-chemical parameters of Amravati Dam, Malpur, Dist. Dhule (M.S.) India.

Key words: Amravati Dam, Malpur, Physical parameters

INTRODUCTION

Environment consists of five elements, air, water, land, flora and fauna that inextricably inter-linked. These tend to interact with each other continuously. Change in one of them may affect other elements, and this disturbs the environmental balance. Water as extraordinary substance, exists in three states as solid, gases, liquid proved important for survivability of life (Simpi et al., 2011).

Out of total volume of water (approximately 1.4 billion km^3) more than 97% is ocean water unsuitable for human use, and only 3% of the earth's water is fresh. An estimated 77.2% of this is in frozen in the form of ice caps and glaciers.

Most of the remaining freshwater (22.4%) is ground water and soil moisture. Rest of the freshwater is a very small amount of surface water. Out of this 0.35% is present in lakes and swamps and less than 0.01% in rivers and streams. The amount of total water available for use in India is estimated to 1990 billion m^3 per year. About 86% of this comes from the surface runoff in river, streams, lakes and ponds, excluding ground water resources that still need to be tapped.

River also serves for domestic, industrial and agricultural disposal, transportation, getting food resources and for recreational activities (Dhote and Dixit, 2011). The good quality drinking water is often regarded as an important means of improve health according to World Health Organization (WHO, 2002) Aquatic organisms need a healthy environment. Maximum productivity depends on optimum level of Physico chemical parameters (Sadia et al., 2013). Limnology is the comprehensive study of fresh water bodies. Water has two dimensions that are closely linked-quantity and quality. The urban pond is influenced by several extrinsic factors which may alter the structural and functional components of such ecosystem (Goswami and Mankodi, 2012). Limnology is also described as "Hydrobiology or aquatic biology. According to Edgar do Baldi a prominent Italian ecologist; limnology is the science dealing with internal action of processes and methods whereby matter and energy are transformed within the lake or pond. Water is one of the most essential needs for the continued existence of all living organisms on earth.

Ever since the spread of environmental awareness all over world, monitoring of water resources through regular analysis has become crucially important feature. It is essential for exploration, exploitation and conservation of the potentials of the water bodies keeping this in view; we have made an attempt to evaluate the important physicochemical and biological parameter.

MATERIAL METHODS

The methods used for the analysis of various Physico-chemical parameters are used from *standard methods for the examination of water* (APHA 1985, Trivedy and Goel 1984).

pH

The pH of most of the natural waterfalls is within the range of 4 to 9. pH is the negative logarithm of hydrogen ion concentration, or more precisely hydrogen ion-activity. Portable digital pH meter was used for the measurement of pH values. Standard buffer solutions of pH 4.0 and 9.2 were used for calibration.

Transparency

Transparency is a water quality characteristic of lake and can be measured quickly and easily using Secchi disc. The Secchi disc was lowered down with the help of a graduated rope till it disappeared from the view and then lifted till it reappeared. The average reading of these two depths (in cm) was considered the limit of visibility and was taken as Secchi disc transparency.

$$\text{Transparency (cm)} = \frac{X+Y}{2}$$

Where,

X = Depth of disappearance (cm)

Y = Depth of reappearance (cm)

Turbidity

Turbidity arises because of wide variety of suspended colloidal materials, run off from barren areas during rain is the most natural contributor of turbidity, particularly silt and clay. Turbidity is interference to the passage of light by suspended particles in water. The scattering of the light is generally proportional to the turbidity.

Total Dissolved Solids (TDS)

The total dissolved solids were estimated by gravimetric method. (Trivedy and Goel 1984). The result was expressed in mg/l.

$$\text{TDS (mg/}l\text{)} = \frac{\text{A-B x 10,00,000}}{V}$$

Where,

A = Final weight of the dish in g

B = Initial weight of the dish in g

V = Volume of sample taken in ml.

Conductivity

Pure water is a poor conductor of electricity. Acids, bases and salts present in water make it relatively good conductor of electricity and such substances are called electrolytes.

The conductivity of water sample was measured with help of a conductivity meter. Electrical conductivity was calculated using observed conductance, cell constant and temperature factor at 25^0C (Trivedy and Goel 1984). The result was expressed as µmhos/cm.

RESULTS & DISCUSSION

pH

The pH of water ranged in 7. to 8.9. The pH of the reservoir Amravati Dam water was less alkaline throughout year. The pH of lake water exhibited positive correlation with TDS, Turbidity, Chloride and negative correlation with Transparency, Free CO_2, Total Alkalinity, Conductivity and Sulfate. pH also exhibited positive correlation with MPN, Rotifers, Cladoceran, Copepods, Total Zooplankton.

The pH was found to be minimum in winter and maximum in rainy season. Maximum pH was recorded in the month of August and September. The minimum pH was recorded in the month of December. It was observed that the pH values were almost within 7 to 8.9 throughout the one year.

Transparency

The transparency of water ranged between 30 cm to 100 cm in year 2018-2019. The minimum transparency of reservoir water was recorded in the month of June 30cm and maximum in December 100cm. Seasonal variations of transparency were also observed. In rainy season, transparency was less as compared to that in summer and winter season. Transparency of station B was comparatively lower than that of remaining stations. Transparence exhibited positive correlation with Sulfate and negative correlation with remaining parameters.

Table 1: Monthly variation in pH at four different stations of Amravati dam, Malpur during June 2018 – May 2019.

Months	Site A	Site B	Site C	Site D
June	8.7	8.6	8.6	8.6
July	8.4	8.6	8.6	8.5
August.	8.9	8.7	8.7	8.6
September.	8.5	8.5	8.8	8.8
October.	8.2	8.3	8.2	8.5
November.	7.6	7.8	7.7	7.5
December.	7.4	7.4	7.6	7.5
January	7.9	8.0	7.9	8.1
February.	8.0	8.0	7.9	8.1
March	8.4	8.5	8.2	8.3
April	8.5	8.4	8.5	8.4
May	8.2	8.4	8.4	8.5

Table No. 2 Monthly variation in Transparancy (cm) four different stations of Amravati dam, Malpur during June 2018 – May 2019.

Months	Site A	Site B	Site C	Site D
June	42	41	42	40
July	33	32	34	31
August.	33	32	34	35
September.	44	42	43	40
October.	61	63	65	64
November.	85	87	92	97
December.	90	80.5	83	85
January	94	85	86	94
February.	75	65	85	84
March	62	63	64	65
April	57	52	53	52
May	48	49	46	48

Table No. 3 Monthly variation in Turbidity (NTU) four different stations of Amravati dam, Malpur during June 2018 – May 2019.

Months	Site A	Site B	Site C	Site D
June	18	20	20	16
July	16	18	18	16
August.	16	14	16	14
September.	14	20	14	18
October.	18	14	18	18
November.	12	11	18	14
December.	12	20	11	12
January	14	12	11	18
February.	4	6	8	6
March	16	15	16	14
April	12	10	12	16
May	20	20	21	20

Table No. 4 Monthly variation in TDS (mg/l) four different stations of Amravati dam, Malpur during June 2018 – May 2019.

Months	Site A	Site B	Site C	Site D
June	280	283	284	270
July	274	282	281	276
August.	278	285	287	285
September.	276	269	275	265
October.	205	209	211	207
November.	184	165	207	203
December.	174	172	168	162
January	190	194	199	192
February.	208	200	204	208
March	204	203	200	198
April	206	208	200	220
May	215	208	211	199

Table No. 5 Monthly variation in Conductive (µmho/cm) four different stations of Amravati dam, Malpur during June 2018 – May 2019.

Months	Site A	Site B	Site C	Site D
June	308	255	258	294
July	271	269	257	254
August.	254	268	264	271
September.	263	267	292	301
October.	299	209	204	204
November.	260	241	360	299
December.	315	309	314	303
January	292	288	296	287
February.	222	231	216	230
March	318	294	303	300
April	264	258	259	273
May	324	448	400	412

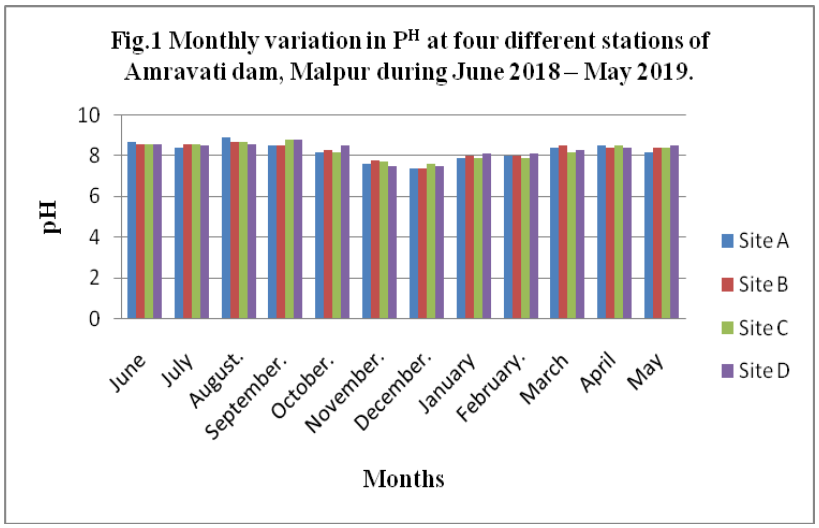


Fig.1 Monthly variation in P^H at four different stations of Amravati dam, Malpur during June 2018 – May 2019.

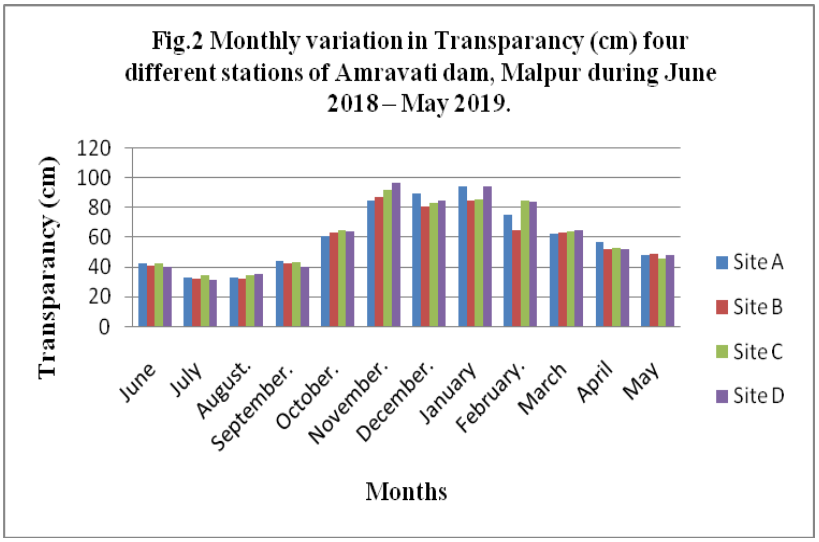


Fig.2 Monthly variation in Transparancy (cm) four different stations of Amravati dam, Malpur during June 2018 – May 2019.

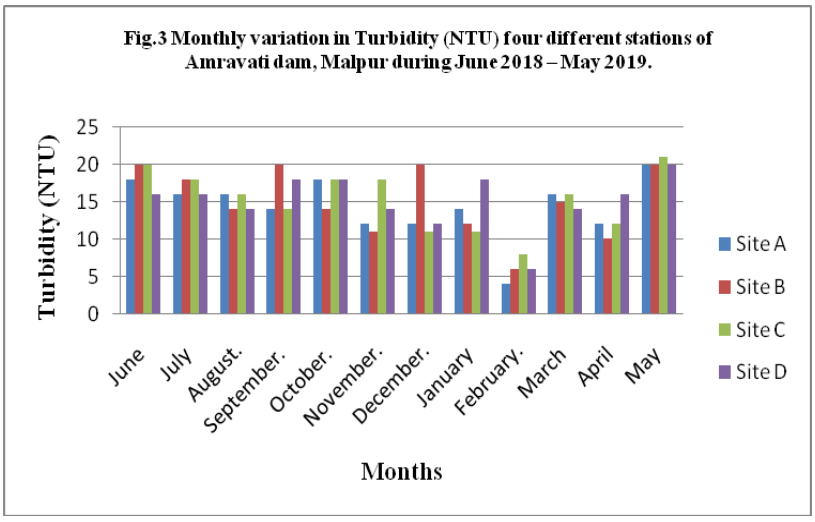
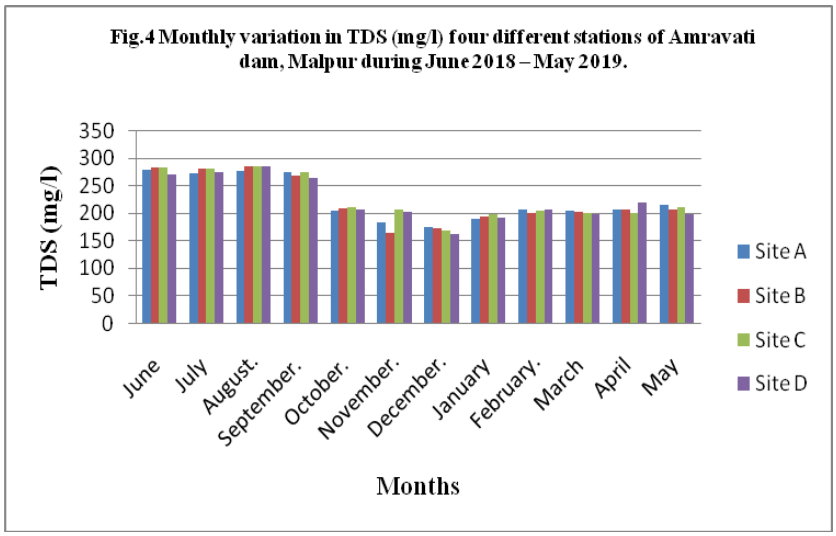
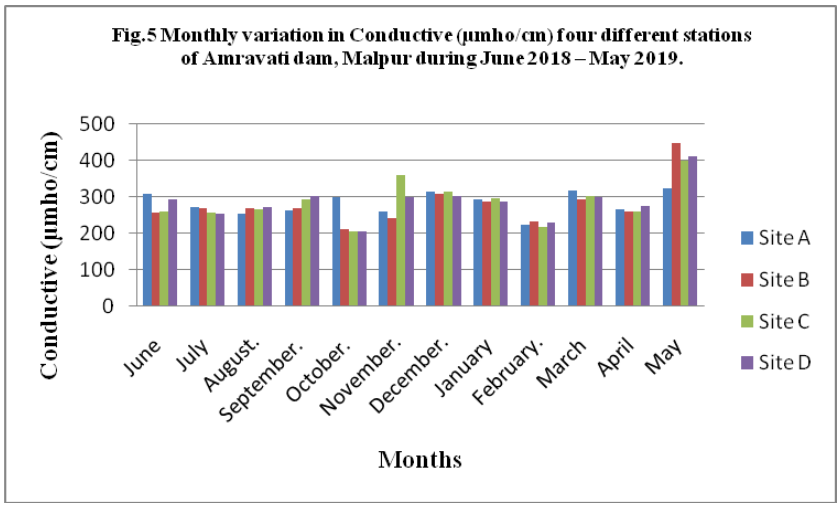


Fig.3 Monthly variation in Turbidity (NTU) four different stations of Amravati dam, Malpur during June 2018 – May 2019.





Turbidity

The Turbidity of water was ranged between 2 to 23 NTU in Year 2018-2019. The turbidity of reservoir water was minimum in summer and winter, while maximum in rainy season. The turbidity of reservoir water exhibited positive correlation with TDS, Conductivity, Free CO_2, Total Alkalinity, Chloride, MPN, TPC, Rotifers, Cladoceran, Total Zooplankton and Productivity.

Total Dissolved Solids (TDS)

Total Dissolved Solid fluctuated between 160 mg/*l* to 285 mg/*l* in year 2018-2019. The minimum TDS of reservoir water was recored in the month of December i.e 160 mg/*l,* while maximum in the month of June in year 2018. Seasonal variation of TDS was also observed. In winter season lower the value of TDS as compared to rainy and summer season in all four-study stations. TDS exhibited positive correlation DO, Chloride and negative correlation with Conductivity, Co_2 Total Alkalinity, Hardness Productivity and Sulphate.TDS also exhibited positive correlation with MPN, TPC, Rotifers, Cladoceran, and Total Zooplankton.

Conductivity

In present investigations Electric Conductivity ranging between 204µ mho/cm and 554 µmho/cm. It was found that the conductivity goes on increasing from June to November and then it declines gradually during December and further once again increases till the end of summer i.e. up to May. Conductivity exhibited positive correlation with Total Alkalinity and negative correlations with DO, Sulfate, MPN and TPC. Conductivity exhibited positive correlation with Rotifer, Cladoceran, Copepods, and Total Zooplankton.

CONCLUSION

Pure water does not actually exist in nature, as all water contains some naturally occurring chemicals that have leached from the surrounding environment. In most

cases, the levels of naturally occurring chemicals are either beneficial, or minimal and of little consequence. There are many human made chemicals that can contaminate water and affect its usability. Sources of chemical contaminants can be naturally occurring chemicals, chemicals from agricultural activities, chemicals from human settlements, chemicals from industrial activities and chemicals from water treatment and distribution. The physical characteristics of water are usually one of those things that we can measure with our own senses such as: turbidity, colour, taste, odour and temperature. In general, drinking water to have good physical qualities if it is clear, tastes good, has no smell and is cool. Physical contaminants generally do have not direct health effects themselves; however, their presence may relate to a higher risk of microbiological and chemical contamination which may be harmful to human health (Vijay S. kale,2016)

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Alam M (1980): Limnological studies of sambhar salt lake and its reservoir Ph. D. Thesis University of Jodhpur, Jodhpur (India) pp.158.

APHA (1980): Standard Methods for the Examination of water and Waste Water (19th Edn.) *American Public Health Association and Water pollution control federation Washington D. C.* pp 1134.

APHA (1998) : Standard Methods for the examination of water and Waste Water 20th ed. *APHA, AWWA and WEF. N. W. Washington D. C.*

Dhote S and Dixit S (2011). Hydro Chemical Changes in Two Eutrophic Lakes of Central India after Immersion of Durga and Ganesh Idol, Res.J.Chem.Sci. 1(1), 38-45.

Goel PK, Trivedi RK and Bhave (1985) : Studies on the limnology of freshwater bodies in southern Maharashtra Indian. *J. Environ. Protection* 5(1) : 19 – 25.

Goswami and Mankodi (2012) Study on Zooplankton of Fresh Water Reservoir Nyari – II Rajkot district, Gujarat, India. ISCA Journal of Biological Sciences; ISCA J. Biological Sci. Vol. 1(1), 30-34.

Sadia A, Feroza HW, Imran Q, Muhammad Hamid SW, Tirmizi SA, Muhammad AQ (2013). Monitoring of anthropogenic influences on underground and surface water quality of Indus River at district Mianwali-Pakistan. Turk. J. Biochem. 38(1):25-30.

Simpi B, Hiremath SM, Murthy KNS (2011). Analysis of Water Quality Using Physico- Chemical Parameters Hosahalli Tank in Shimoga District, Karnataka, India, Global Journal of Science Frontier Research,11:(3).

Vijay S. kale(2016): consequence of Temperature, pH,Turbidity and dissolved Oxygen Water quality parameters,vol.3,(8),ARSET-PP 186-190.

WHO (1984) : Guidelines for Drinking water quality vol. I "Recommendations" 6, *World health Organisation*, Geneva.

WHO (1988) International standards for drinking water quality Vol. I. Recommendations. *World Health Organisation* Geneva, 130 p.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Diversity of Macrofungi from North Maharashtra-II

Patil SY

P. G. Department of Botany, S. S. V. P. S. L. K. Dr. P. R. Ghogrey Science College, Dhule
Email: sambhajiyp@rediffmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Patil SY (2019) Diversity of Macrofungi from North Maharashtra-II, *Int. J. of. Life Sciences*, Special Issue, A13: 78-83.

ABSTRACT

Macrofungi (Mushrooms) are an important and integral component of the ecosystem. Mostly mushrooms are fleshy, sub fleshy or sometimes leathery, umbrella like sporophore, saprophytic in nature. The survey was conducted in rainy and winter season of 2016 in 3 different places which included Mountains, Grassland and Forest areas of North Maharashtra. A total number of eleven species belonging to ten genera were recorded viz. *Aminita pantherina* (Fr.) Krombh*, Coprinus brunnaeofibrillos* Dennis*, Coprinus comatus* (Mull) Pers. *Daedalia stereoides* (Bull.) Fries, *Fomes conatus* (Weinm.) Gill*, Ganoderma lucidum* (Leyss.) Karst*., Gymnopilus chrysopellus* (Berk & Crutis) Murril*, Lactarius deliciosus* (L., Fr.) Gray*., Pholiota kodiakensis* Sm.& Hesler *Pleurotus flabellatus* Sacc., and *Polyporous bicolour* Jungh.

Key words: Macrofungi, Pimpalner, North Maharashtra

INTRODUCTION

Macro fungi are generally mushrooms, which possess fleshy, sub fleshy, leathery, umbrella like fruiting bodies, which bears spore producing gills. These macro fungi are edible or poisonous. Mushrooms are seasonal fungi with diverse importance in the forest ecosystem.

Mushrooms have been extensively studied in most of the parts of India. Berkely (1852) described 15 species of mushrooms in his 'Decades of Fungi' from Darjiling. Latter on Murrill (1915), Saini and Atri (1981, 1982, and 1984), Natarajan and Raman (1980) made a major contribution in Boletaceae. Sathe and Deshpande (1979) discovered new genus *Chlorolepiota* of Agaricales from India

Contribution to knowledge of Indian Aphyllophorales, Agaricales and Polyporales by Natrajan (1995), Natarajan et al (1980, 1985), Bakshi (1971), Vaidya and his colleagues (1987, 1990, 1991, 1993), Sharma (1995), Patil and Thite (1978), Patil et al. (1979,1995), Nanda (1996). Recently various workers studied on macro fungi, Bhosle et al (2010), Randive et al (2011), Nagadesh and Arya (2012), Adnan et al (2012), Shauket et al (2012), Kumari and Atri (2012), Hakimi et al (2013), Lakhanpal (2014), Senthilarasu (2014), Borkar et al (2015), Patil (2019).

New additions of macro fungi to science were made by Aravindakshan and Manimohan (2013) discovered new species of Mycena from Kerala, Das et al (2013) find three new species of Russula from Sikkim, Kaur et al (2013) discovered two new species of Agaricus from Punjab.

MATERIAL METHODS

Regular field trips were carried out during 2015 in rainy and winter seasons at Pimpalner, Toranmal forests. Macroscopic observations like shape, size, colour of fruiting bodies were made at time of collection. Collected fruiting bodies of fungi packed in polythene bags and holes were made to bags for aeration, collected samples brought to laboratory on same day to avoid decay for further work. Microscopic details were studied by free hand sections mounted in 10 % KOH, stained with 1 % Cango red solution. Some sections were mounted in Cotton Blue. Identification of fungi with the help of Lakhanpal (1996), John Ramsbottom (1969), Peter Roberts and Shelley Evans (2011), Hakimi et al (2013) and other relevant literature.

RESULTS & DISCUSSION

Taxonomic Account:

1. ***Amanita pantherina*** (Fr.) Krombh.Habitat: In wood land growing on ground, in debris, in clusters in rainy season, non edible. Cap 3-12 cm in diameter, initially hemispherical, colour dark brown to yellowish brown, veil remnants forming pointed white warts on upper surface. Gills free, crowded, white in colour. Stipe 4-12 cm long, up to 2 cm in diameter, unequal tappers towards the tip, white in colour. Spores globose, smooth, non amyloid, white, 6-11x 5-8 µm

2. ***Coprinus brunnaeofibrillos*** Dennis Habitat: In wood land growing on ground, in debris, in clusters, in rainy season, non edible. Pelius up to 5 cm in diameter, cylindric – campanulate, surface greyish. Stipe up to 6x0.4 cm, white attenuate. Spores black, ovoid to ellipsoid, 8-11x 4-7 µm.

3. ***comatus*** (Mull.) Pers.Habitat: In wood land growing on ground, in debris, in rainy season, non edible. Basidiocarp fleshy, deliquescent, up to 5 cm long. Pelius conical, white, stipe central, veil present or absent, spores black, sub globose to ellipsoidal.

4. ***Daedalia stereoides*** **Fries** Habitat: In wood land, growing on dead wood , in rainy season, non edible. Fruiting body effuse, sessile with narrow base, single, 3-7x2-5x1 cm, upper surface white to buff, zonate, hymenial surface white, pores irregular to daedaloid or irpicoid, rarely sub circular, extending up to margin, 1-2 per mm, basidiospores hyaline, thin walled, cylindric- ellipsoid, 3-6x1.5-2.2 µm.

5. ***Fomes connatus*** (Weinm.) Gill Habitat: In wood land, growing on dead wood, in rainy and winter season, non edible. Sporophore sessile, broadly effused from which pilei develop, usually imbricate, convex to sub granulate, corky becoming stiff and brittle when dry, light in weight, 2-10x2-8x0.5-5 cm. Upper surface grayish black. Basidiospores hyaline, sub globose, ellipsoid, thin walled 3-4 µm in diameter.

6. ***Ganoderma lucidum*** (Leyss.) Karst. Habitat: In wood land, growing on dead wood, in rainy and winter season. Sporophore perennial, stipitate, sometimes sessile, corky becoming woody later, 10-12x10-12x3-4 cm, may grow up to 30 cm or more, stalk lateral or central, up to 10 cm long , 0.5-4 cm thick, upper surface shiny with laccate crust or creamish, turning brown, 2-10 mm thick, hymenial surface whitish or creamish, turning brown latter, pores small, brown, 90-250µm in diameter, basidiospores brown, thick walled, minutely verrucose, truncate, 8-10x5-6.7µm.

7. ***Gymnopilus chrysopellus*** (Berk & Curtis) Murril Habitat: In wood land growing on ground, in debris, in clusters, in rainy season, non edible.Pilus up to 3 cm broad, convex, latter depressed, smooth to fibrillose, orange, margin irregular, lamellas adnate, yellowish brown. Stipe up to 3x0.5 cm, surface smooth, yellowish brown, veil absent. Spore 5.6-7x2.8-4.2µm, ellipsoid, verruculose.

8. ***Lactarius deliciosus*** (L. Fr.) Gray. Habitat: In wood land growing on ground, in debris, in rainy season. Cap convex, orange, becoming weakly funnel shape, smooth, slightly slimy when fresh, dameter up to 5cm. Stipe 3x2 cm, yellowish to orange.

9. ***Pholiota kodiakensis*** Sm. & Hesler Habitat: In wood land growing on ground, in debris, in rainy season. Pelius up to 4 cm broad, convex to planoconvex, surface with appressed scales, light orange, margin.

Fig. 1: A: *Amanita pantherina* (Fr.) Krombh, **B:** *Coprinus brunnaeofibrillos* Dennis, **C:** *Coprinus comatus* (Mull.) Pers. **D:** *Daedalia stereoides* Fries, **E:** *Fomes conatus* (Weinm.) Gill**, F:** Ganoderma lucidum (Leyss.) Karst., **G:** *Gymnopilus chrysopellus* (Berk &Curtis), **H:** Murril *Lactarius deliciosus* (L.Fr.) Gray, **I:** *Pholiota kodiakensis* Sm. & Hesier, **J:** *Pleurotus flabellatus* Sacc. , **K:** *Pleurotus flabellatus* Sacc., **L:** *Polyporous bicolour* Jungh.

incurved, lamellae adnate, olive brown, stipe up to 4x0.4 cm, cylindrical, solid, surface with fine scales, light yellow. Spores yellowish brown, 4.2-5.6 x 2.8-3.5 µm, ovoid to ellipsoid, smooth.

10. ***Plurotus flabellatus*** Sacc. Habitat: In wood land growing on dead wood, in rainy and winter seasons. Pelius white, with context 0.5-1mm. Thick, amellae densely crowded, stipe absent, spores 6-9 µm long.

11.*Polyporous bicolour* JunghHabitat: In wood land growing on dead wood, in rainy and winter seasons. Sporophore annual,. Sessile, reflexed, single or imbricate, coriaceous when fresh, rigid when dry, usually 5-15 x4-7 x0.3x 0.6 cm, upper surface rough, broadly zonate, white greyish, hymenial surface light brown, pores regular, round, minute, 6-7 per mm, extending to margin, basidiospores globose, hyaline, 5.3-6 x 4.3-5.4 µm.

CONCLUSION

The saprophytic macrofungi play an important ecological role in bio deterioration to maintain the balance of forest ecosystem. Some of them have high medicinal value while some cause wood rotting. The present article reports eleven species of macrofungi among them *Daedalia stereoides* (Bull.) Fries, *Fomes conatus* (Weinm.) Gill, *Ganoderma lucidum* (Leyss.) Karst., *Gymnopilus chrysopellus* (Berk & Crutis) Murril, *Pleurotus flabellatus* Sacc., and *Polyporous bicolour* Jungh. Found on dead and decaying wood. Whilr *Aminita pantherina* (Fr.) Krombh, *Coprinus brunnaeofibrillos* Dennis, *Coprinus comatus* (Mull) Pers. *Lactarius deliciosus* (L., Fr.) Gray. and *Pholiota kodiakensis* Sm.& Hesler found saprobes on soil and dead and decaying debris.

Acknowledgements':
Author greatly thankful to Head, Principal and Management of S. S. V. P. S. L. K. Dr. P. R. Ghogrey Science College, Dhule, Maharashtra for laboratory and library facilities and kind support.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Adnan Farook V, Shabeer Khan S and Manimohan P (2012) A checklist of agaricus (gilled mushrooms) of Kerala State, India. *Mycosphere* **4:** 97-131

Aravindakshan DN and Manimohan P (2013) A new species of *Mycena* Sect. Exornatae and some Taxonomic observations. *Mycosphere* **4:** 146-150.

Bakshi BK (1971) Indian Polyporaceae (on trees and lumber). *Indian Council of Agricultural Research*, New Delhi. Pp. 246.

Berkeley MJ (1952) Decades XXXIX, XL Sikkim and Khassya Fungi. *J. Bot.* **4:** 130-142.

Bhosale SK, Randive K, Bapat G, Garad S, Deshpande G and Vaidya J (2010) Taxonomy and Diversity of *Ganoderma* from western parts of Maharashtra (India). *Mycosphere* **1:**249-262.

Borkar Pramod, Anila Doshi and Sudhir Navathe (2015) Mushrooms Diversity of Konkan Region of Maharashtra, India. *Journal of Threatened Taxa* **7:** 7625-7640.

Das k, Atri NS and Buycle B (2013) Three new species of *Russula* (Russulales) from India. *Mycosphere* **4:** 722-732.

John Ramsbottom (1969) Mushrooms and Toad Stools. Collins Publication London. Pp. 306.

Kaur NJ, Saini MK and Kaur H (2013) Two new species of *Agaricus* from India. *Mycosphere* **4:** 856-863.

Kumari B and Atri NS (2012) New additions of basidiomycetous fungi in India mycoflora. *Mycosphere* **4:** 53-59

Lakhanpal TN (1996) Mushrooms of Indian Boletaccae. In: Mukherji K. G. (ed.). *Studies in Cryptogamic Botany* Vol. I. APH Publishing House Corp. New Delhi.

Lakhanpal TN (2014) Mushroom Biodiversity in India: Prospects and Potential. *Proceedings of the 8th International Conference on Mushroom Biology and Mushroom Products (ICMBMP8).* 7-16.

Hakimi MH, Vaidya JG, Randive KR, Jamaluddin and Jite PK (2013) Resupinate Aphyllophorales of India. *Scientific Publisher India.* Pp. 280.

Murrill, WA (1915) Tropical Polyporales. New York Pp. 113.

Nagadeshi, PK and Arya A (2012) New records of lignicolous fungi deteriorating wood in India. *Mycosphere* **3:** 997-1004.

Nanda MK (1996) Wood rotting fungi from Bhimashankar Ph. D. Thesis, Department of Botany, University of Pune. Pp. 397.

Natrajan K (1995) Mushroom Flora of South India (except Kerala) In: Advances in HorticultureVol.13: Mushrooms (eds.K. L. Chadda and S. R. Sharma). Malhotra Publishing House, New Delhi,375-386.

Natrajan K and Raman N (1980) South India Agaricales-IX *Sydowia* **33:** 225-235.

Patil SY (2019) Diversity of Macrofungi from North Maharashtra-I *Journal of Emerging Technologies and Innovative Research.* **6:**302-310.

Patil MS and Thite AN (1978) Fungal Flora of Amboli (Ratnagiri). *Journal of Shivaji University* (Science), Kohlapur.

Patil SD, Nair LN and Kapadnis BP (1979) Studies on Fleshy Fungi of Western India. *Journal of University of Poona, Science and Technology*, **52:**349-354.

Patil SD (1995) Mushrooms Flora of Maharashtra In: Advances in HorticultureVol.13: Mushrooms (eds.K. L. Chadda and S. R. Sharma). Malhotra Publishing House, New Delhi,317-328.

Peter Roberts and Shelley Evans (2013) The Book of Fungi. A Life Size Guide to Six Hundred Species from Around the World. *Ivy Press* U. K. Pp. 656.

Randive KR, Vaidya JG, Jite PK, Randive VD, Bhosale SR, Rabba AS, Hakimi M, Deshpande GS, Rathod MM, Foruteen A, Kaur M, Naik-Vaidya CD, Bapat GS and Lamrood P (2011) Checklist of Aphyllophorales from the Western Ghats of Maharashtra State, India. *Mycosphere* **2:**91-114.

Saini SS and Atri NS (1981) *Russula foetens* (Pres.) Fr. A new record for India. *Curr. Sci*. **50:** 460-461.

Saini SS and Atri NS (1982) North Indian Agaricales I. *Indian Phytopath*,**35:**265-272.

Saini SS and Atri NS (1984) Studies on North West Himalayan Russulaceae. *Geobios New Reports* **3:** 4-6.

Sathe AV and Deshpande S (1979) Chlorolepiota- A new genus of Agaricales from India. *Current Science.* **48** (15), 693-695.

Senthilarasu G. (2014) Diversity of agaricus (gilled Mushroom) of Maharashtra, India. *Current Research in Environmental and Applied Mycology*, **4:** 58-78.

Sharma JR (1995) Hymenochaetaceae of India. Calcutta, India, Botanical Survey of India.Pp. 219.

Shauket Ahmad Pala, Abdul Hamid Wani and Riyaz Ahmad Mir (2012) Diversity of macrofungal genus *Russula* and *Amanita* in Hirpora Wildlife Sanctuary, Sourthern Kashmir Himalayas. *Biodiversitas*, **13:** 65-71.

Vaidya JG (1987) Ecological characteristic of wood decay and cord forming fungi from the campus of Poona University, Poona University Press, Pune. Pp.109.

Vaidya JG And G. L. Bhor (1990) Medicinally important wood rotting with special emphasis on Phansomba. Deerghayu VI:L 1-4.

Vaidya JG And Rabba AS (1993) Valid names for some common Indian wood rotting Polypores, their synonyms and authenticity II. Journal of Indian Academy of Wood Science 24: 35-56.

Vaidya JG, Nanda MK and Rabba AS (1991) Comminity and substratum composition for wood rotting Aphyllophorales from Bhimashankar, Western Ghats. Proceedings of the sixth engineering congress on Transidisciplinary premise of Ecology and Environment, Institute of Engineering, Pune: India III/2/2:56-70.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Efforts for quality biomass of earthworm *Eudrilus eugeniae* by using tomato powder

Patil DS[1], More BC[2] and More SB[3]

[1]NTVS's G. T. Patil College, Nandurbar (M.S) India
[2]Department of Zoology, Karm. A. M. Patil Arts, Com and Kai. N. K. Patil Science Sr. college, Pimpalner, Tal – Sakri (Dhule), (M. S) India
[3]College of Pharmacy, Pune (M.S), India
Email: patildhananjay2007@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Patil DS, More BC and More SB (2019) Efforts for quality biomass of earthworm *Eudrilus eugeniae* by using tomato powder, *Int. J. of. Life Sciences*, Special Issue, A13: 84-86.

ABSTRACT

Earthworm species *Eudrilus eugeniae* is very excellent worm for vermicomposting and rich in protein, lipid and carbohydrates. Also rich in vitamins, similarly earthworms are soil inhabiting organisms and can-do wonderful job for man and biosphere. Therefore, present piece of work has been conducted to explore the effect of tomato powder on the growth and reproductive potential of earthworm species *E. eugeniae*. Earthworm feed along with tomato powder for 72 hours and used for vermicomposting of soil, cow dung, tomato powder. At the end of 60 days of experiment worm shown significant increase in weight of worms, increased no. of cocoons and juveniles. The result indicates that tomato powder is found to be good for growth of earthworm biomass. It is a feasible technology for tomato growers, earthworm growers, farmers, traders and for pharmacists.

Key words: Tomato powder, Soil, Cow dung, *Eudrilus eugeniae*.

INTRODUCTION

Earthworm has dynamic potential and can do wonderful jobs for man and biosphere (Tripati, 2003, Patole and More, 2016.). Earthworms are used as protein rich sources of animal feed. They contain 70-80% protein in a dry weight and also contain essential amino acids, especially lysine rich. The amino acid composition of earthworm is superior for fish meal (Bhorgin, 2012). Earthworms contain all five types of food for human consumption (Julka, 1988). Earthworms are known to be associated with medicines since ancient time to cure various human diseases. In India paste of dried worm were prepare for curing disease in Unani system of medicines for treating wounds, chronic boils, piles, hernia and impotency when applied externally and also have been used in folk medicine to treat pyorrhea and small pox diseases (Edwin et al, 2012). Earthworms have found to be excellent in vitamin B-complex. Among all these niacin and vitamin B_{12} are of significant value (Edward, 1985 and Antha et al., 2012). Modern society is unable to

manage the earthworm amount of household, industrial and agricultural waste that it creates a large fraction of this waste is organic in nature, especially the agricultural and household waste. India produces 3000 million tons of organic waste every year. Actually, this waste has great value and should be used feed stock for making useful items, such as energy, vermicomposting is a simple biotechnological process of composting in which certain species of earthworms are used to enhance the process of waste conversion and produce a better end product (Gandhi *et al.* 1997).

Tomato is the world largest vegetable crop after potato and sweet potato. India has 4th rank in the tomato production. It is a very cheap and good source of vitamins. It also contains large quantity of water, Ca, Niacin and minerals that protect the body from various diseases (Taylor, 1987).

Lycopene is a bright carotenoid pigment found in tomato and other red fruits. Lycopene was discovered by DOGGAR. Its name derived from the tomato's species, *Solanum lycopersicum*. Lycopene is the essential nutrient for man. It is a potent antioxidant, preventing cancer and effective on osteo-proteins etc. Constant intake of tomato and its products can improve the disease conditions and can reduce the risk of diseases (Madhava *et al.* 2011).

Harvest and post-harvest loss of India's major agricultural product is estimated as Rs. 92,651 crore data published by ministry of food processing industries on Aug 9, 2016. Out of this tomato post-harvest loss is more.

Therefore an attempt is made to find out the performance of fully ripped tomato powder on the growth and reproduction of earthworm species, *E. eugeniae.*

MATERIAL METHODS

Collection material:
The earthworm species *Eudrilus eugeniae* was obtained from governmental agricultural nursery (Sakri) (M.S) India. They were maintained and acclimatized in the mixture of organic compost containing soil and month old cow dung for two weeks. Quality soil and month old cow dung collected from agricultural field and cow shade respectively. Ripped tomato were cut into small pieces and dried in sunlight then crushed in mixer. Dry powder was used in the experiment.

Experimental set up:
For this experiment 100 preclitellar worms were selected, washed in distilled water and they were kept on ordinary gel filter paper in a plastic tough which is covered by aluminum foil with pin holes. After 24 hours the gut was cleared of organic matter on they feed. i.e. filter paper. Again, they were washed then placed 50 worms in the plastic tough containing 10gm wet powder of tomato i.e. experimental group. For control group only dry cow dung powder was used and both the tough were covered with aluminum foil with pin holes and was kept for 3 days (72 hrs). The worms feed on that organic matter.

The vermicomposting experiment was performed in dark coloured plastic tough with 5 kg capacity. A total 6 vermibeds were prepared i.e. 3 for control and 3 for experimental. The vermibed content is tabulated table 1. The 50 tomato feeded experimental animals and 50 control animals were released on these vermibed. All the beds were kept for 60 days. At the end of experiment weight of worms, no of juveniles, weight of juveniles and number of cocoons were measured and tabulated (table2).
Percent increase was calculated (Suthar, 2017)

$$\% \text{ increase } = \frac{Worms\ counted - Worms\ introuced}{Earthworms\ counted}$$

RESULTS & DISCUSSION

From table 2, it is noticed that in both the groups the growth of worms was normal, no mortality seen, Results also shown gradual increase in weight of worms and preclitellar worm transformed into clitellar worm in both the groups but significant increase in weight is seen in experimental vermibed as compare to control bed. Similarly maximum number of juveniles and cocoon were recorded in the experiment vermibed. It means tomato powder contains lycopene and other nutrients which is good for increase in earthworm biomass.

Our results are corroborated with More, and More, 2017 that soil of Banyan tree, cow dung and grasses composted along earthworm *Eudrilus eugeniae*, it shows good growth and reproduction of earthworm. Similarly composting of leaf litter of *Sesbania sesban* and *Frutolaria juneca* with micro-organisms gives good growth of worms and quality biofertilizer rich in micro and macro nutrients (More and Patole, 2014).

Table 1: Vermibed groups

Sr. No.	Groups	Biomass
1	Control	Soil + Cow dung 50% + 50 Worms
2	Expt	Soil 50% + Cow dung 45% + 5% Tomato powder + 50 Worms

Table 2: Earthworm Biomass (Weight of juvenile and cocoons)

Groups	Weight of 50 worms		% Increase	No. of Juveniles	Weight of Juveniles	No. of Cocoon
	Initial	Final				
Control	16 gm	23 gm	43.75%	50	4 gm	38
Expt	17 gm	28 gm	64.70%	66	6.5 gm	57

Kitchen waste is rich in organic material, if composted along with cow dung in the ratio of 1:1. Increase was found in micro and macronutrients and in biomass (Mohamed Omer Albastia *et al.* 2015). More et al 2016 reported growth, reproduction and nutrient content of worm *Eudrilus eugeniae* in the degradation of silver coated paper dishes.

CONCLUSION

By the research work, we concluded that tomato powder feeded earthworms and vermibed containing soil, cow dung, tomato powder is found to be excellent for the biomass and reproduction of earthworms. It is the feasible technology for tomato growers, earthworm growers, for municipal market yard or tomato market were ripped tomato some time thrown by the farmers or traders.

Acknowledgement:
The authors are thankful to our Principal for providing laboratory facilities. Thanks to agriculture office (Sakri) Dhule (M.S) for providing earthworm.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Antha J and Indira A Jayraj (2012) Nutritional and antioxidant evaluation of earthworm powder (*Eudriluseugeniae*) *Int. Research Jr. of pharmacy.* 3(2).

Bhorgin L and Uma K (2012) Nutritional evaluation of earthworm powder (*Lampito mauritti*). *J. App. Pharma. Sci*. 3(3): 82-84.

Edward CA (1985) Production of feed protein from animal wastes by earthworms. *Phil. Trans. Res. Soc*. *London*, 310: 299 -307.

Gandhi, Sangewan M, Kapoor, KK and Dilbaghi, N (1997) Composting of household wastes with and withouit earthworms" *Env. And Eco,* 15(2):432-434.

Gopal, Murali, Alka Gupta and Sunil E (2009) Amplification of plant Beneficial Microbial Communities during conversion of Coconut Leaf substrate to vermicompost by *Eudrilus sp. Curr Microbio*, 2009, 59:15.

Julka JM (1988) The fauna of India and adjeacent countries, Megadrile :Oligochaeta (earthworm). Haptotoxida :Lambricina : Megascolecoidea : Octochartidae, XIV + 400 p. *Zoological Survey of India, Kolkata*.

Madhava Reddy, David Banji, Otilia JF, Banjikumar K and Mandav Ragini (2011). Lycopene and its importance in treating various diseases in Humans" *IRJP* 2(8): 31-37.

Mohamed Omer Albasha, Gupta P and Ramteke PW- Management of kitchen waste by vermicomposting using earthworm, *Eudrilus eugeniae*" *Int. Con. On Ad. Agn; Bio and Env.Sci. July* 22-23-201.

More BC and Patole SS (2014). Composting of *Sesbania sesban and Crotolaria juneca* with micro-organiss (PGPMS) and eartgworm *Eudrilus eugeniae*" *Nat. Jr. of Life Science Vol* 11((2), 2014: 169-172.

More BC, Patil DS and Patole SS (2016) Effects of Silver coated paper dishes on growth, reproduction, nutrient content and bioaccumulation of earthworm species, *Eudrilus eugeniae* Kinberg, 1867. *Int. J. Inno. Res. Sci. Eng. and Technol*. 5(8): 15393-15397.

More SB and More BC (2017). Efforts for Biomass and Bio fertilizer by using earthworm *Eudrilus eugeniae. Jr. Env. Res. And Dev.* Vol 11(3), 535-539.

Suthar S (2017). Vermicomposting potential of *Perionyx sansibaricus* (Perrier) in different waste material. *Bioresou. Technol*. 98:1231-1237.

Taylor JK- Text of lectures delivered at the national workshop on fruit and vegetable seedlings production held at NIHORT 9-1.

Tripati G (2003) *Vermiresource Technology*. Discovery publication house New Delhi, ISBN: 81-7141-717-5.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Crust forming Blue Green Algae *Scytonema* Ag. from North Maharashtra Soils

Archana Chaudhari

Assistant Professor, P. G. Department of Botany, S. S. V. P. Sanstha's L.K. Dr. P. R. Ghogrey Science College, Dhule, Maharashtra, India
Email: archanachaudhari74@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Archana Chaudhari (2019) Crust Forming Blue green Algae *Scytonema* Ag.From North Maharashtra Soils, *Int. J. of. Life Sciences*, Special Issue, A13: 87-90.

ABSTRACT

Blue green algae are ecologically important due to their potential ability to thrive on adverse conditions. They occur in diverse habitat and establish themselves successfully on it. Members of blue green algae have mucilage sheathing which protect them from desiccation, also play important role in soil conservation indirectly. Many filamentous taxa of blue green algae forms crust over moist soils. Scytonema Ag. is one of the heterocystous filamentous blue green algae. It forms deep olive green to blackish brown coloured crust on moist soils. Naturally growing total sixteen species of Scytonema Ag. were observed and enumerated taxonomically in present communication from North Maharashtra soils. Heterocystous blue green algal crust helps in enriching soil content by adding combined nitrogen in it.

Key words: Blue green Algae, Crust, Scytonema Ag., North Maharashtra soil.

INTRODUCTION

Algal crust can be observed to grow on barren lands, moist shaded surfaces, plain as well as on hilly regions, cultivated as well as non cultivated soils. Crust forming algal component are ecologically important being primary green producers on barren lands. Earlier few reports were made in this direction are Marathe 1972 ,Marathe and Anantani 1972 , Marathe and Khushaldas 1975 ,Mahajan and Mahajan1994 ,Sarma *et al* 1991, Eldridge and Leys 2003.Algae help to promote ecological succession of other plant community. *Scytonema* Ag. being filamentous mucilaginous form can retain water in crust and keeps soil surface moist for longer periods. It is important to avoid desiccation of soil and ultimate erosion of soil particles. *Scytonema* Ag. can multiply by various ways like hormogones, hormocyst and fragmentation. It colonizes easily and has perennation assets for unfavorable conditions.

MATERIAL AND METHOD

Various habitats of North Maharashtra like barren lands, hilly regions, cultivated and uncultivated soils, damp surfaces, shady place soils was

explored for study of algal crust. Surface growing algal crust samples were collected carefully by scrapping the soil surface and preserved in 4 per cent formalin. Direct observation of naturally inhabiting taxa was followed by microscopic observation and line drawings were made for taxonomical identification. Taxa were identified with the help of Standard monograph of Desikachary 1959 and relevant literature.

RESULTS

TAXONOMICAL OBSERVATION:

1. *Scytonema bohneri* Schmidle (Figure 1)
Thallus blackish green, filament 9-13.5µ broad, false branched, branches mostly single, narrower at apex, sheath colourless,1.5µ thick, homogenous, trichome bluish green,6-7µ broad, cells rectangular, sometimes shorter than broad,4.5-6µ long, heterocyst compressed rectangular,6-7.5µ broad up to 6-7.5µ long.

2. *Scytonema burmanicum* Skuja (Figure 2)
Thallus crustaceous, attached to substratum, prostrate, olivaceous, filaments 15-16.5µ broad, false branched, false branches geminate or solitary,sheath simple with parallel lamellation 2.25-3µ thick, yellow, trichome 10.2-12µ broad, attenuated, more or less constricted, cells 8.5-10.2µ long or 5.25-6µ long, apical cell rounded, content homogeneous, heterocyst cylindrical or discoid 10.2-13.6µ broad, upto 10.2µ long or 6µ broad when depressed, hormogone formed at apices of erect branches.

3.*Scytonema fre'myii* Desikachary (Figure 3)
Filament long, about 10.5µ broad, sheath thick 4.6µ broad or more, yellow not lamellate, false branches geminate, free at base, trichome, constricted at cross wall, cells 3-3.75µ broad, twice long, shorter than long at apices, heterocyst rectangular 3.75µ broad 7.5-11.5µ long.

4. *Scytonema geitleri* Bharadwaja (Figure 4)
Thallus mucilaginous crust, green, filament upto 22.5µ broad, irregularly curved, densely entangled, false branched, short branches club shaped, sheath firm about 6µ thick, outer surface wavy and uneven, in old filaments inner surface following the contour of the swollen cells ,with divergent stratification, 6-9µ broad with constriction at joints, when old, usually narrowed down at the point of branching, cells quadratic or barrel shaped in old trichomes, heterocyst intercalary and terminal, single or in pairs, 10.5-13.5µ broad, 7.5-9µ long, depressed at ends, broader than trichome .

5. *Scytonema hansgirgi* Schmidle (Figure 5)
Filament curved or bent, short, fragile, false branched, false branch single, 13.6-18.7µ broad, apex not attenuated, broadly rounded, sheath thin, yellow, doubling with age, closed to trichome, trichome 10.2-13.6µ broad not constricted, cells rectangular shorter than broad 4.5-6µ long, cell content blue-green, heterocyst as broad as trichome, quadrate or depressed.

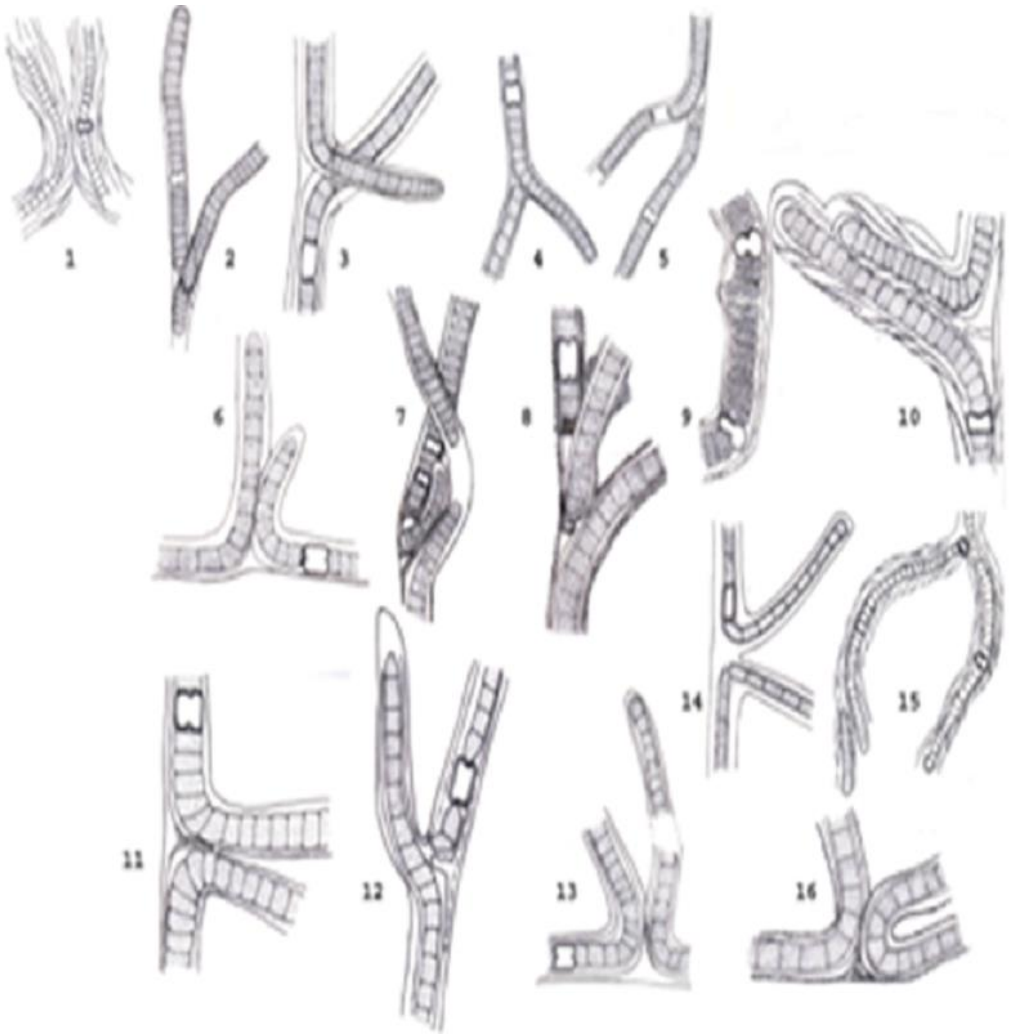
6. *Scytonema hofmanni* Ag. ex Born.et Flah. (Figure 6)
Filament 10.5-15µ broad, aggregated in vertical fascicles, false branches aggregated, sheath firm, trichome 6-7.5µ broad cells are unequal in length, at apices flattened depressed, in rest of trichome longer than broad or quadratic, heterocyst oblong rectangular 6-7.5µ broad, 10.5µ long.

7. *Scytonema javanicum* (Kuetz.) Bornet ex Born.et Flah. (Figure 7)
Filament 13.6-15.3µ broad, aggregation in erect fascicles, false branches long flexuous, aggregated, sheath firm, thin becoming yellowish, trichome 10.2-13.6µ broad, cells compressed to quadrate, heterocyst sub quadrate, 10.2-13.6µ broad, 8.5-10.2µ long.

8. *Scytonema julianum* (Kuetz.) Menegh. (Figure 8)
Thallus impregnated with calcium, filament in more or less distinct erect bundles, up to 9-10.5µ broad, false branches sparse, sheath thin, firm not lamellated yellowish, in older parts densely covered by calcium, trichome 6-6.75µ broad, cells 4.5-6µ long, blue-green, heterocyst rounded, quadrate or cylindrical 6-6.75µ broad, 4.5-12µ long.

9. *Scytonema malaviyaensis* Bharadwaja (Figure 9)
Filament flexuous, interwoven, young up to 7.5-10.5µ broad or more when matures, trichome 6-7.5µ broad, cells constricted at joints slightly 6-9 µ long, heterocyst median quadratic or longer than broad, 7.5-8.25µ broad, up to 9µ long, false branches geminate, hormogones short, few celled commonly produced by formation of biconcave intercellular disc, perennate stays dormant inside the parent sheath, but secreting new hyaline sheath when germinate on recurrence of favorable condition.

10. *Scytonema millei* Bornet ex Born.et Flah. (Fig. 10)
Filament 18-22.5µ broad, interwoven, false branched, sheath firm brownish, when old with parallel lamellation, cells 9-13.5µ broad, discoid, when old becoming elongate up to as long as broad, heterocyst mostly discoid, broader than tricome,13.5-14.25µ broad, 6.8µ long, heterocyst shows variation in length with in same trichome.



Scale -10µ

Figure : 1

1. *Scytonema bohneri* Schmidle 2. *Scytonema burmanicum* Skuja 3.*Scytonema fre'myii* Desikachary
4. *Scytonema geitleri* 5. *Scytonema hansgirgi* Bharadwaja 6. *Scytonema hofmanni* Ag. ex Born.et Flah.
7. *Scytonema javanicum* (Kuetz.) Bornet ex Born.et Flah. 8. *Scytonema julianum* (Kuetz.) Menegh.
9. *Scytonema malaviyaensis* Bharadwaja 10. *Scytonema millei* Bornet ex Born.et Flah.
11. *Scytonema mirabile* (Dillw.)Born. 12. *Scytonema myochrous* (Dillw.)Ag. ex Born. et Flah.
13. *Scytonema ocellatum* Lyngbye ex Born.et Flah. 14. *Scytonema pseudohofmanni* Bharadwaja
15. *Scytonema pseudopunctatum* Skuja f.*minor* f.nov. 16. *Scytonema stuposum* (Kuetz.) Born ex Bornet Flah.

11. *Scytonema mirabile* (Dillw.)Born. (Figure 11)
Filament intricate,12-21µ broad, mostly false branched, sheath lamellated with divergent lamellation, yellowish brown, trichome 8-12µ broad, cells at the ends discoid, more or less barrel shaped 8.25µ-12µ broad,4.5-6µ long ,in older filaments cell narrowed down and elongates, sheath becomes more thick and stratified, heterocyst nearly quadratic 9-10.5µ broad,6-7.5µ long.

12. *Scytonema myochrous* (Dillw.) Ag. ex Born. et Flah. (Figure 12)
Filament 22.5-24µ broad, sheath 4.5-9µ thick, sheath lamellated, yellowish brown, lamellae divergent ,trichome 7.5-9µ broad, cells 6-7.5µ long, constricted at cross walls, generally broader than long, discoid above, heterocyst sub quadrate 10.5-12µ broad,7.5-9µ long,

pseudo branches are free at base, only sheath of upper median region slightly united.

13. *Scytonema ocellatum* Lyngbye ex Born.et Flah. (Figure 13)
Filament 9-18µ broad, sheath yellow, lamellated, false branched, trichome 6-7.5µ broad, cells quadrate or shorter than broad, 4.5-6µ long, heterocyst sub quadrate or longer than broad, 6-6.75µ broad, 6-9µ long, sometimes up to 12µ long.

14. *Scytonema pseudohofmanni* Bharadwaja (Fig. 14)
Thallus with short tufted growth, filament up to13.5µ broad, irregularly entangled curved, false branches single and geminate, sheath firm, up to 3.75µ broad, with indistinct parallel stratification, trichome 4.5-5.25µ broad, cells cylindrical to quadratic 4.5-7.5µ long, heterocyst broader than trichome, 6-6.75µ broad,7.5-8.25µ long.

15. *Scytonema pseudopunctatum* Skuja f.***minor*** f.nov. (Figure 15)
Filament 12-15µ broad, false branched, geminate, sheath 2.25-3µ thick, with parallel lamellation, yellowish brown, anterior portion smooth, posterior portion finely and densely granulated, trichomes 7.5-9µ broad, constricted at cross walls, cells isodiametric as long as broad up to 10.5-12µ long, cell content homogeneous, heterocyst rounded quadrate or discoid 12µ broad,6µ long, propagation by hormogones and hormocyst.

16. *Scytonema stuposum* (Kuetz.) Born ex Bornet Flah. (Figure 16)
Filament 10.5-15µ broad, false branched, false branch as broad as main filament, single or geminate sheath thick gelatinous, trichome olive violet,7.5-9µ broad, cells shorter than broad, 3.75-4µ long, heterocyst 6-9µ broad,3.75-6µ long,sheath 2.25µ thick.

DISCUSSION

Algal crusts are first colonizing green plants on moist soils. Many Blue green algae members are observed to form crust on soil surface. Scytonema Ag.is nitrogen fixing filamentous heterocystous taxa showing false branching. It forms intricate velvety olive green deep brown stratum like growths, at maturity it becomes black. Due to thick crustate growth, indirectly it binds soil particles. It also help to hold moisture in its mucilage sheathing, help to add nitrogen and organic matter in soil after death. Algal crusts on soil are ecologically important.

CONCLUSION

Scytonema Ag.is blue green algal member occurs commonly on moist exposed soil surface. Sixteen taxa of Genus *Scytonema* Ag.were enumerated with taxonomical description. It has various ways for propagation. It withstands unfavorable conditions, also overcome desiccation and establishes successfully on soils forming crusts. Among them *Scytonema geitleri* Bharadwaja,*S. hofmanni* Ag. ex Born.et Flah. and *S. mirabile* (Dillw.) Born. found distributed very commonly. *Scytonema pseudopunctatum* Skuja f. *minor* is newly described forma having minor dimensions of its trichome, heterocyst and cell.

Acknowledgement:
Author wishes sincere gratitude to P.G.Department of Botany, S.S.V.P.S.L.K.Dr.P.R.Ghogrey Science College, Dhule, for providing necessary facilities.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Desikachary TV (1959) Cyanophyta *I.C.A.R. Monograph* New Delhi

Eldridge DJ and Leys JF (2003) Exploring some relationship between biological soil crust,soil aggregation and wind erosion, *J.of Arid Environ*. 53:457-466

Mahajan AD and Mahajan N (1994) Cyanophycean flora from cultivated soils of Jalgaon District, Maharashtra, *Rec. Adv.Phyco*., Rastogi Publ.:345-348

Marathe KV and Khushaldas C (1975) Observation in the algal crust of Nagpur soils, *J.Uni.Bombay* 44:66-76

Marathe KV and Anantani YS (1972) Algal crust as nitrogen source in some arid soils of India

Marathe KV (1972) Soil algae from some India arid soils (Rajasthan) *J. Uni. Bombay,* 42: 88-93.

Sarma YSRK Prasad BN and Mehrotra RK (1991) Terrestrial and sub-aerial algae, *Ind.Phyco.Rev*.1:153-176.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Studies of Seasonal variations of Phytoplankton diversity and their Correlation with Physicochemical Parameters of Susari dam of Shahada Taluka District Nandurbar (M.S.) India.

Patil Ravindra D[1] and Patil Rajendra D[2]

[1]Department of Zoology, Vasantrao Naik Arts, Science and Commerce College Shahada, Dist. Nandurbar.
[2]Department of Zoology, Arts, Commerce and Science College, Navapur, Dist. Nandurbar.

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Patil Ravindra D and Patil Rajendra D (2019) Studies of Seasonal variations of Phytoplankton diversity and their Correlation with Physicochemical Parameters of Susari dam of Shahada Taluka District Nandurbar (M.S.) India, *Int. J. of. Life Sciences*, Special Issue, A13: 91-97.

ABSTRACT

The productivity of an aquatic environment is directly correlated with the density of phytoplankton. In the present investigation's accounts of phytoplankton diversity seasonal variations of phytoplankton density and species richness was studied of Susari dam. In the present study surface water sample were collected at an interval of a month from June 2012 to May 2014. This revealed that the density of phytoplankton was maximum in summer while it was minimum in monsoon. Maximum species richness of phytoplankton was recorded in summer, while minimum species richness was recorded in monsoon. The phytoplankton structure depends on a variety of environmental factors that include various physicochemical factors. The Pearson correlation was calculated by keeping phytoplanktons as dependent variable and other abiotic factors as independent variables. During the period of investigation 51 species of phytoplankton representing four taxonomic groups namely Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae. It accounted for a contribution of 42.30% Bacillariophyceae, 32% Chlorophyceae, 21.78% Cyanophyceae and 3.90% Euglenophyceae. Cyanophyceae and Chlorophyceae found to be Maximum in winter, Bacillariophyceae maximum in summer and Euglenophyceae in monsoon.

Keywords: Susari dam, Phytoplankton, Biodiversity, Seasonal variation, density and correlation.

INTRODUCTION

Biodiversity is one of the important life supporting system on earth. "Biodiversity is the variety and variability among living organism and ecological complexes in which they occur". It is an index of Nations wealth and the basis of human survival. The Phytoplankton of the open water ponds, lakes and large streams consist of a diverse assemblage of microscopic autotrophs. Phytoplanktons are chlorophyll bearing suspended microscopic organism consisting mainly of algae. Phytoplanktons are the basic member of aquatic ecosystem and hence change in phytoplankton population has a direct link with the change of water quality in any aquatic medium. The number and species of phytoplankton serves to determine the quality of water body

(Bahura, 1991). Phytoplankton which includes Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae, etc is important among aquatic flora. The phytoplankton diversity and density are controlled by water quality and other biotic communities in a water body (Reid and Wood, 1976). Phytoplankton functions as the primary producers in the aquatic Biotopes. Hence the quality and quantity of phytoplankton population bear much influence on the production potential of an aquatic ecosystem. Phytoplanktons are ecologically significant as they form the basic link in the food chain of all aquatic animals (Misra, 2001). When they are in large numbers, they make the water greenish.

Study area:

A Susari minor project lies at 21^0 35' North Latitude and74^0 29' East Longitude. A Susari reservoir is the minor project which is built up during the decade of 2006. The catchment area of Susari minor project is 96.94 Sq.Km. The nature of catchment area is hilly and well developed for the collection of water. The dam receives the water by rainfall only. The project is located near Navalpur village for about 500M away and 7Km from Shahada. It is perennial dam and used for irrigation and drinking purposes as well as Pisciculture.

MATERIALS AND METHODS:

Surface water samples were collected from three stations of the dam at monthly intervals for two years during June, 2012 to May, 2014. Water samples were analyzed in the laboratory for the important physico-chemical parameters like temperature (AT and WT), Water cover (WC), Transparency (Trans), Total Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), pH, DO, CO_2, TH, Cl^-, NO_3^-, PO_4^{-3}, SO_4. Mg^{+2} and Ca^{+2} were estimated using standard methods of analysis as per APHA (1998) and Michal (1984).

Ten liters of water was filtered using plankton net No. 25 of bolting silk with mesh size 64 µm and concentrated to 100ml and preserved in separate vials by adding 1ml of 4% formalin, 1ml of Lugol's iodine was added to it for further qualitative and quantitative studies for quantitative estimation of plankton, 1ml well mixed sample was taken on 'Sedgewick Rafter cell'. The average of 5-8 counts was made for each sample. Qualitative study of phytoplankton were carried out with the help of key's given by Edmonson (1963), Sarode and Kamat (1984) and Battish (1992).

Fig. 1: Satellite image and Panoramic view of Susari dam.

RESULTS AND DISCUSSION

The Physico-chemical analysis of Susari dam water has been in (Table- 1 & 2). The phytoplankton communities of the study period total 51 species belong to 4 groups recorded in the Susari dam. These four groups, Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae (Table- 4).

Cyanophyceae:

Cyanophyceae, a rich plankton community with well-marked serial succession is the hallmark of Indian reservoirs. It mainly occurs in clean or polluted water body generally exhibits a characteristic cyclic growth. Cyanophyceae possess a high potential of adaptation to diverse environments (Garcia, Pichel *et al.,* 2001). Cyanophyceae has been reported to dominate phytoplankton communities under reduced light environment (An and Jones, 2000). At the study site Susari dam Cyanophyceae were third dominant quantitative group of total phytoplankton with an average of two years contribution of 21.78% to the total phytoplankton population. In the present study seasonal variation of Cyanophyceae shows maximum density was observed in winter (685± 51.16 No/L) and minimum during monsoon period (270.6±27.43 No/L) (Table- 3 Fig-1). Similar results were reported by various workers, B. Suresh *et al.,* 2013, Agale 2015, Sonule and Mulani (2017).

In the present study seasonal variation of Cyanophyceae maximum density was observed in winter (685± 51.16 No/L) and minimum during monsoon period (270.6±27.43 No/L) (Table- 3, Fig-1). In the present study Cyanophyceae are the positively significantly correlation with Trans at 0.01 level, pH, DO and Mg^{+2} at 0.05 level while negatively significant correlation with AT, WT, TS, TDS, TSS, NO_3^-, PO_4^{-3}, CO^2 and SO^4 at 0.01 level. (Table- 5).

Table: - 1 Seasonal variation in physical parameters of Susari dam over the period of two years from June 2012 to May 2014(Mean ± SEM)

Sr. No	Parameters	Monsoon	Winter	Summer	F value
1.	AT^{0}C	26.13±0.39	22.5±0.62	27.63±0.88	$F_{2\ 21}$ 15.6
2.	WT^{0}C	22.38±0.26	20±0.46	23.75±0.61	$F_{2\ 21}$ 16.18
3.	Water cover%	81.25±5.72	80±2.83	58.13±2.79	$F_{2\ 21}$ 10.21
4.	Transparency(Trans) cm	75±4.62	80±2.83	58.13±2.97	$F_{2\ 21}$ 10.28
5.	Total solids (TS) mg/L	216.8±6.39	160±4.15	206.8±5.63	$F_{2\ 21}$ 29.79
6.	Total Dissolved Solids (TDS) mg/L	148.3±4.81	128.4±3.04	165.8±3.83	$F_{2\ 21}$ 22.3
7.	Total Suspended Solids (TSS) mg/L	68.5±5.34	32.38±2.06	41±1.85	$F_{2\ 21}$ 29.43

Table: - 2 Seasonal Variations in Chemical Parameters of Susari Dam Over the period of two years from June 2012 to May 2014 (Mean ± SEM)

Sr. No	Parameters	Monsoon	Winter	Summer	F value
1.	pH	7.15±0.05	7.63±0.05	7.91±0.11	$F_{2\ 21}$ 23.92
2.	Dissolved Oxygen (DO) mg/L	5.33±0.27	7.11±0.21	4.05±0.22	$F_{2\ 21}$ 41.01
3.	Free Carbon-dioxide (CO_2) mg/L	2.83±0.11	1.73±0.36	3.71±0.17	$F_{2\ 21}$ 16.92
4.	Total Hardness (TH) mg/L	123.5±3.46	139.5±2.39	166.5±6.64	$F_{2\ 21}$ 22.88
5.	Chloride (Cl) mg/L	55.13±3.18	40.88±1.14	64.13±3.75	$F_{2\ 21}$ 16.14
6.	Nitrates (NO_3) mg/L	0.41±0.02	0.22±0.025	0.29±0.02	$F_{2\ 21}$ 15.64
7.	Phosphates (PO_4^{-3}) mg/L	0.66±0.03	0.27±0.04	0.43±0.03	$F_{2\ 21}$ 29.1
8.	Sulphates (SO_4) mg/L	7.42±0.33	4.25±0.37	5.33±0.34	$F_{2\ 21}$ 20.81
9.	Magnesium (Mg) mg/L	6.73±0.99	12.04±1.24	16.13±1.27	$F_{2\ 21}$ 15.93
10.	Calcium (Ca) mg/L	8.07±0.46	12.19±0.82	18.39±1.1	$F_{2\ 21}$ 38.49

Table:- 3 Seasonal variations in density of different groups of phytoplanktons (No/L) with two years mean percentage density at Susari Dam during June 2012 to May 2014.

Parameters	F value	Monsoon	Winter	Summer	Two years %
Total Phyto.	$F_{2\ 21}$ 38.02	1414±80.19	2477±13.9	2655±98.83	
Cyano.	$F_{2\ 21}$ 35.81	270.6±27.43	685±51.16	470±15.09	21.78%
Chloro.	F_{221} 40.89	405±43.67	1045±69.59	646.3±30.23	32.00%
Bacilli.	$F_{2\ 21}$ 39.11	586.9±47.87	701.4±49.84	1479±115.3	42.30%
Eugleno.	$F_{2\ 21}$ 22.87	151.9±19.59	45.38±5.15	60.38±5.05	3.90%

Table: - 4 Diversity of Phytoplankton in Susari dam.

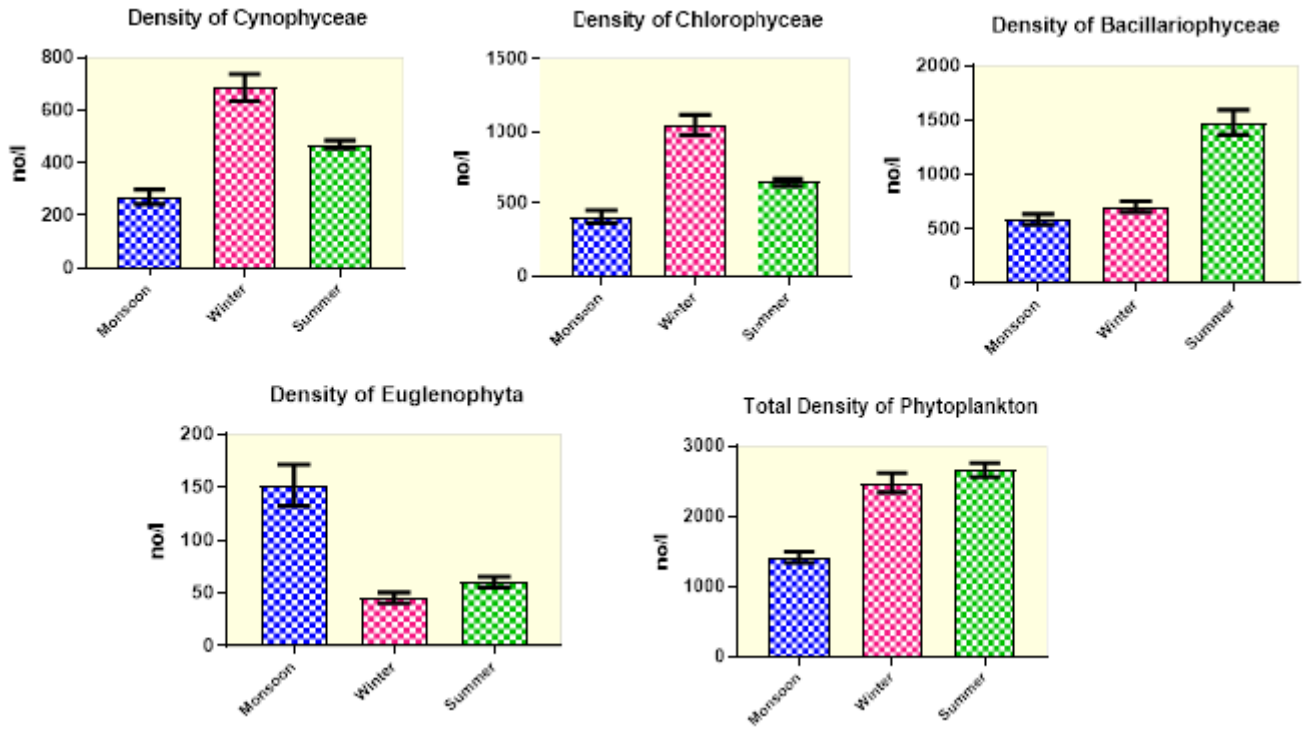
Cyanophyceae	Chlorophyceae	Bacillariophyceae	Euglenophyceae
1. *Microcystis viridis A.Br. Lemm* 2. *Merismopedia convoluta Breb.* 3. *Oscillatoria limosa (Ag)* 4. *Oscillatoria brevis (Kuetz) Gomont* 5. *Phormidium ambigum Gomont* 6. *Phormidium mucosum Gandhi* 7. *Lyngbya limnetica (Lemm)* 8. *Lyngbya aestivani Liemb ex.Gomont* 9. *Anabaena spiroides Klebnn*	1. *Volvox sp.* 2. *Ulothrix fibriate Bold* 3. *Microspora indica Radhwa* 4. *Microspora subsetece (Kuetzing) De. Toni* 5. *Closterium acerosum (Schr.) Ehr.* 6. *Closterium microporum Nageli* 7. *Pediastrum duplex Meyen* 8. *Pediastrum simplex (Meyen)* 9. *Cosmerium subsucumis Cooke.* 10. *Staurastrum spp* 11. *Eudorina spp* 12. *Spirogyra hyalina (Cleve)* 13. *Spirogyra biformis Jao* 14. *Merismopedia convoluta Breb.*	1. *Mastoglia baltica Grun.* 2. *Melosira islandica (O. Muell)* 3. *Synedra affinis Kuetz* 4. *Synedra acus (Kuetz)* 5. *Asterionella spp* 6. *Frustulina spp* 7. *Gyrosigma accuminatum Kuetz* 8. *Navicula papula Kuetz.* 9. *Navicula cuspidate Kuetz.* 10. *Amphora ovalis. Kuetz* 11. *Pinnularia vidarbhensis Sarode et. Kamat* 12. *Pinnularia maharastrensis Sarode et. Kamat* 13. *Rhopalodia gibba Her O. Muell* 14. *Nedium longiceps Grey A. Cl. V.* 15. *Surirella capronii Breb.* 16. *Surirella sabsalsa W. Smith* 17. *Cymbella gracilis (Rabh.) Cleve* 18. *Gomphonema gracile Ehr.* 19. *Gomphonema intricatum Kuetz* 20. *Gomphonema lanceolatum Ehr.* 21. *Fragilaria construens Ehr. Grun* 22. *Fragilaria zafarii Sarode Kamat* 23. *Fragilariarupens Grun.* 24. *Nitzschia jalgaonesis Sarode et. Kamat*	1. *Euglena spirogyra Her.* 2. *Euglena acus Ehrenb.* 3. *Euglena caudata Haben.* 4. *Phacus longicauda Her Duj*

Table: - 5 Pearson correlation of total phytoplankton density along with individual group with Abiotic parameters of Susari Dam during June- 2012 to May- 2014.

	Den.Bacil	Den.Chlor	Den.Cyano	Den.Eugle	Tot.Den
AT	.471*	-.662**	-.568**	.234	-.132
CA	.816**	.195	.284	-.552**	.719**
CL	.604**	-.608**	-.490*	.160	.007
CO2	.565**	-.634**	-.531**	.164	-.046
DO	-.623**	.637**	.507*	-.120	.002
MG	.651**	.321	.460*	-.594**	.712**
NO3	-.175	-.803**	-.759**	.788**	-.674**
PH	.766**	.337	.432*	-.630**	.790**
Den.Bacil	1.000	-.019	.106	-.399	.708**
Den.Chlor	-.019	1.000	.948**	-.796**	.686**
Den.Cyano	.106	.948**	1.000	-.823**	.765**
Den.Eugle	-.399	-.796**	-.823**	1.000	-.832**
Tot.Den	.708**	.686**	.765**	-.832**	1.000
PO4	-.206	-.923**	-.929**	.849**	-.800**
SO4	-.280	-.899**	-.916**	.881**	-.836**
TDS	.715**	-.557**	-.426*	.038	.120
TH	.770**	.156	.283	-.503*	.672**
TRAN	.007	.944**	.942**	-.810**	.675**
TS	.265	-.914**	-.836**	.631**	-.448*
TSS	-.319	-.870**	-.882**	.957**	-.832**
WC	-.740**	.020	-.137	.430*	-.527**
WT	.541**	-.674**	-.558**	.285	-.079

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).



(SD)

Figure 1: Seasonal variation in density of different groups of Phytoplankton (No/L) at Susari Dam during June 2012 to May 2014.

Chlorophyceae:

Chlorophyceae are free living phytoplankton is mostly found in shallow water and found on attached to the submerged plants or moist soil (Huisman, H. *et al.,* 2005). The Chlorophyceae are an extremely large and morphologically diverse group of algae that were more or less distributed in freshwater environment. During the investigation period the Chlorophyceae was second dominant quantitative component of algal composition of Susari dam. The average two years percentage was calculated 32.00%. This group included 14 species and 10 genera. The Chlorophyceae of Susari dam includes *Volvox sp., Ulothrix fibriate Bold ,Microspora indica Radhwa ,Microspora subsetece (Kuetzing) De. Toni ,Closterium acerosum (Schr.) Ehr. ,Closterium microporum Nageli ,Pediastrum duplex Meyen ,Pediastrum simplex (Meyen) ,Cosmerium subsucumis Cooke. ,Staurastrum spp ,Eudorina spp ,Spirogyra hyalina (Cleve) ,Spirogyra biformis Jao ,Merismopedia convoluta Breb.* In the present study seasonal variation of Chlorophyceae showed maximum density was reported in winter (1045± 69.59 No/L) and minimum (405±43.67 No/L) in monsoon period. (Table- 3). In the present study Chlorophyceae are the positively significant correlation with DO and Trans at 0.01 level and negatively significant correlation with AT, Cl, CO_2, NO_3^-, PO_4^{-3}, SO_4, TS, TDS, TSS and WT at 0.01 levels (Table- 5)

Bacillariophyceae (Diatoms):

The Bacillariophyceae constituted an important component of the freshwater or marine. Basically they are autotrophs can also utilize organic substance as nutrients. The diatoms are also being used increasingly as indicators of environmental changes including studies of past climatic changes (Smol and Cumming 2000; Wim *et al.,* 2007). The environmental factor such as physico- chemical and biological factors influence the abundance and species richness of Bacillariophyceae. Maximum density of Bacillariophyceae was recorded in summer (14.79± 115.3 No/L) and minimum in monsoon (586.9± 47.87 No/L) season. (Table- 3, Fig-1). The maximum density of diatoms in summer is also reported by Hafsa and Gupta (2009), Ekhande *et al.,* 2013, Sukla *et al.,* 2013. In the present study Bacillariophyceae are the positively significant correlation with AT, WT, TDS, pH, CO_2, TH, Cl^-, Mg^{+2} and Ca^{+2} at 0.01 level and negatively significant correlation with WC and DO (Table- 5). In the investigation at Susari dam, the total 24 species were recorded belonging to 16 genera (Table- 4).

Euglenophyceae:

Euglenophyceae are commonly found in small water bodies having rich organic matter (Palmar 1969) demonstrated that Euglenophyceae are the key species of biological indicator of organic pollution. Euglenophyceae occupied last position in the phytoplankton diversity. Euglenophyceae was the group represented in the lowest percentage density in the Susari dam water with annual average percentage density of only 3.90% when it's seasonal variations are considered higher density of Euglenophyceae were recorded in Susari dam maximum in monsoon (151.9± 19.59 No/L) and minimum in winter (45.38± 5.15) season (Table- 3, Fig-1). The similar results were reported by Pendase *et al.,* 2000. The Euglenophyceae group included 04 species and 02 genera (Table- 4). In the present investigation in Susari dam the density of Euglenophyceae showed positively significant correlation with TS, TSS, NO_3^-, PO_4^{-3} and SO_4^- at 0.01 levels, while negatively significant correlation with Trans, pH, Mg^{+2}, Ca^{+2} at 0.01 level (Table-5). Presence of *Phacus* species is a direct indication of beginning of pollution

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Agale MC (2015) Study of Seasonal Variation in Physico chemical parameters and planktonic Diversity Budki Medium Irrigation Tank, Shirpur Dist. Dhule (M.S) India. Submitted the Ph. D. Thesis at the North Maharashtra University, Jalgaon (M. S.) India.

An Kwag-Guk and Jones JR (2000): Factors regulating blue-green dominance in a reservoir directly influenced by the Asian monsoon. *Hydrobiologia,* 432:37-48.

APHA (1998) American Public Health Association: Standard methods for the examination of water and wastewater. 20th edition. American water works Association Water Environment Federation. *Washington, D.C.*

Suresh B, Manjappa S and Puttaiah ET (2013) Dynamics of phytoplankton succession in Tungabhadra River near Harihar, Karnataka (India) *Journal of microbiology and Antimicrobials Vol.*5 (7):65.71.

Bahura (1991) The handbook of water Technology Management; Challenges and choices. Vol- I, Dominant publishers, Daryagani, New Delhi: 6-20.

Battis SK (1992) Fresh water Zooplankton of India, *Oxford and IBH publishing company Pvt. Ltd.* 66. Janpath, New Delhi. 110001

Edmonson WT (1963) Freshwater biology *2nd Edn. John Wily and sons. New York, USA.*

Ekhande, AP, Patil JV and Padate GS (2013) Seasonal Variation in Diatoms Density and Their Correlation with Physicochemical Parameters of Yashwant Lake, Toranmal (M.S.) India. *Indian Streams Research Journal* Vol-3(9).

Garcia, Pichel, F. Lopez-cortes. A and Nubel U (2001) Phytogenetic and morphological diversity of cyanobacteria in soil desert crusts from the Colorado plateau. *Appl. Environ, microbial*, 67(4):1902-1910.

Hafsa SL and Gupta S (2009) Phytoplankton diversity and dynamics of Chatla flood plain lake, Barak Valley, Assam, North East India. A seasonal study. *J. Environ. Biol*; 30(6)1007-1012.

Huisman J. H., C.P. Matthisis and P.M. Visser, 2005: *Springer*: 243.

Michal P (1984) Ecological methods for field and Laboratory Investigation. *Tata McGraw-Hill, publishing company Limited* New Delhi.

Misra SM (2001) Assessment of trophic status by using Nygaard index with reference to Bhoi wetland. *Poll. Res.*20.

Palmer CM (1969) Composite rating of algae tolerating organic pollution. *British Phycology Bullettin,* 5:78-92.

Pendse DC, Yogesh Shastri and Bharate (2000) Hydrobiological study of percolation tank of village Dasane, *Ecol. Env. And Cons.6* (1)93-97.

Reid GK and Wood RD (1976) Ecology of inland water and estuaries D. Van Norstand Co. *New York*: 485.

Sarode PT and Kamat ND (1984) Freshwater diatoms of Maharashtra *Saiktup Prakashan Aurangabad.*

Shukla P, Preti and Singh AA (2013) Seasonal variation of plankton population Maheshara Lake in Gorakhpur, India, *Word Journal of Zoology: 8*(1)09-16.

Smol JP and Cumming BF (2000) Tracking long term changes in climate suiting algal indicators in lake sediments. *Phycology,* 36:986-1011.

Sonule Manju D and Mulani Ramjan M (2017) Fresh water algal diversity of Purna River from four sites in Parbhani district, Maharashtra, *Phykos* 47(2): 14- 18.

Wim V; Eile V, Koen S, Koenraad V, Mieke S, Dominic AH, David GM, Steve J, Bart VV, Vivienne J, Roger F, Donna R, Victor AC Cathy K, Pieter V and Aaike DW (2007) Historical processes contrain patterns in global Diatom diversity, *Ecology*, 88(8):1924-1931.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Phyto-taxonomical analysis of Angiospermic species found In Satpura region of Harda district of Madhya Pradesh, India

Sainkhediya Jeetendra[1] and Ray Sudip[2]

[1]Govt.PG College Sendhwa dist. Barwani, M. P., India
[2]PMB Gujarati science college Indore M. P., India**
*Corresponding author Email: jeetu.sainkhediya@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Sainkhediya Jeetendra and Ray Sudip (2019) Phyto-taxonomical analysis of angiospermic species found In Satpura region of Harda district of Madhya Pradesh, India, *Int. J. of. Life Sciences*, Special Issue, A13: 91-101

ABSTRACT

The present study is based on Phyto-taxonomical analysis of angiospermic species found In Satpura region of Harda district of Madhya Pradesh, India during the period of 2011-2016. It is selected because it has been given little attention of its vegetation. Present study records 902 wild and naturalized species of flowering plants which are distributed in 532 genera and 117 families. Dicotyledon represents 672 species, 397 genera and 95 families and monocotyledon represents 230 species, 135 genera and 22 families. The percentage of plant species in dicotyledons is 74.85 % and the monocotyledons represent 25.4 % but in the flora of world, the percentage of dicotyledons and monocotyledons are 81.3 % and 18.7 % respectively. The present quantitative checklist indicates the potential plant resources of the range which can be used for future biodiversity inventories and species conservation. The floristic information of Harda district of Madhya Pradesh is now available for the first time with this publication.

Key word: Harda, Biodiversity, conservation

INTRODUCTION

Floristic study is a necessary prerequisite for much fundamental research in tropical community ecology, such as modeling patterns of species diversity or understanding species distributions (Phillips *et al*. 2003). Forest is an important for biodiversity, environmental and ecological benefits, food security, soil conservation potential, and mitigation of the impact of climate change and job opportunity in tropics. Large scale of deforestation, human settlements, agricultural expansion, pollution, introduces invasive species, and other infrastructure related to development over the last century led to a rapid decline of tropical forests throughout the world, which in turn affected the biodiversity, climate change, ecological services, soil fauna, soil productivity and the livelihoods of forest dwelling as well as rural people. On the other hand, lack of technical and scientific infrastructure makes efforts of sustainable management of these natural resources extremely difficult. global biodiversity crisis has given rise to a growing concern at the prospect of a rapidly accelerating loss of species, population, domesticated varieties, medicinal herbs and natural habitats. The need of the hour is conservation

and sustainable use of biodiversity as an integral component of economic development.

The present study area Harda district is selected for the floristic studies because it has not been given attention its vegetation. Harda district is one of the unexplored districts of Madhya Pradesh, India and it is situated in eastern part of Madhya Pradesh. It lies on 21◦53' to 22◦36' longitude and 76◦47' to 77◦20' latitude. The area of the district is 2644.32 Sq. Km. of which forest covers 780.92 Sq. Km. Harda district is bounded by Sehore to the north, Hosangabad to the southeast, Khandwa to south and west and Dewas to northwest. The southern part of the district is covered by Satpura hill ranges and extended part of Malwa plateau. The soil of the area is black cotton soil and chiefly belong to ash of the Daccan trap. The river, Narmada is the sole river of this area. The knowledge of the plant community is a prerequisite to understand the overall structure and function of ecosystem. The floristic information of the flora of Harda district is now available for the first time with this publication.

MATERIAL AND METHODS

Intensive floristic survey has been carried out in different seasons from 2011-2016 by well-planned schedule. For plant collection and preservation of voucher specimen's standard methodology has been followed (Jain and Rao 1977). Voucher specimens were collected in polybag and identified in the laboratory with the help of flora (Hooker, 1892-1897; Cook, 1903; Gamble et al., 1915; Haines,1921-1924; Duthie,1960; Verma *et al.*,1994; Mudgal et. al., 1997; Singh *et al.*,2001; Khanna *et al.*,2001). Recent up-to-date nomenclature of ICBN was followed. Herbarium specimens were deposited in PMB Gujarati Science College, Indore. Analysis of the Phyto-taxonomical analysis of angiospermic species found In Satpura region of Harda district of Madhya Pradesh, India have been worked out on the basic data recorded during floristic studies of Harda district.

RESULTS & DISCUSSION

The investigation was carried out in order to explore the angiospermic species found In Satpura region of Harda district of Madhya Pradesh, India in Harda district of Madhya Pradesh, India during 2011-2016. The vegetation was arid to semiarid and dry deciduous, thorny scrub type. The Study revealed that the presence of some important shrubs and trees in the area. Present study records 902 wild and naturalized species of flowering plants which are distributed in 532 genera and 117 families (Table-1). Dicotyledon represents 672 species, 397 genera and 95 families and monocotyledon represent 230 species, 135 genera and 22 families. The percentage of plant species in dicotyledons is 74.85 % and the monocotyledons represent 25.4 % but in the flora of world, the percentage of dicotyledons and monocotyledons are 81.3 % and 18.7 % respectively. 145 exotic plant species have been recorded in Harda district which are distributed in 42 families of angiosperms. These are naturalized in study area which accounts 16 % of total flora Sainkhediya, (2016).

Table-1: Distribution of flowering plants

Category	Dicot		Monocots		Total
	No.	%	No.	%	
Family	95	81.1	22	18.8	117
Genera	397	74.3	135	25.5	532
Species	672	74.5	230	25.4	902

Table-2: Percentage of different growth forms

Life form	No. of species	Percentage (%)
Herbs	610	67.62
Shrubs	97	10.75
Trees	131	14.52
Climbers	64	7.09
TOTAL	902	99.98

Table-3: Number wise distribution of species within a genus

S. No.	No.of Genus	Total no. of Species	% of total
1.	1 Species × 382	382	42.35
2.	2 Species × 93	186	20.62
3.	3 Species × 18	54	5.98
4.	4 Species × 16	64	7.09
5.	5 Species × 6	30	3.32
6.	6 Species × 6	36	3.99
7.	7 Species × 2	14	1.55
8.	8 Species × 4	32	3.54
9.	9 Species ×1	9	0.99
10.	10 Species ×1	10	1.10
11.	11 Species ×1	11	1.21
12.	12 Species ×1	12	1.33
13.	62 Species ×1	62	6.87
14.	Total	902	99.94

Poaceae is dominant families of Harda along with 122 species. Different growth habit of a total 902 plant species are 610 herbs, 97 shrubs, 131 trees and 64 climbers. The present study reveals that Cyperus (20) is the most dominant genus. Percentage of different growth forms is shown in Table-2. Number wise distribution of species within a genus is shown in Table-3.

CONCLUSION

Vegetation is the most precious gift, nature has provided to us as meeting all kinds of essential requirements of the humans in the form of food, fodder, fuel, medicine, timber, resins, and oil, etc. Plant communities play a fundamental role in sustainable management by maintaining biodiversity and conserving the environment. Floristic studies acquire increasing importance in recent years in response to the need of developing and under developing countries to assess their plant wealth.

All the species are not equally important but there are only a few overtopping species which by their bulk and growth modify the habitat and control the growth of other species of the community as these species are called dominants. The immense variety of the climatic, edaphic and altitudinal variations in this region pay the way for a great range of ecological habitats for the harda district of M.P. It has poor forest cover but it has fairly rich biodiversity. A major constraint faced in assessing threat status and ecological significance of rare, endangered and threatened species is lack of continuous monitoring over and over again in the previously explored areas or new areas often referred as unexplored areas. Thus, species once common remains common even though population becomes scarce or a rare species turns common as the forms of rarity are less understood (Sainkhediya & Ray 2012, Sainkhediya 2016). Understanding species biodiversity and phyto-taxonomical patterns is important for helping managers to evaluate the complexity and resources of these forests. In this view, an objective of this study was to analyze the patterns of species, for conservation though best management, so that expansion of the protected area network can be suggested.

Acknowledgement

I would like to express my boundless and great respect to my supervisor Dr. Sudip Ray Department of Botany, P.M.B. Gujarati Science College Indore for his guidance during this entire study. It gives me pleasure to record my deep sense gratitude to Principal, P. M. B. Gujarati Science College Indore for providing research and library facilities. My sincere thanks are due to forest officials for their co-operation and allowing me to carry out plant exploration work in Harda forest division. I extend my profound thanks to Dr. S. R. Yadav, Shivaji University, Kolhapur, Maharashtra, for their help in identifying some plant specimens.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Cook T (1903) Flora of the presidency of Bombay. Vol. 1-3. BSI Publications Calcutta, India.

Duthi JF (1960) Flora of the upper gangetic plains. Vol.2. BSI Publications Calcutta, India.

Gamble JS (1915) Flora of the presidency of Madras.Vol.1-3. BSI Publications, Calcutta, India.

Hains HH (1921-1924)The Botany of Bihar and Orissa.Vol.1-6.BSI Reprint, Calcutta, India.

Hooker JD (1892-1897) Flora of British India. Vol. 1-7. BSI Publication, Calcutta, India.

Jain SK and Rao RR (1977) A handbook of field and herbarium method, today and tomorrows.

Printers and publisher New Delhi, India.

Khanna KK, Kumar A, Dixit RD and Singh NP (2001) Supplementary flora of Madhya Pradesh.

BSI Publications, Calcutta, India.

Mudgal V, Khanna KK and Hajara PK (1997) Flora of Madhaya Pradesh, Vol. 2. BSI

Publication, Calcutta, India.

Phillips OL, Martinez RV and Vargas PN (2003) Efficient plot-based floristic assessment of

tropical forests, J. Tropi. Eco., 19, 629-645 .

Sainkhediya (2016) Invasive Alien Flora of Harda District of Madhya Pradesh. *Indian journal of*

applied research. Volume : 6 ,Issue : 4.page 343- 346.

Sainkhediya J (2016). Invasive alien flora of Harda district of Madhya Pradesh. *Indian journal of*

*applied research.*6:4:343-346.

Sainkhediya J and Ray S (2016) A report on some threatened plant taxa of Harda district of

Madhya Pradesh, India. *International Journal for Environmental Rehabilitation and*

Conservation. Volume III No. 2:92 – 96.

Singh NP, Khanna KK, Mudgal V and Dixit RD (2001) Flora of Madhaya Pradesh. Vol.3. BSI

Publication, Calcutta, India.

Verma DM, Balakrishnan NP and Dixit RD (1993) Flora of Madhya Pradesh. Vol.1 BSI

Publication, Calcutta, India.

.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Insecticidal activity of seeds extracts of *Argemone mexicana* against *Tribolium castaneum* (Herbst, 1797) (Coleoptera: Tenebrionidae)

Patil Dipti R[1] and Zambare SP[1]

Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University Aurangabad-431004 Maharashtra. India
Email- patild833@gmail.com | sureshchandraz@yahoo.co.in

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Patil Dipti R and Zambare SP (2019) Insecticidal activity of seeds extracts of *Argemone mexicana* against *Tribolium castaneum* (Herbst, 1797) (Coleoptera: Tenebrionidae), *Int. J. of. Life Sciences*, Special Issue, A13: 102-105.

ABSTRACT

Extracts from seeds of *Argemone mexicana* were tested against 6th instar larvae of the *Tribolium castaneum*.100% mortality was observed after treatment with acetone extract at 1.6ml/kg wheat while 56.6±4.16 larvicidal effect was observed after treatment with ethanol extract at the same dose 20.1±1.73 adult were emerged from those pupated having abnormalities. Only 50.6±4.35and 40.0±2.64larval mortality was recorded in chloroform and methanol extract respectively and from the remaining pupated, 23.3±2.08 and 16.6±1.52 adult emerge. Those treated at lower doses and having some adult emergence, most were having abnormalities. The acetone and ethanol extract can be used to control the infestation of the rust red flour beetle, *Tribolium castaneum.*

Key words-*Tribolium castaneum, Argemone mexicana*

INTRODUCTION

Infestation by stored-product pests causes serious losses in food and feed commodities (Ress,1996). Pest infestations are responsible for changes in the chemical composition of stored food, reductions in nutritional values and contamination by harmful compounds and allergens (Rajendran and Parveen 2005).Insects often cause extensive damage to stored grains and grain products, amounting to 5-10% loss in temperate regions and 20-30% in the tropical regions (Nakakita, 1998). In India, post-harvest losses caused exclusively by insect pests is 12% (Mohan, 2003).

The *Tribolium castaneum* is one of the most destructive pest throughout the world(Pronoto,*et. al.,*1991).The presence of this pest in stored products results in contamination and economic damage and also decreases their nutritive value as well (Barkholder and Faustini, 1991).Pesticide chemicals which are mostly used for crop protection could be environmentally pollutants and also have adverse effects on animals and human beings (Meena *et al.,* 2006, Hashim and Davi, 2003).

The plant kingdom can be a rich source ofa variety of chemicals with the potential for development as successful pest control agents (Rahaman *et al.*1999, Malik and Naqvi 1984). Secondary compounds from plants include

alkaloids, terpenoids, phenolics, flavonoids, and other minor chemicals can affect insects in several ways. The effects of plant products so far reported include insecticidal, repellent and anti-feedant activities (Huang *et al*., 1998).

In the present study *Argemone mexicana* has been selected as one of the safer substitutes to control the stored pest *Tribolium castaneum*.

MATERIAL AND METHODS

Initial stock of *Tribolium castaneum* was obtained from infested wheat grain bought from local market in Aurangabad and was reared in a plastic jar of 10kg capacity covered with muslin cloth to ensure ventilation in the laboratory. The grains were sterilized at 60˚C for24hours in an oven. A standard mixture of whole wheat grain with 5% powdered dry yeast was used as food medium throughout the experimental period with 70-75% relative humidity. Mature 6th instar larvae were selected for present study.

Preparation of plant extract

The seeds of *Argemone mexicana* were collected from the local market of Aurangabad and were washed with distilled water and dried in the shade and then oven for sterilization at 45^0c.The dried seeds were powdered with the help of the grinder. The powder of seeds was packed in the filter paper and extract was extracted in soxhlet apparatus in 1:10 ratio i.e.20gm of seed powder in 200ml solvent. After eight hours of continuous extraction the final extract was kept open to evaporate the solvent and remaining as a stock solution extract was stored in a refrigerator at 4^0c temperature with proper labeling. The extracts were extracted in chloroform, acetone, methanol and ethanol separately.

The seed extract of *Argemone mexicana* in each solvent was separately mixed with 25gm of crushed wheat grains at 0.4,0.8, 1.2 and 1.6ml/kg concentration and were placed into 250gms plastic bottles then five male and five female *Triboliumcastaneum*6^{th} instars larvae were placed into the plastic bottles and covered with a piece of muslin cloth, tied with rubber band to prevent escape. The experiment was conducted under the laboratory environment as mention above. The percentage of larval mortality, pupation, pupal mortality and number of adult emerged were recorded. The morphological abnormalities of the treated live larvae were recorded in each group. The abnormal individual was separated and the deformed character was studied.

RESULTS

The larvae were treated with the high dose of extracts had reduced body size and showed incomplete metamorphosis. No any mortality occurred in the larvae feed on controldiet. Larval mortality was increased with increased concentration of seed extract of *Argemone mexicana.* In seed extract of *Argemone mexicana* in acetone at 0.4mlconcentration not larval mortality was recorded whereas atthe 1.6ml concentration 100% mortality was recorded. With the increase in the concentration, a significant reduction in pupation and adult emergence was observed. Pupation was 76.7±1.52% at 0.4ml concentration which decreases to 33.4±4.04% at 1.2ml concentration of *Argemone mexicana*. At 1.6mlconcentration of extract 100% pupal mortality was observed. In ethanol extract at 0.4ml concentration larval mortality was recorded as 13.3±1.52% while 56.6±4.16% larval mortality was recorded at 1.6ml concentration of *Argemone mexicana*. As the concentration increased, a significant reduction in pupation and adult emergence was observed in ethanol extract. Pupation was 86.7±1.52%in 0.4ml concentration in ethanol which decreased to 43.4±3.51% at 1.6ml concentration of *Argemone mexicana.*so correspondingly only 20.1±1.73 adult emergences were recorded at 1.6ml concentration of *Argemone mexicana* because pupal mortality increased insignificantly with increase of the concentration. At 0.4ml concentration, 13.3±1.52% pupal mortality which increased to 23.3±2.51at 1.6ml concentration of *Argemone mexicana* in ethanol extracts.

The present investigation showed that the effect of different dose level of *Argemone mexicana* seed extract in acetone and ethanol on the larval, pupal and adult stages of the *Tribolium castaneum*. As the concentration increased a significant reduction in pupation and adult emergence was observed (Table 1) Body become paralyzed, black color, reduced body sized and shrinkage body segment. The treated larvae showed the curling up, vigorous body movement which are the characteristic of the neurotoxicity.

The Acetone and ethanol extract showed the highest mortality of larvae and pupa as compared with the methanol and chloroform extract.

Table 1 : Efficacy of seed extract of *Argemone mexicana* in chloroform, Acetone, Methanol and Ethanol solvents against larval to adult mortality of *Tribolium castaneum*

Solvent	Conc. of extract in ml/kg	Larval mortality (%)	Pupation (%)	Pupal mortality (%)	Adult emergence (%)
Chloroform	Control	0	100	0	100
	0.4	0	100	0	100
	0.8	23.3±1.15	76.7±1.52	13.3±1.15	63.4±2.51
	1.2	36.6±1.52	63.4±2.51	16.6±2.08	46.8±4.72
	1.6	50.6±4.35	49.4±4.16	23.3±1.52	26.1±2.30
Acetone	Control	0	100	0	100
	0.4	23.3±2.08	76.7±2.30	13.3±1.15	63.4±3.78
	0.8	40.0±1.73	60.0±3.00	16.6±1.52	43.4±3.51
	1.2	66.6±0.05	33.4±4.04	23.3±2.08	10.1±1.00
	1.6	100	0	0	0
Methanol	Control	0	100	0	100
	0.4	0	100	0	100
	0.8	3.33±1.52	96.6±4.99	6.00±2.64	90.6±1.00
	1.2	46.6±2.88	53.4±378	13.3±1.52	40.1±3.60
	1.6	40.0±2.64	60.0±4.00	16.6±1.52	36.6±2.51
Ethanol	Control	0	100	0	100
	0.4	13.3±1.52	86.7±1.52	13.3±1.52	73.4±3.78
	0.8	33.3±2.51	66.7±2.51	13.3±1.15	53.4±4.16
	1.2	46.6±3.05	53.4±4.16	16.6±2.08	36.8±3.05
	1.6	56.6±4.16	43.4±3.51	23.3±2.51	20.1±1.73

± indicates the standard Deviation of three observations.

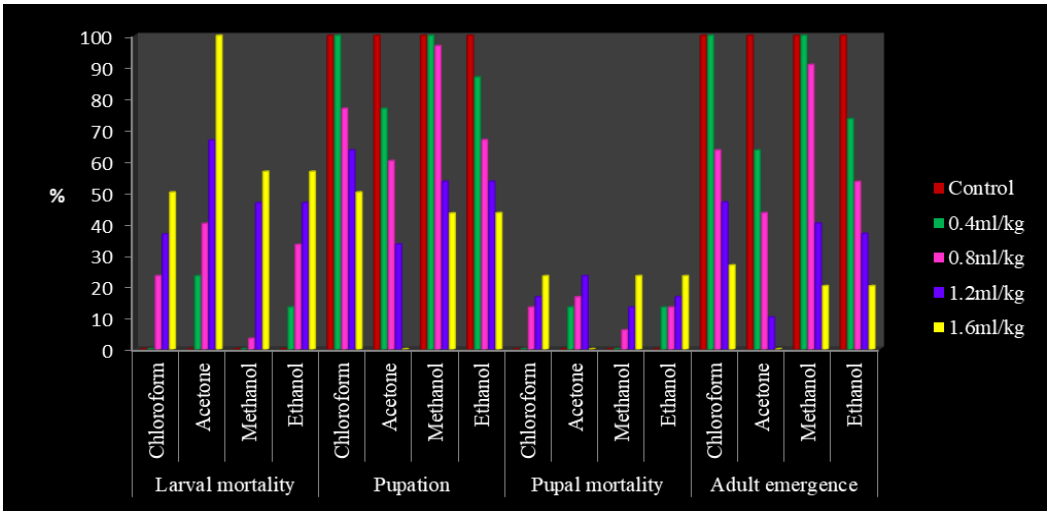


Figure 2: Efficacy of seed extract of *Argemone mexicana* in chloroform, Acetone, Methanol and Ethanol solvents against larval to adult mortality of *Tribolium castaneum.*

DISCUSSION

The *Argemone mexicana* showed the insecticidal activity on *Tribolium castaneum* and might have a potential role as an alternative pest control. Chemical investigations of this plant have revealed the presenceof alkaloids (Hussain *et al.,* 1983; Nakkady *et al.,*1988), amino acids (Dinda *et al.,* 1986), phenolics (Harborne *et al.,* 1983) and fatty acids (Gunstone*et al.,*1977). The plant is used mostly for the treatment of HIV (YuChwen *et al., 2003*). The plant contains many alkaloids (YuChwen *et al.,* 2003, Sangwan and Malik,1998) and was found to possess larvicidal and growth inhibiting activity against the second instar larvae of *Aedes aegypti* (Sakthivadivel and Thilagavathy, 2003). *A. mexicana* was found to be the

most efficient deterrent agent against *A. aegypti.* Ranvir and Chaterjee, (1989) studied the toxicity of *A. mexicana*seeds to rats and observed significant reduction in body weight, significant increase in blood glucose.

Petroleum ether extract and acetone extract of *Argemone mexicana* leaves possess maximum ovicidal effect against *T. granarium* (Dwivedi and Kumar,1998). Three iso quinoline alkaloids have been isolated as dihydropalmitine hydroxide; berberine and protopine, from the seeds. Oil contain up to 40% free glycerides of fatty acids (Anonymous, 2004). Protopine and sanguinarine in seed of *A. mexicana* was identified as the active moiety causing snail death by co-migration of active agent with seed powder (Singh and Singh, 1999).

CONCLUSION

The seed extract of *Argemone Mexicana* have potential as grain protectants. Their extract in acetone has strong insecticidal effect against *Tribolium castaneum.* These plants have a range of chemicals which can be isolated and used for pest control.

In the investigation it may be conclude that seed extract of *Argemone mexicana* in acetone can be used to control the Infestation of *Tribolium castaneum* in wheat.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Anonymous (2004). In the Wealth of India A Dictionary of Indian Raw Materials and Industrial Products. Council of Scientific and Industrial Research, New Delhi, Vol. I, 2004: 86-87.

Barkholder WE and Faustini DL (1991). Biological methods of survey and control. In*:* Ecology andmanagement of food industrypests, a OAC Press, pp. 161- 372.

Dinda B and Bandyopadhyay MJ (1986). Free amino acids of *Argemone mexicana*. *J. Indian.Chem. Soc*. 63, 934D36

Dwivedi SC and Kumar Rajesh (1998). Screening of some plant extracts for ovicidal properties against the Khapra beetle, *Trogoderma gramarium* proc. Nat. Sem Ent. in 21st cent Udaipur, P. 176

Gunstone FD, Holliday JA and Scrimgeour CM (1977). Fatty acids, Part 51. The long-chain (argemonic acids) in *Argemone mexicana* seed oil. Chem. Phys. Lipids **20**, 331D335

Harborne JB and Williams CA (1983) Flavonoids in, the seeds of *Argemone mexicana*: a reappraisal. Phytochemistry 22, 1520D1521.

Hasim MS and Davi KS (2003). Insecticidal actionof the polyphenolic rich fractions from the stem bark of *Streblusasper* on *Dysdercus cingulalus*. *Fitoterapia*, **74**: 670-676.

Huang Y, Tan JMWL, Kini RM and Ho SH (1998). Toxic and antifeedant action of nutmeg oil against *Tribolium castaneum* (Herbst) and *Sitophilus zeamais*Motsch. Journal of Stored Products Research 33: 289-298.

Hussain SF, Nakkady S, Khan L, and Shamma M (1983). oxyhydrastinine, an isoquinoline alkaloid from the Papaveraceae. Phytochemistry **22**, 319-320.

Meena R, Suhag P and Prates HT (2006). Evaluation of ethanol extracts of *Baccharis genistelloides* against stored grain pests. J. Stored Prod. Res.,34: 243-29.

Rahman ML, Hossain M and Ahmad M (1999). Repellent effectsof urmoi, neem and turmeric extracts against rice weevil and granary weevil: Bangladesh, J. Entomol. 9-16.

Malik MM and Naqvi SHM (1984). Screening of some indigenous plants as repellents orantifeedants for stored grain insects, J. stored Prod. Res. 20 41-44.

Mohan S (2003). Issues in the management of insects of food grain. Proceedings of the National Symposium on frontier areas of Entomological Research, IARI, New Delhi:423

Nakakita H. (1998). Stored rice and stored product insects. In: Rice Inspection Technology Manual. A.C.E. Corporation, Tokyo, Japan: 49-65.

Nakkady S and Shamma, M (1988). Studies on the chemical constituents of *Argemone mexicana* Egypt. J. Pharm. Sci. **29**, 53D61.

Pranoto RIMS, Sim AME, Howie and Ho SH (1991). Current Trends in Integrated Pest Management for Grain Storage in the Asean Region, Asean Grain Post Harvest Programme, Thiland,pp:67-80

Rajendran S and Parveen HKM (2005). Insect infestation in stored animal products. J. Stored Prod. Res. 41:1–30

Ranivar P and Chatterjee VC (1989). The toxicity of mexicana poppy (*Argemone mexicanaL.*) seeds to rats. Vet. Hum. Toxicol., **31:** [555-558].

Rees DR (1996) Coleoptera, in Integrated Management of Insects in Stored Products, ed. By Subramanyam B and Hagstrum DW Marcel Dekker, New York, USA, pp. 1–40 (1996)

Sangwan NK and Malik MS (1998). A long-chain alcohol from *Argemone mexicana.* Phytochemistry, 1998; 49: 755 – 756

Sakthivadivel M and Thilagavathy D (2003). Larvicidal and chemosterilants activity of the acetone fraction of petroleum ether extract from *Argemone mexicana* L. seed. Bioresource Technology, 89: 213-216

Singh S and Singh DK (1999): Molluscicidal property of seeds of *Argemone mexicana* Chemosphere, vol. 38(14): 3319-3328

YuChwen C, Hseih PW, Chang FR, Wu RR, Liaw CC, Lee KH and Wu YC (2003). Two new

protopines argemexicaines A and B and the anti HIV alkaloid 6 acetonyldihydrochelerythrine from Formosan *Argemone mexicana*. *Planta Medica*,; 69:148-152.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Morphotaxonomic Studies of Diversity of Genus Eragrostis of Family Poaceae of Nagpur Division, Maharashtra, India

Deore Ashok N[1] and Tathod Swati S[1]

Associate professor, Department.of Botany S.S.S.K.R. Innani Mahavidyalaya,Karanja Lad. Dist. Washim, Maharashtra.
Email- ashokdeore777@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Deore Ashok N and Tathod Swati S (2019) Morphotaxonomic Studies of Diversity of Genus Eragrostis of Family Poaceae of Nagpur Division, Maharashtra, India, *Int. J. of. Life Sciences*, Special Issue, A13: 106-109.

ABSTRACT

Nagpur division is the part of vidarbha it includes about 6 districts. Survey of grasses biodiversity of study area conducted during 2014-2018, reported 168 species belonging to 70 genera. Eragrostis is largest genus of study area. It has 14 species which belong to subfamily pooideae. The aim of our study is morpho-taxonomic study of family Poaceae and details of macro and micro morphology of some important grasses

Keywords - *Vidharba, Biodiversity, Grasses, Morphology.*

INTRODUCTION

Grasses are most beautiful group of monocotyledonous plants. As grasses do not like shade, they are not usually abundant within the forest. But in open places they grow very well and sometimes whole tracts become grasslands.

Grasses are important for entire ecosystem. Tiger is the king of forest ecosystem. If we want to save tiger, we have to save the grasses because tigers are indirectly dependant on grasses for their food. Robinson writes "Grass is king" it rules and governs the world, without it the earth would be a barren waste.

In the early days when the population was much limited and when limited land was under cultivation much of it was covered with plenty of green grasses. So the farmers paid no attention to the grasses. But now population has increased, open land is decreased very much and cattle's have increased in number hence farmers have to pay more attention toward grasses. The present destruction of grasses is mainly due to overgrazing, increasing agricultural practices, over use of herbicides, open coal field mines, formation of big dams, road widening, clean agricultural practices and trampling by men and cattle's. Grazing needs to be inhibited in certain areas and also reduce the use of herbicides. Sugarcane is main source of sugar. A high proportion of the most fertile and productive soil were developed under a vegetative cover of grasses. Root, rhizome and other part of grasses are good soil builders and effective soil stabilizers. Most of the birds and animals depend upon grassland habitat for food, shelter and normal completion of their life cycles Gould (1968).

Despite utmost importance of grasses to human beings, the study on grasses continues to be a neglected subject. This is mainly because of the feeling that it is a difficult group for identification, the leaves and branches of grasses are very much similar, Small floral organs, special terminology and variation in the structure of spikelet and inflorescence. "Grasses of Burma, Ceylon, India and Pakistan" studied is the main standard reference work on Indian grasses.

Study Area

Nagpur division is the largest part of eastern Vidarbha includes about 6 districts i.e. Nagpur, Wardha, Gondiya, Bhandara, Chandrapur and Gadchiroli. It is the eastern part of Vidarbha and has an expanse of 51,336 sq.km. It is surrounded by Madhya Pradesh to its north, Andhra Pradesh to it's south, Chattisgarh to the east side, and Yavatmal and Amravati to it's west. There are many rivers and their tributaries crisscrossing the entire area. Major rivers in Nagpur division are Wainganga, Godavari, Indravati, Pranhita, Wardha, Sipna, Kanhan, Pench , Bor, Vena, etc. Tippagarh hills in Gadchiroli, Ramtek hills in Nagpur are some of hilly regions of Nagpur division. Bor , Navegaon bandh, Itiyadoh, Gosikhurda are some of the major dams in the region. Whereas Bhandara district is fondly called as 'district of lakes'. Chandrapur is the most polluted city in study area. Adjoining areas of Chandrapur, Wani and Warora has become barren wasteland because of open coal mines; these are amongst highly polluted areas in the country, soil of these areas has become compact, hard and saline, it has lost it's fertility. Gadchiroli district has highest forest i.e. 78% in Maharashtra.

The monumental work of Bor. (1953) on "Grasses of Burma, Ceylon, India and Pakistan"(excluding Bambusiae) published about 50 years ago has changed this scenario and created interest on the study of grasses. This resulted in publication of several books on grasses and the latest addition is "Flora of Tamil Nadu-Grasses" by Altaf and Nair (2009) that deals with 447 species (excluding Bamboos).

Patunkar (1980) studied "Grasses of Marathwada" region has also published a book "Grasses of Marathwada". Recently, Potdar (2012) has published "Grasses of Maharashtra", the book is an outcome of exploration and detailed studies conducted on documents of grass diversity of Maharashtra for last 20 years. During this period 415 species belonging to 125 genera have been described. There are above 10,000-11,000 species belonging to 700 genera in the world in India there are more than 1200 species belonging to 268 genera .Nagpur division of Vidarbha represents the area that is rich in forest cover, Purekar (1985) reported 188 species belonging to 82 genera from Nagpur District, while 100 species belonging to 57 genera from Wardha district were reported by 130 species were reported from Gadchiroli and Chandrapur district Patil (1991), 118 species from Gondia district Kahalkar (2009) and 220 species belonging 94 genera from Gadchiroli district by Govekar.

MATERIAL AND METHODS

Plan of Work:

Study of Habitat:

In every season the selected areas were explored systematically. Grass covered sites were targeted for study. Grasses were collected from different habitats like irrigated fields, un- irrigated fields, open grasslands, forest, bunds of field, bank of rivers, wastelands, rice fields and rocky places.

Sample collection and preservation-

During excursion specimens of grasses were collected and field number is given to each specimen. Field observations were noted down in field diary. After collection the samples are critically studied in laboratory. Then it was dried properly, poisoned by using 2% Mercury Chloride and mounted using conventional methods. For critical cases BSI (Pune) was consulted to match the specimens.

Identification-

The identification was confirmed by using floras like flora of British India (Hooker 1872-1897), Flora of Bombay Presidency (Cook 1958), Flora of Marathwada (Naik 1998), Flora of Maharashtra(Almeida,1990), Grasses of Maharashtra (Potdar, Salunkhe and Yadav, 2012) Grasses of Marathawada (Patunkar,1980). Specimens were observed under Sterioscopic binocular microscope.

Artificial keys were provided for genera and species. Population variations are critically studied. Latest nomenclature is given in detail for proper taxonomic level. Each grass specimen description was supported by a note on distribution and herbarium specimen number. Genera and species are arranged alphabetically. Floristic analysis was done to get clear picture of grass biodiversity. Grass species are arranged

according to N.L. Bor. All the specimens were deposited in the herbarium of S.S.S.K.R. Innani Mahavidyalaya, Karanja (Lad), Dist-Washim (M.S.)

ERAGROSTIS Wolf-

Annual usually slender glabrous grasses of various habit; stems erect or ascending. Leaves narrow; ligule usually reduced to a line of hairs. Spikelets 2-many flowered, in open or contracted panicles (rarely spicate), strongly laterally compressed, ovate-oblong or linear, not (or rarely) articulate on their pedicels on a simple terminal rachis; rhachilla disarticulating above the involucral glumes and between the floral ones, or tough and persistent, not produced beyond the upper floret. Glumes many, broad, obtuse, acute or mucronate, never awned, thin, dorsally rounded and keeled; involucral glumes much shorter than the spikelet, equal or unequal, empty, persistent or separately deciduous, 1-nerved, rarely 3-nerved, usually membranous; floral glumes imbricating, at length deciduous from the rhachilla, 3-nerved, all bisexual or the uppermost and rarely the lowest imperfect, ovate to lanceolate, membranous to chartaceous, usually glabrous, the lateral nerves short, not reaching the midnerve; palea equal to their glumes or slightly shorter, membranous, 2-keeled, deciduous or persistent on the rhachilla. Lodicules 2, small, cuneate, more or less fleshy. Stamens 3 (rarely 2). Styles distinct; stigmas plumose, laterally exserted. Grain minute, globose, oblong, ovoid or obovoid, free in the glume and palea.

RESULTS AND CONCLUSION

Present survey is the outcome of exploration tours conducted to document the grass diversity of study area from 2014-2018 and visited different areas of Nagpur division in different seasons. During this period over 900 specimens were collected from the study area. During the study 168 species belonging to 70 genera were collected.

Out of 70 genera Eragrostis is the largest genus belonging to sub-family pooideae. The 45 species collected from study area were found to be monotypic whereas 17 species were bitypic. In Nagpur pure patches of *Aristada, Chrysopogon, Apluda, Ischaemum, Dinebra, Themeda, Andropogon, Ophiuros, Rottboellia, Heteropogon, Dicanthium, Cynodon, Saccharum, Vetiveria* were observed.

Though grasses are herbaceous in nature, but are tough in texture so it is easy to prepare herbarium specimen. Some of the beautiful grasses are *Paspalum scorbiculatum, Thelepogon elegans, Mnesithea laevis, Mnesithea granularis, Chrysopogon fulvus, Ischaemum rugosum, Vetiveria zizanioids*. Nagpur division being the area of wildlife sanctuaries grasses has vital importance in maintaining the diversity of animals in this area. In remote areas undisturbed grasslands are observed. Some dominant genera are *Apluda, Aristada, Dicanthium, Cynodon, Dinebra, Eragrostis, Ischaemum, Rottboellia, Heteropogon, Ophiuros, Setaria*.

Table 1: Species of Eragrostis and habitat,

Sr.No	Name of Species	Habitat	Distribution	Specimen No.
1	*Eragrostis aspera*	Fields	C	SST02
2	*Eragrostis bifaria*	Forest	C	SST683
3	*Erogrostis cilianensis*	Open grassland	C	SST01
4	*Erogrostis ciliaris*	Shady places	C	SST07
5	*Eragrostis cangetica*	Wetlands	C	SST589
6	*Eragrostis japonica*	Stream banks	F	SST08
7	*Eragrostis muticaulis*	Fields	O	SST435
8	*Eragrostis nutans*	Wetlands	C	SST03
9	*Eragrostis Pilosa*	Open grassland	C	SST677
10	*Eragrostis riparia*	Stream Banks	R	SST583
11	*Eragrostis tef*	Open grassland	R	SST06
12	*Eragrostis unioloides*	Forest	C	SST04
13	*Erogrostis vicosa*	Road side	C	SST05
14	*Erogrostis zeylanica*	Road side	R	SST905

Distribution: A=Abundant, C=Common, F=Frequent, O=Occasional, R=Rare

Key for species of genus Erogrostis.

1a. Spikelets in clustered	*E.zeylanica*
1b. Spikelets not in clustered	2
2a. Panicle contracted	*E.riparia*
2b. Panicle not contracted	3
3a. Spikelets breaking up from above downwards	4
3b. Spikelets breaking up from below upwards	8
4a. Spikelets not breaking at maturity	*E. tef*
4b. Spikelets breaking at maturity	5
5a. Panicle effuse	*E.aspera*
5b. Panicle not effuse	6
6a. Keels of palea scabrid or smooth not ciliate	*E.japonica*
6b. Keels of palea more or less ciliate	7
7a. Lemma ciliated on keels	*E.ciliaris*
7b. Lemma not ciliated on keels	*E. viscosa*
8a. Perennials, lemmas upto 1.8mm long	*E.nutans*
8b. Annuals, lemmas upto 1.8mm long	9
9a. Plants glandular	*E.pilosa*
9b. Plants not glandular	10
10a. Panicles contracted	*E.gangetica*
10b. Panicles not contracted	11
11a. Spikelets 3-5 flowered	*E.muticaulis*
11b. Spikelets more than 7 flowered	12
12a. Plants glandular	*E.cilianensis*
12b. Plants eglandular	*E. unioloides*

In Bhandara districts Arundo donax and Vetiveria zizanioides are found frequently. The wild species of Sorghum are frequent in Nagpur district. Dicanthium filiculme is found restricted to Chargaon and Nagpur forest area whereas Coix is found abundant in Gadchiroli.

Some grasses have underground rhizomes i.e. Ischaemum pilosum , Cynodon dactylon, Saccharum spontaneum which cannot be eradicated hence the productivity of crops decreases. Cynodon is the first class fodder grass present throughout study area. It is palatable and resistant to grazing and trampling because of underground rhizomes. Dactyloctenium aegyptium, Chrysopogon fulvus is other palatable species of grasses. Cymbopogon martini, Vetiveria zizanioides, Saccharum spontaneum and Cynodon dactylon are the medicinal grasses. Hollow internodes of Arundo donax is used for making pens and musical pipes by locals. The forest areas shortlisted for the study are of mixed dry deciduous type with teak as dominant species. Saccharum spontaneum, Vetiveria zizanioides, Phragmites vallatorius, Arundo donax are present along the sides of rivers and stream which reduce the pressure of flood.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Altaf K and Nair VJ (2009). Flora of Tamil Nadu- Grasses, Botanical Survey of India. Calcutta.

Gould FW (1968).Grass systematic.McGraw-Hill.New York.

Kahalkar VI (2009). Floristic studies on Gondia district of Maharashtra state, Ph.D thesis Nagpur University, Nagpur.

Patil BM (1991). Floristic and palynological investigations in the Monocot flora of Chandrapur and Gadchiroli district, of Vidarbha region, of Maharashtra State. Ph.D thesis, Nagpur University Nagpur.

Patunkar BW (1980). Grasses of Marathwada. Scientific Publisher, Jodhpur.

Potdar GG, Salunkhe CB and Yadav SR (2012). Grasses of Maharashtra, Shivaji University, Kolhapur.

Purekar PN (1885). Grasses of Nagpur District-Taxonomy and Palynology. Ph.D thesis Nagpur University, Nagpur.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Biochemical change in protein of fresh water fish *Channa punctatus,* in response to treatment with glyphosate

Rohankar Pratibha H[1] and Feroz Ahmad Dar[1]

Department of Zoology, Govt. Vidarbha Institute of Science and Humanities, Amravati 444604, India.
Email- rohankarp@yahoo.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Rohankar Pratibha H and Feroz Ahmad Dar (2019) Biochemical change in protein of fresh water fish *Channa punctatus,* in response to treatment with glyphosate, *Int. J. of. Life Sciences*, Special Issue, A13: 110-112.

ABSTRACT

Glyphosate [N-(phosphonomethyl) glycine] is a broad spectrum, post growing herbicide and is widely used in agricultural chemicals globally. Fish are highly sensitive to a wide variety of agrochemicals with glyphosate herbicide that may occur from not only on purpose discharge of these chemicals into waterways but also from approved agricultural practices. Herbicide Glyphosate has been extensively used in aquatic and agricultural weed control in numerous countries including India. Glyphosate plays vital role in agriculture to control the growth of weed species in the fields and yield high production of harvesting, but are very dangerous for flora and fauna. In the present study protein shows significant decrease in fresh water fish *Channa punctatus* for 24, 48, 72 and 96 hours respectively. Kidney Protein have been estimated by Lowry's method.

Keywords: Protein estimation, kidney, glyphosate, *Channa punctatus*.

INTRODUCTION

Pesticides yield high result of production in agriculture and public health activities. The pesticides impact in ecological particularly in streams, lakes, river water etc. are determined by their toxicity, persistence, fate and content of impurities. Pesticides are vital environmental contaminants due to higher concentration of biological toxicity (Moustafa *et al.*, 2016). The importance of herbicides is to protect the crops, is a predictable for management practice and benefit of agricultural productivity. Glyphosate is the active constituent and is first introduced in 1974 for nonselective weed control (Franz *et al.,* 1997).

Mishra and Sharma (2004), have examined that the proteins are the main source of energy, and plays an important role in tissue manufacturing. The protein in kidney has its own importance, but over protein is dangerous, but in fact pesticides cause alteration in the amount of protein present in kidney. The acute exposure due to glyphosate causes various symptoms have features and underlying mechanisms already well known (Bradberry *et al*., 2004; Roberts *et al*., 2010). Accumulation of pesticides in tissues can cause many physiological and biochemical changes in fresh water fishes, and influencing

the activities of various enzymes. Various workers have reported that the alteration or change in biochemical contents in various tissues of fish, due to toxic effects of various herbicides (Das *et al*., 1999; Khare and Singh, 2002).

The present study is thus aimed at examining the toxicity and effects of herbicide a glyphosate on fresh water fish *Channa punctatus* by determining the protein alterations in the kidney due to toxic stress.

MATERIALS AND METHODS

Some live specimens of snake headed fishes *Channa punctatus* were brought from the local market Amravati. The fishes having average length, weight 15 ± 1 cm and 50 ± 5 gm respectively were brought to the laboratory and were treated with 0.1% KMnO4 then after transferred aquarium. These specimens were kept in aquarium for ten days for acclimatization, and aquarium was connected with aerator. As *Channa punctatu* is carnivores dried fish was given daily after changing the water of aquarium. The specimens were treated with glyphosate herbicide after completion of acclimatization. Alteration in protein was done in kidney *Channa punctataus*. Protein estimation was done by Lowry's method 1951. The herbicide, glyphosate was purchased from local market chemist shop for the present study.

RESULT AND DISCUSSION

The result shows the significant decrease in protein due to the exposure of glyphosate an herbicide in kidney. Below, table shows gradual change and difference or significant change between control and 24 hrs, 48 hr, 72 hrs, 96 hrs in the kidney of fresh water fish *Channa punctatus.*

Table 1: Changes in Total Protein level of fresh water fish *Channa punctatus* exposed to Glyphosate a herbicide at different exposure period (mg/ 100 mg wet wt. tissue)

Biochemical Organ	control	24	48	72	96
Kidney	36.04±1.23	28.83±1.41	20.96±2.0	12.59±1.69	5.68±1.30

*Values in mean +S.E. (standard deviation) n=5,*P<0.05, **P<0.01, ***P<0.001 when compared with control, ns = non signification.*

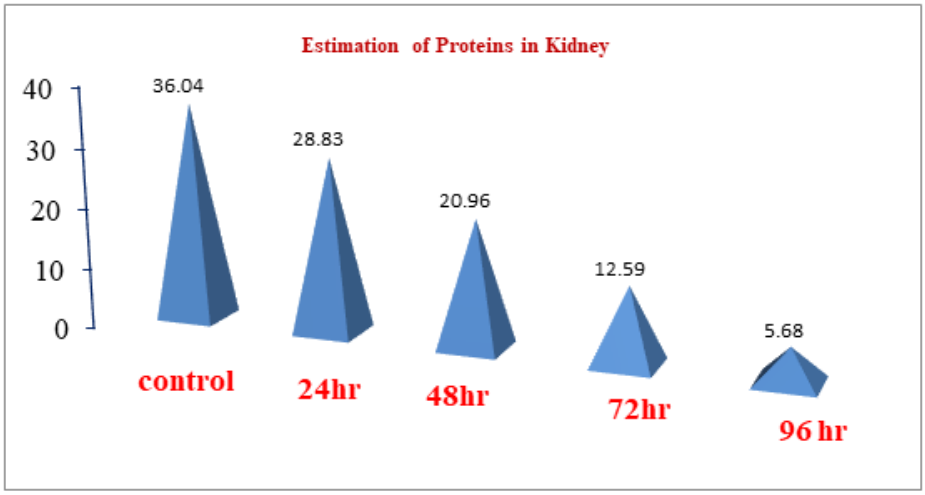


Figure 1: Changes in protein content (mg/g wet wt of tissue) in kidney of fresh water fish *Channa punctatus,* exposed to sublethal concentration of glyphosate for 24, 48, 72 and 96 hrs.

It is clears from above table, that glyphosate effects on kidney in a snake headed fresh water fish *Channa punctatus* and shows the significant decrease in protein content. Proteins play the vital role and have the top priority in the body of organisms, proteins are composed of amino acids which are organic compounds made of carbon. As whole the body is made up of proteins, though Proteins has chief significant and high priorty in the living world by their biological specificity among various types of cell (Bhushan *et al*., 2002). Fish are main organisms that are used to identify and document pollutants released into their environment.

Various studies have been noticed and states that glyphosate a herbicide is toxic to fish which give rise to morph and functional changes in aquatic animals. While various facts shows negative outcomes from glyphosate exposure, which including birth defects and neurological, fetal death and neurodevelopment (Battaglin *et al*.,2005; Jurewicz and Hanke 2008).

CONCLUSION

It was concluded that the herbicide glyphosate is very harmful for both flora and fauna in an aquatic medium. The glyphosate is mainly used in various orchids and agriculture purposes. As, is washed out through rain and ultimately reaches to the nearby river or lakes, and ultimately affect directly or indirectly on the fauna organisms which in turn effect the human health by food chain.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Battaglin WA, Kolpin DW, Scribner EA, Kuivila KA and Sandstrom MW (2005). Glyphosate, other herbicides and transformation products in Midwestern streams 2002: agricultural hydrology and water quality. *J. Am. Water Resour. Assoc. Middleburg,* VA, ETATS-UNIS.

Bhushans, Kuhn C, Berglund AK, Roth C and Glaser E (2006). The role of the N-terminal domain of chloroplast targeting peptides in organellar protein import and miss-sorting. *FEBS Lett.* 580, Pp 3966–3972.

Bradberry SM, Proudfoot AT and Vale JA (2004). Glyphosate poisoning. *Toxicol Rev* 23, Pp 159-167.

Das LV, Jeewaprada PN and Veeraiah K (1999). Toxicity and effect of cypermethrin on biochemical constituents of freshwater teleost *Channa punctata*. *J. Ecotoxicol. Environ. Monit.,* 9(3), Pp 197-203.

Dawson AH (2010). A prospective observational study of the clinical toxicology of glyphosate-containing herbicides in adults with acute self-poisoning. *Clin Toxicol (Phila) 48*, Pp 129-136.

Franz JE, Mao MK and Sikorski JA (1997). *Glyphosate: A Unique Global Herbicide,* ACS Monograph No. 189. *Am. Chem. Soc. (ACS), Washington, DC.*

Jurewicz J and Hanke W (2008). Prenatal and childhood exposure to pesticides and neurobehavioral development: review of epidemiological studies. *Int. J. Occup. Med. Environ. Health*, 21 Pp 121.

Khare A and Singh S (2002). Impact of Malathion on protein content in the freshwater fish, *Clarias batrachus*. *J. Ecotoxicol. Environ. Monit*. 12(2), Pp 129-132.

Lowry OH, Rosenbrough NJ, Farr AL and Randall RJ (1951). Protein measurement with the Folin –phenol reagent ; *J. Biol.Chem*., 193, Pp 265 -273.

Mishra A and Sharma AP (2004). Fish in Human Welfare. *Everyman's Science*. XXXIX (2), Pp 111-114.

Moustafa GG, Shaaban FE, Hadeed AHA and Elhady WM (2016). Immunotoxicological, biochemical, and histopathological studies on Roundup and Stomp herbicides in Nile catfish (*Clarias gariepinus*) *Vet World*. 9(6), Pp 638–647.

Roberts DM, Buckley NA, Mohamed F, Eddleston M, Goldstein DA, Mehrsheikh A, Bleeke MS and

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Spermatogenesis in freshwater Mussel, *Lamellidens corrianus*, when subjected to Cereralectomy.

Dongre Sangeeta B

Department of Zoology, Government Vidarbha Institute of Science and Humanities. Amravati. (M.S). 431001. India.
Email: sangeetadongre24@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Dongre Sangeeta B (2019) Spermatogenesis in freshwater Mussel, *Lamellidens corrianus*, when subjected to Cereralectomy, *Int. J. of. Life Sciences*, Special Issue, A13: 113-116.

ABSTRACT

Lamellidens corranius is a freshwater mussel. During spermatogenesis compact follicles, spermatogonia, spermatids, spermatocytes with mature follicles occurred during different stages were recognized. The experiment was conducted throughout the year, the animals were grouped into three, group a) Control animal, group b) Unilaterally cerebralectomized animal and group c) Bilaterally cereralectomized animals. A comparative study showed an abnormal growth in cerebralectomized animals as compared with control. Thus, cerebral ganglia accelerated the growth of gamete which was more pronounced in bilaterally cerebralectomized animals.

Key words: Spermatogenesis, Cerebralectomized, Season, *Lamellidens corranius.*

INTRODUCTION

Bivalve species can be found all around the globe in a variety of environments, from the poles to the tropics (Tebble 1966, Hayward and Ryland 1995, Dance and Ward 2002). Over such a range, differences in environmental conditions such as in water temperature, salinity, food availability and water current occur. These differences influence growth, survival and reproduction and, ultimately, they limit and determine the distribution of species. In many bivalve species, spawning occurs once a specific threshold temperature is reached (Loosanoff and Davis 1963, Lammens 1967, DeWilde and Berghuis 1978, Giese and Kanatani 1987, Drent 2004). Overall, temperature is seen as a key factor directly or indirectly affecting physiological processes. After severe winters, the amount of settled bivalve larvae (spat) on the seafloor appears to be higher than after mild winters (Reise 1987, Beukema et al. 2001). At a local scale, physiological processes in bivalves are affected by other environmental factors as well. Food quality and quantity, tidal level and sediment type are known to influence growth and reproduction, and these seem to have locally a more important role (Newell and Hidu 1982, De Montaudouin 1996, Beukema and Cadée 1997, Honkoop and Beukema 1997, Beukema et al. 2002, Carmichael et al. 2004).

The physiological components regulating intraspecific growth differences among individuals living in the same environment may be affected by

differences in energy acquisition (food consumption and assimilation), differences in the allocation of energy among maintenance, growth, reproduction and other consuming activities, and differences in the metabolic cost of growth (Bayne, 1999). The energy budget or `scope for growth' provides a means of integrating the basic physiological processes into an index of energy available for growth and reproduction. In bivalves, the scope for growth has proved to be an accurate predictor of total production, which includes growth rate and gamete production (Pouvreau et al., 2000; Rueda and Smaal; 2004). Thus, the present study was undertaken in *Lamellidens corrianus*, so as to study the impact of cerebral ganglia ectomy unilaterally and bilaterally on reproduction with special emphasize on spermatogenesis in summer, monsoon and winter season.

MATERIALS AND METHODS

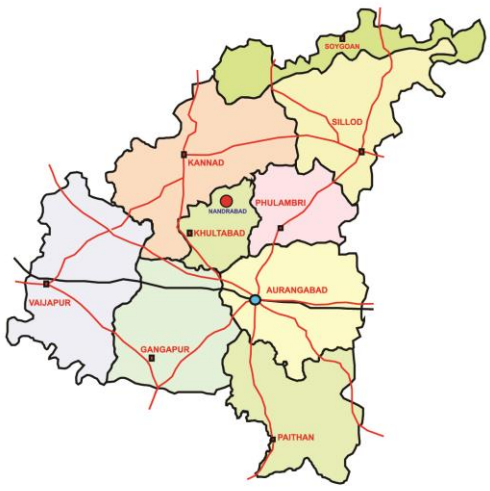
During different seasons, the collection of 15 individuals of the shell length 90-110 mm, were brought from the pond situated at Nandrabad, 19 Km away from Aurangabad to the laboratory and were brushed so as to remove the biomass and mud. There were then kept for about 2 to 3 hour in the laboratory conditions. The surgical operations were performed so as to remove cerebral ganglion unilaterally and bilaterally within 30 second. The animals were divided into 3 groups non-operated served as control and other two were experimental further fixed in Bouin's Hollande for 24 hour. The gonad were dissected, dehydrated and processed as per micro technique methods and serial section were cut at 6-7 mm thickness and were stained with Mallory's triple stain the section were observed under the research microscope before photomicrography.

RESULT AND DISCUSSION

Lamellidens corrianus from the Nandrabad pond is a dioecious animal which cannot be morphologically differentiated. Gonad development in bivalve's studies is energy demanding processes, histologically in summer gametogenesis, maturation of gametes occurred in monsoon and mature partially spawned in winter. The various physiochemical parameter were also studied, (Table 1)

In summer there was formation of number of sperms, the nutritive cells and lipid globules were many in the control group animals compared to both experimental animals. The size of spermatogonia in control animals was 2.8 ± 0.029µm, in mean diameter and in unilaterally cerebralectomized animal and bilaterally cerebralectomized animals showed a significant increase in size to 2.9 ± 0.096 µm and 3.6 ± 0.196µm respectively.

In monsoon during the maturation of gamete stage the follicle were compact, few sperms were observed in control animals, but number of sperms has been increased in bilaterally cerebralectomized animals. The size of spermatogonia is 2.3 ± 0.100µm in control, 2.4 ± 0.086µm an increased size in unilaterally cerebralectomized animal and 2.6 ±0.021µm in bilaterally cerebralectomized animals.



MAP : THE MAP OF AURANGABAD DISTRICT

West

Figure 1: Nandrabad pond

Table 1: The Physico-chemical Parameters of the FreshWater Nandrabad Pond, Aurangabad.

S.N.	Season Month	Rainfall (mm)	Day Length	pH	Temperature (^{0}C)	Dissolved Oxygen ml / l	Chlorides (mg/l)
1	Summer May, 2000	--	13.07	7.7	33^{0}C	4.40	17.89
2	Monsoon August 2000	23	13.32	7.6	29^{0}C	5.24	09.94
3	Post Monsoon October - 2000	--	12.18	7.5	23^{0}C	7.66	11.36
4	Winter February - 2001	--	11.25	7.6	22^{0}C	9.67	12.78

Figure 2: The Photograph showing inner view of Shell : Adductor muscles scars and hinge teeth in *L. corraianules*

In winter spawning occurs with sperms in experimental group, few spermatids, and few relics' sperm and very few spermatogonia were seen, very few lipid globules were seen only in experimental group animals. The size of spermatogonia in control was 8.8±0.76µm, increase growth in cerebralectomized animals1.5 ±0.015µmand 2.1 ±0.379µm, respectively.

In spermatogenesis studies in bivalves, it has been noted that secondary spermatocytes are rarely observed, Sastry (1979). Brain gondotophic hormones in spermatogenesis of *P. verdis* play a essential role for normal maintains and for development of mature spermatogonia, Nagabhusanam.et.al (1976).

In the present histological observation showed the increase in the size of the spermatogonia in the experimental animals in all the season might be due removal of cerebral ganglia increased the size or growth of the gamete, Lubet and Streiff, (1982), support the present results. Peredo; *et.al* (1990), also compared the sperm morphology in freshwater bivalves and drawn similar conclusions. In the two major groups of mollouscs the cephalopod and gastropod evidences for the endocrine control reproduction system is well established, Golding 1974, Wells and Wells (1972). The physiological components regulating intraspecific growth differences among individuals living in the same environment may be affected by differences in energy acquisition (food consumption and assimilation), differences in the allocation of energy among maintenance, growth, reproduction and other consuming activities, and differences in the metabolic cost of growth Bayne, (1999).

Thus, considering the importance of endogenous regulation in the general physiology and reproduction in bivalves from freshwater environment the present study is aimed at understanding the role played by cerebral ganglia in phases of gamete growth in different seasons of the freshwater bivalve *Lamellidens corrianus (Lea*).

Thus, cerebral ganglia plays an important role mostly inhibitory one in regulating the gonad development in the *L. corrianus*, but perhaps more elaborate researshing factors which triggers the metabolic demand and controls reproduction is needed.

It is clears from above table, that glyphosate effects on kidney in a snake headed fresh water fish *Channa punctatus* and shows the significant decrease in protein content. Proteins play the vital role and have the top

priority in the body of organisms, proteins are composed of amino acids which are organic compounds made of carbon. As whole the body is made up of proteins, though proteins has chief significant and high priorty in the living world by their biological specificity among various types of cell (Bhushan *et al*., 2002). Fish are main organisms that are used to identify and document pollutants released into their environment. Various studies have been noticed and states that glyphosate a herbicide is toxic to fish which give rise to morph and functional changes in aquatic animals. While various facts shows negative outcomes from glyphosate exposure, which including birth defects and neurological, fetal death and neurodevelopment (Battaglin *et al*.,2005; Jurewicz and Hanke 2008).

CONCLUSION

It was concluded that the herbicide glyphosate is very harmful for both flora and fauna in an aquatic medium. The glyphosate is mainly used in various orchids and agriculture purposes. As, is washed out through rain and ultimately reaches to the nearby river or lakes, and ultimately affect directly or indirectly on the fauna organisms which in turn effect the human health by food chain.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Bayne BL (1999). Physiological components of growth differences between individual oysters (*Crassostrea gigas*) and a comparison with *Saccostrea commercialis. Physiol. Biochem. Zool.* **72**,705 -713.

Beukema JJ and Cadée GC (1997). Local differences in macrozoobenthic response to enhanced food supply caused by mild eutrophication in a Wadden Sea area: Food is only locally a limiting factor. Limnol.Oceanogr. 42, 1424-1435.

Beukema JJ, Cadée GC and Dekker R (2002). Zoobenthic biomass limited by phytoplankton abundance:evidence from parallel changes in two long-term data series in the Wadden Sea. J. Sea Res. 48, 111-125.

Beukema JJ, Dekker R, Essink K and Michaelis H (2001). Synchronized reproductive success of the main bivalve species in the Wadden Sea: causes and consequences. Mar. Ecol. Prog. Ser. 211, 143-155.

Carmichael RH, Shriver AC and Valiela I (2004). Changes in shell and soft tissue growth, tissue composition,and survival of quahogs, *Mercenaria mercenaria*, and softshell clams, *Mya arenaria*, in response to eutrophic-driven changes in food supply and habitat. J. Exp. Mar. Biol. Ecol. 313, 75-104.

Dance SP and Ward M (2002). Shells: The Photographic Recognition Guide to Seashells of the World (Smithsonian Handbooks). DK Publishing, New York.

De Montaudouin X (1996). Factors involved in growth plasticity of cockles *Cerastoderma edule* (L.), identified by field survey and transplant experiments. J. Sea Res. 36, 251-265.

De Wilde PAWJ and Berghuis EM (1978). Laboratory experiments on the spawning of *Macoma balthica*; its implication for production research. (Eds.), Physiology and behaviour of marine organisms: proceedings of the 12th European Marine Biology Symposium. Pergamon Press, Oxford, 375-384.

Drent J (2004). Life history variation of a marine bivalve (*Macoma balthica*) in a changing world. PhD thesis,Rijksuniversiteit, Groningen,

Giese AC and Kanatani (1987). Maturation and spawning. In: Giese, A.C., Pierse, J.S., Pierse, V.B. (Eds.),Reproduction of marine invertebrates. Blackwell Scientific Publications, California, 252-313.

Hayward PJ and Ryland JS (1995). Handbook of the marine fauna of north-west Europe. Oxford UniversityPress, Oxford.

Honkoop PJC and Beukema JJ (1997). Loss of body mass in winter in three intertidal bivalve species: Anexperimental and observational study of the interacting effects between water temperature, feeding time and feeding behaviour. J. Exp. Mar. Biol. Ecol. 212, 277-297.

Lammens JJ (1967). Growth and reproduction in a tidal flat population of *Macoma balthica* (L.). Neth. J. SeaRes. 3, 315-382.

Loosanoff VL and Davis HC (1963). Rearing of bivalve mollusks. In: Russell, F.S. (Ed.), Adv. Mar. Biol..Academic Press, London, 1-136.

Nagbhusanam R and Mane UH (1975). Reproduction in mussel, Mytilus viridis at Ratnagiri. *Bull. Dept. Mar. Sci. Univ. cochin* India, 7; 377-3.

Newell CR and Hidu H (1982). The effects of sediment type on growth rate and shell allometry in the soft-shellclam *Mya arenaria* L. J. Exp. Mar. Biol. Ecol. 65, 285-295.

Pouvreau S, Bacher C and Heral M (2000). Ecophysiological model of growth and reproduction of the black pearl oyster, *Pinctada margaritifera*: potential applications for pearl farming in French Polynesia. *Aquaculture* 186,117 - 144.[CrossRef]

Reise K (1987). Distribution and abundance of small and juvenile macrofauna on the tidal flats in the Frisian Wadden Sea In: Tougard, S., Asbirk, S. (Eds.) Proceedings of the 5th International Wadden Sea Symposium, 7-25. Esbjerg, Norway.

Rueda JL and Smaal AC (2004). Variation of the physiological energetics of the bivalve *Spisula subtruncata* (da Costa, 1778) within an annual cycle. *J. Exp. Mar. Biol. Ecol.* **301**,141 -157.[CrossRef]

Tebble N (1966). British bivalve seashells: a handbook identification. British Museum (Natural History), London.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Estimation of Oxidative Stress in Indigenous Bull's Semen during Cryopreservation Following Incorporation of Trehalose

Shaikh Kashif Qadeer

Livestock Development Officer, Animal Husbandry Department, Maharashtra.
Email id: shaikh.kashif786@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Shaikh Kashif Qadeer (2019) Estimation of Oxidative Stress in Indigenous Bull's Semen during Cryopreservation Following Incorporation of Trehalose, *Int. J. of. Life Sciences*, Special Issue, A13: 117-121.

ABSTRACT

Cryopreservation of sperm is associated with an oxidative stress induced by free radicals formation during freezing process, their by inducing physical and chemical stress on the sperm membrane which in turn reduces sperm viability and fertilizing ability. The objective of this study was to estimate oxidative stress in cryopreserved Kankrej bull's semen samples by using Trehalose as antioxidant semen diluent additive. The pooled semen samples were diluted with Tris-based extender containing different Trehalose concentrations (viz. 50 mM, 100 mM, 150mM) and control(no additive), evaluated for oxidative stress parameters at freezing and frozen thawed stages. Results, clearly indicated the Malondialdehyde (MDA) level were 43.9 ± 0.05 µmol/ml, 34.2 ± 0.09 µmol/ml and 20.06 ± 0.1 µmol/ml at post-dilution, post-equilibration and post-thaw stages of cryopreservation; which were significantly ($P<0.05$) lower in 100mM Trehalose group when compared with the control group. And the glutathione (GSH) level were 55.8 ± 0.1 U/L, 64.0 ± 0.1 U/L and 84.0 ± 0.1 U/L at post-dilution, post-equilibration and post-thaw stages of cryopreservation; which were significantly ($P<0.05$) higher in 100mM Trehalose group when compared with the control group. Conclusively, supplementation of 100mM Trehalose in the Tris-based extender can be best concentration for Kankrej bull's semen cryopreservation.

Key words- Trehalose, Tris-based extender, Cryopreservation, Oxidative stress, Malondialdehyde, Glutathione reductase.

INTRODUCTION

Kankrej Cattle, the heaviest and dual-purpose breed found in the Kankrej area of Banas District in Gujarat State, had shown a sizeable potential with respect to milk production, disease resistance and draughtability at Livestock Research Station, SDAU (Annual Progress Report, 2009). The National Breeding Policy of India is now focusing on the indigenous breed conservation of cattle with the help of artificial insemination in rural areas for the improving the livelihood of people (Shaikh *et al.,* 2016a). Artificial insemination is assisted reproductive technology that has made possible the effective use of best breeding bulls, thus greatly improving the genetic potential of breeding herds (Januskauskas and Zilinskas, 2002). Cryopreservation technique has allowed specific opportunities for the

cryopreservation of semen and widespread dissemination of precious genetic resources through sperm banks that collaboration in breed improvement programs by means of artificial insemination (Holt, 1997).

Semen cryopreservation associates with an oxidative stress induced by free radicals formation during different processing stages (Salvador *et al*., 2006; Shaikh *et al.,* 2016b). The plasma membranes of sperm cells had supplementary content of unsaturated fatty acids and their cytoplasmic components are deficient in antioxidants. Therefore, sperm cells are highly susceptible to lipid peroxidation (LPO) in presence of ROS, leading to impaired function activity (Hu *et al*., 2009; Hu *et al*., 2010; Shaikh *et al.,* 2016b). In past few decades, antioxidants are used to protect sperm cells from the deleterious effects of cryopreservation and free radicals formation with the incorporation of antioxidants (Stradaloli *et al*., 2007; Umut *et al*., 2013; Shaikh *et al.,* 2016b). So, cryoprotectants are incorporated in tris-based extender to reduce the damage to sperm during the process of freezing and cryopreservation (Badr *et al*., 2010; Purdy, 2006; Bucak *et al*., 2007).

Trehalose, as non-permeating and non-reducing disaccharide which contains two glucose molecules linked together as 1, 1-glycosidic linkage (α-d-glucopyranosyl-l, 1-α-d-glucopyranoside), mostly found in yeast and fungi at higher concentrations (Woelders *et al*., 1997; Aisen *et al*., 2000; Aisen *et al*., 2002; Shaikh *et al.,* 2016a). Trehalose probably plays a crucial role in preventing deleterious effects to the sperm membrane by maintaining the osmotic pressure of the diluent, acting as a non-reducing cryoprotectant and providing energy substrate for the sperm cell during dilution, equilibration, cryopreservation and post-thawing (Liu *et al*., 1998; Uysal and Bucak, 2009; Shaikh *et al.,* 2016a). Incorporation of trehalose to semen extenders is known to improve the individual motility and sperm viability during cryopreservation (Matsuoka *et al*., 2006; Sztein *et al*., 2001). Trehalose showed a synergic effect with glycerol and prevented intracellular ice crystal formation, when added in hypertonic condition (Gutierrez *et al*., 2009; Shaikh *et al.,* 2016a).

In view to the facts above, the present study was carried out to determine suitable concentration following incorporation of Trehalose to improve the Kankrej bull semen quality during cryopreservation and frozen thawed stages. This might not only help in improving preservability of semen but also provide a way for fastest utilization of Kankrej bull semen towards indigenous breed improvement.

MATERIALS AND METHODS

A total of 36 ejaculates, 12 ejaculates per bull were obtained once in a week using artificial vagina from three healthy Kankrej bulls aged between 4 to 5 years, of Dama Semen Production Unit, Banas dairy, Palanpur during research work. Immediately after collection, semen collection tubes were placed in water bath at 37^{o}C until their assessment in the laboratory.

Ejaculates of semen with more than 70 per cent initial motility were used for the research work. The collected semen samples were pooled to split further into 4 equal aliquots and each one was diluted with Tris-Fructose Egg Yolk Citrate Glycerol (TFYG) freezing extender containing different Trehalose concentrations viz. 50mM, 100mM, 150mM and no additive (control) so as to obtain a final sperm concentration of 80 million sperms per ml. Extended semen aliquots were filled, sealed and printed in French Mini Straw of 0.25 ml capacity using automatic machine (IS-4, IMV-France) and were stored in Liquid Nitrogen at -196^{0}C. After cryopreservation period of 24 hrs, straws were thawed at 37^{0}C for 30 seconds in a water bath for post thaw evaluation.

The seminal plasma was separated from processed semen straws at different stages of cryopreservation by centrifugation at 5000 rpm for 10 min. and stored at -20° C before being assayed. The seminal plasma samples were thawed before analyzing the lipid peroxidation and glutathione reductase values. Membrane peroxidative damage in seminal plasma was determined in terms of malondialdehyde (MDA) by using the method of (Placer *et al*., 1966). The values of MDA were expressed as µmol/ml. The GSH content of sperm was measured using the method of (Sedlak and Lindsay, 1968). The values of GSH were expressed as U/L. The data were statistically analyzed using Completely Randomized Design (CRD) and Duncan New Multiple Range Test to determine levels of significance. The interrelationship was worked out as per the procedure described by (Snedecor and Cochran, 1994).

RESULT AND DISCUSSION

The overall mean Malondialdehyde (MDA) values using different concentrations of Trehalose were 57.7 ± 0.1,

40.1 ± 0.06 and 32.1 ± 0.09 µmol/ml in 50mM group; 43.9 ± 0.05, 34.2 ± 0.09 and 20.06 ± 0.1 µmol/ml in 100mM group; 50.06 ± 0.08, 39.01 ± 0.1 and 28.04 ± 0.08 µmol/ml in 150mM group and 58.01 ± 0.08, 40.1 ± 0.07 and 31.9 ± 0.07 µmol/ml in control group at post-dilution, post-equilibration and post-thaw stages of cryopreservation. The overall mean Malondialdehyde (MDA) value in 100mM Trehalose group was significantly (P<0.05) lower in post-dilution, post-equilibration and post-thaw stages of cryopreservation as compared to that of the 50mM Trehalose, 150mM Trehalose and control groups. Whereas, Malondialdehyde (MDA) values was found to be significantly (P<0.05) higher in 50mM Trehalose and control groups as compared to that of the 150mM Trehalose group (Table-1). These findings are in accordance with (Badr *et al*., 2010) who have reported that the addition of 100mM Trehalose to the freezing extender resulted in decreased Malondialdehyde (MDA) values in buffalo bulls and also with that of the similar findings in Karan-Fries bulls (Chhillar *et al*., 2012; Kumar *et al*., 2012; Shaikh *et al.,* 2016a; Shaikh *et al.,* 2016b).

Due to higher production of reactive oxygen species, during cryopreservation the semen is exposed to cold shock at atmospheric oxygen which in turn increases the susceptibility to lipid peroxidation (Perumal *et al*., 2009). The free radicals are known to be involved in lipid peroxidation as well as DNA and sperm membrane damages which may lead to decreased sperm motility or cell death (Shaikh *et al.,* 2016a). Therefore, in the present study addition of Trehalose in semen might be a beneficial factor in preventing the damage to sperm cells and reduced generation of ROS, which otherwise had negatively affected the spermatozoa (Uysal *et al*., 2007).

The proper mechanism of Trehalose reacting with the sperm membrane is not known, but theoretically it form hydrogen bonds with the polar head of the phospholipids and its introduction into the sperm membrane limits the amount of dehydration that can occurs due to cryopreservation and thawing (Liu *et al*., 1998). Trehalose has a protective action in relation to the osmotic effect and specific interactions with the membrane phospholipids, which renders the media hypertonic, thereby reduces the degree of sperm cell injury during the freeze-thaw process (Molinia *et al*., 1994; Storey *et al*., 1998; Shaikh *et al.,* 2016a).

The overall mean glutathione reductase (GSH) values using different concentrations of Trehalose were 38.1 ± 0.1, 50.2 ± 0.07 and 62.1 ± 0.08 U/L in 50mM group; 55.8 ± 0.1, 64.0 ± 0.1 and 84.0 ± 0.1 U/L in 100mM group; 42.1 ± 0.07, 50.1 ± 0.07 and 57.07 ± 0.06 U/L in 150mM group and 38.3 ± 0.1, 49.1 ± 0.07 and 62.04 ± 0.07 U/L in control group at post-dilution, post-equilibration and post-thaw stages of cryopreservation.

Table 1: Lipid Peroxidation(µmol/ml) values in Different Groups of Additive at Various Stages of Cryopreservation (Mean ± S.E.)

Semen Additive Concentration	Post-Dilution Stage (PDS)	Post-Equilibration Stage (PES)	Post-Thaw Stage (PTS)
Trehalose 50mM	57.7 ± 0.1^{c}	40.1 ± 0.06^{c}	32.1 ± 0.09^{c}
Trehalose 100mM	43.9 ± 0.05^{a}	34.2 ± 0.09^{a}	20.06 ± 0.1^{a}
Trehalose 150mM	50.06 ± 0.08^{b}	39.01 ± 0.1^{b}	28.04 ± 0.08^{b}
Control	58.01 ± 0.08^{c}	40.1 ± 0.07^{c}	31.9 ± 0.07^{c}

Means with different superscripts within column differ significantly at (P<0.05) level.

Table 2: Glutathione Reductase(U/L) values in Different Groups of Additive at Various Stages of Cryopreservation (Mean ± S.E.)

Semen Additive Concentration	Post-Dilution Stage (PDS)	Post-Equilibration Stage (PES)	Post-Thaw Stage (PTS)
Trehalose 50mM	38.1 ± 0.1^{a}	50.2 ± 0.07^{b}	62.1 ± 0.08^{b}
Trehalose 100mM	55.8 ± 0.1^{c}	64.0 ± 0.1^{c}	84.0 ± 0.1^{c}
Trehalose 150mM	42.1 ± 0.07^{b}	50.1 ± 0.07^{b}	57.07 ± 0.06^{a}
Control	38.3 ± 0.1^{a}	49.1 ± 0.07^{a}	62.04 ± 0.07^{b}

Means with different superscripts within column differ significantly at (P<0.05) level.

The overall mean glutathione reductase (GSH) value in 100mM Trehalose group was significantly (P<0.05) higher in post-dilution, post-equilibration and post-thaw stages of cryopreservation as compared to that of the 50mM Trehalose, 150mM Trehalose and control groups. Whereas, glutathione reductase (GSH) values was found to be significantly (P<0.05) lower in 50mM Trehalose and control groups as compared to that of the 150mM Trehalose group (Table-2). Present findings are in harmony with (Badr *et al*., 2010; Hu *et al*., 2010; Shaikh *et al.,* 2016a; Shaikh *et al.,* 2016b) who have reported that the addition of 100mM Trehalose to the freezing extender resulted in increase glutathione reductase levels in buffalo and bovine bulls, respectively.

Glutathione, a naturally occurring tri-peptide plays an integral role on scavenger ROS and free radicals with the help of the glutathione reductase in semen cycle (Meister and Anderson, 1983; Shaikh *et al.,* 2016b). A well known fact of glutathione reductase, it plays an integral role in protecting mammalian cells from oxidative damages. The enhanced antioxidant ability indicated the increase in glutathione reductase activity (Perumal *et al*., 2009; Serpil *et al*., 2009). Therefore, higher GSH values in the semen are factor in making the sperm membrane more resistant to the spontaneous lipid peroxidation that destroys the structure of the lipid matrix (Mohanty and Ansari, 2004). Trapping of the free radicals by Trehalose, thereby alleviating GSH consumption by the enzymatic antioxidant defenses might be implicated in higher GSH values observed in the present study.

Conclusion

From the above observations, it was concluded that semen extender supplemented with 100mM trehalose resulted in higher GSH values and lower MDA values, during the cryopreservation process and are beneficial in minimizing the oxidative stress provoked by freeze thaw process. The optimum trehalose concentration determined to be 100mM in tris-extender for cryopreservation of Kankrej bull's semen.

Acknowledgement

The author is highly thankful to the authorities of Sardarkrushinagar Dantiwada Agricultural University as well as Dama semen Station, Banas Dairy for providing financial assistance and necessary facilities to conduct the research during his Post Graduate Studies.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Aisen EG, Alvarez HL, Venturino A and Garde JJ (2000) Effect of trehalose and EDTA on cryoprotective action of ram semen diluents. Theriogenology, 53: 1053-1061.

Aisen EG, Medina VH and Venturino A (2002) Cryopreservation and post-thawed fertility of ram semen frozen in different trehalose concentrations. Theriogenology, 57: 1081-1088.

Annual Progress Report (2009) Livestock Research Station, SDAU, Sardarkrushinagar, Banaskatha (District), Gujarat.

Badr MR, Malak MG and Hassan MH (2010) Effect of Trehalose on cryopreservation, oxidative stress and DNA integrity of buffalo spermatozoa. Journal of Reproduction and Fertility, 1(2): 50-57.

Bucak MN, Atessahin A, Varisli O, Yuce A, Tekin N, Akcay A (2007) The influence of trehalose, taurine,cysteamine and hyaluronanon ram semen: Microscopic and oxidative parameters after freeze-thawing process. Theriogenology, 67: 1060-1067.

Chhillar S, Singh VK, Kumar R and Atreja SK (2012) Effects of Taurine or Trehalose supplementation on functional competence of cryopreserved Karan Fries semen. Animal Reproduction Science, 135(1-4): 1-7.

Gutierrez PO, Juarez MM, Carvajal SM and Ortega ME (2009) Boar spermatozoa cryopreservation in low glycerol/trehalose enriched freezing media improves cellular integrity. Cryobiology, 58: 287-292.

Holt WV (1997) Alternative strategies for long- term preservation. Reproduction, Fertility and Development, 9: 309-319.

Holt WV (2000) Fundamental aspects of sperm cryobiology: the importance of species and individual differences. Theriogenology, 53: 47-58.

Hu JH, Li QW, Jiang ZL, Yang H, Zhang SS and Zhao HW (2009) The Cryoprotective Effect of Trehalose Supplementation on Boar Spermatozoa Quality. Reproduction in Domestic Animals, 44(4): 571-575.

Hu JH, Zan LS, Zhao XL, Li QW, Jiang Li YK and Li X (2010) Effects of trehalose supplementation on semen quality and oxidative stress variables in frozen-thawed bovine semen. Journal of Animal Science, 88: 1657-1662.

Januskauskas A and Zilinskas H (2002) Bull semen evaluation post-thaw and relation of semen characteristics to bull's fertility. Veterinarija IR Zootechnika. T, 17(39): 1-12

Kumar R, Singh V, Chhillar S and Atreja SK (2012) Effect of Supplementation of Taurine or Trehalose in Extender on Immunolocalization of Tyrosine Phosphoproteins in Buffalo and Cattle (Karan Fries) Cryopreserved Spermatozoa. Reproduction in Domestic Animals, (Abstract).

Liu Z, Foote RH and Brockett CC (1998) Survival of bull sperm frozen at different rates in media varying in osmolarity. Cryobiology, 37: 219-230.

Matsuoka T, Imai H, Kohno H and Fukui Y (2006) Effects of bovine serum albumine and trehalose in semen diluents for improvement of frozen-thawed ram spermatozoa. Journal of Reproduction and Development, 52: 675-683.

Meister A and Anderson ME (1983) Glutathione. Annual Review of Biochemistry, 52: 711-760.

Molinia FC, Evans G, Casares PI and Maxwell WMC (1994) Effect of monosaccharides and disaccharides in Tris based diluents on motility, acrosome integrity and fertility of pellet frozen ram spermatozoa. Animal Reproduction Science, 36: 113-122.

Mohanty DN and Ansari MR (2004) Studies on certain seminal plasma enzymes of crossbred bulls in relation to freezability of semen. Indian Journal of Animal Science, 25: 29-32.

Perumal P, Barik AK, Mohanty DN, Das RK and Mishra PC (2009) Seminal characteristics of Jersey crossbred bulls. In Proc. XXVth annual convention of the Indian Society for Study of Animal Reproduction and International Symposium, pp: 196.

Placer ZA, Cushman L and Johnson BC (1966) Estimation of products of lipid peroxidation (Malonyldialdehyde) in biological fluids. Analytical Biochemistry, 16: 359–64.

Purdy PH (2006) A review on goat sperm cryopreservation. Small Ruminants Research, 63: 215-225.

Salvador I, Yaniz J, Viudes-De-Castro MP, Gomez EA and Silvestre MA (2006) Effect of solid storage on caprine semen conservation at 5^{o}C. Theriogenology, 64: 252-260.

Sedlak J and Lindsay RHC (1968) Estimation of total, protein bound and non-protein sulfhydryl groups in tissue with Ellmann's reagent. Analytical Biochemistry, 25: 192-205.

Serpil S, Tuncer PB, Bucak MN and Ulutas PA (2009) Influence of Various Antioxidants on Microscopic-Oxidative Stress Indicators and Fertilizing Ability of Frozen-Thawed Bull Semen. Acta Veterinaria Brno, 78: 463–469.

Shaikh KQ, Nakhashi HC, Suthar BN, Sutaria PT and Sharma VK (2016a) Trehalose as semen diluents additive for cryopreservation of Kankrej bull's semen. Life Sciences Leaflets, 71: 29-40.

Shaikh KQ, Nakhashi HC, Suthar BN, Sutaria PT and Sharma VK (2016b) Comparision of fresh semen parameters with frozen thawed semen following incorporation of trehalose. Life Sciences Leaflets, 76: 107-115.

Snedecor GW and Cochran WG (1989) Statistical methods. 8thEdn. Affiliated East-West Press, New Delhi, India.

Storey BT, Noiles EE and Thompson KA (1998) Comparison of glycerol, other polyols, trehalose and raffinose to provide a defined cryoprotectant medium for mouse sperm cryopreservation. Cryobiology, 37: 46-58.

Stradaloli G, Noro T, Sylla L and Monaci M (2007) Decrease in glutathione (GSH) content in bovine sperm after cryopreservation:Comparison between two extenders. Theriogenology, 67: 1249-1255.

Sztein JM, Noble K, Farley JS and Mobraaten LE (2001) Comparison of permeating and nonpermeating cryoprotectants for mouse sperm cryopreservation. Cryobiology, 42: 28-39.

Umut T, Buyukleblebici S, Tuncer PB, Coskun E, Ozgurtas T, Aydin FN, Buyukleblebici O and Gurcan IS (2013) Effects of various cryoprotectants on bull sperm quality, DNA integrity and oxidative stress parameters. Cryobiology, 66(1): 38-42.

Uysal O and Bucak NB (2009) The role of different trehalose concentrations and cooling rates in freezing of ram semen. Ankara University, Veterinary Faculty Degree, 56: 99-103.

Uysal O, Bucak MN, Yavas I and Varish O (2007) Effect of various antioxidants on the quality of frozen-thawed bull semen. Journal of Animal Veterinary Advances, 6: 1362-1366.

Woelders H, Matthijs A and Engel B (1997) Effects of trehalose and sucrose, osmolality of the freezing medium and cooling rate on viability and intactness of bull sperm after freezing and thawing. Cryobiology, 35: 93-105.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Morphotaxonomic studies of diversity of genus *Panicum* l. of family Poaceae of Amravati District, Maharashtra, India

Masatkar Priyanka A and Deore Ashok N

Associate Professor, Department of Botany S.S.S.K.R. Innani Mahavidyalaya, Karanja Lad. Dist. Washim, Maharashtra. Sant Gadge Baba Amravati University, Amravati.
Email-Priyankamasatkar1989@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Masatkar Priyanka A and Deore Ashok N (2019) Estimation of Oxidative Stress in Indigenous Bull's Semen during Cryopreservation Following Incorporation of Trehalose, *Int. J. of. Life Sciences*, Special Issue, A13: 122-125.

ABSTRACT

Amravati is one of the 11 districts of vidarbha. It includes 14 talukas. Flora of Amravati district has been already studied by Dhore (2002) reported 84 species of grasses, during last 16 years no survey was conducted of the area. Survey of grasses conducted during 2014-2018 revealed 117 species belonging to 60 genera. *Panicum* L. *is a* forth largest genus of study area It has 4 species which belong to subfamily panicoideae and tribe paniaceae.The aim of our investigation is to study morphotaxonomic revision of family poaceae. It focuses on details of macro and micro morphology of some important grasses.

Key words : Amravati, Flora, Survey, morphology.

INTRODUCTION

Grasses are most beautiful group of monocotyledonous plants. They occur on every soil, in all kind of situations and under all climatic conditions. As grasses do not like shade, they are not usually abundant within the forest. But in open places they grow very well and sometimes whole tracts become grasslands.

Grasses are important for entire ecosystem. Tiger is the king of forest ecosystem. If we want to save tiger, we have to save the grasses because tigers are indirectly dependent on grasses for their food. Robinson writes "Grass is king" it rules and governs the world, without it the earth would be a barren waste.

In the early days when the population was much limited and when limited land was under cultivation much of it was covered with plenty of green grasses. So, the farmers paid no attention to the grasses. But now population has increased, open land is decreased very much and cattles have increased in number hence farmers have to pay more attention to grasses. The present destruction of grasses is mainly due to overgrazing, increasing agricultural practices, over use of herbicides, formation of big dams, road widening, clean agricultural practices and trampling by men and cattles. Grazing needs to be inhibited in certain areas and also reduce the use of herbicides. Tender

shoots of Bamboo are used as vegetables and also as pickle by locals. The grains of grasses certainly provide a staple food supply for the human beings *Oryza sativa, Triticum aestivum, Zea mays, Avena sativa, Setaria italica, Eleusine coracana, Echinochloa colonum, Sorghum* speciesand rice feeds more human beings than any other plant product. Sugarcane is main source of sugar. A high proportion of the most fertile and productive soil were developed under a vegetative cover of grasses. Root, rhizome and other part of grasses are good soil builders and effective soil stabilizers. Most of the birds and animals depend upon grassland habitat for food, shelter and normal completion of their life cycles Gould (1968).

Despite utmost importance of grasses to human beings, the study on grasses continues to be a neglected subject. This is mainly because of the feeling that it is a difficult group for identification, the leaves and branches of grasses are very much similar, Small floral organs, special terminology and variation in the structure of spikelet and inflorescence. "*Grasses of Burma, Ceylon, India and Pakistan*" studied by Bor (1960) is the main standard reference work on Indian grasses.

Study Area

Amravati district is located in the state of Maharashtra-India. It is at $20^0$55' and 20.93 North latitude $77^0$45' and 77.75 East longitudes. It has an average elevation of 343 meters (1125 feet). Total area of the district is 12210 sq. km. Amravati district has tropical wet and dry climate with hot, dry summer from April to June. The annual average rainfall in the district is 852.1 mm and the temperature has recorded between 18^0C to 46^0C (Falling rain Genomics, inc. 2010).

Apart from this, Amravati is one of the largest district of Maharashtra states. It includes fourteen (14) taluka namely Amravati, Achalpur, Warud, Chandurbazar, Dharni, Morshi, Daryapur, Anjangaon Surji, Chandur Railway, Dhamangaon Railway, Teosa, Nandgaon-Khandeshwar, Bhatkuli, and Chikhaldara . Chikhaldara is the largest talukas of Amravati district and Bhatkuli is the smallest one.

Though botanical exploration of India has long history, Vidarbha and Marathwada regions remained somewhat neglected. A thorough exploration of Marathwada has been done by Naik and his students for nearly 30 years. Outcome of this work is *"Flora of Marathwada"* by Naik (1998) which a wonderful survey and reference flora.

The monumental work of Bor (1953) on *"Grasses of Burma, Ceylon, India and Pakistan"* (excluding Bambusiae) published about 50 years ago has changed this scenario and created interest on the study of grasses. This resulted in publication of several books on grasses and the latest addition is *"Flora of Tamil Nadu-Grasses"* by Altaf and Nair (2009) that deals with 447 species (excluding Bamboos).

Patunkar(1980) studied *"Grasses of Marathwada"* region has also published a book "*Grasses of Marathwada*".
Recently, Potdar (2012) has published "*Grasses of Maharashtra*", the book is an outcome of exploration and detailed studies conducted on documents of grass diversity of Maharashtra for last 20 years. During this period 415 species belonging to 125 genera have been described. There are above 10,000-11,000 species belonging to 700 genera in the world (Clayton and Renvoize, 1989 and Watson and Dallwitz, 1992) in India there are more than 1200 species belonging to 268 genera (Karthikeyan *et al*., 1989, and Moulk 1997). Kamble and Pradhan (1988) reported 87 species belonging to 49 genera from Akola district. Acharya (1985) reported 100 species belonging to 57 genera from Wardha district. Deore (2010) reported 65 species of grasses from Washim district. Karthikeyan (1993) reported 81 species from Yavatmal district and Diwakar (2000) reported 60 species from Buldhana district.

Floristic surveys of different area of Maharashtra have been compiled and published by Botanical Survey of India such as*" Flora of Maharashtra state, Monocotyledon"*, Sharma *et al.,* (1996), *"Flora of Maharashtra state, Dicotyledon"*vol. I Singh *et al.,* (2000), vol.II Singh *et al*., (2001).

MATERIALS AND METHODS

Study of Habitat

In every season the selected areas were explored systematically. Grass covered sites were targeted for study. Grasses were collected from different habitats like irrigated fields, unirrigated fields, open grasslands, forest, bunds of field, bank of rivers, wastelands, rice fields and rocky places.

Sample collection and preservation-

During excursion specimens of grasses were collected and field number is given to each specimen. Field observations were noted down in field diary. After collection the samples are critically studied in

laboratory . Then it is dried properly, poisoned by using 2% Mercury Chloride and mounted using conventional methods. For critical cases BSI (Pune) was consulted to match the specimens.

Identification-

The identification was confirmed by using floras like flora of British India(Hooker 1872-1897), Flora of Bombay Presidency (Cook 1958), Flora of Marathwada (Naik 1998), Flora of Maharashtra(Almeida,1990), Grasses of Maharashtra (Potdar, Salunkhe and Yadav, 2012) Grasses of Marathawada (Patunkar,1980). Specimens were observed under Sterioscopic binocular microscope.

Artificial keys were provided for genera and species. Population variations are critically studied. Latest nomenclature are given in detail for proper taxonomic level. Each grass specimen description was supported by a note on distribution and herbarium specimen number. Genera and species are arranged alphabetically. Floristic analysis was done to get clear picture of grass biodiversity. Grass species are arranged according to N.L. Bor. All the specimens were deposited in the herbarium of S.S.S.K.R. Innani Mahavidyalaya, Karanja (Lad), Dist-Washim. (M.S.)

RESULT AND CONCLUSION

Present study is the outcome of exploration tours conducted to document the grass diversity of study area from 2014-2018 and visited different areas of Amravati district in different seasons. During this period over 600 specimens were collected from the study area. During the study 117 species belonging to 60 genera were collected.

Out of 60 genera *Eragrostis* is the largest genus belonging to sub-family pooideae. The 35 species collected from study area were found to be monotypic. In Amravati district pure patches of *Aristada, Ischaemum, Themeda, Andropogon, Heteropogon, Dicanthium, Cynodon and Saccharum* were observed. Though grasses are herbaceous in nature, but are tough in texture so it is easy to prepare herbarium speciman. Some of the beautiful grasses are *Thelepogon elegans, Mnesithea granularis, Chrysopogon fulvus, Ischaemum rugosum and Dichanthium species.*

Some dominant genera are *Apluda, Aristada, Dicanthium, Cynodon, Dinebra, Eragrostis, Ischaemum, Rottboellia, Heteropogon, Ophiuros, Setaria*.Some grasses have underground rhizomes i.e. *Ischaemum pilosum, Cynodon dactylon, Saccharum spontaneum* whichcan not be eradicated hence the productivity of crops decreases. *Cynodon* is the first class fodder grass present throughout study area. It is palatable and resistant to grazing and trampling because of underground rhizomes. *Dactyloctenium aegyptium* , *Chrysopogon fulvus* are other palatable species of grasses. *Cymbopogon martini,Vetiveria zizanioides, Saccharum spontaneum* and *Cynodon dactylon* are the medicinal grasses. Hollow internodes of *Arundo donax* are used formaking pens and musical pipes by locals. The forest areas of Melghat (Chikhaldara and Dharni) are of mixed dry deciduous type with teak as dominant species.

Species of *Panicum* and habitat.

Sr. No.	Specimen No.	Name of Species	Habitat
1	PAM 67	*Panicum phoiniclados* Naik &Patunkar	Rice fields
2	PAM 36	*Panicum Psilopodium* Trin.	Open grasslands
3	PAM 47	*Panicum repens* L.	Paddy fields
4	PAM 130	*Panicum trypheron* Schult.	Open grasslands

Key for the species of *Panicum*

1a -	Lower glume orbicular, rounded or truncate	*2*
1b -	Lower glume acute, acuminate or cuspidate	*3*
2a -	Rhizome present, spikelets ovate to narrowly elliptic	*P. repens*
2b -	Rhizome absent, spikelets green or greenish- purple deciduous	*p. psilopodium*
3a -	Plants rhizomatous or with creeping root stock	*P. phoiniclados*
3b -	Plants without rhizomes or creeping root stock	*P. trypheron*

Saccharum spontaneum, Vetiveria zizanioides, Arundo donax present along the sides of rivers and stream which reduce the pressure of flood. The dominant tribes of Melghat are Gond, Korku and Gawali. Gond, and Gawali are the tribal residents of Melghat forest range are the consumers as they feed their livestock mainly by grazing of grasses. Efforts are required to prevent free grazing as once vegetation is lost, it is very difficult to restore.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Acharya RM (1985). *Flora of Wardha district.* Ph.D. Thesis unpublished, Nagpur University, Nagpur.

Altaf K and VJ Nair, (2009). *Flora of Tamil Nadu- Grasses*, Botanical Survey of India. Calcutta.

Deore AN (2010). Floristic Survey of Washim District, Ph.D. Thesis unpublished, Amravati University, Amravati.

Dhore MA (2002). Flora of Amravati District with Special Reference to the Distribution of Tree Species, Amravati University, Amravati.

Diwakar PG and Sharma BD (2000). Flora of Buldhana District, Maharashtra State. Botanical Survey of India, Calcutta.

Gould FW (1968). Grass systematic. McGraw-Hill New York.

Kahalkar VI (2009). Floristic studies on Gondia district of Maharashtra state, Ph.D thesis Nagpur University, Nagpur.

Kambale SY and Pradhan SG (1988). Flora of Akola District, Maharashtra. Botanical Survey of India, Calcutta.

Karthikeyan KS and Anand Kumar (1993). Flora of Yavatmal District. Botanical Survey of India, Calcutta.

Naik VN (1998). Flora of Marathwada, Vol.I and II.Amrut Prakashan, Aurangabad.

Patil BM (1991). Floristic and palynological investigations in the Monocot flora of Chandrapur and Gadchiroli district, of Vidarbha region, of Maharashtra State. Ph.D thesis, Nagpur University Nagpur.

Patunkar BW (1980). *Grasses of Marathwada*. Scientific Publisher, Jodhpur.

Potdar GG, Salunkhe CB and Yadav SR (2012). Grasses of Maharashtra, Shivaji University, Kolhapur.

Purekar PN (1885). Grasses of Nagpur District-Taxonomy and Palynology. Ph.D thesis Nagpur University, Nagpur.

Sharma BD, Karthikeyan S and Singh NP (1996). Flora of Maharashtra state, Monocotyledones. Botanical Survey of India. Calcutta.

Yadav SR and Sardesai MM (2002). Flora of Kolhapur District Shivaji University, Kolhapur.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Taxonomical investigation of Cyanophyta From Nandurbar District MS, India

Jaiswal AG[1] and * Gavit UG[2]

[1] Arts, commerce and Science College Navapur, Nandurbar. 425418
[2*] G. D. M. Arts, K.R.N. Commerce and M.D. Science College Jamner Dist Jalgaon. 424206
E-mail: ujwalagavit@gmail.com /navapuracs@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Jaiswal AG and Gavit UG (2019) Taxonomical investigation of Cyanophyta From Nandurbar District (M.S.), *Int. J. of. Life Sciences*, Special Issue, A13: 126-134.

ABSTRACT

The term Biodiversity refers to the totality of Genus, Species and Ecosystem of the region. The group Cyanophyta is an extremely diverse group of prokaryotic organisms which make valuable contribution to soil fertility by fixing atmospheric nitrogen These have tremendous potential in environment management, A number of "floras" summarizing the known species of cyanophyta in particular regions have been published during the 20th centuries.. For comparative account with previous work the present investigation was done. Systematic account and statistical analysis of genus and species of group cyanophyta was explored in present work. District Nandurbar selected for the investigation. The work was also done for seasonal variation, and addition of any new finding of species in light of biodiversity and various distribution of group Cyanophyta. In the present taxonomic survey total 52 species of group cyanophyta are reported, total 14 genera, 52 species, 05 varieties have been identified spread over the class Chroococcales of Cyanophyta. Based on the number of taxa the dominance of algal Genera is *Oscollatoria* with 06 species, and Genus *Lynbya* with 5 species. *Microcystis* with 06 species, and Genus *Aphanocapsa* with 5 species Based on the number of taxa the dominance of algal order is as Chroococcales with 27 taxa, Nostocales with 24 taxa, stigonematales 01 taxon, are recorded.

Key words :- Taxonomy, Biodiversity, Cyanophyta, Nandurbar, *Oscollatoria*

INTRODUCTION

The group Cyanophyta is an extremely diverse group of prokaryotic organisms which make valuable contribution to soil fertility by fixing atmospheric nitrogen. These have tremendous potential in environment management, as soil conditioners, bio- fertilizers, feed for animals and protein supplements etc. A number of "floras" summarizing the known species of cyanophyta in particular regions have been published during the 20th centuries. Several of these provide a lot of information about species occurring elsewhere in the world. In any case it is clear that many species have a very wide distribution. Once the importance of BGA was realized, several taxonomic studies were undertaken by various workers to explore the

algal flora from different parts of the country. (Dixit 1936, Rao 1937, Desikachary 1959, Kamat 1963, Nandan & Patel 1985). Sahay et. al. (1992) Bhoge (1984); Bhoge and Ragothaman (1986); Nandan and Kumavat, (2003), Kamble, Priydarshani *et. al*, (2014) reported 127 species from 36 genera belongs to 4 order of blue green alga. Jain D. (2015) 19 taxa of *Oscillatoria* from Devbhane dam of Dhule district. Jaiswal (1993); Jaiswal and Ragothaman (1993); While studying algal flora of the Nandurbar reported 14 taxa of Cyanophyceae. There is no information exist on the Algal flora of Cyanophyta of District Nandurbar. For comparative account with previous work the present investigation is done. Systematic account and statistical analysis of genus and species of group cyanophyta. District Nandurbar is selected for present investigation. The present work is done for seasonal variation, periodicity and addition of any new finding of species in light of biodiversity and various distribution of group Cyanophyta. In the present taxonomic survey total 52 species of group cyanophyta are reported, total 14 genera, 52 species, 05 varieties have been identified spread over the class Chroococcales of Cyanophyta. Based on the number of taxa the dominance of algal Genera is *Oscollatoria* with 06 species, and Genus *Lynbya* with 5 species. *Microcystis* with 06 species, and Genus *Aphanocapsa* with 5 species Based on the number of taxa the dominance of algal order is as Chroococcales with 27 taxa, Nostocales with 24 taxa, stigonematales 01 taxon, are recorded.

MATERIAL METHODS

The taluka Navapur and Nandurbar from District Nandurbar is selected for Systematic account of Cyanophyta. Navapur taluka lies near the boundary of Gujarat state. Navapur Taluka is in Nandurbar District of Maharashtra, India. The algal collection were made at monthly interval from different places of taluka Navapur and Nandurbar The sampling sites were select carefully, so as to get maximum number of algal forms growing in the varied habitats **.**Another important aim of this method of selection is to correlate the species identification to the changes taking place in the habitats. All collections was preserved in 4% formalin for further Taxonomical investigation. Temporary and permanent preparations of slides were done during this work. Line drawings of different forms of algae were made by camera Lucida. The algae were identified by relevant monographs and recent available literature (Desikachary, 1959).

Preparation of Semi-permanent Slides for Blue Green Algae:

A drop of glycerin formalin mountant (6 ml glycerin 10 ml of 40% formaldehyde + 84 ml of distilled water) was taken on slide, to which a drop of concentrated preserved sample was added and was covered by a cover slip of suitable size.

MORPHOLOGICAL DESCRIPTION

1. *Microcystis elabens* (Breb) Kuetz. var.*minor* Nygaard

Desikachary T.V. 1959, P.97, Pl.20, F.8 [Pl.1, Fig.1]
Colony spherical and expanding, blue-green, cells oblong 1.1 µ broad and 2.2µ long.
Habitat : Planktonic
Locality : Dhanarat (Paddy field) Nawapur .June 2017

2. *Microcystis holsatica* Lemmermann

Desikachary T.V. 1959, P.96 [Pl.1, Fig.2]
Colonies spherical Clathrate, margins of colonial mucilage, well defined cells closely arranged 1.6 µ in diam. with gas vacuoles blue-green.
Habitat : Planktonic
Locality : Dhanarat, Nawapur. June 2017

3. *Microcystis pulverea* (Wood.) Forti

Desikachary T.V. 1959, P.96 [Pl.1, Fig.3]
Colonies rounded to ellipsoidal often many together limits of colonial mucilage distinct. Cells spherical, closely arranged 2.2 µ broad, blue-green without gas vacuoles.
Habitat : Planktonic
Locality : Dhanarat , Nawapur .June 2017

4. *Microcystis robusta* (Clark) Nygaard

Desikachary T.V. 1959, P.85, F.86. [Pl.1, Fig.4]
Colonies rounded and clathrate; sheath distinct; gelatinizing. Cells 5.9 µ diam. spherical, without gas-vacuoles.
Habitat : Planktonic in standing water.
Locality : Dhanarat, Nawapur .June 2017

5. *Microcystis stagnalis* Lemm.

Desikachary T.V. 1959, P.95. [Pl.1, Fig.5]
Colonies very long and small sometimes expanding and clathrate, colonial mucilage indistinct cells. Very closely arranged spherical 1.6µ in diam. Pale blue-green without gas-vacuole.
Habitat : Planktonic
Locality : Chauki,Nawapur .June 2017

6. *Microcystis viridis* (A.Br.) Lemm.
Desikachary T.V. 1959, P.87, F.88. [Pl.1, Fig.6]
Colonies round consisting of a large number of daughter colonies surrounded by a common mucilaginous sheath, margins of colonial mucilage definite and highly refractive cells 3.3 μ in diam. spherical.
Habitat : Free floating on a water.
Locality : Dhanarat ,Nawapur .June 2017.

7. *Chroococcus indicus* Zeller
Desikachary T.V. 1959, P.109. [Pl.1, Fig.7]
Thallus gelatinous thin a pale brownish cell single oblong to sub-spherical 6.10 μ in diam. Greenish sheath hyaline conspicuous contents granular.
Habitat : Occuring on the rock.

8. *Chroococcus limneticus* Lemm.
Desikachary T.V. 1959, P.107, F.129. [Pl.1, Fig.8]
Cells spherical, free floating in tubular gelatinous layer, without sheath cells 9.5 μ in diam. Sheath distinct unlamellatd, colourless, colonial mucilage broad blue-green.
Habitat : on Moist soil
Locality : Chauki,Nawapur .June 2017

9. *Chroococcus turgidus* (Kuetz.) Nag.
Desikachary T.V. 1959, P.101, 102, F.129. [Pl.1, Fig.9]
Cell spherical, ellipsoidal single very seldom many blue-green, olive green without sheath, 9.4 μ in diam. With sheath 12.21 μ in diam. sheath colourless not distinctly lamellated.
Habitat : Planktonic
Locality Dhanarat ,Nawapur .June 2017

10. *Gloeocapsa calcarea* Tilden
Desikachary T.V. 1959, P.115, F.122. [Pl.1, Fig.10]
Thallus with calcium incrustation cells with or without individual sheath 8.3 in diam., blue-green sheath colourless often thin.
Habitat : On a bank of river.
Locality : Dhanarat ,Nawapur .June 2017

11. *Gloeocapsa polydermatica* Kuetz.
Desikachary T.V. 1959, P.114, F.139. [Pl.1, Fig.11]
Thallus mucilaginous, compact; cell spherical, without sheath 3.3μ in diam., blue-green; sheath colourles very thick as protoplast, very distinct.
Habitat : On wet rocks.
Locality : Dhanarat ,Nawapur .June 2017.

12. *Gloeocapsa stegophila* (Itzings) Rabenh. var.*crasa* Rao. C.B.
Desikachary T.V. 1959, P.119-20, F.126. [Pl.1, Fig.12]
Thallus soft yellowish brown cells, spherical elongated cell without sheath 5.9 μ broad, 9.5 μ long with sheath 7.8μ broad, 10.7μ long cell single or in colonies of 2-4 sheath golden yellow sheath up to 3.2 μ thick.
Habitat : On moist soil bank of river.
Locality : Dhanarat ,Nawapur .June 2017

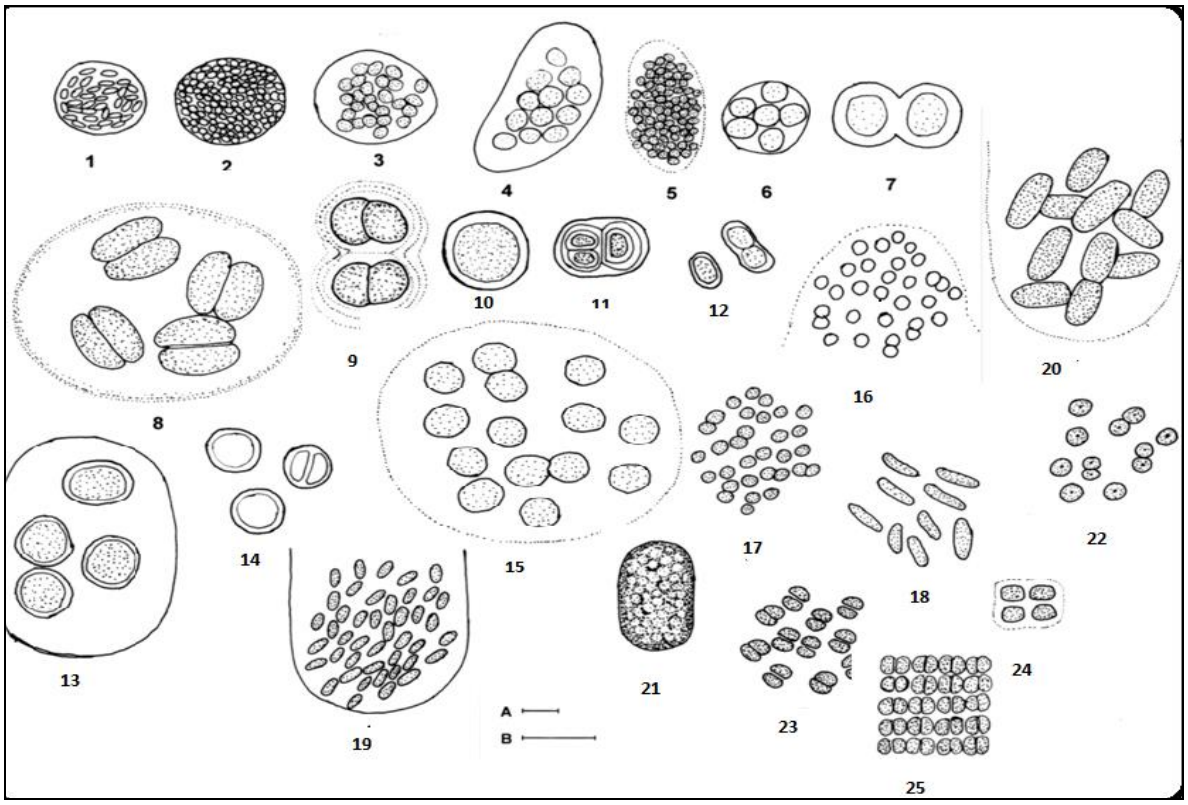
13. *Aphanocapsa banaresensis* Bharadwaja
Desikachary T.V. 1959, P.133, F.104. [Pl.1, Fig.13]
Plant mass soft spherical, hollow, cream coloured cells. Oval to spherical 6.1 μ in diam. Sheath thick unstratified hyaline closely adpressed to the cells upto 1 μ thick..
Habitat : In stagnant pond near the river.
Locality : Dhanarat ,Nawapur .June 2017

14. *Aphanocapsa biformis* A.Br.
Desikachary T.V. 1959, P.134, F.100. [Pl.1, Fig.14]
Thallus olive green, gelatinous, often expanding cells 4.9μ diam., spherical mostly with a special envelope, loosely arranged 2-4 together in common mucilaginous envelope.
Habitat : On moist ground.
Locality : Dhanarat ,Nawapur .June 2017

15. *Aphanocapsa grevillei* (Hass.) Rabenh.
Desikachary T.V. 1959, P.134, F.100. [Pl.1, Fig.15]
Thallus gelatinous, spherical light blue green cells. Spherical 4.9μ in diam. Contents finely granular closely arranged in a homogenous mucilage.
Habitat : Planktonic in river.
Locality : Dhanarat ,Nawapur .June 2017

16. *Aphanocapsa koordersi* Strom.
Desikachary T.V. 1959, P.132, F.110. [Pl.1, Fig.16]
Colonies spherical, dull green 2-3 in diam. cells loosely arranged in group spherical, 2.2 μ in diam.
Habitat : Planktonic in stagnant water.
Locality : Dhanara, Nawapur .June 2017

17. *Aphanocapsa montana* Cramer
Desikachary T.V. 1959, P.135, F.92. [Pl.1, Fig.17]
Thallus of no definite shape gelatinous blue-green in colour, cells 2.22 μ in diam. Spherical light. Blue-green single and in pairs mucilage colourless.
Habitat : On submerged object.
Locality : Rangawali River S-V, December, 2006.



18. *Aphanothece castagnei* (Breb.) Robenh.
Desikachary T.V. 1959, P.140, F.100. [Pl.1, Fig.18]
Thallus gelatinous, without any definite shape, slimy blue-green, cells ellipsoidal to cylindrical 2.2µ broad, 5.5µlong densely arranged; sheath diffluent colourless.
Habitat : Free floating
Locality : Dhanarat ,Nawapur .June 2017

19. *Aphanothece nidulans* Richter. P.
Desikachary T.V. 1959, P.138, F.104. [Pl 1, Fig.19]
Thallus irregularly expanded often found between other algae, plankton form more or less round cells cylindrical, straight 1.6 µ broad upto 3.3µ long blue-green, most densely arranged; mucilage sheath diffluent brownish yellow.
Habitat : On moist soil.
Locality : Rangawali River S-I, S-II, S-V, January, 2018.

20. *Aphanothece stagnina* (Spreng.) A.Br.
Desikachary T.V. 1959, P.137, F.100. [Pl.1, Fig.20]
Thallus gelatinous, spherical, ellipsoidal upto many cm in diam. Pale blue-green, in the inside often with calcareous crystals; cells oblong. 3.8 µ broad, 8.3µlong, sparsely arranged, inside of the colony, without individual envelopes, homogenous mucilage.
Habitat : Free-floating.
Locality : Dhanarat ,Nawapur .June 2017

21. *Synechococcus aeruginosus* Nag.
Desikachary T.V. 1959, P.143, F.126. [Pl.1, Fig.21]
Cells cylindrical 8.8 µ broad single pale, blue-green.
Habitat : on moist soil in stream near the river.
Locality : Dhanarat ,Nawapur .June 2017

22. *Synechocystis aquatilis* Sauv.
Desikachary T.V. 1959, P.144, F.126. [Pl.1, Fig.22]
Cells spherical, single 5.9 µ broad, pale blue-green.
Habitat : Planktonic
Locality : Rangawali River S-I, S-II, S-III April, 2018.

23. *Synechocystis pevalekii* Erecgovic
Desikachary T.V. 1959, P.145, F.126. [Pl.1, Fig.23]
Thallus indefinite among other algae, cells spherical 2.7µ broad 2 together contents blue-green homogenous.
Habitat : Planktonic
Locality : Dhanarat ,Nawapur .June 2017

24. *Merismopedia aeruginea* Breb.
Desikachary T.V. 1959, P.156, F.92. [Pl.1, Fig.24]
Thallus limited, 4-64 cells in a colony, colonies 3.5µ broad cells, spherical 5.9 µ broad, blue-green in colour.
Habitat : on the bank of river
Locality : Dhanarat, Nawapur. June 2017

25. *Merismopedia glauca* (Ehrenb) Nag.
Desikachary T.V. 1959, P.155, F.151. [Pl.1, Fig.25]
Colonies mostly small with 16-64 cells 45-150 μ in diam, cells oval, closely arranged 4.4μ broad, pale blue-green in colour.
Habitat : Planktonic in Stagnant water.
Locality : Dhanarat, Nawapur. June 2017.

26 *Merismopedia minima* Beek
Desikachary T.V. 1959, P.154, F.151. [Pl.2, Fig.26]
Cells pale blue-green 4-many in small colonies 0.5 μ broad, free swimming of 4 cells 2x3μ.
Habitat : Planktonic
Locality : Dhanarat, Nawapur. June 2017

27. *Merismopedia punctata* Meyen
Desikachary T.V. 1959, P.155, F.151. [Pl.2, Fig.27]
Colonies small, 4-64 cells, cells not closely packed spherical 2.5 μ broad pale blue-green.
Habitat : Planktonic in stagnant water.
Locality : Dhanarat ,Nawapur .June 2017

28. *Spirulina meneghiniana* Zanard ex. Gomont
Desikachary T.V. 1959, P.197, F.194. [Pl.2, Fig.28]
Trichome 1.1μ broad flexible, irregularly spirally coiled bright blue-green, forming a thick blue green thallus spirals 4.4μ broad and 3.8μ distant from each other.
Habitat : Planktonic
Locality :Dhudipada, Nawapur .June 2018

29. *Oscillatoria amoena* (Kuetz.) Gomont
Desikachary T.V. 1959, P.230, F.214. [Pl.2, Fig.29]
Thallus blue-green trichomes straight, slightly constricted at the cross walls end gradually attenuated, 3.3μ broad and 2.2μ long septa granulated, end cells capitates broadly conical with calyptras.
Habitat : In running soiled trench water.
Locality :Wasarwel, Nawapur. June 2017.

30. *Oscillatoria curviceps* Ag. ex Gomont
Desikachary T.V. 1959, P.209, F.208. [Pl.2, Fig.30]
Thallus light blue-green; trichomes straight, very little attenuated, not constricted at the cross-walls, 16.6μ broad, 2.7μ long end-cells flat rounded, not capitates.
Habitat : Planktonic
Locality : Dhanarat, Nawapur. June 2017

31. *Oscillatoria formosa* Bory ex Gomont
Desikachary T.V. 1959, P.232, F.214. [Pl.2, Fig.31]
Thallus blue-green trichome; straight slightly constricted at the cross wall 3.3μ broad bright blue-green attenuated at the end and bent, cells nearly quadrate 2.7μ long septa slightly granulated, end-cells nearly obtuse, calyptras absent not capitates.
Habitat : In Phytoplankton of rivers.
Locality : Dhanarat ,Nawapur .June 2017

32. *Oscillatoria laete-virens* (Crouan) Gomont
Desikachary T.V. 1959, P.213, F.212. [Pl.2, Fig.32]
Thallus thin, membranous, green, trichome yellowish, green, straight, fragile, slightly constricted at the cross-walls, 3.3 μ broad, apices attenuated slightly bent cells nearly as long as broad 2.7 μ long end cell not capitates without calyptras.
Habitat : Planktonic
Locality : Dhanarat, Nawapur. August 2017

33. *Oscillatoria laete-virens* var. *minimus* Biswas
Desikachary T.V. 1959, P.213, F.212. [Pl.2, Fig.33]
Trichomes 2.2μ in diam. Slightly constricted at the cross walls, apex of the trichome slightly tapering, slightly covered, not distinctly hooked; cells 1.6μ in length cross-wall granulated cells contents
uniformly grandular, blue-green.
Habitat : Planktonic
Locality Dhanarat, Nawapur. June 2017

34. *Oscillatoria perornata* Skuja
Desikachary T.V. 1959, P.205, F.220. [Pl.2, Fig.34]
Trichomes erect and flexuous, apices briefly attenuated and bent well constricted at the cross walls, 15.1μ broad single cells 2.7μ long contents pallid tenerumgue, aeruginius, finely granular, end cell humilis depressed, hemispherical.
Habitat : Planktonic
Locality : Dhanarat ,Nawapur. May 2018

35. *Oscillatoria princeps* Voucher ex Gomont
Desikachary T.V. 1959, P.210, F.204. [Pl.2, Fig.35]
Trichomes blue-green, brownish, straight not constricted at the cross-walls 30.9 μ broad slightly attenuated at the apices and bent 4.7μlong end cells flatly rounded slightly capitates, without thickened membrane blue-green.
Habitat : Floating on the water
Locality Dhanarat ,Nawapur .June 2017.

36. *Oscillatoria princeps* var. *pseudolimosa* Ghose
Desikachary T.V. 1959, P.210, F.212. [Pl.2, Fig.36]
Thallus blue green, trichome straight rigit and fragile cross-walls not granulated 34.5 μ broad cells short apices straight apical slightly convex, 4.7 μ long, calyptra absent.
Habitat : Free floating
Locality : Chauki May, 2018.

37. *Oscillaoria pseudogeminata* G.Schmid. var. *unigranulata* Biswas
Desikachary T.V. 1959, P.229, F.212. [Pl.2, Fig.37]
Trichomes 3.8 µ in diam, tenuous straight slightly curved not constricted at the cross walls not attenuated at the apices obtusely rounded not capitates cells, 2.7 µ in length, cell-wall distinct with one large granule situated at the centre of the partition walls on either side blue-green.
Habitat : In stagnant water.
Locality : Dhanarat ,Nawapur. June 2017

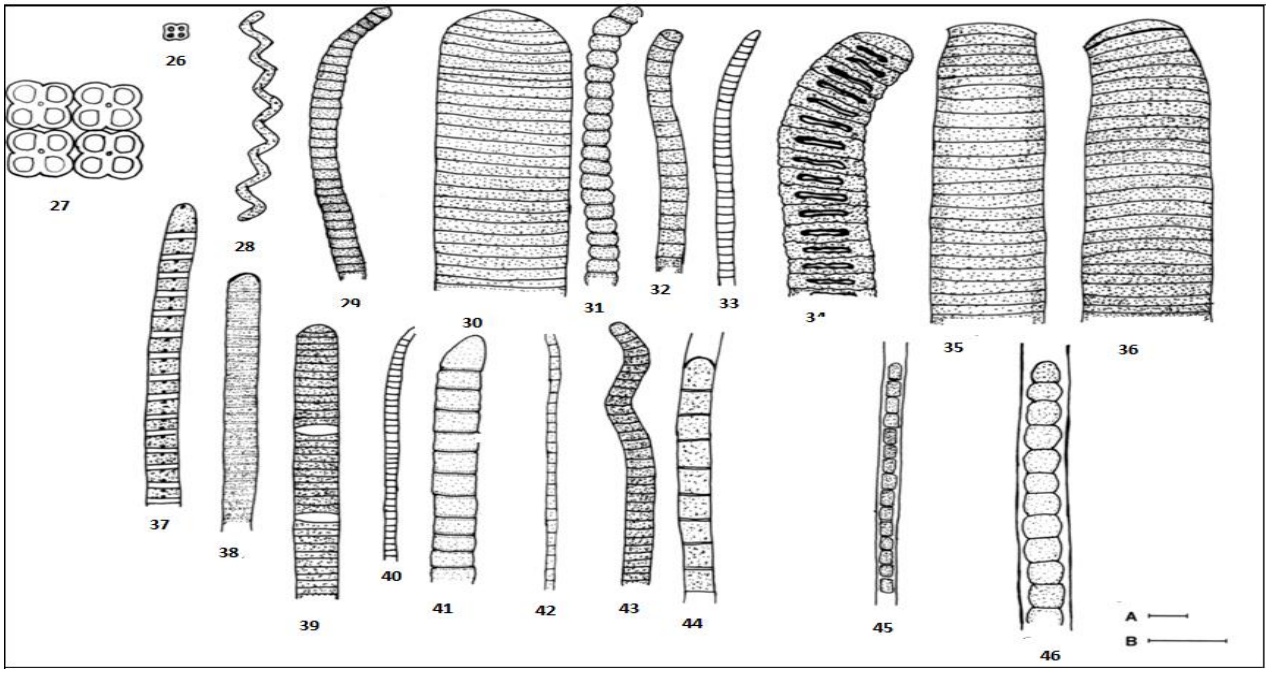
38 *Oscillatoria rubescens* DC. ex. Gomont
Desikachary T.V. 1959, P.235, F.204. [Pl.2, Fig.38]
Trichome straight at the ends gradually attenuated. According to Rao, C.B. trichomes 8.3µ broad and cells 2.3µ long blue-green in colour often granulated at the septa end cells capitates with convex calyptras.
Habitat : Planktonic
Locality : Dhanarat ,Nawapur .June 2017

39. *Oscillatoria subbrevis* Schmidle
Desikachary T.V. 1959, P.207, F.204. [Pl.2, Fig.39]
Trichomes singles, 5.5µ broad, straight not attenuated at the apices; cells 1.6 µ long not granulated at the cross-walls end-cell rounded calyptras absent.
Habitat : On the moist bank of River.
Locality :Wasarwel, Nawapur .June 2017

40. *Oscillatoria subtillissima* Kuetz.
Desikachary T.V. 1959, P.215. [Pl.2, Fig.40]
Trichomes single seldom forming a thallus yellowish green, 1.6µ broad curved septa indistinct without gas-vacuoles.
Habitat : Planktonic in fresh water
Locality : Dhanarat ,Nawapur .June 2017

41. *Oscillatoria tenuis* Ag. ex.Gomont
Desikachary T.V. 1959, P.222. [Pl.2, Fig.41]
Thallus thin blue-green, slimy trichome, straight, fragile slightly constricted at the cross-walls, 5.5µ broad slightly bent at the ends not capitates 3.3µ long at the septa granulated.
Habitat : Straggling portion of river.
Locality : Dhanarat , Nawapur. June 2017

42. *Oscillatoria trichoides* Szafer
Desikachary T.V. 1959, P.228, F.220. [Pl.2, Fig.42]
Trichome straight not constricted at the cross-walls. According to Skuja (1949 Pl.8 Fig.23), filaments 1.1 µ broad slightly curved ends not markedly tapering and not bent little constricted at the cross-walls, cells 2.2µ long greenish yellow.
Habitat : In Running water
Locality :Raipur, Nawapur .June 2017



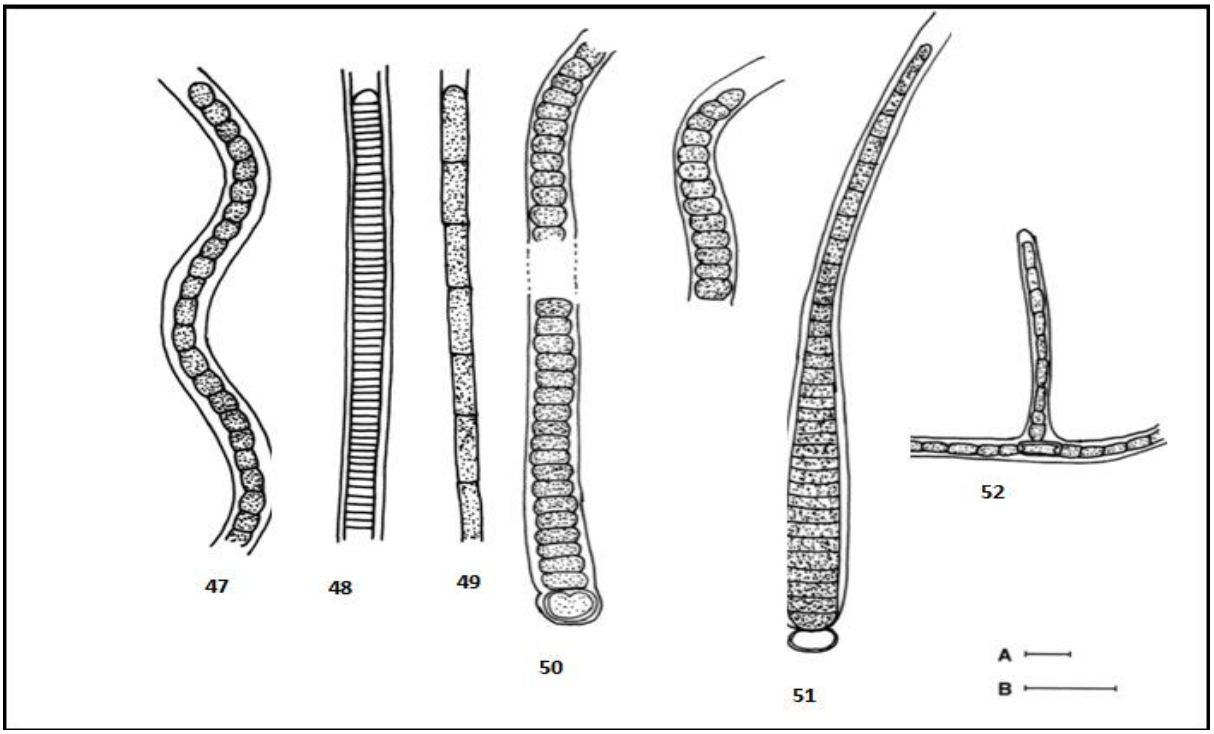
43. ***Oscillatoria willei*** **Gardner em.Drouet**
Desikachary T.V. 1959, P.217, F.208. [Pl.2, Fig.43]
Trichome pale blue-green bend at the ends i.e. screw like 3.3µ broad unconstructed at the cross-walls ends not attenuated, not capitates, cells 1.6µ long cell rounded without a thickened membrane.
Habitat : Found on wet soil Paddy field
Locality : Dhanarat, Nawapur .August 2017

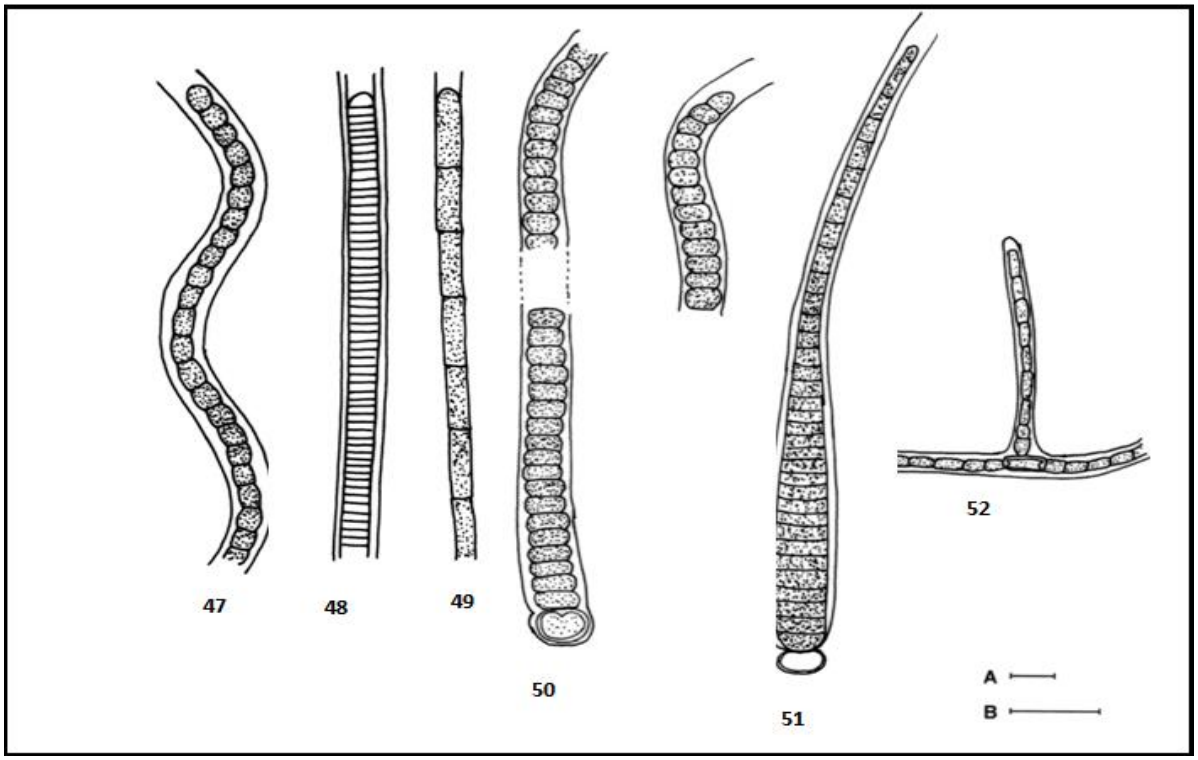
44. *Phormidium corium* (Ag) Gomont
Desikachary T.V. 1959, P.269-70, F.264. [Pl.2, Fig.44]
Thallus expanded, membranous, lathery, brownish green, filament long, more flexuous, densely entangled; sheath thin, gelatinizing trichome blue-green, not constricted at the cross walls, end straight, not capitates, 3.8µ broad, cell nearly quadrate, up to twice as long as broad 4.4 µ long, not granulated at the cross-walls, end cell obtuse conical, calyptras absent.
Habitat : On moist soil Paddy field
Locality : Dhanarat, Nawapur. June 2017

45. *Phormidium purpurascens* (Kuetz.) Gomont
Desikachary T.V. 1959, P.262, F.264. [Pl.2, Fig.45]
Thallus compact, leathery, purple violet, trichome strongly bent entangled, not constricted at the cross-walls, end not attenuated, according to Rao, C.B. filament 1.6µ broad, sheath 0.5µ thick cells 2.2µ long cells nearly quadrate cross-walls marked by two granules on either side end-cell rounded calyptras absent.
Habitat : Submerged in water, attached to rock.
Locality : Nagazari, Nawapur .June 2017

46. *Lyngbya holdenii* Forti.
Desikachary T.V. 1959, P.286, F.292. [Pl.2, Fig.46]
Filament attached to other algae by their middle ends free, about 80µ broad; sheath thin, delicate;
trichome, pale green, distinctly constricted at the cross-walls, 4.4µ broad; cells sub quadrate 3.8µ
long; end cell rounded.
Habitat: On other alga growing on chunks in deep-water.
Locality : Nagazari ,Nawapur .June 2017.

47. *Lyngbya lagerheimii* (Mob.) Gomont
Desikachary T.V. 1959, P.290, F.288. [Pl.3, Fig.47]
Filament single, irregularly spirally coiled; sheath thin, colourless; trichome about 2.2 µ broad; cells
3.3 µ long, not constricted at the cross walls, without single granules on either side, pale blue-green; end cell rounded.
Habitat : Free floating
Locality : Nagazari ,Nawapur .August 2017





48. *Lyngbya lutea* (Ag.) Gom.
Desikachary T.V. 1959, P.310, F.304. [Pl.3, Fig.48]
Thallus gelatinous, leathery, olive-green, filament coiled and densely entangled; sheath colourless,
smooth, thin, 8.3µ broad cross-walls granulated cells quadrate. 1.6 µ long end cell with rounded calyptras.
Habitat : Planktonic
Locality : Dhanarat ,Nawapur .June 2017

49. *Lyngbya perelegans* Lemm.
Desikachary T.V. 1959, P.309, F.306. [Pl.3, Fig.49]
Thallus with many elongated straight filament, filament 2.2µ broad sheath thin hyaline, not
constricted at the cross-walls, cross-walls with a single granule on either sides, cells 8.3µ long, pale-
blue-green end cell rounded, not attenuated.
Habitat : Attached to submerged aquatic plants.
Locality : Dhanarat ,Nawapur .June 2017

50. *Calothrix marchica* Lemm var. *crassa* Rao.C.B.
Desikachary T.V. 1959, P.543-44, F.539. [Pl.3, Fig.50]
Filament in groups, irregularly bend and closely entangled 14.2µ broad, up to 450 µ long; sheath thin,
firm, yellowish; trichomes 11.9 µ broad, constricted at the septa, ends tapering but without a hair, end
cell conical with a rounded apex, cells quadratic, 3.5µ long, at the apices up to 4.8µ long, heterocyst
single, basal, spherical, 10.7µ broad and 5.9µ long.
Habitat : On a moist rock.
Locality : Raipur , Nawapur . July 2017

51. *Calothrix viguieri* Fremy
Desikachary T.V. 1959, P.538, F.520. [Pl.3, Fig.51]
Thallus irregular, thin, flake like, maculiform, grey-green, filament entangled, nearly straight, falcate
up to 200 µlong, slightly broader at the base, above sub-cylindrical, and 16.6µ broad, gradually
attenuated, sheath thin, firm, colourless, paryraceous, irregularly lamellated, trichome 11.9µ broad
above the base, filament 16.6µ broad at the base, at the top 7.14µ broad; trichome 11.9µ broad at
the top 2.3µbroad; cells 3µ long at the base, cross wall with granules; heterocysts 10.7µ broad, 5.9µ
long, basal, enclosed by the sheath.
Habitat : In a small pond near the river.
Locality: Wasarwel, Nawapur .June 2017

52. *Hapalosiphon intricatus* W.et. G.S.West
Desikachary T.V. 1959, P.291-92, F.587. [Pl.3, Fig.52]
Thallus caesapitose, blue-green, small, filamently densely, interwoven, sparsely branched, 4.7µ
broad; sheath close to the trichome, colourless often indistinct; cells spherical, to cylindrical,
heterocysts intercalary, sub quadrate; 4.7µ broad.
Habitat : Epiphytic on plants in a stream.
Locality : Wasarwel, Nawapur. June 2017.

CONCLUSION

In the present taxonomic survey total 14 genera, 52 species, 02 varieties have been identified spread over the classes Chroococcales of Cyanophyta. Based on the number of taxa the dominance of algal Genera is *Microcystis* with 06 species, and Genus *Aphanocapsa* with 5 species, *Oscollatoria* with 06 species, and Genus *Lynbya* with 5 species.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Das SN and Varma BN (1996) Algal flora of Chitwan and Nawlparasi district of Nepal. Phykos, 35(1-2):119-127.

Desikachary TV (1959) Ctyanophyta. ICAR, New Delhi.

Dixit SC (1936) Themyxophyceae of Bombay presidency. India-I. Proc. Indian Acad. Sci.Bot. 3:93

Jain DS (2015) A systematic account of *oscillatoria* species from sonvad dam and devbhane dam of dhule, Maharashtra Journal of Experimental Biology and Agricultural Sciences, March - 2015; Volume – 3(2) ISSN No. 2320 – 8694 (132-137) .

Jaiswal AG and Ragothanan (1993) Taxonomic survey of algal flora from Dhule Region, Maharashtra (India) M.Phil. Dissertation, S.G. University, Surat.

Jaiswal AG (1993) Studies on the freshwater algae (Cyanophyceae) of Sakri and Navapur taluka, Maharashtra (India). Nat. Conf. Phytotaxonomy, Aurangabad (Abstract) P.13.

Mahajan AD and Mahajan Neelima. (1989) Ecological survey of blue green algae in different habitats of Jalgaon district, Maharashtra, India J. Phytol. Res.2 (2):229-232.

Mazel D Houmard J Castets AM Tandeau De Marsac N (1990) Highly repetitive DNA sequences in cyanobacterial genomes. J. Bacteriol.I72.2755-2761.

Nandan SN and Patel RJ (1983) Seasonal variations of Phytoplankton in Vishwamitri River Broda.Proc.AI.A.Pc. Kanpur, 262-269.

Pabby A Prasanna R Nayak S Singh PK (2003) Physiological characterization of the cultured and freshly isolated endosymbionts from different species ofAzolla. Plant Physiol.Biochem. 41, 73-79.

Pabby A Prasanna R Singh PK (2004) Morphological characterization of cultured and freshly separated cyanobionts (Nostocales, Cyanophyta) fonn Azolla species. Acta Bot.Hungar. 46, 211-223.

Packer I and Glazer AN (1988) Methods in enzymolpgy: cyanobacteria. San Diego: Academic Press:

Rao CB (1939) TheMyxophyceae of Bihar Province India-I. Proc.IndianAcad.Sci. B. 9(3):142-150.

Sahay AP Das PK and. Verma BN (1992) Studies on the algal flora of Nepal-I. Chlorophyceae.Geophytology 20(2):155-158.

Sankaran V (1984) Algae of the Aliyar River. Phykos 23(1-2):75-79.

Zheng W Song T Bao X Bergman (2002) High cyanobacterial diversity in coralloid roots of cycads revealed by PCR fingerprinting. FEMSMicrobiol.Lell. 40, 215-222.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Biochemical, Physiological and Mycological changes in Gram seeds due to infestation of Pulse beetle during storage

Lambat Ashish [1], Gadewar Rajesh [1] and Lambat Prachi [2]

[1]Sevadal Mahila Mahavidyalaya and Research Academy, Nagpur (MS), India
[2]D R B Sindhu Mahavidyalaya, Nagpur, M.S

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Lambat Ashish, Gadewar Rajesh and Lambat Prachi (2019) Biochemical, Physiological and Mycological changes in Gram seeds due to infestation of Pulse beetle during storage, *Int. J. of. Life Sciences*, Special Issue, A13:135-138.

ABSTRACT

Gram is an important sources of protein. The seed infestation by pulse beetle during storage is a major problem. This paper gives a brief account of certain Physical, Physiological, Biochemical and Mycological changes in qualities of Gram seeds due to infestation of pulse beetle during storage. In the present study, it was found that the percentage of moisture content, total ash, crude fiber, and crude protein significantly increased and crude fat total carbohydrate, total sugar reducing sugar and non-reducing sugar significantly decreased in pulse beetle infested seeds of Gram during storage. Increase in protein content is attributed to insect metabolites like uric acid, which is nitrogenous is nature. The incidence percentage of fungi such as species of *Alternaria, Aspergillus, Curvularia, Fusarium Penicilium* and *Rhizopus were* predominant over all other fungi on infested gram seeds and it is increased with increase in pulse beetle infestation during storage. The physical and physiological qualities of Gram seeds i.e. 100-seed weight, germination, seedling vigour and field emergence percentage decreased with increase in infestation of pulse beetle during storage.

Key words: Gram, Pulse beetle, infestation, seed quality and storage.

INTRODUCTION

Pulses are the most important source of protein in Indian diet. Storage of pulse seeds is a major problem and it is estimated that about 10% of stored pulse seeds are lost due to biological factors of which insects and rodents alone account of 5%. In severe cases the infestation was observed to be about 90%. Pulse beetles of various species belong to the family Bruchidae are important insect pest attacking variety of pulses in store. Adult female stick their eggs on the pulse seeds and the emerging grubs and bore into the seeds. The grubs remain inside the seed and appearance of a capped exit hole on the seed indicates the pupil stage. After a few days the adult emerges from the seed. About one month is required to complete one generation.

The stored grain insect's pest's infestation also encourages fungus growth by increasing the moisture content of the seeds which decreased the quality and viability of the seeds.

Christensen and Kaufmann (1969) reported that the fungal pathogen associated with stored seed are chiefly responsible for seed deterioration and reduction in germination potential. Apart from this the seedling vigour is also adversely affected. Among the storage fungi species, many were well known toxin producers. The present work was carried out to investigate the post-harvest losses in qualities of Gram seeds due to pulse beetle infestation.

MATERIAL METHODS

The Freshly threshed Gram seeds were dried upto the safe moisture level (10±1%) and the experiment conducted in glass bottle of two litre capacity. The glass bottle was then filled with 1,000 grams of Gram cv. Chaffa- 816 seeds. There were four replications. Ten pairs of 2-3 days old pulse beetle (*Callosobruchus analis*) were released in glass bottles covered with muslin cloth. The set of experiment was kept in well ventilated wire mesh almirah in mesonary building having cemented walls, roof and floor under ambient temperature (18.7 to 46.9°C) and relative humidity (24 to 87%) from March 2015 to Aug. 2015. For determination of physical, physiological, biochemical and mycological changes in stored seeds of Gram were observed at interval of 3 months. The initial observations also taken at the start of experiment. The physical qualities of Gram seeds i.e. seed infestation percentage, moisture content and 100 seeds weight were studied. 100 seed weight was tested in quadruplicated with 100 seeds in each replication. The infested seeds we counted and total damaged seeds were reported in percentage. Moisture percentage was estimated according to International rule for seed testing (Anon. 1985). The physiological qualities of Gram seeds i.e. seed germination, seeding vigour and field emergence were studied. The germination percentage was evaluated on the value for percent normal seedlings (Anon. 1985). The seedling vigour index was worked our following the method of Abdul-Baki and Anderson (1973. For field emergence test, sowing of Gram seeds was done in randomized block design with four replications with inter and intra-row spacing of 1 feet and 6 inches respectively. Observations for field emergence were recorded daily and finally the established seedlings were counted after one month of sowing.

To assess the biochemical qualities of the seeds of Gram i.e. protein, fat, total ash, crude-fibre, reducing and non-reducing sugars according to the standard procedures of A.A.C.C. (Anon., 1962). Values for carbohydrate and total sugar were calculated (Joslyn, 1970) The fungal flora of the seeds were detected by the standard moist blotter and agar medium techniques as prescribed by I.S.T.A. (Anon., 1976) the different types of fungal growth on the seeds were expressed in percentage. The experimental data was statistically scrutinized as per Panse and Sukhatme, 1967.

RESULTS & DISCUSSION

It was observed from the Table 1 that the moisture content of the seeds increased with increasing the storage periods i.e. 3 months (10.91%) and 6 months (12.26%). A significant increase in moisture content was observed this might be due to the activities of pulse beetles on seeds during storage. Similar observation also reported by Shrivastava *et al.* (1989). Gadewar *et al.* (2011) Seed damage is increased with increasing the storage periods of 3 months (25.10%) and 6 months (59.28%) respectively. Charjan *et al.* (2006) and Gadewar *et al.* (2011) reported that the infestation of pulse beetles increased with increasing the storage periods. The 100-seed weight of seed decreases with increasing the storage periods. Similar observation also reported by Charjan (1995). Similarly the germination, seedling vigour and field emergence % decreases with increasing the storage periods. In coastal region of Andhra Pradesh percent germinability of Bengal gram was found to decrease from 81% to 65% within 4 months of storage (Vimla and Pushpamma, 1993). Charjan and Tarar (1994) and Gadewar *et al.* (2011) reported that the germination percentage, seedling vigour and field emergence percentage decreases with increasing storage periods in moth bean and pigeon pea infested by pulse beetles during storage.

Pulse beetle feeds on the cotyledonous portion of the Bengal gram seed leaving the seed coat intact and that is one reason that higher values for crude fibre and total ash have been obtained in infested seed, as seed coat is rich in crude fibre and minerals (Singh *et al.* 1968 and Shrivastava *et al.* 1989). Increase in protein content is attributed to insect metabolites like uric acid, which is nitrogenous in nature (Shrivastava *et al.* 1989). Increase in reducing sugars and decreasing in non-reducing sugars has been shown in stored Bengal gram seeds. Similar results have been reported by Khare (1972), Shrivastava *et al.* (1989) Gadewar *et al.* (2011) Charjan and Tarar (1994). The following fungi were found to be associated with stored seeds of Gram. The present pulse

Table 1; Effect of pulse beetle infestation on physical, physiological, biochemical and mycological qualities of Gram during storage.

	Seed Quality parameters	Initial	After 3 months	After 6 months
	Physical seed quality			
A	1. Seed moisture (% wb)	10	10.2	12.7
	2. Seed damage (%)	0.00	25.1	52.1
	3. 100-seed weight (gm)	10.12	9.0	7.9
	Physiological seed quality			
B	1. Germination (%)	96	88	49
	2. Seedling Vigour Index (SVI)	4516	3617	2014
	3. Field emergence (%)	88	73	34
	Biochemical seed quality			
	1. Total ash (%)	4.01	5.62	6.67
C	2. Crude fibre (%)	7.9	9.0	8.9
	3. Crude Protein (%)	24.01	24.90	30.0
	4. Crude fat	2.9	3.2	2.1
	5. Total carbohydrate	70.10	69.1	64.0
	6. Total sugar (%)	9.2	8.2	7.1
	7. Reducing sugar (%)	12.7	10.7	2.4
	8. Non-reducing sugar	8.9	7.1	6.1
	Mycological observation			
	1. Alternaria sp. (%)	7.25	5.25	1.75
D	2. *Aspergillus* sp. (%)	3.25	9.25	4.25
	3. *Curvualaria* sp. (%)	1.75	5.75	21.00
	4. *Fusarium* sp. (%)	0.25	6.25	11.75
	5. *Penicillium* sp. (%)	0.25	4.25	12.25
	6. *Rhizopus sp.* (%)	0.25	4.25	12.75
	7. Total incidence (%)	14.00	27.00	70.25

beetles damaged seeds yielding a particular fungus viz., *Alternaria* sp., *Aspergillus* sp., *Curvualaria* sp., *Fusarium* sp., *Penicillium* sp. and *Rhizopus* sp. irrespective of storage periods. In the present study, the incidence percentage of storage fungi increases with increasing seed damages by pulse beetles and storage periods. The results are in conformity with the results of Charjan *et al.* (2006) and Gadewar *et al.* (2011)

Thus from the present study, it can be concluded that infestation of pulse beetle in Gram increases the moisture content which is favorable for multiplication of fungal flora and decreases the 100-seed weight, germinability, seedling vigour and field emergence percentage of seeds during storage. It also observed that the decrease of the crude fat, total carbohydrates and total sugars and increase of total ash, crude fibre and crude protein in infested Gram seeds. Increase in protein content is attributed to insect metabolites like uric acid, which is nitrogenous in nature. The percentage of storage fungi increases with increasing pulse beetles damage and storage period. Among the identified fungi species, many were well known toxin producers. The pulse beetle infested Gram seeds should be avoided for sowing or consumption purposes.

Conflicts of interest: The authors stated that no conflicts of interest.

References

Abdul Baki and Anderson AA (1973) Vigour determination in soybean seed by multiple criteria. Crop Science. 13: 630-633.

Charjan SKU (1995) Efficacy of *Acorus calamus* L. rhizome powder against the pulse beetle, *Callosobruchus chinensis* L. infested stored pigeon pea (*Cajanus cajan*). In : Herbal, medicine, biodiversity and conservation strategies (Ed. Rajak and M.K.Rai) International Book Distributor, Deharadun: 242-246.

Charjan SKU and Tarar JL (1994) Biochemical changes in jowar grains due to infestation of rice weeil and khapra beetel during storage proceeding National Academy of Science. 64 (B) IV: 381-384.

Charjan SKU, Wankhede SR and Jayade KG (2006) Viability, vigour and mycoflora changes in pulse beetle (*Callosobruchus* sp.) damaged seeds of cowpea produced in dryland condition. In: Economics of sustainability of dryland agriculture, Nagpur: 5-6.

Cristensen CM and Kaufmann HH (1969) Grain Storage-the role of fungi in quality loss. 153 pp. Univ. of Minnesola Press, Minneapolis.

Gadewar R, Lambar A, Charjan S, Charde P, Cherian K and Lambat P (2011) Post harvest losses in qualities of pigeon pea due to pulse beetle infesttion. In: Proc. International conference in Agricultural engineering. Chonburi, Thailand Page No. C/45-51.

AACC (1962) Approved methods of American Association of Cereal Chemist, 8th rev. ed. St. Paul (Minnesota)

ISTA (1976) International rules for seed testing. Seed Sci. and Technol. 4: 108.

ISTA (1985) International rules for seed testing . Seed Sci. and Technol. 13: 299-513.

Joslyn MA (1970) Methods of food analysis: Physical, chemical and instrumental methods of analysis. Academic Press, New York: 845.

Khare BP (1972) Insect pest of stored grain and their control in Uttar Pradesh. Research Bulletin. No. 5 G.B.U.A.T., Panthagar: 132-139.

Panse VG and Sukhatme PV (1967) Statistical methods for agril Workers, I.C.A.R. Publication, New Delhi.

Shrivastava S, Gupta KC and Agrawal A (1989) Japanese mint oil as fumigant and its effect on insect infestation, nutritive value and germinability of pigeon pea seed during storage. Seed Res. 17 (1): 96-98.

Singh S, Singh HD and Sikka KC (1968) Distribution of nutrients in anatomical parts of common Indian pulses. Cereal Chem. 45: 13-18.

Vimla V and Pushpamma P (1983) Storage quality of pulses stored in three agroclimatic regions of Andhra Pradesh II. Viability Changes. Bull. Grain 21(3): 217-22.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

In vivo Effect of Sprint against Rot Pathogens associated with Cucurbitaceae members.

Shaikh Farah T[1] and Sahera Nasreen[2]

[1]Department of Botany,B.S.Patel ACS College.Pimpalgaon kale, Jalgaon Jamod. Dist-Buldhana, Maharashtra, India
[2]Department of Botany, Govt. Institute of Science. Nagpur, Maharashtra, India.
Email Id- shaikhfarah26@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Shaikh Farah T and Sahera Nasreen (2019) In vivo Effect of Sprint against Rot Pathogens associated with Cucurbitaceae members., *Int. J. of. Life Sciences*, Special Issue, A13: 139-142.

ABSTRACT

This study evaluated the effectiveness of applying the Carbendazim+ Mancozeb (Sprint) to control different vegetable rot fungal pathogens in vivo. As in-vitro results clearly indicate that, Carbendazim+Mancozeb (Mix fungicide) was most effective as it completely inhibited the radial growth averagely 71.59% in the previous studies. The selected pathogens for the present study were *Fusarium moniliforme*, *Fusarium oxysporum*, *Fusarium solani*, *Rhizoctonia solani*, which were isolated from infected vegetables viz., *Cucumis sativus* L, *Lagenaria siceraria* L, *Cucurbita pepo* L, *Momordica charantia* L. Pathogenicity test was done according to Koch's postulates. For effective and economically viable control of the vegetable rot, 2 sprays of Carbendazim+Mancozeb (Sprint) at an interval of 15 days from disease initiation were found effective and recommended. Phytotoxic symptoms were observed after the application of fungicide when used at recommended doses. The percent of disease reduction with carbendazim+Mancozeb treatment was maximum, averagely 70% in all treated vegetables. MIC of fungicide against pathogenic fungi was found to be in between 50-60 µg/ml.

Key words: Sprint, Vegetable rot, MIC, Fungal Pathogens

INTRODUCTION

Pathogenic fungi alone cause nearly 20% reduction in the yield of major food and cash crops (Agriose, 2000). Anthracnose rot attains serious status during transit, storage and market causing considerable economic losses (Rana. 2001). Use of modern fungicides greatly contributed to reducing damage caused by a variety of diseases and to increasing not only yields but also quality of crops. Concerns about toxicological and environmental problems which some but not all classical pesticides possessed undoubtedly prompted the development of selective fungicides, single-site (site-specific) inhibitors in particular. Chemical control measures have been tested and found effective in the control of diseases (Ogundana and Denis, 1981; Plumbley, 1985). Certain protective fungicides although hazardous to environment are still used for the control of fungal diseases (Nwankiti *et al*.,1990; Vaish and Sinha, 2003). Likewise, use of pesticides of plant origin have been suggested by some workers as alternative to synthetic chemicals in order to counter the potential

hazardous effect on the environment associated with the use of synthetic chemicals (Singh, *et al*., 1997; Amadioha, 2000). Fungicides have been used widely to control these pathogens in vitro (Reuveni, 2006) and in vivo (Errampalli, 2004). Various fungicides including captafol, mancozeb, benomyl, carbendazim, metiram, copperoxychloride + dichlofluanid and copper oxychloride + folpet have been used for the control (Ramakrishnan and Kandaswami, 1978).

MATERIAL METHODS

For the assessment of fungicidal assay at field condition, sowing of each vegetable was carried out in 12×12 m plot in the field. After 7 days of interval, 200ml spore suspension of each targeted plant pathogenic fungi was mixed in the soil of the field respectively. After 30-40 days (depending on vegetables) of duration, the diseases symptoms were developed on the vegetables. Afterwards required minimum inhibitory concentrations (MIC) in µg/ml of respective fungicides from *in vitro* results were selected for *in vivo* study. The define concentration of each fungicide were sprayed directly onto the vegetables. The fungicide treatment was applied at an interval of days depending on the vegetables. In all cases, vegetable without fungicide treatment served as control and tagged. Simultaneously all treated vegetables were also tagged with respect to tested concentrations. After certain days of treatment, among each treated vegetable plants, the total number of fruits on each plant and total number of infected fruits on each plant were counted and average in triplicates was recorded. The effectiveness of each fungicide was evaluated by calculating the Percent Diseases Incidence (PDI) and Percent Diseases Reduction (PDR) over control by using following formula,

$$PDI = \frac{Number\ of\ diseased\ fruits\ on\ each\ plant}{Total\ number\ of\ fruits\ on\ each\ plant} \times 100$$

and

$$PDR = \frac{PDI\ in\ control - PDI\ in\ treatment}{PDI\ in\ control} \times 100$$

RESULTS & DISCUSSION

The MIC values of Carbendazim+Mancozeb fungicide against eight pathogenic fungi of different vegetables were varied and recorded in the range of 50 µg/ml to 60 µg/ml. While the percent inhibition of mycelial growth of *F. moniliforme, F. oxysporum, F. solani* and *R. solani* were found to be significant as 66.03%, 60.68%, 51.73% and 58.16% respectively in vitro by Shaikh, FT and Sahera N (2018). For the assessment of fungicidal efficacy in vivo MIC values in µg/ml of Carbendazim + Mancozeb from the in-vitro test were used. These concentration were directly sprayed onto the vegetables plants after 15 days of interval and after different time duration depending upon the growth rate of vegetables the effectiveness of fungicide were recorded by tabulating the percent disease incidence (PDI) and percent disease reduction (PDR). The percent of disease reduction with carbendazim + Mancozeb treatment was maximum, averagely as 70% as given in the table 2.

Similar findings were recorded by Harlapur *et al*, (2007) revealed that mancozeb @ 0.25 per cent found most effective in inhibiting the growth of *E. turcicum.* The use of Benomyl, Carbendazim and Mancozeb significantly inhibited *Physoderma maydis* on maize (Brown spot) reported by Osunlaja, (1999) and there was complete inhibition of sporangia germination at 10,000 ppm i.e. of the fungicides. Carbendazim and Carbendazim + Mancozeb gave 100 % inhibition of mycelial growth of *F. solani* at 0.2 and 0.3% concentrations Chavan *et al*, (2009). Carbendazim fungicide has been shown to completely inhibit the *mycelia*l growth of *F. oxysporum* in Richard's medium reported by Sharma, (2006).

Table 1: MIC of various fungicides against plant pathogenic fungi in µg/ml.

Pathogens	**Sprint**
Fusarium moniliforme	50
Fusarium oxysporum	60
Fusarium solani	60
Rhizoctonia solani	60

Table 2: *In-vivo* effect of fungicide on vegetable disease reduction.

Vegetables	Control		Treated		PDI in control	PDI in treated	PDR(%)
	No. of Infected Fruits	Total no. of Fruits	No. of Infected Fruits	Total no. of Fruits			
C. sativus.	10	20	06 08 04	25 24 24	50	24 33.3 16.66	52 50 71
C. pepo.	02	08	01 02 01	08 09 10	25	12.5 22.22 10	56 44 63
L. siceraria.	04	10	01 02 02	08 10 11	40	12.5 20 18.18	68.75 52 70
M. charantia.	08	25	06 07 04	26 25 28	32	23.07 28 14.28	56 52 71

All values are mean of triplicate; where PDI = Percent Diseases incidence and PDR = Percent Diseases reduction.

Patel *et al*, (2005) evaluated five different fungicides such as mancozeb, carbendazim, copper-oxychloride and potassium per-manganate *in vitro* for their efficacy mycelial growth of *Alternaria* sp. and observed that all tested fungicides at different concentration resulted in significant reduction in the colony diameter as compared to control.

CONCLUSION

In in vivo studies the fungicide tested against vegetables revealed that Carbendazim+Mancozeb was highly effective in controlling the disease incidence. The percent of disease reduction with carbendazim+Mancozeb treatment was maximum, averagely 70% in all treated vegetables.

Acknowledgment:
We wish to thanks the Botany Department, Govt. Institute of Science. Aurangabad, for providing laboratory facility and field for in vivo work.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Amadioha AC (2000) Controlling rice blast in vitro and in vivo with extracts of *Azadirachta indica*. Crop Protection, 19: 287-290.

Chavan SC, Hegde YR and Prashanthi SK (2009) Management of wilt of patchouli caused by *Fusarium solani.* J Mycol Pl Pathol. 39: 32-34.

Errampalli D (2004) Effect of fludioxonil on germination and growth of *Penicillium expansum*

and decay in apple cvs. Empire and Gala. Crop Prot. 23: 811-817.

Harlapur SI, Kulkarni MS, Wali MC and K. Srikant (2007) Evaluation of Plant Extracts, Bio-agents and Fungicides against *Exserohilum turcicum* (Pass.) Leonard and Suggs. Causing Turcicum Leaf Blight of Maize. Karnataka J. Agric. Sc. 20(3): 541-544.

Nwankiti AO, Kalu AD and Ene LSO (1990) Seed yam production by minisett technique. Varietals responses to curing treatment as alternative to chemical seed dressing. Nigerian Journal of Plant Protection,13: 1-5.

Ogundana SK. and Denis C (1981) Assessment of fungicides for prevention of storage rot of yams. Pesticide Science, 11: 491-494.

Osunlaja SO and Alamutu MA (1999) Evaluation of fungicides for the control of Brown spot disease of Maize caused by *Physoderma maydis* (miyabe). Nigerian journal of Plant Protection.vol. **18**:84-95.

Patel NA, Dange SR. and Patel SI (2005) Efficacy of chemicals in controlling fruit rot of tomato caused by *Alternaria* tomato. Indian J. Agric. Res. 39: 72-75.

Plumbley RA (1985) Benomyle tolerance in strain of *Penicillium sclereteginum* infecting yams and use of imazalid as a means of control. Tropical Agriculture Trinidad, 61: 182-185.

Ramakrishnan, L. and T.K. Kandaswamy, (1978) Efficacy of fungicides on the Control of Alternaria leaf spot of tomato. Madras Agri. J., 65: 122-123.

Reuveni M (2006). Inhibition of germination and growth of Alternaria alternate and mouldy-core development in Red Delicious apple fruit by Bromuconazole and Sygnum. Crop Protection 25: 253-258.

Shaikh FT and Sahera N (2018). Invitro inhibitory effect of sprint againt fungal pathogens. International journal of scientific research in science and technology. 2018. 4(1)101-105.

Sharma SK, Verma BR and Sharma BK (1999) Biocontrol of *Sclerotinia sclerotiorum* causing stem rot of Chickpea. Ind. Phytopathol. 52: 44-46.

Singh SN, Yadav BP, Sinha SK and Ojha KL (1997) Efficacy of plant extract in inhibition of radial growth of *Colletotrichum capsici*. Journal of Applied biology, 51:180-183.

Vaish DK. and Sinha AP (2003) Determination of tolerance in *Rhizocotnia solani*, *Trichoderma virens* and *Trichoderma* sp. (isolate 20) to systemic fungicides. Indian journal of Plant Pathol, 21(1-2):48-50.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Effect of Yoga practices with suryanamaskar on flexibility, BMI, Hb level in underweight anemic college students

Nandre YM[1] and Patole SS[2]

[1]Department of Zoloogy, Karm. A. M. Patil Arts, Comerce & Kai. Annasaheb N. K. Patil Sci. College, Pimpalner, Dist. Dhule. India.
[2]Proffesor, Department of Zoology, S. G. Patil Arts, Sci, &Commerce senior College Sakri, Dist. Dhule India.
Email: yogesh.nandre7@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Nandre YM and Patole SS (2019) Effect of Yoga practices with suryanamaskar on flexibility, BMI, Hb level in underweight anemic college students, *Int. J. of. Life Sciences*, Special Issue, A13: 143-149.

ABSTRACT

The main aim of this study is to find out the effect of Yoga suryanamaskara on flexibility, BMI and anemia in underweight anemic college students. Anemia hampered the strength, efficiency and health.Yoga has become part and partial of our healthy life and empowerment. For this study, 50 underweight (BMI < 18.50) and anemic students aged between 18-22 years who were willingly to participate in the program were selected randomly as subjects from Senior College , Pimpalner, Dhule(MS) for 60 days program from 1st Nov. to 30th Dec.2018. They were divided into an experimental group and a control group. Yogic practices were progressively introduced to the experimental group on six day in a week for nearly 60 to 70 minutes.The therapy was carried out in the evening from 5.30 pm to 6.45 pm.in Maratha mangal Karyalaya, Pimpalner, Dist. Dhule. The control group was not exposed to any yogic practices. Assesment has been done before and after study for the parameters like flexibility, height, weight andHb% for both groups. After the Yoga therapy every student showed significant positive improvement in flexibility, weight gaining and Hb level among experimental group when compared to control group. Flexibility, BMI and Hb level showed a significant improvement.

Key words: Yoga, suryanamaskar, BMI, Flexibility, underweight, Hb etc.

INTRODUCTION

Flexibility is an important ability for health related fitness. Lack of flexibility in back can be cause for bad posture, back pain and many more may be due to compression of peripheral nerves. With good flexibility an individual have great ease movements, less chance of injury during movements (Miller 2006). The practice of asanas is one of the best ways to improve flexibility. There are plenty of studies have been done to see the effect of yogic asanas on flexibility and suryanamaskar is itself combination of six asanas(Bhavanani 2011).What happens when you are underweight?Some people might be underweight genetically, others are probably under the mark because they don't get required nutrients to remain in the pink of health.

These nutrients are not reaching where they should because of lack of consumption or improper absorption. In such condition immune system takes a hit, difficult to fight infections and illness, individual will also be more prone to flu and pneumonia.Being anemic and extremely slender could also affect menstrual cycle in females; MC will be irregular or completely stop due to lesser estrogen. There may be lethargic, fatigued and lower stamina (Google-by Shrishti walia).

How does yoga help you gain weight? Yogic asana alone may elicit a positive improvement in the body mass index (Aloke 2016). Yoga is such an incredible workout that it has solutions to almost all health-related problems. Yoga is a mind body therapy it addresses problems like poor metabolism, stress, lack of appetite and digestive issues. While it helps overcome these problems, it also stabilizes flexibility, weight and ensures the right weight goals. Yoga enhances the circulation of oxygen and blood and this helps improve the nutrients absorption. It also induces the proper secretion of enzymes and hormones needed for proper health. It strengthens the muscles and allows becoming strong and flexible. It also improves stamina of individuals. Essentially yoga works mainly towards regulating metabolism (Google-by Shrishti walia). In India, a great need of yoga and yogic practices to be taught and also to practice yoga, to overcome physical, mental, and physiological problems, as it is the current need.A lot of research is conducted in Yoga for the prevention anemia (Ramanath 2013),BMI and Cholesterol level (Seema Patel and Kamakhya Kumar 2016), Obesity (Dhara *et al,* 2012).

Anemia is the most common ailments in developing countries, especially in women and children, mostly it encountered in general practice is iron deficiency anemia and it affect up to 10% world population (Petry *et al,* 2016, Hasan *et al, 2016* and Zsaku *et al,* 2016). Anemia is a medical condition in which decrease in number of red blood cells or less than the normal quantity of hemoglobin in the blood. Anemic patients have feeling of weakness or fatigue and poor concentration (Medicine net.com 2000, Merran 2009). Yoga as a therapy works on the body as a whole: Increases the RBCs production as well as purifies the blood. Helps to manage symptoms of anemia.Helps to improve vital energy in the body. Improves mental health, blood circulation appetite and maintain good health (Seshadri, 2013).

Yoga practices can make them emotionally stable and make them free from psychological disturbances. It helps to control and check emotions. It gives balance of mind, physically fit and healthy and their approach the future life without any disturbances (Sharma *et al,* 2014). Yoga is a self discipline method of the integrating the body, breath and mind and attaining one's full potential. The antistress and antioxidant effect of yoga is beneficial in the improvement of hematological parameters in anemic patients. Yoga increases the circulation of the blood and improves the functioning of entire circulatory system (Neena Sharma and Ritu Gupta 2016 and Purohit *et al* 2013).

The Pranayama which is systematic and rhythmic respiration helps to relax the physical and mental organs of the body and keeps every cell oxygenated which helps in metabolism. Psychological benefits: Regular Yoga practice creates mental clarity and calmness, increases body awareness, relieves chronic stress patterns, relaxes attention and sharpens concentration (Sharma Preeti and Pradeep Kumar 2016). Haemoglobin is the iron-containing oxygen-transport agent in the red blood cells of all vertebrates which carries oxygen from the respiratory organs to the rest of the body (i.e. the tissues) where it releases the oxygen to burn nutrients to provide energy to power the functions of the organism and collects the resultant Co2 to bring it back to the respiratory organs to be dispensed from the organism.

Blood Hb level is the weight and quantity of Hb in the blood measured in gms/100ml. The quantity of Hb/deciliter or 100ml of blood is determined by Hemoglobinometer. The normal value of Hb for men is 13-18g/dl and for women is 11.5-16.5g/dl.Therefore this study undertaken to test the effectiveness of yogic practices with suryanamaskar in the management of flexibility, low BMI and anemic condition.

Objectives of the Study:

1. To help students to build their capacity and quality.
2. To provide opportunities for students to be physically, mentally, emotionally and spiritually empowered.
3. To make them aware about old Indian culture and social behaviour with in the society.
4. To create the awareness in society about this new field of treatment of diseases by Yoga.

MATERIAL METHODS

Study setting: The place of work was Karm. A. M. Patil and Kai. N. K. Patil Sr. College, Pimpalner, Dhule (M.S.) India.

Selection criteria: Selection was based on inclusion and exclusion criteria as fallows,

Inclusion Criteria:

1) Age group of 18 to 22 years
2) Subjects of both genders.
3) Willingness towards participation
4) Anemic and underweight (low BMI) students.

Exclusion Criteria:

1) Students who are below 18 years and above 22 years.
2) Students with cardiac abnormalities/disease.
3) Female students who are pregnant.
4) Any congenital anomaly and auto immune disease.
5) Students suffering from any kind of diagnosed / clinically seems to be neurologically/orthopedic disorders.
6) Body mass index more than 18.5.
7) Studentswho underwent major surgery.
8) Visual problems.

Parameters used in study:

i. **Flexibility:** Extensibility of lower back and hamstring muscles was taken for flexibility of the body.
ii. **Body Mass Index:** the ratio of weight and hight.
iii. **Blood hemoglobin** level by *Hemoglobinmeter*.

Tools used in study:

i. **Modified sit and reach assessment score chart and sit-and-reach test box** : used for measurement of flexibility of lower back and hamstring muscles.
ii. **Height frame and weighing machine**: to measure height and weight for calculation of body mass index.
iii. **Hemoglobinometer:** for Hb estimation.

Duration of study: The total study period was of two months (8 weeks)**.**

Procedure: Subjects were selected based on inclusion and exclusion criteria with a written consent signed by them for participation in the study.

Flexibility of lower back and hamstring muscles was assessed by modified sit and reach test score (Tsang and Mak 2004) using a sit-and-reach test box and the score was taken for the consideration. The sit and reach test box (Base: 18" Length X 12" Width X 13-3/4" Height and Top: 27 ½" Length X 12" Width, as per Lafayette adjustable Sit and Reach Flexibility Tester 2003) has been tested and found good test-retest reliability (0.994). The sit and reach test scores (Davis 2000) are considered in 7 grades; Very poor (1), Poor (2), Fair (3), Average (4) and Good (5), Excellent (6), Super (7). The very poor (grade 1) consist of <-20 score for men and <-15 foe women, poor (grade 2) consist of -19 to -9 for men and -14 to -8 for women, fair (grade 3) consist of -8 to -1 for men and -7 to 0 for women, average (grade 4) consist of 0 to +5 for men and +1 to +10 for women, good (grade 5) consist of +6 to +16 for men and +11 to +20 for women, excellent (grade 6) consist of +17 to +27 for men and +21 to +30 for women.

The test involves sitting on the floor with the back and head against a wall, legs fully extended with the bottom of the feet against the sir-and-reach box. Later on placing the hands on top of each other, stretching the arms forward while keeping the head and back against the wall. The distance has been measured from the fingertips to the box edge with a ruler. This becomes zero or starting point. Later slowly bending and reaching forward as for as possible sliding the fingers along the ruler, holding the final position for two seconds and the distance reached was recorded. The test was repeated three times, and the best distance was noted for the score. In this study grade has been taken for consideration.

Standard height and weighing machine have been used for the measurement of height and weight. BMI (WHO 1997) was calculated by taking the ratio of the subject's height (in meter) and weight (in kilogram) i.e.(weight/height2). BMI has been divided in to three groups; Low BMI (<18.5), Medium BMI (18.5-24.9), and High BMI (>25).

Blood hemoglobin level is the weight and quantity of Hemoglobin in the blood measured in gms /100ml. The quantity of Hb/deciliter or 100ml of blood is determined by *Hemoglobinmeter*. The normal value of hemoglobin for men is 13-18g/dl and for women is 11.5-16.5g/dl.

The present study was conducted to assess the effect of Yogic practices with suryanamaskar among young

students who were underweight (low BMI) and less in Hb content. The study was undertaken at Maratha Mangal Karyalaya,Pimpalner, Dist-Dhule (MS). All the subjects of the study were of the age group of 18 to 22 years. The practices were taught six days in a week for nearly 60 to 70 minutes. Every day the therapy was carried out in the evening from 5.30 pm to 6.45 pm. The 50 subjects were divided randomly into two groups. Experimental group containing 25 subjects and Control group containing 25 subjects. The control group was not exposed to any yogic practices. Yoga therapy was introduced to the experimental group,

The set of Asanas and Pranayama included in the course (10)

I. Humming in meditative postures- Sukhasana (Easy pose)/ Padmasana (Lotus pose) / Vajrasana (Thunderbolt)

II. Loosening Exercises-Warm ups : starting from head, working towards the toes.

1. Neck roll, 2.Shoulder rotation, 3. Arm rotation, 4. Elbow movement, 5. Wrist movements, 6. Finger movements, 7. Waist movements, 8. Knee rotation, 9. Ankle rotation, 10. Toe movements

III. Suryanamaskar (One avartan daily i.e. 11 times)

IV. Asanas–(A) Standing

1. Konasan (Side bend pose), 2.Tadasana and 3. Vrikshasana (Tree pose)

(B) Sitting

1. Vajrasana or Shashankasana (Forward bending)
2. Ustrasana/Ardhachandrasana(Backward pose)
3. Vakrasana (Twist pose)/Ardhamatsyendra -sana (Half-spine twist pose)
4. Paschimotanasana (Back stretch pose)

(C) Lying on stomach (prone)

1. Bhujangasana (Cobra pose), 2. Shalbhasana (Leg back bend), 3. Dhanurasana (Bow pose)

(D) Lying on back (Supine)

1. Markatasana (Twisting pose), 2.Pavanmuktasana (Wind relieving pose)
3. Setubandhasana (Bridge pose), 4.Sarvangasana (Shoulder pose), 5.Matsysana (Fish pose)

V. Deep Relaxation in Shavasana pose (Corpse pose)

VI. Pranayama (Breathing practices)

1. Bhastrika
2. Kapalbhati (Short and strong forceful exhalation and inhalation happens automatically)
3. Anuloma-viloma(Alternate nostrilbreathing)
4. Ujjai
5. Bhramari (Om Chating/ Honybee sound during expiration)
6. Udgeeth (Chating of Om mantra)

VII. Deep Relaxation In Shavasana pose

VIII. Humming in meditative postures- Sukhasana (Easy pose)/ Padmasana (Lotus pose) / Vajrasana (Thunderbolt)

RESULTS & DISCUSSION

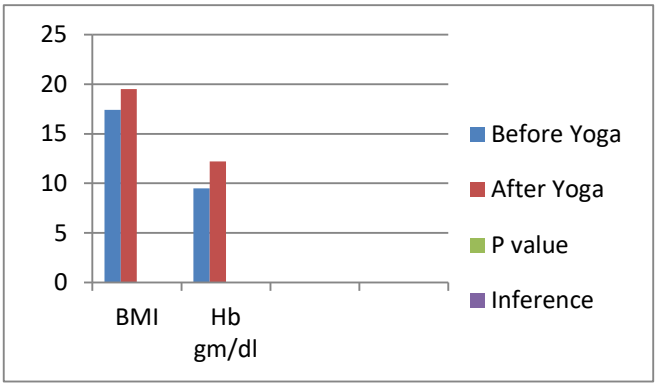
Results are displayed on table 1, we found significant changes between experimental and control groups in flexibility, BMI and hemoglobin.

Experimental group –depicts significant improvement in flexibility poor (Grade 2: -19 to -9) to Average (GRADE 4: +1 to +5) [*], Weight 45.33 to 48.20 [*], BMI 17.40+-0.4 to 19.50+-0.3 [*] and Hb 9.5+-0.3 to 12. 2+-0.2 [**].

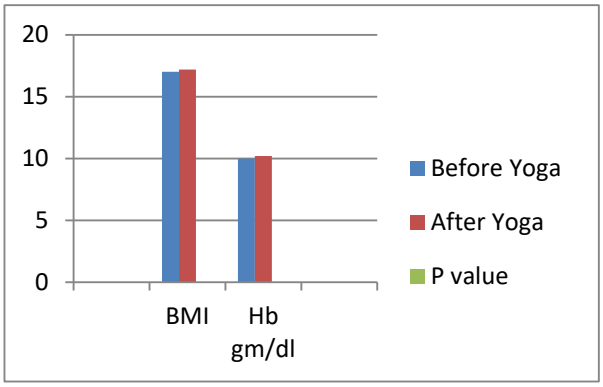
Control group –depicts no significant improvement in flexibility poor (Grade 2: -18 to -9) to Average (GRADE 4: -17 to -8) [NS] ,Weight 45.60 to 45.65 [NS], BMI 17.00 to 17.20 [NS] and Hb 10.00 to 10. 2 [NS].

Table 1

Variables	Experimental Group		Control Group	
	Before Yoga Mean Score	After Yoga Mean Score	Before Yoga Mean Score	After Yoga Mean Score
Flexibility (cm) mean	Poor (Grade 2) -19 to -9	Average (Grade 4) 0 to +5	Poor (Grade 2) -18 to -9	Average (Grade 4) -17 to -8
BMI	17.40 +- 0.4	19.50 +- 0.3*	17.00	17.20 (NS)
Hb gm/dl	9.5 +- 0.3	12.2 +- 0.2**	10.00	10.2 (NS)



1) Experimental Group



2) Control Group

DISCUSSION

From the results it is evident that the eight week of yoga with suryanamaskar programme showed significant improvement in flexibility level. The finding is supported by the study conducted by (Shankar and Pancholi, 2011, Galantino ML et al; 2004 and Bal B. S. and Kaur P. J. 2009).The finding of Sisodia A Singh 2017 also revealed that a significant improvement found in flexibility due to regular practice of suryanamaskar. It may be due to regular stretching exercise increase extensibility of muscles, ligaments and tendons.

From the results it is also evident that the eight week of yoga with suryanamaskar programme showed significant improvement also in BMI level of underweight students. The increase of body weight may be due to the decrease of body fat and increase of body mass. Similar finding also reported by Aloksen Sen Borman 20016.

The present work was also carried out to investigate Hb % by yoga with suryanamaskar in anemic students. As shown in above table among 24 students the Hb % was increased in 90 % students., the reason for increased red blood cell count can be explained by two different mechanisms; it may be due to hypoxia that release more erythropoietin during yoga practices and second is that yoga practices increased release of iron stores from reticulo endothelial cells and splenic concentration enhance the release of reserved RBCs. Very similar results was found by other researchers Verma Rahul et al; 2017, Karpoor Chandrashekher, Vikash K Tiwari et al; 2017 and Ramnath B. et al; 2013.

The practices of asanas and pranayama have proved very valuable for the production of hemoglobin and necessary element in the blood in the pure form (6). Trikonasana (Budilovsky Joan and Adamson Eve 2000 and Swami Muktibodhanand Saraswati 2006) and its variations, Sarvangasana (Francina 2003), Surya namaskara, Yoga mudras (kongtrul 2005) are useful for purification of blood and increases of blood cells.*Yoga practices hold great* promise and potential in the field of medical science. Yoga therapy will definitely emerge as a major branch of medical treatment and eventually become a standard of care and practice in coming few years. India has made great progress in yogic science research as evidenced by a number of scientific and clinical papers in various journals.

Although Yoga as a therapy is still at the stage of clinical research, advances have been made in understanding how to use these practices for treating various diseases via correlating its biochemical, hematological spectrum (Preeti Sharma and Pradeep Kumar 2016). Krishna Sharma et.al 2014 also demonstrated that short-term yoga practice increase Hb, Hematocrite, White Blood Cell count and Peck Expiratory Flow rate dut to 1 month regular practice of yoga. Yoga can help in incresing RBC count in two ways. One is by making use of breathing exercses and the other is by doing special asanas. Breathing exercises like Ujjayi, Suryabhedana, AnulomViloma and Kapalbhatti increases circulation of blood and improre functioning of the entire circulatory system. According to various Yoga gurus anaemic patients should start their Yoga session with Pranayama followed by Trikonasan. Other Yoga poses for anaemia are Sarvangasana, Paschomittanasana,Uttanpadasana, learit-Karani-mudra and various shavasans.(30). For Anaemia the practice of asanas and Pranayama have proved very valuable for prduction of hemoglobin and necessary elements in the blood in the pure form. The practices of asana are useful for purification of blood

and increase of blood cells.ThePranayams like Sivanands, Shitali, Sitkari and AnulomVilom are recommended for anaemia (30).By doing Sivananda Pranayama, may get maximum oxygen by inhaling. The air (Containing oxygen) that we breathe into our lungs is transfered into our blood, which travels around our body delivering oxygen to our brain, organs and all other parts of our body. It helps the nervous system, the heart, the digestive system, muscles, sleep, energy levels, mental soundness, concentration and memory and much more, when we exhale properly, we also get rid of the waste products like carbon dioxide, toxins etc.(30). Shitali and Sitkari Pranayamas are performed in the early morning before sunrise, a very good digestive power is observed, hunger increases, blood gets pured. Anulom - VilomPranayam increase of working capacity of intestines creates a new process of sending the iron that is produced additionally, in the various organs of the body. KapalBhatti / KapalBharti controls breathing and increases oxygen level in the blood, thus increasing body capacity and the lung capacity. It also detoxifies the body of toxins (31).

CONCLUSION

The present study reveals that yoga with suryanamaskar helps efficiently in enhancing flexibility; enhance BMI of underweight and reducing the symptoms of anemia with minimum effort. Based on above results and discussion, we can come to the following conclusion -

1. This short-term study has showed very significant results in Hb level.
2. The yogic practices can be used efficiently to improve flexibility and BMI.
3. The yoga therapy would yield more result if it is carried out for longer duration unlike present study.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Acharya Balkrishna, Pranayam Rahayshya. *Divya Prakashan, Patanjali Yogpeeth, Hardwar.* R & D

Aloke Seb Borman (2016) Effect of yogic asana on body mass index.*Int J of Physiology. Nutrition and Physical Education; 1(1):01-04.*

Anuroadh Singh Sisodia (2017) Effect of Suryanamaskar on flexibility of school girls. *Int. Journal of Phy Education, Sports and Health; 4(20:154-156.*

Available from: Google- by SrishtiWalia - *https://food.ndtv.>health*

Available from: Google-*https://www.stylecraze-com>ef.*

Bal BS and Kaur PJ (2009) Effect of selected asanas in Hatha yoga on Agility and Flexibility level. *Journal of Sport and Health Research, 1(2):75-87.*

Bhavanani B *et al* (2011) A comparative study of slow and fast suryanamaskar on physiological function. *Int. Jour. Of Yoga (IJOY); 4(2):71-76.*

Budilovsky Joan and Adamson Eve (2000**).** The complete idiot"s guide to yoga (2 ed.). *Penguin.p.143.*

Doshi Dhara R and Yogesh A. Jogsan (2012). A Study on Impact of Yoga on Self-Control in Obese Women. *Int J of Sci & Res Publications, Vol 2, Issue 8 ,ISSN 2250-3153.*

Francina Suza (2003) Yoga and the Wisdom of Menopause: A Guid to Physical, Emotional, and Spiritual Health at Midlife and Beyond. *HCL.* P. 233.

Galantino ML et al (2004) The impact of modified Hatha yoga on chronic low back pain: a pilot study. *AlternTher Health Med, 10(2):56-59.*

Hassan TH *et al* (2016) Impact of iron deficiency anemia on the function of the immune system in children. Medicine. 95:47.

Internet - Google, 2009 www.th://indianmirror.com/game/yoga/yog....

Karpoor Chandrashekhar**.** Effect of six week yogasana training on hematological parameters and lipid profile.*National J. of Basic Medical Sciences; Vol. 3,Issue-2: 119-122.*

Kongtrul, Jamgon. (2005) The Treasury of Knowledge (shesbyakun la khyabpa"Imdzod). Book Six, Part Four: Systems of BiddhistTantra, The Indestructible Way of Secret Mantra. *Bolder, Colorado, USA: Snow Lion Publications.* P.493.

Krishna Sharma K *et al* (2014) A Study on the effect of Yoga Therapy on Anaemia in Woman. *European Scientific Journal*, Edition vol.10, No.21, Pp..283-290.

MedicineNet.com -Definition of Anemia Last Editorial Review: 12/9/2000 8:31:00 AM

Merran. (2009). Webster dictionary-anemia Retrived on May 25,2009.

Miller David K (2006). Measurement by the physical educator why and how. McGraw Hill., 259.

Neena Sharma and Ritu Gupta (2016). A study on yoga in anemic patients.*Int J Med Sci Public Health. 5(3): 399-401.*

Petry N *et al* (2016) The proportion of anemia associated with deficiency in low, medium and high human development index countries: A systematic analysis of national surveys. Nutrients. 8:693.

Preeti Sharma and Pradeep Kumar (2016). Scope of Yoga practices in Hematological and Biochemical alterations. *Asian J of Pharmaceutical and Clinical Research.* Vol 9, Issue 1, pp 73-75.

Purohit G *et al* (2013) Cardioprotectant and antistress effect of Yoga training and its co-relation with haematologicalparamiters: prospective study of 47 young individuals.*SchJ ApplSci,* 1(8):8526.

Ramanath B *et al* (2013). A randomized control study of Yoga on anemic patients. *Int. J. of Res in Med Sci. 1(3):240-242.*

Seema Patel &Kamakhya Kumar (2016). A study on the effect of Yoga and diet-control on Body Mass Index and Cholesterol level of the Obese Youth. *Int J of Sci andConsciousness. 2(1),13-17.*Savita

Seshadri VR (2013) Controlling Anaemia through Indian System of Medicine. *State Planning Commission, Tamilnadu,Workshop Series : 2/HSW/2013.*

Shankar G and Pancholi B (2011) The effect of Suryanamaskar Yoga practice on the heart rate, blood pressure, flexibility and upper body muscle endurance in healthy adult. *Int. Jour. Of Health Sciences and Research, 1(1):2-6.*

Swami Muktibodhananda Saraswati (2006). Energy: The spark of life & universal goddess, A book about yoga and personal growth for men and women. *Trafford Publishing.* Pp. 63-64.

Verma Rahul *et al* (2017) Hematological modulation in regular practice of Yoga in young healthy medical students. *World J of Pharmacy and Pharmaceutical Sciences; 6(8):1701-1712.*

Vikash K Tiwari *et al* (2017) Yoga enhances bioavailability and assimilation of oral iron on young female patients of iron deficiency anemia. *Int. J. of Contemporary Medical Research;4(7):1475-1477.*

Zsaka U *et al* (2016). Effect of oral iron on markers of oxidative stress and antioxidant status in children with iron deficiency anemia. *J. of Clinical and Diagnostic research. 10:13-19.*

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Impact of different Pesticides on Beneficial Insects: a serious damage to natural ecosystem.

Tayade Rupali[1], Sharma Chetankumar[1] and Patil Geeta[2]

[1]Dept. of Zoology, Arts, Commerce and Science College Bodwad. (M.S)
[2]Dept. of Botany, Arts, Commerce and Science College Bodwad. (M.S)

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Tayade Rupali, Sharma Chetankumar and Patil Geeta (2019) Impact of different Pesticides on Beneficial Insects: a serious damage to natural ecosystem., *Int. J. of. Life Sciences*, Special Issue, A13: 150-154.

ABSTRACT

Globally we are aware about some toxic and poisonous chemical pesticides still developing country like India continuously using these pesticides such as monocrotophos and acetamiprid etc. which is neurotoxin and ban in other countries. The present investigation concluded that the monocrotophos and acetamiprid have harmful effect on beneficial insects by treatment of monocrotophos in the cotton seed sown fields and found that mortality rate of beneficial insects like honey bee, wasp, mantid, ants etc. was increased up to 68% which causes serious damage to natural predation of pest and increase in imbalance of ecosystem.

Key words: Monocrotophos, acetamiprid neurotoxin, pesticides etc.

INTRODUCTION

To increase the yield of cotton the farmers uses large amount of several different pesticides such as organophosphate, organochlorine, carbamate, neonicotinoids and fungicides insecticides, and herbicides. The worldwide consumption of pesticides is about two million tons per year, of which 24 % is consumed in the USA alone, 45 % in Europe and 25 % in the rest of the world (Pathak *et al,* 2012). India's share is just 3.75 %. The usage of pesticides in India is only 0.5 kg/ha, while in Korea and Japan, it is 6.6 and 12.0 kg/ha, respectively (Gupta PK 2004). Out of the total consumption of pesticides, 80 % are in the form of insecticides, 15 % are herbicides, 1.46 % is fungicide and less than 3 % are others. In comparison, the worldwide consumption of herbicides is 47.5 %, insecticides are 29.5 %, and fungicides, 17.5 % and others account for 5.5 % only (Gupta PK 2004).

Still the small scale farmer prefers this cheapest, moderately available and can kill broad numerous pest at a time which can cause health and environmental problems.

Pesticides occupy a special position among the many chemicals to which man can be exposed, in that they are deliberately diffused into the environment for the purpose of killing or damaging some forms of life.

Ideally, the injurious action of pesticides should be highly specific for undesirable target organisms and innocuous to desirable, non-target organisms. In the present study we determine how the pesticides (monocrotophos) are destroying beneficial insects at the alarming level.

MATERIAL METHODS

The experiments were conducted during the year 2014 and 2016. In the cotton Growing season of Bodwad Dist Jalgaon M.S India. Starting from 12th June 2014 sample of dead beneficial insects were collected from the middle and the corner of the cotton cultivated area to determine the rate of beneficial insect mortality. Before spraying of insecticide the sample considered as control and after spray the sample were collected and considered as treated. the Monocrotophos and Acitamiprid was used as pesticide for the present study. For foliar treatment, insecticides were diluted with water (200 l/fed). Each was sprayed using a knapsack sprayer with one nozzle.

Sample collection of dead beneficial insects:
Samples of dead (beneficial insects) were collected from the five different villages near to the Bodwad Taluka, namely as Bodwad, Saalshingi, Bhankheda, Vichwa and Shelwad. From each village selected ten cotton fields respectively. The area of field was considered near about 1 acre. Sample collected from the middle and the corners of the cotton cultivated area determines the rate of insect mortality. Abbott's formula is used to, (classic papers: ABBOTT'S FORMULA by journal of the American mosquito control association volume-3 no- 2 pp-302, June 1987) (3) Calculate the insect mortality rate.

*ABBOTT'S FORMULA: X-Y/X * 100 = Percent mortality.*

X = the percent dead in the check
Y= the percent dead in treated
X-Y = the percent killed by the treatment. The percentage of the reduction of the insects

Population was calculated according to the following equation:
% R = [(No. of insects in the control – No. of insects in the treatment)/ No. of insects in
The control] × 100

RESULTS & DISCUSSION

In the present investigations difference in the mortality rate of insects in the various fields of cotton was found. Notably In the control fields of Bodwad village the mortality rate was in the range of 1- 18 % during the year 2014 and 2016. The treated fields with monocrotphos the Rate of mortality was found 96.6% and 98.49 % as per given in graph No 1 and Table No -1. While in next year treated field's has 85.5 % and the acetamiprid has 72.8% mortality. The monocrotophos is more toxic to the insects consequently the mortality rate increased. Out of 10 fields 4 were spread with acetamiprid and 6 fields were spread with monocrotophos. High mortality rate was found in field no. 7, 85.5% while the acetamiprid spread field -6 shown 72.8% mortality. The variation in the death rate may be due to improper use of insecticides dilutions, spraying techniques and inadequate knowledge of use of insecticides.

In the control fields of Saalshingi the mortality rate was in the range of 2-18% during both the experimental years. The mortality rate of treated fields of the village Saalshingi is given in to the graph and table no.2. In 1st year monocrotophos spread field no.5 has highest mortality rate 86.70 % while the lowest mortality rate was found in field no. 6, 49.40 % treated with acetamiprid. In 2nd year the highest mortality was shown by treated cotton field no.7 that is 86.30% spread with acetamiprid and the monocrotophos spread field was shown by 2nd highest mortality rate it was 70.67%. In the field no.8 the mortality rate was very much reduced that is 17.78%. It is due to the proper pest management by the farmers and proper over look of the field because the farmer applied IPM techniques.

In the Bhankheda the reading was not much differ as that of previous villages in the experimental year 1st. There was four fields were spread with monocrotophos and 6 fields were spread with acetamiprid. Out of that field no. 4 and 8 spread with acetamiprid was found the highest mortality rate that is 71.53 % and 76.82 %. When we observed the fields in 2nd experimental year there was increased in mortality rate of insects. But it was due to the monocrotophos as compare to acetamiprid that was shown by field no. 4 and 7 96.52% and 93.7%. This was due to the heavy rainfall which causes favorable conditions for insect's growth. Rest of the fields has also increased rate of mortality of the insects.

Table 1: Showing insect mortality percentage in the cotton field of Bodwad.

Sr. No.	Control mortality of insects		Treated mortality of insects by monocrotophos		Treated mortality of insects by acetamiprid	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
1.	3%	10%	62%	---	---	53%
2.	16%	8%	68%	---		42%
3.	8%	2%	---	35%	59%	---
4.	12%	5%	57%	48%	---	---
5.	4%	8%	---	22%	59%	---
6.	5%	11%	60%	---		55%
7.	3%	16%	82%	---	---	58%
8.	15%	4%	---	---	64%	51%
9.	2%	3%	72%	48%	---	---
10.	18%	9%	--	61%	66%	---

Table 2: Showing insect mortality percentage in the cotton field of Saalshingi

Sr. No.	Control mortality of insects		Treated mortality of insects by monocrotophos		Treated mortality of insects by acetamiprid	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
1.	9%	2%	---	52%	---	66%
2.	12%	8%	---	58%	59%	---
3.	4%	3%	---	61%	---	50%
4.	10%	15%	60%	---	48%	---
5.	2%	4%	83%	---	52%	---
6.	3%	12%	---	45%	43%	---
7.	8%	18%	71%	---	---	56%
8.	10%	10%	---	62%	71%	---
9.	5%	14%	72%	---	---	41%
10.	3%	4%	---	49%	64%	---

Table 3 : Showing insect mortality percentage in the cotton field of Bhankheda

Sr. No.	Control mortality of insects		Treated mortality of insects by monocrotophos		Treated mortality of insects by acetamiprid	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
1.	10%	8%	55%	---	---	52%
2.	3%	4%	---	---	58%	60%
3.	8%	3%	38%	---	---	45%
4.	6%	18%	---	52%	71%	---
5.	1%	17%	59%	---	---	66%
6.	15%	25%	---	---	59%	57%
7.	1%	11%	56%	59%	---	----
8.	18%	14%	---	68%	63%	----
9.	2%	1%	---	70%	48%	---
10.	9%	12%	----	40%	54%	---

Table 4: Showing insect mortality percentage in the cotton field of shelwad.

Sr. No.	Control mortality of insects		Treated mortality of insects by monocrotophos		Treated mortality of insects by acetamiprid	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
1.	24%	2%	61%	69%	---	---
2.	2%	2%	---	65%	45%	---
3.	8%	10%	40%	61%	--	---
4.	1%	12%	42%	---	---	58%
5.	32%	3%	---	----	57%	53%
6.	4%	8%	52%	----	---	59%
7.	10%	11%	---	48%	51%	---
8.	18%	4%	71%	58%	---	---
9.	3%	2%	41%	40%	---	---
10.	12%	15%	---	---	69%	49%

Table no. 5 showing insect mortality percentage in the cotton field of Vichwa.

Sr. No.	Control mortality of insects		Treated mortality of insects by monocrotophos		Treated mortality of insects by acetamiprid	
	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
1.	3%	15%	---	64%	45%	---
2	4%	10%	---	30%	48%	---
3	8%	2%	55%	--	---	20%
4	2%	16%	46%	38%	---	---
5	11%	8%	61%	---	---	45%
6	10%	3%	65%	71%	---	---
7	4%	11%	35%	---	---	52%
8	3%	4%	---	---	58%	53%
9	1%	15%	---	50%	42%	---
10	5%	2%	20%	41%	----	---

The observation of 1st year of cotton fields in Shelwad, most of the fields spread with both the insecticides shown decreased rate of mortality near about 40-50% but the field no-1,8 and 10 has found mortality rate 80.27 %, 86.59% and 78.41%. The fluctuation may be due to the variation in the sowing period. Some farmers sowed the field in the first week of month June, which shows low mortality rate of insects due to minimum infestation of insects. In the experimental year 2nd of shelwad, monocrotophos spread fields no.-1, 2, 3 and 8 shown high rates of insects mortality than acetamiprid spread fields no.-5, 6 and 10. The percentage was 70.40 %, 66.32%, 67.77% and 60.41%, the acetamiprid field were 54.63%, 64.31% and 57.64%.

The investigation of cotton fields of village Vichwa which was spread with monocrotophos had high mortality rate in experimental year 1st of about 72.23 %, 69.00 % and 60% in the field no. 6,5 and 3. While the acetamiprid fields had slightly lower rate of about 59.79 %, 50 % and 47 % in the fields no. 8,2 and 1. In 2nd year of the study of cotton fields in same village, the monocrotophos spread fields no. 1, 10 and 6 found high percentage of insect mortality of about 70.40%, 56.25% and 78.41% while Study of acetamiprid fields no.3, 4, 5 and 7 shown lower mortality rate, that was 43.48 %, 42.43%, 48.27 % and 56.27% compared with monocrotophos ,but the acetamiprid spread field no. 8 shown higher percentage which was 86.59 %, this variation is due to excess use of insecticides and unawareness of proper preparations of dilutions by the farmer.

The present study has found the toxic effect of pesticides monocrotophos and acetamiprid on beneficial insect specially the honey bee and wasp which mostly affected by monocrotophos. The study found farmers of of Taluka Bodwad Dist. Jalgaon generally prefers

monocrotophos and acetamiprid because it is chief in cost and has broad spectrum towards many pests (NRA Review).

The present investigation found monocrotophos is more toxic than acetamiprid because it is non volatile and remains in soil as residues (Jeschke *et al* 2011) which produce soil pollution. The acetamid is a neonecotinoid and volatile in nature which causes less soil pollution compare to the monocrotophos but both the pesticides kills non targeted insects. The neonecotinoid is new class of insecticide with replacement of old class like organo-chloride, phosphate etc. but the present study found that the neonecotinoid (acetamiprid)is also toxic to the beneficial insects(Charmillot *et al* 2001) which causes natural damage to environmental ecosystem, the balance of ecosystem get disturbed consequently the birds which feeds on insects get decreased in population(Tomizawa *et al* 2005) to maintain the balance of food chain and ecosystem we should find the alternative of chemical bases pesticide otherwise the damage could not be overcome easily. This is the right time to save the natural pest control through parasitoids and natural pest enemy but in the present study the above pesticides monocrotophos and acetamiprid are killing the natural pest controlling agent like beneficial insects.

CONCLUSION

The present investigation concluded that the monocrotophos and acetamiprid both Insecticide have harmful effect on beneficial insects because the mortality rate of treated cotton Fields were increased as compare to the untreated cotton fields. It was more in monocrotophos spread fields than acetamiprid spread fields. In study area the farmer mostly prefers monocrotophos was confirmed by interviewed of farmer. monocrotophos has toxic effects on beneficial organism, birds and mammal. The persistence of monocrotophos in the soil is not much because it is biodegradable. The present study observed that soil has less water holding capacity and cotton crop requires more water and this area is dry land type non-irrigated.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Gupta S, Gajbhiye VT and Gupta RK (2004). Soil dissipation and leaching behavior of a neonicotinoid insecticide thiamethoxam. Bulletinof Environmental Contamination and Toxicology, 80, 431–437

National Registration Authority for Agricultural and Veterinary Chemicals, Australia. The NRA Review of Monocrotophos – Agricultural Assessment.

Jeschke P, Nauen R, Schindler M and Elbert A (2011) Overview of the status and global strategy for neonicotinoids. Journal of Agricultural and Food Chemistry, 59, 2897–2908.

Charmillot PJ, Gourmelon A, Fabre AL and Pasquier D (2001). Ovicidal and larvicidal effectiveness of several insect growth inhibitors and regulators on the codling moth *Cydia pomonella L.* (Lep., Tortricidae). J. Appl. Entomol. 125 (3): 147–153

Tomizawa, M and Casida, JE (2005) Neonicotinoid insecticide toxicology: mechanisms of Selective Action. Annual Review of Pharmacology and Toxicology, 45, 247–268.

Pathak *et al,* (2012) Int. J. Res. Chem. Environ. Vol. 2 Issue 1 January 2012(1-6) Atrazine and its Use.

Gupta PK (2004) Pesticide exposure- Indian Scene, Toxicology, 198(1-3), 83-90.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Noteworthy on colourless euglenoids from North Maharashtra region, India

Kumawat DA, Patil Jayashri K and Shaikh Tauseef J

Department of Botany, Dhanaji Nana Mahavidyalaya, Faizpur – 425503 Dist. Jalgaon (M.S)
Email- tausifahmad969@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Kumawat DA Patil Jayashri K & Shaikh Tauseef J (2019) Noteworthy on colourless euglenoids from North Maharashtra region, India, *Int. J. of. Life Sciences*, Special Issue, A13: 155-159.

ABSTRACT

During the course of studies on biodiversity in algae from North Maharashtra region, the authors came across the 13 colourless euglenoids during January 2019 to November 2019. These are *Khawkinea quartana* (Moroft) Jahn et MC Kibbben, *Astasia comma* Pringsh., *A. klebsii* Lemm. , *A. applanata* Pringsh., *Rhabdomonas costata* (Korsch) Pringsh. , *Peranema cuneatum* Playf., *P. inflexum* Skuja, *Urceolus gobii* Skv. *Petalomonas tricarinata* Skuja, *Anisonema platysomum* Skuja, *Entosiphon ovatum* Stokes, *Heteronema acutissimum* Skuja, & *Gyropaigne spirale* (Mutv.) Bourr. These were found in polluted waterbodies which have pH below 6 except *khawakenea quartana* was reported in freshwater, it's pH was 7.9. The species *Gyropaigne spirale* is first time recorded from India. All the presented species are described thoroughly & illustrated in this paper.

Keywords: Colourless, Euglenoids, Maharashtra.

INTRODUCTION

Euglenoids are interesting and beautiful microorganisms in biology that can eat food as animals by heterotrophy and can photosynthesis like plants by autotrophy, hence called them "plant-animal" organism in kingdom. North Maharashtra the northern part of Maharashtra state is rich in polluted and fresh water bodies. These water bodies represents a great variety in aquatic environments. Over the past year few reports are available on green Euglenoids occurring in Maharashtra (Kamat;1964, Kamat & freitas 1976; Ashtekar, 1982; Barhate & Tarar, 1985; Bhoge & Ragotheman, 1986; Waghodekar 2001; Narkhede, 2007; Kumawat,2013 & Dhande et al,2019) but colourless species are not reported from North Maharashtra keeping this in view the author surveyed the members of Euglenoids from North Maharashtra. The present communication includes 13 taxa of colourless Euglenoids are morphologically & ecologically described.

MATERIAL METHODS

Material for the present study were collected from different locality of North Maharashtra comprises Jalgaon, Dhule & Nandurbar district are located in the North-west region of the state Maharashtra (20 38' to 20 32' NL & 73 15' to 70 28' EL) the materials were collected between 8.00-10am.

Each sample allow to settle by Lugol's solution & small piece of copying pencil lead was added to it for staining of the flagella. Later sample were preserved in 3% formaldehyde. The camera Lucida drawings were drawn from fresh materials as far as possible immediately when the materials was brought in the laboratory & salient morphological features were recorded. Microphotograph of taxa were taken by Nikon Coolpix P4 camera. The taxa are identified with help of Monographs (Huber-Pestalozzi, 1955 & Asual, 1975). And the relevant research publications. The collections have been deposited in botany department, Dhanaji Nana Mahavidyalaya, Faizpur Dist. Jalgaon.

Systematic account

Euglenoids are one of the best flagellates algal group. Instead of a cell wall, they have protein rich membrane called "pellicle". They have a eyespot & majority are autotrophs but few are heterotrophs. They serve as connecting link between plants and animals.

1.*Khawkinea quartana(*Moroff),**(Pl.1,Fig.1; Pl.2, Fig.5)**

Jahn et McKibben Z.I.Asaul, 1975Z.I.Asaul, 1975, p.281, pl. 178, fig. 1-12.

Cell elongate oval; narrowing anteriorly, bilabiate; posteriorly tapering into a tail like process. Pellicle spirally striated. Paramylum scattered oval granules, sometimes irregular in shape. Flagellum more than the body length.Cells 33.2-60x 11-23.4

Habitat- Found in Polluted water (P^{H}-5.9). Near Faizpur Dist. Jalgaon. During Feb. 2019.

2. *Astasia comma* Pringsh. **(Pl.1, Fig.2; Pl.2, Fig.6)**

Z.I.Asaul, 1975, p.293, pl. 190, fig. 1-6.

Cell elongate ,wedge shaped ;narrowing slightly towards the anterior end ;broadly rounded at the posterior end .cytoplasm hyaline with a few many scattered paramylum granules. Pellicle apparently smooth. Flagellum thick , about the body length ,showing peculiar trailing movement while swimming. Cells 28.86x7.41um

Habitat- Fairly common species of peaty water, particularly with decaying leaves (P^{H}-5.2). from Raver dist. Jalgaon. During May 2019.

3. *A. klebsii* Lemm. **(Pl.1, Fig.3; Pl.2, Fig.8)**

Z.I.Asaul, 1975, p.287, pl. 183, fig. 1-5.

Cell colorless, fusiform to spindle shaped; anterior half of body draw out into a long tail like process. Pellicle spirally straited, striae very faint. Paramylum bodies many, ovoid in the wider posterior half of the cell. 43 x 19.5 μm.

Habitat- In a brackish water (P^{H}-6.0). Bhusawal, March 2019.

4. *A. applanata* Pringsh. **(Pl.1, Fig.4; Pl.2, Fig.10)**

Z.I.Asaul, 1975, p.304, pl. 198, fig. 11-18.

Cells colourless ;osmotrophic ;free-swimming ; uniflagellate; solitary ;without any envelope ; non rigid ,showing euglenoid movement moderate or pronounced ;fusiform or elongate,cell oval to fusiform ,slight flattening of the cell. Eyespotand flagellar swelling absent.contractile vacuole always present. Cells 33.15x19.11um

Habitat- In a fishery smell ditch in Tapi river, sarangkheda, Dist. Nandurbar, (P^{H}-5.2). in May 2019.

5. *Rhabdomonas costata*(Korsch) Pringsh**(Pl.1, Fig.5; Pl.2, Fig.3)**

Z.I.Asaul, 1975, p.312-313, pl. 206, fig. 12-22.

Cell colorless, rigid, uniflagellate, spirally ridged, roudned at both the ends; slightly curved one side. Paramylum 2 oval discs with minute granules. 16.4 x 5.9 μm.

Habitat- In panzara river water mixed with effluent from sewage, found in Dhule, September 2019.

6. *Peranema cuneatum* Playf. **(Pl.1, Fig.6; Pl.2, Fig.2)**

Z.I.Asaul, 1975, p.324, pl. 213, fig. 6-8.

Cell elongate, wedge shaped; narrowing slightly towards the anterior end; broadly rounded at the posterior end. Cytoplasm hyaline with a few small scattered paramylum granules. Siphon body prominent. Pellicle apparently smooth. Flagellum thick, about the body length ,cell colourless,39 x 13.65 μm.

Habitat- In polluted water near village Nashirabad, Dist. Jalgaon. During August 2019.

7. *P. inflexum* Skuja **(Pl.1, Fig.7; Pl.2, Fig.1)**

Z.I.Asaul, 1975, p.325, pl. 214, fig. 1-3.

Cells cylindrical-conical; tapering anteriorly; truncated or rounded posteriorly. Pellicle soft and spirally striated. Cytoplasm granular. Pharyngeal rod present. Paramlum many small rounded granules, crowded in mid-region. Flagellum about the body length. Nucleus present posteriorly. 27.6 x 9.4 μm.

Habitat- In polluted puddle (P^{H}-4.5) near village Mukati, Dist. Dhule. In January 2019.

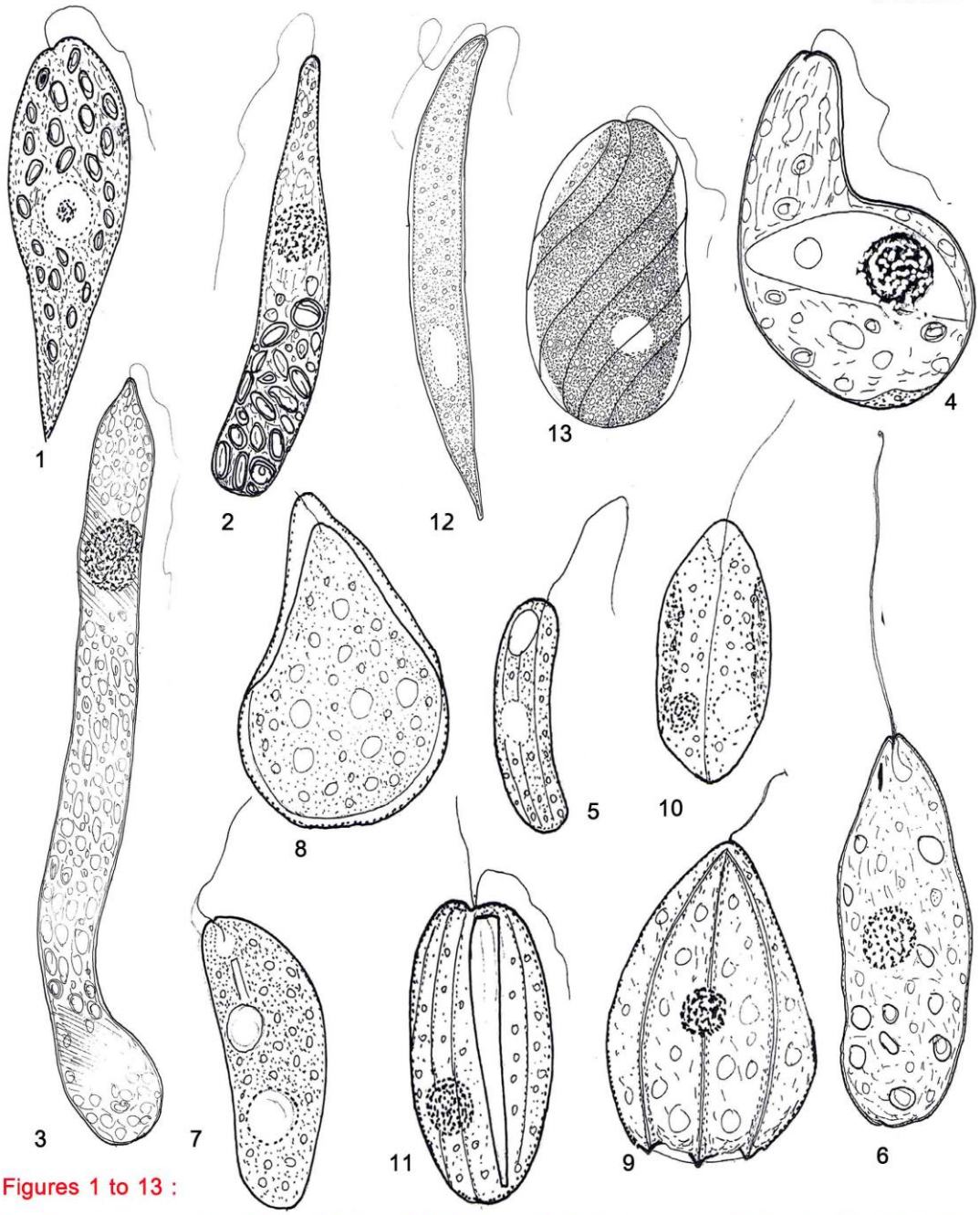
8. *Urceolus gobii* Skv. **(Pl.1, Fig.8; Pl.2, Fig.13)**

Z.I.Asaul, 1975, p.341, pl. 223, fig. 1,2.

Cell colorless, flask-shaped with attenuated enterior end and broadly rounded posterior end. Pellicle smooth. Flagellum single and long 44 x 21.5 μm.

Habitat- In polluted tiny pool (P^{H}-5.8) near village Lumkheda, Dist. Nandurbar.

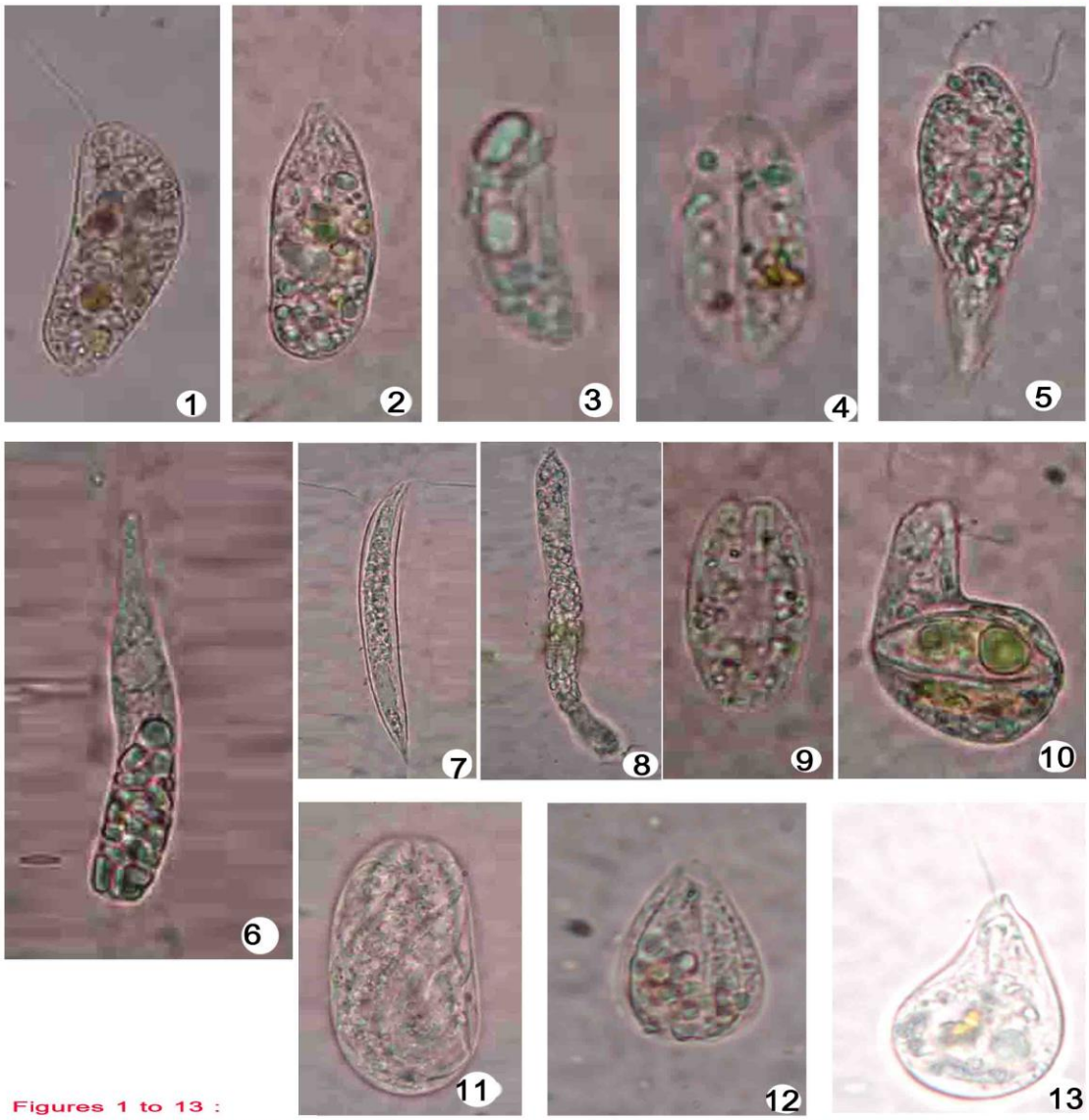
PLATE - 1



Figures 1 to 13 :

1. *Khowkenia quartana*(Moroff)Jahn et McKibben, 2. *Astasia comma* Pringsh., 3. *A.klebsii* Lemm. , 4. *A. applanata* Pringsh. , 5. *Rhabdomonas costata*(Korsch) Pringsh, 6. *Peranema cuneatum* Play f., 7. *P.inflexum* Skuja, 8. *Urceolus gobii* Skv., 9. *Petalomonas tricarinata* Skuja 10.*Anisonema platysomum* Skuja, 11. *Entosiphon ovatum* Stokes, 12. *Heteronema acutissimum* Skuja, 13. *Gyropaigne spirale* (Matv)Bourr

PLATE - 2



Figures 1 to 13 :
1. *Paranema inflexum* **Skuja**, 2. *P. cuneatum* **Playf.**, 3. *Rhabdomonas costata*(**Korsch**) **Pringsh** 4. *Anisonema platysomum* **Skuja**, 5. *Khowkenia quartana*(**Moroff**)**Jahn et McKibben**, 6. *Astasia comma* **Pringsh**. 7.*Heteronema acutissimum* **Skuja** 8. *Astasia klebsii* **Lemm.**, 9. *Entosiphon ovatum* **Stokes**, 10. *Astasia applanata* **Pringsh**. 11. *Gyropaigne spirale* (**Matv**)**Bourr**, 12.. *Petalomonas tricarinata* **Skuja** 13. *Urceolus gobii* **Skv**.

9. *Petalomonas tricarinata* Skuja**(Pl.1, Fig.9; Pl.2, Fig.12)**

Z.I.Asaul, 1975, p.385, pl. 246, fig. 1-4.

Cell colorless, broadly ovoid, flattened anterior end narrowed, truncated; posterior end broadly rounded with three keels Pellicle striations run parallel to keels. Paramylum granules tend to lie in longitudinal row. Flagellum single. 25.7 x 13.5 µm.

Habitat- Present mixed slimy detritus (P^{H}-4.9) near railway bridge Bhusawal, Dist. Jalgaon, In April 2019.

10. *Anisonema platysomum* Skuja**(Pl.1, Fig.10; Pl.2, Fig.4)**

Z.I.Asaul, 1975, p.352, pl. 227, fig. 16-17.

Cell colorless, rigid, oval; anterior end rounded; posterior end slightly narrowed, flattened with one longitudinal furrow. Flagella 2 and equal. Pellicle smooth. 19.5 x 10.5 µm.

Habitat- Polluted zone of the river tapi near Dipnagar, Bhusawal Dist. Jalgaon, June 2019.

11. *Entosiphon ovatum* Stokes **(Pl.1, Fig.11; Pl.2, Fig.9)**

G.Huber-pestalozzi,1955, p.533, pl.109 ,f.1101

Cell oval, rounded at the both the ends. Pellicle with 10-12 longitudinal ridges, clearly located at anterior end of cell. Swimming flagellum smaller than the body length,the siphon funnel shaped reaching the length of the body.Cytoplasm clear with scattered paramylum granules. 21.7-29 x14.2-16.2µm

Habitat- In a drying water pool, (P^{H}-4.0) Sakri, Dist. Dhule, march 2019.

12. *Heteronema acutissimum* Skuja **(Pl.1, Fig.12; Pl.2, Fig.7)**

Z.I.Asaul, 1975, p.330, pl. 218, fig.5,6.

Cell colourless, twiste and acuminate at anterior end; posterior end rounded, obliquely cut. Pharyngeal rod present, separated from the gullet. Cytoplasm hyaline, with peripheral small granules. Reservior with 1-2 vacuoles. Swimming flagellum about 1½ times the body length, trailing flagellum about the body length. Nucleus slightly sub-central. Slightly metabolic. 17.5 x 21.5 µm.

Habitat- Along with other algae (P^{H}-5.0) near Mandane Dist. Dhule, May 2019.

13. *G. spirale* (Matv)Bourr**(Pl.1, Fig.13; Pl.2, Fig.11)**

Z.I.Asaul, 1975, p.311, pl. 204, fig. 8,9.

Cell colourless, broadly ovate; narrowed anteriorly; broadly rounded. Pellicle indistinctly striated.31.2 x 24.2 µm.

Habitat- In stagnant fresh water pond (P^{H}-7.9) near village Prakasha Dist. Nandurbar, May 2019.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Asaul ZL (1975) Euglenophyta of the Ukranian RSR Pub. Naukova 2 Dumka Kiev. pp. Pub. *Naukov 2 Dumka Kiev*. pp. : 1-405.

Ashtekar PV (1982) Euglenophyceae of Aurangabad, Maharashtra.Phykos, 24: 184-185

Barhate VP and Tarar JL (1985). Additions to algal flora of Maharashtra Chlorophyceae from Khandesh-I. *Phykos*, **24** : 180-183.

Bhoge ON and Ragothaman G (1986) Studies on the Euglenophyceae from Jalgaon region, Maharashtra. Phykos, 25 : 132-135.

Dhande JS, Jawale AK, Chaudhari NA and Vanjari SD (2019) Contribution to some euglenopids from Hartala lake Maharashtra, India. Research Journey 134: 135-137

Huber-Pestalozzi G (1955) Euglenophyceen Das phytoplankton des Susswassers. Systematik and Biologie Euglenophycean. 4 stuttgard, Jena. pp1135.

Jawale AK, Waghodekar VH and Kumawat DA (2003) Euglenophyceae of fish ponds at Anjale district Jalgaon, Maharashtra. J.Adv.Sci. and Tech. 6: (I & II) : 64-71.

Kumawat DA (2013) Euglenineae genus *Strombomonas* Delf. From Jalgaon district of Maharashtra State, India. Flora and Fauna, 19(2) : 253-258

Narkhede PN (2007) Euglenophyceae of Suki Dam Jalgaon District, Maharashtra. Jr. Phytol. Res. 20 (1) : 91-94.

Waghodekar VH (2001) Addition to the euglenoids to the Maharashtra state. J.Adv. Sci. and Tech.4 (I & II) : 13-16.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Antimicrobial activities and phytochemical analysis of ethanolic flower extract of *Thevetia peruviana* (Pers.) K. Schum (Thevetia Yellow)

Ghavri Krati [1] and Adhav Madhavi [2]

Department of Botany, P.M.B. Gujarati Science College, Indore, Madhya Pradesh, India
Email: kratighavri@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Ghavri Krati and Adhav Madhavi (2019) Antimicrobial activities and phytochemical analysis of ethanolic flower extract of *Thevetia peruviana* (Pers.) K. Schum [Thevetia Yellow], *Int. J. of. Life Sciences*, Special Issue, A13: 160-168.

ABSTRACT

Thevetia peruviana (Pers.) K. Schum is widely grown as an ornamental and medicinal plant belongs to the family Apocynaceae and is commonly known as pili kaner. It is an evergreen and glabrous small tree .The cardiac glycosides obtained from bark, kernals and flowers are useful for heart diseases. The leaves are emetic and purgative. The ethanolic flower extract of Thevetia yellow was tested for antimicrobial activity against human pathogenic bacteria. Thevetia yellow flower extract showed strong antimicrobial activity against *Bacillus subtilis, Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae, Proteus vulgaris, Pseudomonas aeruginosa and Salmonella typhi.* The phytochemical and TLC analysis reveals the presence of alkaloids, essential oils, flavanoids, cardiac glycosides, phenolic compounds, phytosterols, saponins, tannins and terpenoids, which are mainly contributed to antimicrobial activity and medicinal utility of the plant. Thus Thevetia Yellow flowers may be utilized in the preparation of some newer antibiotics against tested microorganisms.

Key words: Antimicrobial activity, Cardiac glycosides, Phytochemical analysis, TLC (Thin Layer Chromatography), *Thevetia peruviana* (Pers.) K. Schum.

INTRODUCTION

The medicinal plants are a divine gift to us from 'mother nature' who has kept these green remedies in her plant kingdom for mankind to use and cure against various diseases and ailments. It is up to us to explore, seek, search and reap the benefits of this precious treasure. At present there are many valuable and lifesaving medicines obtained from plants. The plant world comprises a rich store house of biochemical that could be tapped for use as antimicrobial agent.

Thevetia peruviana (Pers.) is a small tree, with 3-6 m high belongs to the family Apocynaceae originally a native of America and West Indies. Leaves are simple, linear – lanceolate and whorled .Flowers 8-11 cm, medium, yellow,

solitary or in few flowered cymes. (Figure 1). All parts of this plant abound in a milky juice which is highly poisonous. (Chopra *et al*.,1984). The plant (Thevetia Yellow) is bitter, pungent, acrid, astringent to the bowels, useful in urethral discharges, worms, skin diseases, leucoderma, wound piles, eye trouble, itching, fever and bronchitis (Kirtikar and Basu,1981). The cardiac glycosides obtained from bark, kernals and flowers (Thevetia Yellow) are useful for heart diseases. (Prajapati *et al.,*2007) The root of this plant is made into a paste and applied to tumours. (Singh and Dey,2005). The leaves are emetic and purgative. Leaf decoction is given to prevent conception. The purified glycosides thevetin extracted from the seed is prescribed as a cardio tonic drug. Seeds used as an abortifacient and purgative in rheumatism and dropsy; also used as an alexeteric. Diluted latex is given to treat irregular menstruation. (Ambasta,1986; Kaushik and Dhiman ,1999; Retnam and Martin,2006).

MATERIAL METHODS

1. Collection of Plant Material

Plant materials (Flowers) of *Thevetia peruviana* (Pers.) were collected from Devi Ahilya Vishwavidyalaya campus, Indore. The collected plant materials were identified with the help of Flora of Madhya Pradesh. (Mudgal *et al*.,1997).

2. Extraction

To obtain ethanolic extract 100gm. of shade dried plant material was extracted with 500 ml. of ethanol (95%) in "Soxhlet Extraction Apparatus. Finally, the prepared plant material was macerated with water for 24 hrs. to obtain aqueous extract. Each extract was concentrated by distilling off the solvent (Kokate, 1994 and Kokate *et al*.,1993).

3. Preliminary Phytochemical Screening

The extract thus obtained was than subjected to preliminary phytochemical screening for identification of various plant constituents by methods suggested by (Finar, 1962; Farnsworth, 1996; Harborne, 1973; Harborne *et al.,*1979).

4. Thin Layer Chromatography (TLC)

Each ethanolic extract was than subjected to Thin Layer Chromatography by methods suggested by Kokate (1994), Stahl (1969), Wagner *et al*. (1984), Indhumathi and Mohandas (2013). The absorbent silica gel GF_{256} was coated to a thickness of 0.3 mm on clean TLC plates by commercial spreader. The plates were activated at 105°C for 30 minutes and used. Rf values were calculated. Various solvent systems were used to detect the phytochemical constituents. The selection of mobile phase depends upon, type of constituents to be analyzed. Here (10) different mobile phases were used.

5. Antimicrobial Testing

Each extract sample was tested for antimicrobial activity against human pathogenic bacteria by 'Cup Borer Method (Kavanagh, 1963; Cheesbrough,1993). The cultures of bacteria have been obtained from Microbial Type Culture, Gene Bank Chandigarh. The name and culture number of bacteria are as follows:

Gram-positive bacteria Gram-negative bacteria
Bacillus subtilis ATCC 6633.
Escherichia coli, MTCC 739
Staphylococcus aureus ATCC 9144
Klebsiella pneumoniae ATCC 33495
Salmonella typhi ATCC 10749
Pseudomonas aeruginosa ATCC 25668
Proteus vulgaris MTCC 1771

RESULTS & DISCUSSION

Phytochemical screening

The flower extract of Thevetia Yellow reveals the presence of alkaloids, flavanoids, glycosides-cardiac glycosides, phenolic compounds, tannins, phytosterols, carbohydrates, saponins, terpenoids, proteins and amino acids was noted in the observation Table, while fixed oils, fats, gums and mucilages were found absent. (Table 1).

Thin Layer Chromatography (TLC)

In Thevetia Yellow flower extract maximum separation was found in Ethyl acetate: Benzene (2:1) and Ethyl acetate: Chloroform (6:4) mobile phases which are used for the detection of glycosides and terpenoids. The result of TLC analysis reveals the presence of alkaloids, amino acids, essential oils, flavanoids, glycosides, phenolic compounds, phytosterols, saponins, tannins and terpenoids.

Antimicrobial Testing

The ethanolic and aqueous flower extracts of Thevetia Yellow exhibits strong antimicrobial activity against *Bacillus subtilis, Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae, Proteus vulgaris, Pseudomonas aeruginosa* and *Salmonella typhi.*

Table No.1: Phytochemical screening of ethanolic flower extract of *Thevetia peruviana* (Pers.) K. Schum [Thevetia Yellow]

S. No.	Plant Constituents Test/Reagents	Results
1.	**Alkaloids**	
	Mayer's reagent	+
	Dragendorff's reagent	+
	Hager's reagent	+
	Wagner's reagent	+
2.	**Carbohydrates**	
	Molish's reagent	+
	Benedict's reagent	+
	Fehling solution	+
3.	**Types of Carbohydrates**	
	Glucose	+
	Fructose	+
	Galactose	-
	Lactose	+
	Starch	-
4.	**Phytosterols**	
	Liebermann-Burchard's test	+
5.	**Terpenoids**	
	Salkowski reaction	+
6.	**Fixed oils and fats**	
	Spot test	-
7.	**Saponins**	
	Foam test	+
8.	**Phenolic compounds**	
	Ferric chloride solution	+
9.	**Tannins**	
	Lead acetate solution	+
10.	**Proteins**	
	Biuret test	+
	Xanthoprotic test	+
11.	**Amino acids**	
	Ninhydrin reagent	+
12.	**Gums and mucilages**	
	Alcoholic precipitation	-
13.	**Flavanoids**	
	Shinoda test	+
	Lead acetate test	+
14.	**Cardiac glycosides**	
	Killer kiliani test	+

+ Present, - Absent

Table No. 2: TLC observations of different phytoconstituents from ethanolic flower extracts of *Thevetia peruviana* (Pers.) Thevetia Yellow

S.No.	Name of the Phytoconstituents	Mobile phases	Visible Light			UV Light		
			Number of spots on TLC plates	Colour	Rf	Number of spot on TLC plates	Colour	Rf
1.	Alkaloids	$CHCL_3$: Methanol : Glacial acetic acid (83:17:10)	_	_	_	1 2	Dark Brown Dark Brown	0.75 0.96
2.	Amino acid	n-Butanol :Acetic acid:Water (4:5:1)	_	_	_	1	Dark Brown	0.66
3.	Essential oil	Hexane : Acetone (9:1)	1	Brown	0.20	1	Violet	0.20
4.	Flavanoids	Ethyl acetate :Methyl ethyl ketone :Acetic acid : Water(5:3:1:1)	_	_	_	1 2	Violet Violet	0.87 0.97
5.	Glycosides	Ethyl acetate: Benzene (2:1)	1	Brown	0.16	1 2 3 4	Brown Brown Brown Brown	0.23 0.36 0.86 0.98
6.	Phenolic Compounds	n - Butanol : Acetic acid : Water (35 : 5 : 12)	-	-	-	1 2	Violet Violet	0.68 0.97
7.	Phytosterols	P. ether : Ethyl acetate (7 : 3)	-	-	-	1	Violet	0.54
8.	Saponins	Chloroform : Methanol : Water (7:4:1)	1	Brown	0.86	1	Violet	0.86
9.	Tannins	Chloroform: Ethyl acetate: Ethanol (6:4:4)	-	-	-	1 2	Violet Violet	0.68 0.97
10.	Terpenoids	Ethyl acetate: Chloroform (6:4)	-	-	-	1 2 3 4	Violet Violet Violet Violet	0.17 0.42 0.82 0.98

Table No. 3*:* Antimicrobial activity of Thevetia Yellow flower extracts (ethanolic and aqueous) against gram positive and gram negative bacteria

S. No.	Extract used	Quantity of extract in ml.	Gram positive bacteria		Gram negative bacteria				
			Bacillus subtilis	*Staphylococcus aureus*	*Escherichia coli*	*Klebsiella pneumonia*	*Proteus vulgaris*	*Pseudomonas aeruginosa*	*Salmonella typhi*
			Average diameter of zone of inhibition in mm.						
1.	Ethanolic	.05	No Zone	12	12	12	10	10	No Zone
		.08	12	14	14	14	12	11	13
		.11	14	15	16	16	13	12	16
		.14	16	16	18	18	14	14	17
		.17	18	18	20	20	16	16	18
	R		0.894	0.990	1	1	0.990	0.985	0.855
2.	Aqueous	.05	No Zone	No Zone	10	10	No Zone	No Zone	No Zone
		.08	12	12	12	12	12	No Zone	10
		.11	14	14	14	14	13	12	12
		.14	16	16	16	16	14	15	14
		.17	18	18	18	18	16	16	16
	R		0.894	0.894	1	1	0.85	0.930	0.914

r = Correlation coefficient

r = +1 perfect positive correlation, r = -1 perfect negative correlation

Fig 1: *Thevetia peruviana* (Pers.) [Thevetia Yellow Flowers]

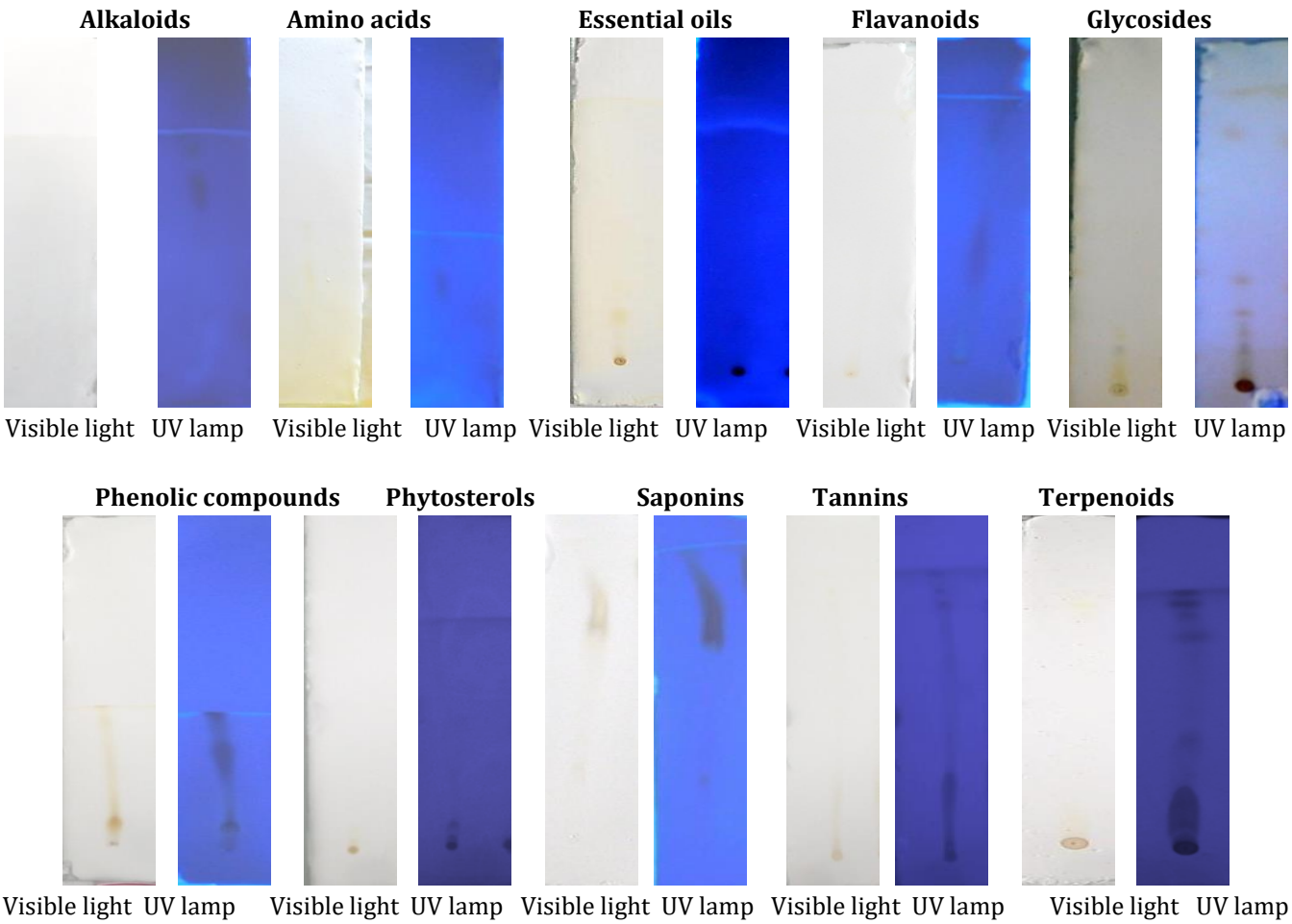


Fig.No.2: TLC observations of ethanolic flower extracts of Thevetia Yellow in different mobile phase.

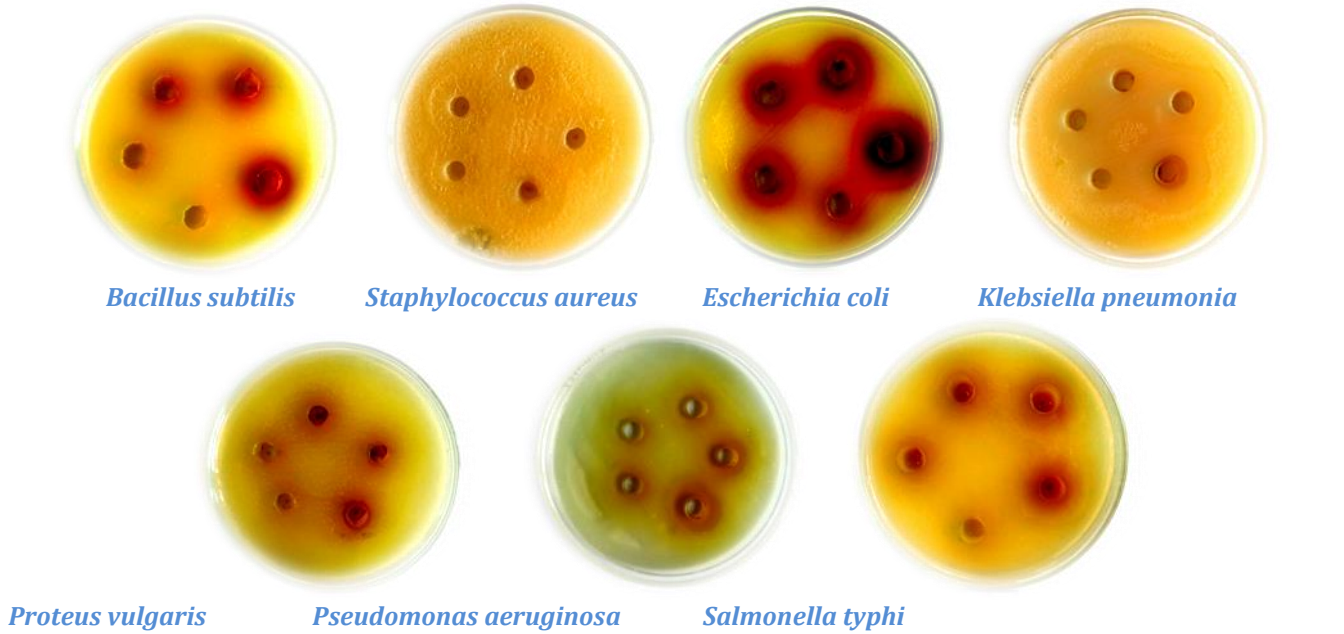


Fig.No.3: Antimicrobial activity of ethanolic flower extract of *Thevetia peruviana* (Pers.) K. Schum [Thevetia Yellow] against gram positive and gram negative bacteria.

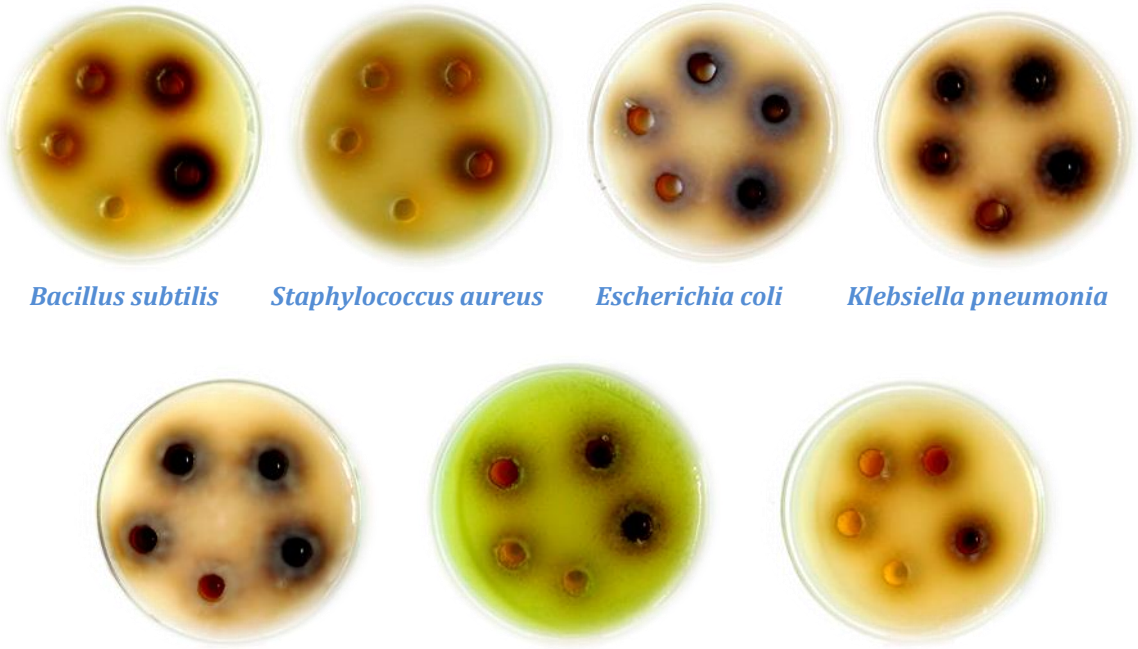
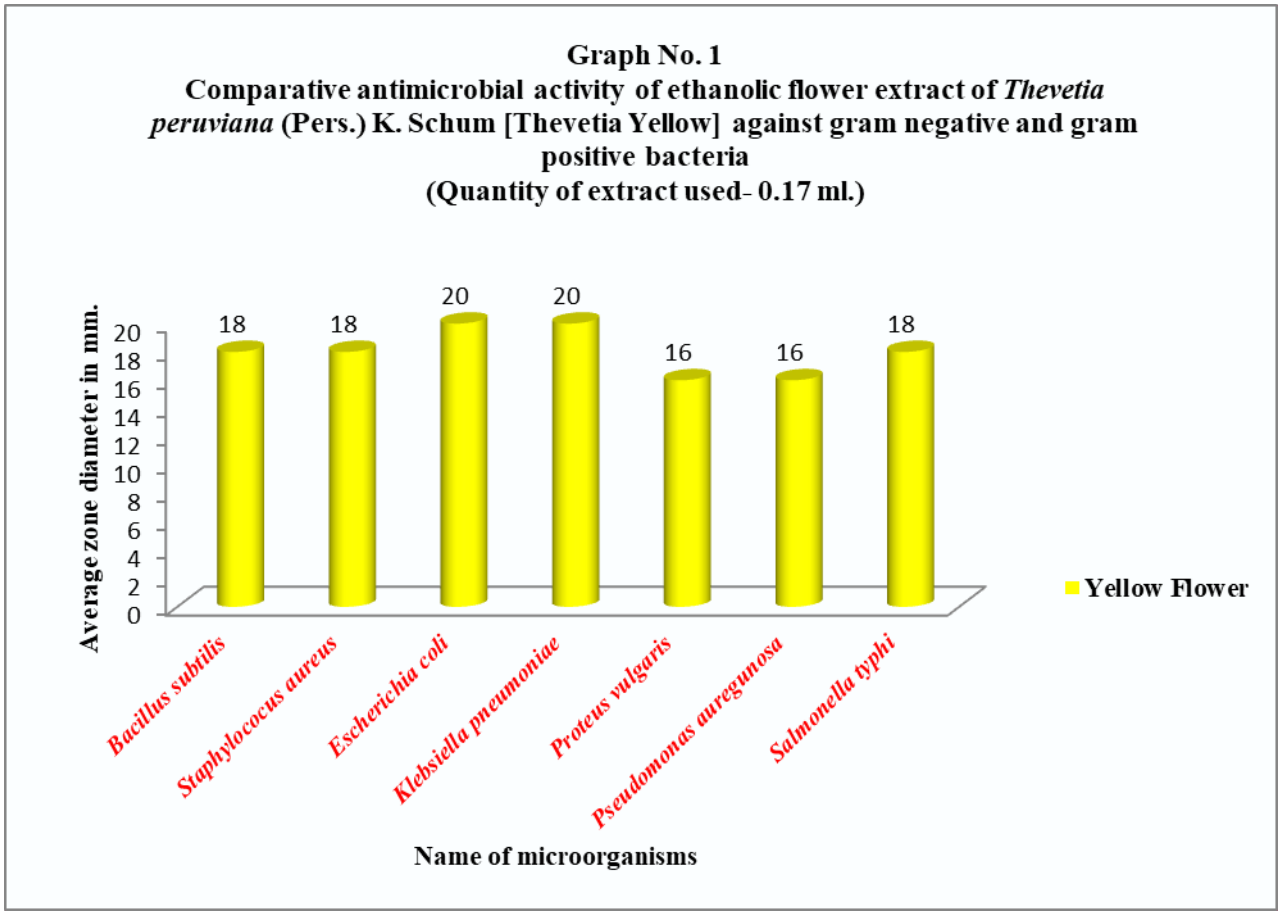
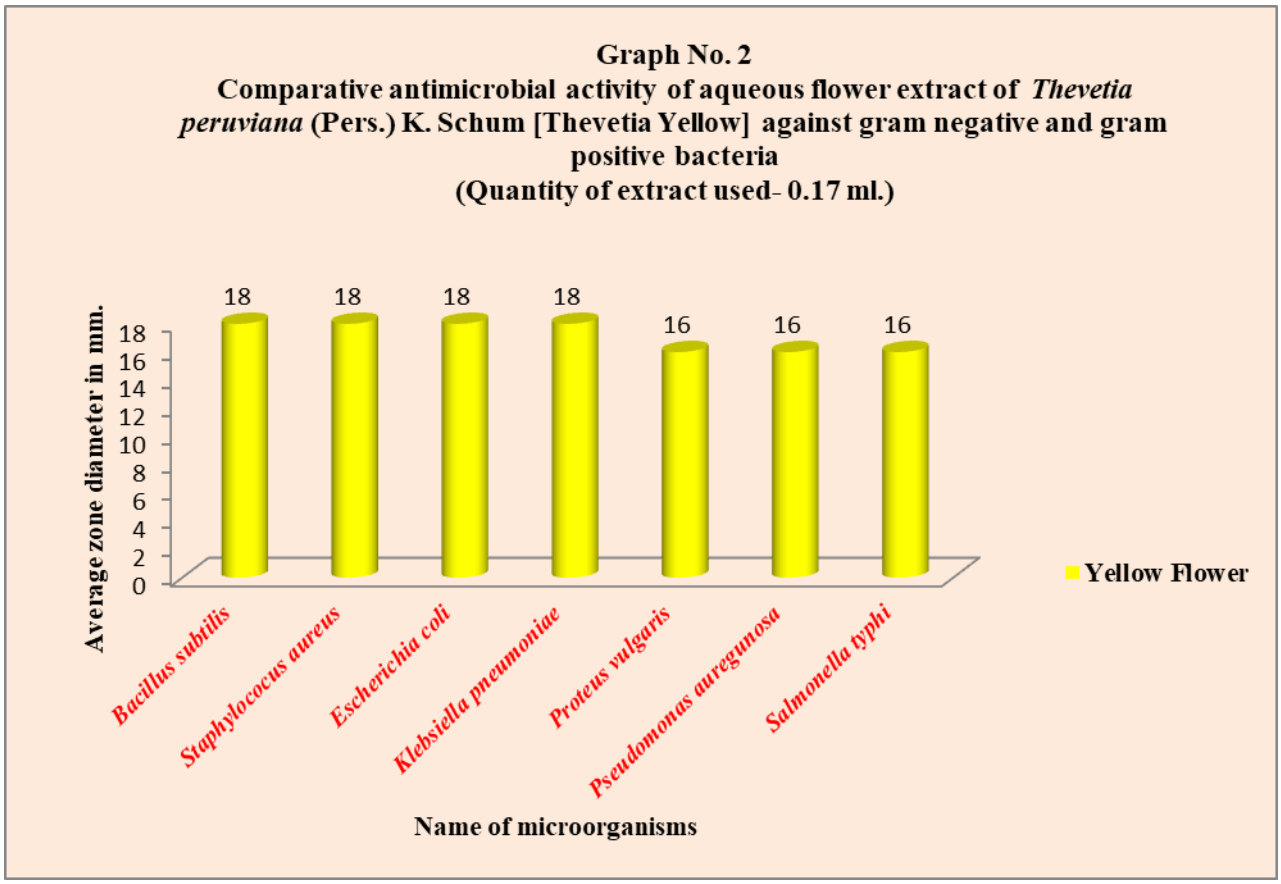


Fig.No.4: Antimicrobial activity of aqueous flower extract of *Thevetia peruviana* (Pers.) K. Schum [Thevetia Yellow] against gram positive and gram negative bacteria.





CONCLUSION

The flower extract of *Thevetia peruviana* (Pers.) K. Schum [Thevetia Yellow] showed strong antimicrobial activity against tested gram-positive bacteria *Bacillus subtilis, Staphylococcus aureus* and gram negative bacteria *Escherichia coli*, *Klebsiella pneumoniae, Proteus vulgaris, Pseudomonas aeruginosa* and *Salmonella typhi*. The results of preliminary phytochemical analysis reveals the presence of alkaloids, essential oils, flavanoids, cardiac glycosides, phenolic compounds, tannins, terpenoids, phytosterols and saponins. This was also confirmed by Thin Layer Chromatographic [TLC] analysis. So, this proves its correlation with antimicrobial activity, Thus Thevetia Yellow flowers may be utilized in the preparation of some newer antibiotics against tested microorganisms.

Acknowledgement
We wish to express our sincere gratitude to the Principal and Head of the Department of Botany, P. M.B. Gujarati Science College, Indore, for provided full research laboratory facilities throughout our work.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Ambasta SP (1986) The useful plants of India. Publications and Information Directorate, CSIR, New Delhi, India, pp:636.

Cheesbrough M (1993) Medical laboratory manual for tropical countries. Vol. II .Microbiology EIBS with Tropical Health Technology/Butte worth – Heinemann. *Great Britain at the university press*, Cambridge, pp:201.

Chopra SRN, Badhwar RL and Ghosh S (1984) Poisonous Plants of India. Vol. I. Academic Publishers, Jaipur, India , pp:665-668.

Farnsworth N (1996) Biological and Phytochemical Screening of Plants. *J. pharm. Sci.* 55:225-276.

Finar LL (1962) Organic chemistry, Lonngman, Green Grosvent Street, London.

Harborne JB (1973) Phytochemical methods, Chapman and Hall Ltd London, pp:49-188.

Harborne JB, Mabry TJ, Mabry H (1979) The flavonoids .Chapman and Hall International Edition, London.

Indumathi T and Mohandas S (2013) Identification of bioactive components in *Solanum incanum* fruit by Thin Layer Chromatography and HPTLC. *International journal of scientific research*; 2(6):22-25.

Kaushik P and Dhiman AK (1999) Medicinal plants and raw drugs of India. Bishen Singh Mahendra Pal Singh Publication, Dehradun, India, pp: 352-353.

Kavanagh F (1963) Analytical Microbiology. *Academic Press,* London, pp:125-141.

Kirtikar KR and Basu BD (1981) Indian medicinal plants. Vol II, International book distributors,pp: 1553-1556.

Kokate CK, Purohit AP, Gokhale BB (1993) Pharmacognosy, Twelth Edition, Nirali Prakashan, Pune, India, pp:90-93.

Kokate CK (1994) Practical Pharmacognosy, Fourth Edition, Vallabh prakashan , Delhi,India,pp:107-111.

Manandhar S, Luitel S and Dahal RK (2019) In vitro antimicrobial activity of some medicinal plants against human pathogenic bacteria. *Journal of Tropical Medicine,* pp:1-5.

Mudgal V, Khanna KK, Hajra PK (1997) Flora of Madhya Pradesh. The director, Botanical Survey of India, Calcutta.59-60.

Prajapati ND, Purohit SS, Sharma AK, Kumar T (2007) A Handbook of medicinal plants. *Agrobios, Jodhpur,* India*,* pp:511-512.

Rahman N, Rahman H, Haris M, Mahmood R (2019) Antioxidant, anti-inflammatory and wound healing properties of ethanolic extracts of *Thevetia peruviana* (Pers.) K. Schum. *J. Res. Pharm;* 23(1):101-113.

Retnam Raveendra K, Martin P (2006) Ethnomedicinal plants. Agrobios publication, India.

Singh MP and Dey S (2005) Indian medicinal plants. *Satish Serial Publishing House,* Delhi,399.

Stahl E (1969) Thin layer chromatography- A laboratory hand book. *Springer Verlag,* Berlin.

Wagner H, Baldt, S and Zgainski, E.M. (1984) Plant drug analysis. A thin layer chromatography atlas. *Springer-verlag, Berlin Heidelberg*, New York Tokyo.1-309.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Ethnobotanical study of Socioeconomic Indigenous wine product plants used by tribals of Dhar district, Madhya Pradesh, India

Alawa KS[1] & Ray S[2]

[1] Department of Botany, Govt. P.G. College, Dhar (M.P.)
[2] Department of Botany, PMB Gujarati Science College, Indore (M.P.)
Email: kamalsinghalawa@gmail.com & sudbot@yahoo.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Alawa KS & Ray S (2019) Ethnobotanical study of Socioeconomic Indigenous wine product plants used by tribals of Dhar district, Madhya Pradesh, India , *Int. J. of. Life Sciences*, Special Issue, A13: 169-172.

ABSTRACT

Present paper deals with indigenous knowledge of wine product plants used by tribals of Dhar district, Madhya Pradesh. The ceremonial drink known as "Daru or Mand" in a widely spoken language in local people. It is easy to prepare with varied tastes by local people. The indigenous wine is manufactured by fermentation of cereals grains, fruits, flower and stem juice. Different strain of saccharomyces cerevisiae is used to produce indigenous wine. Most commonly used plants for wine product are *Madhuca longifolia* (J.koening) , *Borassus flabellifer* L, *Phoenix sylvestries* L, *Saccharum officinarum*L, *Malinkara hexandra (*Roxb*).* It is consumed mostly during social and religious ceremonies. Present indigenous records 16 plant species distributing in 10 family and 12 genera which are used by tribals of the study area.

Key words: Dhar district, Ceremonial, Ethnobotanical plants, Indigenous wine, Tribes.

INTRODUCTION

Dhar district is situated in the South-western part of Madhya Pradesh state. The district lies between the latitude of 22º 1' 14" and 23º 9' 49" North and longitude of 74º 28' 27" and 75º 42' 43" East. The elevation varies from 588 m. above the sea level. The total population of the district is 2,184,672. Which is 54 percent population belongs to tribals. Major population in the district belongs to Scheduled Tribes hence district is considered as tribal district. The various tribes like *Bhil, Bhilala, Barela* and *Patelia* inhabit in the study area. *Bhil* and *Bhilala* are dominant tribals found in Dhar district are the most accounting second largest tribes in Madhya Pradesh. The study Area is Kukshi, Dahi, Gandhwani, Mandu and Sardarpur are the main pockets of tribals (Srivastava, 1984; Verma and Dixit, 1993). And they dependent on the wild biological resources for their livelihood.

A wine or alcoholic beverage is a part and partial of Bhil and Bhilala tribes in every occasion and festival.

They enjoy the local wine and also give wine to woman after delivery and newly borne baby. These fermented beverages have been consumed during and recreational and ceremonial events i.e. social gathering, marriage, naming ceremonies, festivals, settling disputes etc. it is processed and consumed mostly on special religious occasions such as wedding and festivals are Holi, Diwali, Dusshurra, Raksha Bandhan and other anytime take in local wine drink.

Fermentation is the natural process in which carbohydrates are oxidized to alcohol and other compounds by anaerobic microbes. These alcoholic beverages are manufactured by fermentation of cereals grains, fruits, and flower and stem juice. Different strains of Saccharomyces cerevisiae are used to produce various types of alcoholic beverages. The process relies on alcoholic fermentation conversion of sugar to alcohol by microbial enzymes.

Generally one week's time is needed for normal fermentation to take Place although ageing may take months or years. During aging secondary fermentation develop the flavor or aroma.

Few research papers have been published regarding ethnobotanical observations on *Bhil* and *Bhilala* tribes in Madhya Pradesh was done (Maheshwari *et al*.1986, Verma and Dixit 1993, Jain 2004, Maheshwari *et al*. 2004, Samvatsar and Diwanji 2004, Wagh and Jain 2010, Alawa *et al.* 2018 & Alawa, 2018). There are no published works on wine product plants used by tribes of Dhar district Madhya Pradesh. So present study has been carried out.

MATERIAL METHODS

Ethnobotanical survey was carried out during 2018-2019. Survey and interviews were taken to gather the information's regarding plants used and methodology of indigenous wine production. Information was collected on the traditional preparation method of the wine. During field work data were verified and cross checked. The collected plants were identified with the help of flora, monographs and available literature (Mudgal *et al*.1997, Verma *et al*. 1993, Singh *et al*. 2001). Herbarium of the dried and pressed plants was prepared following standard method (Jain and Rao 1977). Photographs of important plants of wine preparation were snapped out. Confirmed deposited in the Botanical survey of India, Central circle, Allahabad.

RESULTS & DISCUSSION

Present study records 16 plants used for the production of wine by tribals of Dhar district, Madhya Pradesh. These plants are distributed in 10 families for wine production. Among them, 11 were trees, 3 shrubs and 2 were herbs and 12 species are fruits, 2 species are flowers, 2 species are stem juice and jaggeries. These wine product plants are enumerated with botanical name, family, vernacular name, plant parts used, and method of preparation (Table 1).

Table-1 Wine product plants used by tribals of Dhar district (M.P.)

S. No.	Botanical name	Family	Vernacular name	Part used	Method
1	*Azadirachta indica* A.Juss.	Maliaceae	Neem (Margosa tree)	Fruits	Dry fruits 8-10 kg. berries of Azadirachta and 15-16 liter water kept in old clay pot. 250 ml. fermented juice is added to inoculate and Clay pot is buried in the ground. The fermentation is complete. 4-5 liter wine is yield.
2	*Bombax ceiba* L.	Bombacaceae	Simul (Redsilkcotton)	Flowers	8-10 kg. Fruit and 16-17 liter water. 2-3 liter wine is yield. The wine production of further step is same.
3	*Borassus flabellifer* L.	Arecaceae	Toddy palm	Stem juice	10-12 liter pure juice and 15-18 liter water. 3-4 liter wine is yield. The wine production of further step is same.
4	*Citrus lemon* L.	Rutaceae	Nimbu(Lemon)	Fruits	7-8 10 kg. Fruit and 15-16 liter water. 2-3 liter wine is yield. The wine production of further step is same.

Table 1: continued…

S. No.	Botanical name	Family	Vernacular name	Part used	Method
5	Citrus reticulata L.	Rutaceae	Santara (Orange)	Fruits	7-8 10 kg. Fruit and 15-16 liter water. 3-4 liter wine is yield. The wine production of further step is same.
6	Citrus sinensis L.	Rutaceae	Musambi (Sweet orange)	Fruits	7-8 kg. Fruit and 15-16 liter water. 2-3 liter wine is yield. The wine production of further step is same.
7	Ficus racemosa L.	Moraceae	Gular (Clusterfig)	Fruits	7-8 kg. Fruit and 15-18 liter water. 3-4 liter. The wine production of further step is same.
8	Ficus religiosa L.	Moraceae	Pipal (Peepul)	Fruits	10-12 kg. Fruit and 15-16 liter water. 3-4 liter wine is yield. The wine production of further step is same.
9	Madhuca longifolia (J.koen.) Macbr.	Sapotaceae	Mahua tree	Flowers	8-10 kg. flower and 15-20 liter water. 4-5 liter wine is yield. The wine production of further step is same.
10	Malinkara hexandra (Roxb.)	Sapotaceae	Khirni (Kauki)	Fruits	8-10 kg. Fruit and 15-16 liter water. 4-5 liter wine is yield. The wine production of further step is same.
11	Mangifera indica L.	Anacardiaceae	Aam (Mango)	Fruits	8-10 kg. Fruit and 15-16 liter water. 3-4 liter. The wine production of further step is same.
12	Musa paradisiaca L.	Musaceae	Kela (Banana)	Fruits	7-8 kg. Fruit and 15-16 liter water. 3-4 liter wine is yield. The wine production of further step is same.
13	Phoenix dactylifera L.	Arecaceae	Khajur (Datepalm)	Stem-juice, Fruits	8-10 kg.4-5 kg. Fruit and 15-16 liter water. 4-5 liter wine is yield. The wine production of further step is same.
14	Phoenix sylvestris (L.) Roxb.	Arecaceae	Khajuri (Wild date)	Stem-juice, Fruit	8-10 kg. fruit and 15-16 liter water. 3-4 liter wine is yield. The wine production of further step is same.
15	Saccharum officinarumL.	Poaceae	Ganna (Sugarcane)	Gud, Juice	4-5 kg. Gud and 15-18 liter water. Wine product in 4-5 liter wine is yield. The wine production of further step is same.
16	Ziziphus Jujuba Lamk.	Rhamnaceae	Ber (Jujube)	Fruits	8-10 kg. Fruit and 15-16 liter water. 3-4 liter wine is yield . The wine production of further step is same.

Generally Flower, fruits, stem juices are used for wine production but sometime jaggeries are also used as an ingredient. It is observed that *Madhuca longifolia* yield highest production 7-8 liter of wine from 7-8 Kg. of raw mate.

It is revealed that overall method of wine production from different plant is same but quantity of ingredients and parts used are different. In all the cases plant parts used are mixed with variable quantity of water and kept in clay pot. Fermented juice is added to inoculate the fermentation. Mouth of the pot is covered with clean cloth and buried in the ground 3-4 days' time period for fermentation time required for fermentation is varied. It takes less time in summer season and takes more time in other season. These fermented liquid kept in an aluminum vessels a clay pot having a hole is inverted placed on the mouth of aluminum vessels and hollow bamboo stem or plastic pipe is connected to the holes of the inverted pot. Aluminum vessels are allowed to boil.

Alcohol production is confirmed after one hour by fire test. Normally it takes 2-3 hours for complete alcohol production.

CONCLUSION

A wine beverage is a part of tribals in every occasion and festival. They enjoy the local wine and also give wine to woman after delivery and newly borne baby. Mostly on special religious occasions such as wedding and festivals are Holi, Diwali, Dusshurra, Raksha Bandhan and other anytime taking in local wine drink. These alcoholic beverages are manufactured by fermentation of cereals grains, fruits, and flower and stem juice. Different strains of Saccharomyces cerevisiae are used to produce various types of alcoholic beverages. The traditional preparation method strictly followed by tribal's young generation. Hence, considering the high sociocultural and economic values there is an urgent need of more research on the indigenous wine.

Acknowledgement:
The author is grateful to the research guide Dr. Sudip Ray, PMB Gujarati Science College, Indore and Principal Dr. H.L.Fulware & Dr. Subhash Soni, HOD, Govt. P.G. College, Dhar for providing research facilities. We are also thankful to Divisional forest Officer, Dhar for help during the tribal village's and forest areas. She is also thankful to all tribal people for their important information valuable information.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Alawa KS and Ray S (2018) Some plants associated of tribal Clans of Dhar district, Madhya Pradesh, India and their Role in Conservation. *Bioscience Discovery*, 9 (2): 260-263.

Alawa KS (2018) Ethnobotany: Plants use in Fishing and Trapping by Bheel Tribes of Dhar district, Madhya Pradesh, India. *International Journal of Science and Research*, 8 (1): 733-735.

Jain S P (2004) Ethno-Medico-Botanical Survey of Dhar district Madhya Pradesh. *Journal of Non-Timber Forest products*,11(2): 152-157.

Jain SK and Rao RR (1977) *A handbook of field and Herberium methods*. Today and Tomorrow Publishers, New Delhi.

Kalakoti BS and Lal B (1986) Ethnomedicine of *Bhil* Tribe of Jhabu District, Madhya Pradesh. *Anc. Sci. Life*. 5: 255-261.

Madgal V, Khanna KK and Hajra PK (1997) *Flora of Madhy Pradesh*, Vol. II. BSI. Calcutta.

Satya V and Solanki CM (2010) Piscicidal plants used by *Bhils* in Western Madhya Pradesh. *ethnobotany* 22. pp. 132-135.

Singh NP, Khanna KK, Mudgal V and Dixit RD (2001) *Flora of Madhya Pradesh*, Vol. III, BSI, Calcatta.

Samvatsar S and Diwanji VB (2004) Plant used for the treatment of different types of fever by *Bheels* and its sub tribes in India. *Indian J. Traditional Knowledge*: 3(1): 96-100.

Verma DM, Balakrishan NP and Dixit RD (1993) *Flora of Madhya Pradesh*, Vol. I, BSI, Calcatta.

Wagh VV and Jain AK (2010) Ethnomedicinal observations among the *Bheel* and *Bhilala* tribe of Jhabua District, Madhya Pradesh, India *Ethnobotanical Leaflets* 14: 715-720.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Diversity of Some less-known economic species of sorghum in tribal region of Western Madhya Pradesh, India

Dawar suwalal[1] and Satya Veena[2]

[1]PMB Gujarati science college, Indore
[2]SBN Govt. PG College Barwani, (M. P)
Email: dawar33@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Dawar suwalal and Satya Veena (2019) Diversity of Some less-known economic species of sorghum in tribal region of Western Madhya Pradesh, India , *Int. J. of. Life Sciences*, Special Issue, A13: 173-177.

ABSTRACT

This paper informs about diversity and traditional utility in view of food security in tribal tehsils of western Madhya Pradesh region of India. In all 21 species belonging to Poaceae family are utilized as food security. Apart from dietary uses, other miscellaneous and traditional use reports are also studied. Overall subsistence throughout the year is highlighted. Utilization, apart from the classic purposes, adapted by the tribals is noteworthy. The study showed that about 21 sorghum landraces were in active cultivation in the four sub regions, though there is a possible duplication in the naming of landraces. Among of landraces was based on maturity dates, grain color, plant height and uses. Sorghum Grain was used for home consumption in the form of roti (90%), Ghat (50%) papad (30%) and local alcoholic beverages (5%). And maturation time of different species are 2 species are 3 months duration, 2 species are 3.5 months , 7 species are 4 months, 3 species are 4.5 months, 6 species are 5 months, and 1 species are 6 months duration. Western Madhya Pradesh region of India has remained hitherto unstudied. The present authors carried out in-depth study especially in the tribal region of western Madhya Pradesh (India). Fruit security a segment of their study, are being communicated in this paper. The utilization and cultivation of these species should be promoted to maintain the dietary needs of the household in Western Madhya Pradesh region of India. The study can provide a baseline data that may be helpful for prioritization of conservation through sustainable use and management of the resources.

Key words: *Sorghum,* Western Madhya Pradesh, landraces, less-known economic species.

INTRODUCTION

Agriculture is the lifeline of economic system. India is the region of diversity of many major cultivated crop plants like rice, wheat, millets, sorghum etc. The traditional crop varieties are important element of genetic resources (FAO 1997). Agro biodiversity is confluence of the past, present and future and both a tangible and intangible resource critical for both rural and urban food and nation security (Kumar et al. 2015). The diversity in the wild species not only gives variation in diet but also provides nutritional diversity. It contributes to the house hold food security in this region.

Western Madhya Pradesh is one the most ancient, religious and visited region of the Madhya Pradesh in India. Major tribes inhabiting of this area are Bhils, Bhilala, Barela, and other diverse groups. their inhabitance is located around the areas of Alirajpur, Barwani, Dhar, Jhabua and Khargone. Majority of the tribes practice agriculture and also depend on wild/natural resources for their subsistence. Various studies have found that wild edible species are potential source of nutrition while in many cases they are more nutritious then conventionally eaten crops. Western Madhya Pradesh region of India has remained hitherto unstudied. The present authors carried out in-depth study especially in the tribal region of western Madhya Pradesh (India).

MATERIAL METHODS

The present study was conducted in some important districts i.e. Alirajpur, Barwani, Dhar, Jhabua and Khargone of Western Madhya Pradesh during 2015-2018.

Fig. 1: Map Showing Study area

A village wise study was conducted of tribal families residing in different villages was prepared with the help of local tribals. We are selected tribal families residing in selected village, owning large number of traditional sorghum species. These are select randomly from each village. Information was obtained through personal observation, consultation with tribal family members having detailed discussion with key informants, aged persons and housewives etc. During the period of study the farmers and agriculturists of each districts were interviewed about seasonal crops and their flowering and fruiting season. Plant collection and herbarium preparation was carried out by standard method (Jain and Rao, 1977). Plant specimens were preserved by dipping the whole specimens in saturated solution of Mercuric chloride and alcohol. Dry and preserved plants mounted on herbarium sheets by fevicols. Identification of plants done with the help of flora (Verma et.al., 1993; Mudgal et al,.1997; Khanna et al., 2001; Shah, 1978; Duthi, 1960; Hains,1921-1924; Cook, 1903; Hooker, 1872-1897) and other taxonomic literature. The entire plant specimen was deposited in herbarium of SBN Govt. PG College Barwani, M.P.

RESULTS & DISCUSSION

The investigation of diversity of the wild species in forest of Western Madhya Pradesh region of India has been carried out in the year 2015-2018. The variation in this region the heavy rainfall, humid climate and red lateritic soil is helpful for the new regenerated vegetation variety of resources wild plant rich diversity which is nutritional value and edible by farmers and people in this region. Wild Edible Plant Diversity- During the field survey 21 species was documented in the Poaceae family (Table 1).

The present report on the use of wild vegetable plant for food purposes draws support from earlier studies in different parts of India (Arinathan et al 2007, Reddy et al 2007; Sharma and Savant, 2012). *Sorghum* is the most important staple food crop in India. A study conducted in western Madhya Pradesh of India to determine farmers' perceptions on sorghum diversity and utilization. sorghum are used extensively in this region and this species are used during festival of "Gauri & Ganpati" as a food offering to the Goddess. In the plants nutritional value means, out of the 21 recorded species some are good source of protein some are carbohydrate and some are variable minerals (Shore, 2000) indicated that uncultivated foods constituted nearly 40 per cent of

food requirement of the communities in India. Amongst the very poor, landless members of these communities dependence on such sources of food and fodder is nearly 100 per cent. The study highlighted that most of the tribal preferred to make use of sorghum plant for staple food. Sorghum Grain was uses showed in table-2(Fig.2) and maturation time of different species are showed in table-3(Fig.3).

Table-1: characteristics of sorghum species

Local name	Hight (inch)	No of node	Leaf (Inch)	Ear in (Inch)	Grain (mm)	Shape of grain	Colour of grain	Color of glume	Covered grain %
			L×W	L×W	L×W				
Mavdi Juwar	75	9	30×3	10×4	6×3	Ovate	white	black	20
kantholi (Kalikiray)	82	10	31×3	8×3	4×3	Ovate	white	black	50
Aadam	131	15	33×4	15×5	5×3	ecoit round	gerua	white	75
Safed dhani	93	11	23×3	11×4	5×3	Ovate	white	white	25
Chari juwar	133	11	33×3	14×4	5×4	Ovate	orange	orange	80
watadi dhni	131		31×3	13×4	6×3	Ovate	white	white	80
Chikani lal	120	12	30×3	11×6	4×3	Rounded	Red	Broun red	20
Chikani safed	104	12	30×4	11×6	5×4	Plated round	white	black	20
Bajri kanthali	52	13	24×3	6.5×2	4×2	rounded	white	black	20
Haldiya ghati juwar	77	10	26×3	7×3	5×3	Plated round	white	black	40
Gorunawad	82	15	33×3	9×5	6×4	Ovate	white	grey	10
Aagiyu juwar	100	12	30×3	10×6	5×4	Round	white	Broun	40
Bhaliya juwar	93	12	27×3	8.5×3	4×2	Ovate	white	Broun red	60
Bhuyda juwar	91	12	24×3	13×10	5×4	Plated round	milky white	Broun white	20
Nanbay juwar	54	9	14×2	5×2	4×2	Hearted	white	black	20
Ratlitusali mogari	118	10	36×3	9×5	5×4	Round	white spotted	red	30
Kalatusa kantoli	58	8	28×3	7×3	4×3	long Ovate	poor white	poor black	20
Laltusa kantoli	60	5	26×3	8×4	4×3	long Ovate	poor white	poor red	20
Bani juwar	94	10	24×3	12×3	4×4	plated round	white	white	50
Fikali juwar	106	15	30×3	6×3	4×3	white	white	white	30
Mandavi juwar	45	11	27×3	10×4	3×3	white	white	white	20

Table-2: Sorghum Grain uses

S.N.	USES	PERCENTAGES (%)
1	Roti	90
2	Ghat	50
3	Papad	30
4	Alcoholic beverages	5

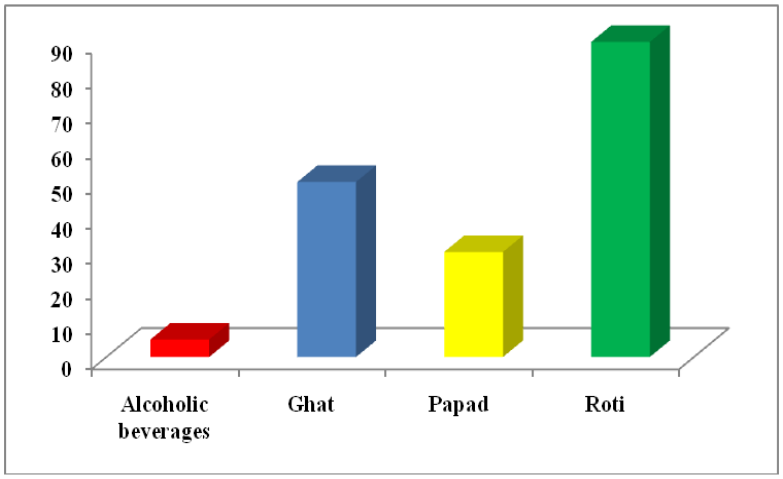


Fig.2 Sorghum Grain uses

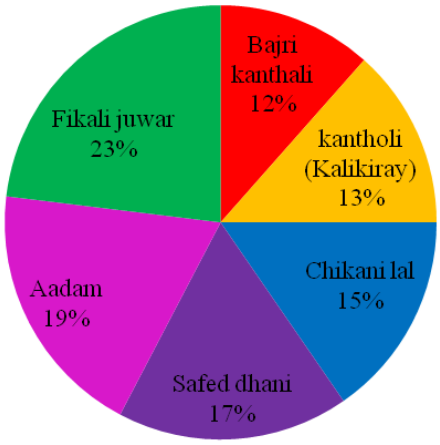


Fig.2: Maturation time of different species

Table-3: maturation time of different no. of species

SN	No. of species	Maturation time in months
1.	Bajri kanthali	
2.	Mandavi juwar	3
3.	kantholi (Kalikiray)	
4.	Nanbay juwar	3.5
5.	Chikani lal	
6.	Chikani safed	
7.	Haldiya ghati juwar	
8.	Aagiyu juwar	
9.	Bhaliya juwar	
10.	Ratlitusali mogari	
11.	Kalatusa kantoli	4
12.	Safed dhani	
13.	Chari juwar	
14.	Mavdi Juwar	4.5
15.	Aadam	
16.	watadi dhni	
17.	Gorunawad	
18.	Bhuyda juwar	
19.	Laltusa kantoli	
20.	Bani juwar	5
21.	Fikali juwar	6

CONCLUSION

The present investigators obtained information about food resources, and result is being presented in the research paper. Utilization of plant resources needs the survey and exploration of factual data. Our data of Sorghum species diversity *is* offer critical knowledge of food plants. Results from the study showed that about 21 sorghum landraces were in active cultivation in the four sub regions, though there is a possible duplication in the naming of landraces. Among of landraces was based on maturity dates, grain color, plant height and uses. Sorghum is the second most important cereal after wheat with followed by millets. *Sorghum* is the most important staple food crop in India. A study conducted in western Madhya Pradesh of India to determine farmers' perceptions on sorghum diversity, utilization. Resources of food are always in great demand all over

the world. Assessment of the Food wealth and the resulting inventory of plant resources of potentially economic value would not only help plant based industries but also encourage rural people to utilize the food products in Western Madhya Pradesh.

Acknowledgement:
We are very much thankful to Principal PMB Gujarati science college, Indore for providing research and library facilities. The help and co-operation during plant survey rendered by informants, guide, and local people of Western Madhya Pradesh is highly acknowledged.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Arinathan V, Mohan VR, Britto AJD, Murugan C. Wild edibles used by Palliyars of the Western Ghats, Tamil Nadu. Indian Journal of Traditional Knowledge. 2007; 6(1):163-168.

Cook T, 1903.Flora of the presidency of Bombay.BSI Publications Calcutta, India.1-3.

Duthi JF, 1960.Flora of the upper Gangetic plains.BSI Publications Calcutta, India.2

FAO, (1997)**.** The state of the world's plant genetic resources for food and agriculture FAO, of the United Nations, Rome.

Hains HH, 1921-1924.The Botany of Bihar and Orissa.BSI Reprint, Calcutta, India.1-3

Hooker JD, 1892-1897.Flora of British India.BSI Publication, Calcutta, India.1-7.

Jain SK and Rao RR, 1976.A Handbook of Herbarium methods. Today and tomorrow publ. New Dehli.

Khanna KK, Kumar A, Dixit RD and Singh NP, 2001. Supplementary flora of Madhya Pradesh. BSI Publications, Calcutta, India.

Kumar NA, Nambi VA ,Rani MG,King edio,Chaudhary SS, Misra S. 2015. Community agro biodiversity conservation continuum: an integrated approach to achieve food and nutrition security. Current Science. 109; 3; 474-487.

Mudgal V,Khanna KK and Hajara P K, 1997. Flora of Madhaya Pradesh.2.

Reddy KN, Pattanaik C, Reddy CS, Raju VS. Traditional knowledge on wild food plants in Andhra Pradesh. Indian Journal of Traditional Knowledge. 2007; 6(1):223-229.

Samvatsar S.1996. The flora of Western Tribal Madhya Pradesh, India. Scientific Pub. Jodhpur.

Shah GL, 1978.Flora of Gujarat state. University press, S. P. University, Vallabh Vidhyanagar, Gujarat, India.1-2.

Sharma PP, Savant RJ. Some less-known plants parts as supplementary foods. International Multidisciplinary Research Journal. 2012; 2(12):12-13**.**

Shore K. 2000. Protecting uncultivated food sources in south Asia.

Singh NP, Khanna KK, Mudgal V and Dixit RD (2001). Flora of Madhaya Pradesh (BSI Publication, Calcutta, India) 3.

Verma DM, Balakrishnan, NP and Dixit RD, 1993. Flora of Madhya Pradesh. BSI Publication, Calcutta, India.1.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

A comparative study of changes in protein contents in freshwater bivalves after chronic exposure to cadmium

Waykar BB and Shinde SM

Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, 431004 Maharashtra, India
Department of Zoology, JET's Z. B. Patil College, Dhule, 424002 Maharashtra, India
E-mail: bbwaykar@gmail.com, satish.shinde02@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Waykar BB and Shinde SM (2019) A Comparative Study of Changes in Protein Contents in Freshwater Bivalves after Chronic Exposure to Cadmium, *Int. J. of. Life Sciences*, Special Issue, A13: 178-182.

ABSTRACT

The objective of our present research was to investigate changes in protein contents in different tissues like mantle, gill, digestive glands and whole soft body of freshwater bivalves *Corbicula striatella, Parreysia corrugata* and *Parreysia cylindrica* after exposure to cadmium. Bivalves were exposed to chronic concentration of cadmium (0.1284 ppm) upto 20 days. Changes in protein contlents were found to be exposure dependent. *Parreysia cylindrica* shows highest protein depletion in different soft tissues as compared to the other studied bivalve species. Among the different studied tissues the digestive glands shows highest depletion in protein content. Thus, the changes in protein contents can be used for early diagnosis of stress or as a probable biomarker for assessment of cadmium metal pollution in aquatic ecosystem.

Key words: protein, freshwater, *Corbicula striatella, Parreysia corrugata*, *Parreysia cylindrica*, cadmium, chronic concentration

.

INTRODUCTION

Maintaining the quality of aquatic ecosystems is one of the most difficult challenges in the 21st century. Natural processes and anthropogenic activities lead to input of heavy metals in aquatic environments (Franca et al. 2005). Heavy metals are non-biodegradable, highly toxic, have the ability to bioaccumulate and have deleterious effect to most organisms (Kaoud and Dahshan, 2010) and also influence the structure and function of the ecosystems. Thus, contamination of water bodies due to heavy metal pollution has turn out to be a topic of concern all over the world. Among the chemicals reaching aquatic ecosystems cadmium is a persistent, non-essential, non-biodegradable, potentially toxic even at trace concentrations, it retained for long periods of time in organisms after bioaccumulation and ranks eighth in the priority list of top 20 hazardous substances (Glenn, 2001) and therefore it is a serious environmental contaminant.

Biomarkers have recently generated significant interest as a diagnostic tool to assess the environmental pollution. Biomarkers are measurable changes in a biological system in response to a chemical, physical or biological agent.

They have been used to indicate stress in aquatic organisms or the level of environmental pollution. An ideal biomarker should be easily measurable, consistent and its levels must correlate with increase in response to stress or pollution. The changes occurring in the organisms can be measured at molecular, biochemical, physiological or histological level. Among these the molecular and cellular biomarkers play an important role in ecotoxicology and environmental pollution monitoring. They are useful for diagnosing the impact of pollution, for the detection of sublethal and chronic effects with their relation to ecological alterations (Relyea and Hoverman, 2006). The assessment of biochemical changes at organism level will help to develop a reliable approach for environmental risk assessment, to predict the early detection and effects of heavy metal water pollution and our understanding of organism response after exposure to heavy metal stress.

The bivalves are considered as useful bioindicator organisms in assessment of risk associated with water contamination and thus used for biomonitoring purpose worldwide (Otchere, 2003, Tay et al. 2004). Bivalves are benthic, widespread in distribution and ecologically important because of their biological filtration activity. They can accumulate heavy metals in their tissues at concentrations in excess of the ambient water (Poteat et al. 2013) through ingestion of sediment particles, food and directly from overlaying water. Accumulated heavy metal stress causes biochemical alterations in the organs involved in detoxification mechanisms (Zhang et al. 2010; Rajkumar and Milton, 2011). Thus, the study on biochemical changes in bivalves is essential to understand the mechanism of metal toxicity as well as to know how bivalves deals with the stress of pollutants at the biochemical level which can be serves as biomarkers of environmental pollution.

MATERIALS AND METHODS

The freshwater bivalves, *Corbicula striatella*, *Parreysia corrugata* and *Parreysia cylindrica,* were collected from Girna dam 39.6 km away from Chalisgaon city of Jalgaon district of Maharashtra state, India. After collection animals were brought to laboratory and were cleaned and acclimatized in aquarium containing dechlorinated tap water for 10 days. During acclimatization and experimentation, the animals were fed with fresh water algae and water of aquarium was changed after every 24 hours.

Experimental design

After acclimatization, the active, medium, uniform size and healthy bivalves of each species were selected by measuring their shell length and width and divided into two groups. Each species was separately exposed to fixed average chronic concentrations ($LC_{50/10}$) of ionic form of cadmium. 1st group was maintained as control and 2nd group was exposed to chronic concentration of cadmium (0.1284 ppm) upto 20 days. On 10th and 20th days of exposure period animals of each species from experimental and control groups were dissected and their mantle, gills, digestive glands and whole soft body tissues were removed and dried in oven at 70^0-80^0C till constant weight was obtained. After oven drying, dry tissues were blended into dry powder. These powders were used for the estimation of protein.

Protein estimation:

Protein content of the tissues was estimated by Lowry's method (Lowry et al. 1951). The optical density of blue colour developed was read at 530nm on a double beam Spectrophotometer (Elico BL 200). The blank was prepared in same way without dissolving protein precipitate. The protein content in different tissues was calculated referring to standard graph value and it was expressed in terms of mg protein/100 mg of dry tissue. The Bovine serum albumen was used as a standard.

RESULTS & DISCUSSION

The changes in protein content of all the studied soft tissues of experimental bivalve species, *C. striatella*, *P. corrugata* and *P. cylindrica* after chronic exposure to cadmium for 10 and 20 days are summarized in table no.1. The obtained results revealed that, the Cd causes significant depletion in protein contents in all studied tissues of the experimental bivalve species as compared to those of control bivalves. A maximum depletion in protein contents in response to cadmium exposure was observed in different soft tissues of *P. cylindrica* as compared to *C. striatella* and *P. corrugata*. The organ wise order of protein depletion observed in experimental bivalve species was, digestive glands > whole soft body > gills > mantle.

The results obtained during the present study were clearly revealed progressive depletion in protein content along with the increase in exposure period. The obtained results are in harmony with the results reported by various researchers (Nawale, 2008; Andhale and Zambare, 2011; Patil, 2011; Waykar and

Pulate, 2012; Tripathi et al. 2012). The presence or absence of biochemical changes in laboratory animals exposed to environmental chemicals/xenobiotics is an important diagnostic tool in the overall assessment of the risk and hazards of potential human or animal exposure (Krishna and Ramachandran, 2009). The effects of long term stress on animals specifically affects metabolism and various biochemical processes occurring in cells leads to an imbalance of the cellular redox status and causes damages in different biomolecules and mutagenic and carcinogenic processes can occur (Sies and Stahal,1992).

Proteins represent the molecular phenotype of cells which have a direct effect on organismal physiology (Feder and Walser, 2005). Protein responds for better survival by either increasing or decreasing their levels. These are the key substance to show the effects of heavy metals. The heavy metals have affinity for metal sensitive groups, such as thiol groups. It blocks functional groups of proteins, displace and/or substitute essential metals, induce conformational changes, denature enzymes and disrupt cell and cell organelle integrity (Hall, 2002).

Bioaccumulated heavy metal Cd can indirectly induce oxidative stress by generation of reactive oxygen species (ROS) which results in strong defenses, tissue destruction, altered enzyme activities and alteration in protein metabolism by direct oxidation of their amino acid residues and cofactors or by secondary attack via lipid peroxidation (Requena et al. 2003), possible utilization of the products of their degradation for metabolic purposes (Ambrose et al. 1994) and blocking of protein synthesis (Somnath, 1991). Oxidative stress also affects protein folding and protein ubiquitination in molluscs (Jie Meng et al. 2017).

Table 1: Profile of protein content in different tissues of freshwater bivalve, *Corbicula striatella, Parreysia corrugata* and *Parreysia cylindrica* after chronic exposure to different heavy metals (Values are in mg/100mg of dry weight).

Bivalve species	Treatment	Mantle		Gill		Digestive gland		Whole soft body	
		10th day	20th day	10th day	20th day	10th day	20th day	10th day	20th day
Corbicula striatella	**Control**	49.89 ±3.44	49.57 ±2.02	61.71 ±3.37	60.98 ±3.53	54.09 ±1.80	53.60 ±1.98	57.22 ±1.36	56.54 ±3.39
	Cd	41.42^{NS} ±2.44 (-16.98)	35.62* ±2.84 (-28.14)	47.40** ±1.66 (-23.18)	40.12* ±2.63 (-34.21)	39.57^{NS} ±3.04 (-26.84)	33.35** ±1.86 (-37.77)	46.30** ±1.80 (-19.08)	37.91** ±2.56 (-32.95)
Parreysia corrugata	**Control**	46.39 ±2.32	45.60 ±3.52	60.14 ±3.57	59.66 ±3.73	51.18 ±1.69	50.46 ±1.78	55.46 ±1.18	54.88 ±2.54
	Cd	37.79* ±2.95 (-18.52)	32.69^{NS} ±3.13 (-28.31)	45.99** ±2.33 (-23.54)	38.28* ±2.14 (-35.84)	37.05^{NS} ±1.97 (-27.61)	29.73* ±3.53 (-41.08)	42.05** ±1.98 (-24.19)	34.53^{NS} ±3.68 (-37.07)
Parreysia cylindrica	**Control**	50.37 ±3.27	49.78 ±2.46	64.48 ±2.93	64.07 ±3.45	57.38 ±1.96	56.60 ±3.71	59.95 ±3.70	59.33 ±3.08
	Cd	39.64* ±3.79 (-21.31)	33.68* ±2.96 (-32.35)	47.74* ±3.63 (-25.97)	38.52** ±3.97 (-39.88)	40.53^{NS} ±2.22 (-29.37)	32.21** ±2.57 (-43.09)	44.22* ±3.10 (-26.25)	35.49* ±3.54 (-40.17)

1. (+) or (-) indicate percent change over control
2. (±) value indicates S.D. of three observations
3. Values are significant at ***P<0.001, **P<0.01, *P<0.05, NS- not significant

Oxidation of amino acid side chains consequences in the formation of carbonyl derivatives which are non-reversible, causing conformational alterations, declined catalytic activity of enzymes and finally resulting into breakdown of proteins by proteases as a result of increased susceptibility (Almroth et al. 2005). Increased protease activity in fresh water bivalves after exposure to pollutants was observed by Waykar and Lomte (2002, 2004). Another possible reason for the depletion in protein might be the diversification of energy to meet the impending energy demand when the animal is under stress (Waykar and Lomte, 2001a; Satya Parameshwar et al. 2006). Hence, depleted protein contents in the bivalves exposed to the chronic concentration of Cd indicates interruption of usual metabolic processes.

CONCLUSION

The alterations in protein contents in different tissues of the bivalves exposed to the chronic concentration of Cd can be used as biomarker and considered as a diagnostic tool to determine the physiological responses of the cells and organs for its toxic effect. Among the studied bivalves, *Parreysia cylindrica* is a good bioindicator species for biomonitoring of pollution while the digestive glands can be used as a potential bioindicator organ.

Acknowledgement:
The financial assistance from University Grants Commission is appreciatively acknowledged.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Almroth BC, Sturve J, Berglund A and Forlin L (2005) Oxidative damage in eelpout *(Zoarces viviparus),* measured as protein carbonyls and TBARS, as biomarkers. Aquat Toxicol, 73: 171-180.

Ambrose T, Cyril Arun Kumar L, Vincent S, Roselyn Lambert (1994) Biochemical responses of Cyprinus carpio communis to toxicity of tannery effluent. J Ecobiol, 6(3): 213-216.

Andhale AV and Zambare SP (2011) Effect of nickel induced biochemical alterations in fresh water bivalve, *Lammellidens marginalis*. Journal of Ecobiotechnology, 3(11): 18-24.

Feder ME and Walser JC (2005) The biological limitations of transcriptomics in elucidating stress and stress responses. J Evolution Biol, 18: 901–910.

Franca S, Vinagre C, Cacador I, Cabral HN (2005) Heavy metal concentrations in sediment, benthic invertebrates and fish in three salt marsh areas subjected to different pollution loads in the Tagus Estuary (Portugal). Marine Pollut Bull, 50: 993-1018.

Glenn VD (2001) Top 20 Hazardous substances from the cercla priority list of hazardous substances for 2001. Electronic Resources Review 16, 2.

Hall JL (2002) Cellular mechanisms for heavy metal detoxification and tolerance. J Exp Bot, 53: 1-11.

Jie Meng, Wenxiong Wang, Li Li1, Qi Yin and Guofan Zhang (2017) Cadmium effects on DNA and protein metabolism in oyster (*Crassostrea gigas*) revealed by proteomic analyses. Scientific Reports, 7: 11716. DOI:10.1038/s41598-017-11894-7.

Kaoud HA and El-Dahshan AR (2010) Bioaccumulation and Histopathological Alterations of the Heavy Metals in *Oreochromis niloticus* Fish. Nature and Science, 8: 147-156.

Krishna H and Ramachandran AV (2009) Biochemical alterations induced by acute exposure to a combination of chlorpyrifos and lead in winstar rats. *Biology and Medicine,* 1(2): 1-6.

Lowry OH, Rosenbrough NJ, Farr AL and Randall RJ (1951) Protein measurement with the Folin phenol reagent. J Biol Chem, 93(1): 193-265.

Nawale SP (2008) Synergistic effect of Caffeine (1, 3, 7-Trymethylxanthine) and ascorbic acid on heavy metal induced alterations in an experimental model, *Lamellidens corrianus* (Lea). Ph. D. Thesis, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S.) India.

Otchere FA (2003) Heavy metals concentrations and burden in the bivalves (*Anadara* (*Senilia*) *senilis*, *Crassostrea tulipa* and *Perna perna*) from lagoons in Ghana: Model to describe mechanism of accumulation/excretion. Afr J Biotechnol, 2(9): 280-287.

Patil AG (2011) Protein changes in different tissues of freshwater bivalve *Parreysia cylindrica* after exposed to indoxacarb. Recent Research in Science and Technology, 3(3): 140-142.

Poteat MD, Garland T Jr, Fisher NS, Wang WX and Buchwalter DB (2013) Evolutionary patterns in trace metal (Cd and Zn) efflux capacity in aquatic organisms. Environ Sci Technol, 47, 7989–7995.

Rajkumar JSI and John Milton MC (2011) Biochemical changes induced by cadmium, copper, lead and zinc exposure to *Perna viridis* under long term toxicity

test. International Journal of Pharma and Bio Sciences, 2(3): 41-49.

Relyea R, Hoverman J (2006) Assessing the ecology in ecotoxicology: a review and synthesis in freshwater systems. Ecol Lett, 9:1157–1171.

Requena JR, Levine RL and Stadtman ER (2003) Recent advances in the analysis of oxidized proteins. Amino Acids, 25: 221-226.

Satya Parameshwar K, Reddy TR and Vijaya KN (2006) Study of carbohydrate metabolism in selected tissues of fresh water mussel. *Lammellidens marginalis (L)* under copper sulphate toxicity. J of Envi Biol, 27(1): 39-41.

Sies H and Stahl W (1992) Antioxidant functions of vitamins. Vitamins E and C, beta-carotenee, and other carotenoids. Ann NY Acad Sci, 669: 7-20.

Somnath B (1991) Effect of acute sub-lethal concentration of tannic acid of the protein, carbohydrate and lipid levels in the tissues of the fish *Labeo rohita.* J Environ Biol, 12(2): 107 – 112.

Tay C, Asmah R, Biney CA (2004) Trace Metal Concentrations in Commercially Important Fishes from some Coastal and Inland Waters in Ghana. West Afr J Applied Ecol, 13: 38-49.

Tripathi S, Mishra BB and Tripathi SP (2012) Effect of heavy metal Cadmium sulphate on the toxicity and biochemical parameters of reproductive cycle of *Colisa fasciatus*. Researcher, 4(4): 65-68.

Waykar BB and Lomte VS (2001a) Total protein alterations in different soft tissues of freshwater bivalve, *Parreysia cylindrica* after cypermethrin exposure. Ecol Env and Cons, 7(4): 465-469.

Waykar BB and Lomte VS (2004) Carbaryl induced changes in the ascorbic acid content in different tissues of fresh water bivalve *Parreysia cylindrica*. Asian J Microbiol Biotech Env Sci, 6(3): 181-189.

Waykar BB and Pulate PD (2012) Ameliorating effect of L-ascorbic acid on profenofos induced alterations in the protein contents of the freshwater bivalve, *Lamellidens marginalis* (L). The Bioscan, 7(1): 35-38.

Waykar Bhalchandra and Lomte VS (2002) Carbonyl induced alteration in the enzyme secretary activity of hepatopancrease of freshwater bivalve *Parreysia cylindrica*. J Aqua Biol, 17(1): 65-68.

Zhang Y, Song J, Yuan H, Xu Y and He Z (2010) Concentrations of cadmium and zinc in seawater of Bohai bay and their effects on biomarker responses in the bivalve *Chlamys farreri*. Archives of Environmental Contamination and Toxicology, 59: 120-128.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Studies on Plant diversity of Laling Forest of Dhule District (Mh), India

Dhole JA and Patole MG

SSVPSs L. K. Dr. P.R. Ghogrey Science college, Dhule.
Email: Jyotidhole.2008@rediffmail.com, | mmpatole1995@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Dhole JA and Patole MG(2019) Studies on Plant diversity of Laling Forest of Dhule District (Mh), India, *Int. J. of. Life Sciences*, Special Issue, A13: 183-189.

ABSTRACT

The present paper focuses on the Plant diversity of Laling Forest of Dhule District (Mh), India via Survey conducted during January to December, 2017. A Total 137 plants species belonging to 53 families and 122 genera were collected and identified from Laling forest in which 49 plants were found to be herbs, 16 were shrubs, 47 were trees and only 07 were found to be climbers. Total 18 different cacti were identified situated in Cactus house and more than fifty medicinal plants were planted in medicinal plant garden which is developed by forest department under the scheme of conservation.

Key words: Biodiversity, Plant species, Laling forest, cactus.

INTRODUCTION

India has one of the oldest, richest and most diverse cultural traditions associated with the use of medicinal plants as medicine like Ayurveda, Siddha, Unani and the Tibetan systems (Retnam and Martin, 2006). Indian economy depends greatly on the number of wild plant species. The forest of Maharashtra covers a hugs area of 61.939 sq km. thus covering about 21% of the total land. In order to preserve the wildlife, 33% of the land is given to the state government so that is can utilize the area to create more national parks as well as sanctuaries Nagpur is said to have the longest forest area while Aurangabad has the least forest area. The forest of dhule district covers an area of 209 thousand Hectors which is 28.5% of the total state area. In the present study of plant diversity of laling forest situated in Dhule district. Laling forest area has spread over 4200 hectors. The laling forest spread around the laling fort and situated 9.65 kilometers away from Dhule city. The forest area around the laling fort having rich plant diversity. Many medicinal plants, herbs, shrubs, climbers and evergreen trees spread laling forest around the laling fort and nobody investigated the plant diversity of this area. The study of plant diversity particularly in the laling forest feels to be a most urgent need of this study region. Considering these facts present research work is undertaken in view to Plant Diversity of laling forest of Dhule District (Mh.) India.

MATERIAL METHODS

The plant diversity Laling forest of Dhule District was studied as per the methods described by Rahman et al (2007). Accordingly, the plant survey of Studies on Plant diversity of Laling forest, Dhule District was made during January, 2017 to December, 2017. For this regular excursions were arranged to Laling forest, of each and every zone at least twice in a week and later on twice in a month. The excursions were arranged in such a way that it covered the entire study area. As a result of this most of the plants could be collected in different growth stages. The identified plants were categorized as herbs, shrubs, trees and climbers as per the methods described by Bisht et al, 2004.

Identification

The collected weeds were identified on the spot and in the laboratory on the basis of their natural characters with the help of identification keys. The flora of Jalgaon District (Kshirsagar et al, 2008) was extensively used. Flora of Marathwada (Naik, 1998) Flora of Kolhapur District (Yadav and Sardesai, 2002), Flowering plants of chittoor district Andhra Pradesh (Chetty, 2008), Further Flower of Sahyadri (Ingalhalikar, 2007), Flowers of Sahyadri (Ingalhalikar, 2012) were also used for the identification of collected plants.

RESULTS & DISCUSSION

It is clear from the results presented in table that, total 137 plants belonging to 53 families and 122 genera were collected and identified from Laling forest. Among all the identified plants, total 49 plants were found to be herbs, 16 were shrubs, 47 were trees and only 07 were found to be climbers. The table also showed that, Total 18 different cacti were identified situated in Cactus house and more than fifty medicinal plants were planted in medicinal plant garden which is developed by forest department under the scheme of conservation. Most of the plants were found to be common and dominant in laling forest. Most of cacti were common in this forest. Similarly Ingalhalikar S. (2007), reported 1200 plant species from North Western Ghats of India. Total 158 plant species were identified from the main campus site of central university of punjap in 2013 (singh et al, 2014). Total of 532 plant species belonging to 308 genera and 80 families were identified as crop land by Prayaga M. P and Venkaiah M., (2011) during 2006-09. During 2006-09, these 382 were dicots, 149 monocots and one pteridophyte. Out of 532 species 396 were herbs, 36 undershrubs, 51 shrubs and 49 falls under climbing category. One species belonging to Solanaceae is the new record to Andhra Pradesh. Poaceae, Fabaceae, Asteraceae, Acanthaceae, Euphorbiaceae, Cyperaceae, Rubiaceae, Lamiaceae, Convolvulaceae, Malvaceae, Amaranthaceae, Commelinaceae, Asclepiadaceae, Scrophulariaceae and Solanaceae were among the largest families represented by more than 10 species. Rad Eshaghi J. et. al (2009), 104 species were recorded from Four communities, including Querco-Carpinetum betulii, Carpineto-Fagetum Oriental, Rusco-Fagetum Oriental and Fagetum Oriental in different layers including 12 trees, 9 shrubs and 83 herbs. Mligo, C. (2015), reported total 312 plant species belonging to 62 families from Namatimbili forest. Similarly, Patunkar (1976) made an excellent study of grasses of Marathwada. These forests also shelter scores of rare endemic elements of flora and fauna. Ramanujam and Cyril (2003) studied the woody species diversity of four sacred groves in the Pondicherry region of South India. Athaya et al (2006) studied the ecological biodiversity of some forests of Sagar District. Naik (1969) explored and described morphology and uses of eight hundred four plants belonging to four hundred seventy two genera and one hundred six families of Angiospermic plants. He published his work in the flora of Osmanabad district. Parthasarathy and Karthikeyan (1997) worked on plant biodiversity inventory and conservation of two tropical dry evergreen forests on the Coromandel Coast, south India. Similar work has been carried out by different workers such as Sayeeduddin (1940), Rahman et al (2007), Kandya and Prashanth (2008), Arjaria and Chaurasia (2008), Shrikant et al (2008), Chakraborty(2009), Choudhary and Upadhyaya (2009), Ahirwar and Tripathi (2009), Jagtap and Mukherjee (2013), recorded total 237 species belonging to 184 genera and 73 families which are listed in this paper. Out of 73 families listed, 63 belong to dicotyledonae and 10 belong to monocotyledonae. Dominant families were Fabaceae (21 genera), Acanthaceae (12 genera) followed by Asteracece (9 genera).

Table-1: Studies on plant diversity of Laling Forest of Dhule District (Mh.), India.

Sr. No	Botanical Name	Common Name	Family	Habit
1.	*Andrographis lineata* Wall. Ex Nees	Kalmedh	Acanthaceae	Herb
2.	*Andrographis paniculata* (Burm.f.) Nees	Kali chiraet	Acanthaceae	Annual Herb
3.	*Adhatoda vassica* (Medic)	Adulsa	Acanthaceae	Shrub
4.	*Agave Americana* L.	Ketki	agavaceae	Sub shrub
5.	*Trianthema portulocastrum* L.	vasu	Aizaceae	Herb
6.	*Amaranthus spinosus* L.	Matla	Amaranthaceae	Herb
7.	*Celosia argentea* L.	Kurdu	Amaranthaceae	Herb
8.	*Alternanthera sessilis* (L.) R.Br,ex DC		Amaranthaceae	Herb
9.	*Magnifera indica* L.	Amba	anacardiaceae	Tree
10.	*Semecarpus anacardium* L. f.	bibba	anacardiaceae	Tree
11.	*Annona squamosa* L.	Sitaphal	Annonaceae	Tree
12.	*Annona reticulate* L.	Ramphal	Annonaceae	Tree
13.	*Catharanthus roseus* L.	Sadafully	Apocynaceae	Herb
14.	*Nerium indicum* L.	Kanher	Apocynaceae	Shrub
15.	*Carissa inermis* Vahl	Karvand	Apocynaceae	Shrub
16.	*Rauvolfia serpentine* (L.)Bth.ex Kurz	Sarpagandha	Apocynaceae	Shrub
17.	*Cascabella thevetia* / *Thevetia peruviana* (Pers.) K. Schum	Bitti	Apocynaceae	Tree
18.	*Calotropis procera* L.	Rui	Asclepiadaceae	Herb
19.	*Gymnema sylvestre* (Retz.)R.Br. Schultes	Pitani	Asclepiadaceae	Climber
20.	*Eclipta prostrata* L.	Maka	Asteraceae	Herb
21.	*Tridax procumbens* L.	Kolashi	Asteraceae	Herb
22.	*Parthenium hysterophorus* L.	Gajor-Ghass	Asteraceae	Herb
23.	*Grangea maderaspatana* (L.) Poir.		Asteraceae	Herb
24.	*Vicoa indica* (L.) DC.	Sonkari	Asteraceae	Herb
25.	*Tecoma stans* (Linn.) H.B.& K.	Tecoma	Bignoniaceae	Small Tree
26.	*Bombax ceiba* L.	Katesavar	Bombacaceae	Herb
27.	*Coldenia procumbens(L)*		Boraginaceae	Herb
28.	*Cordia dichotoma* Forst. F.	Bhokar	Boraginaceae	Tree
29.	*Cordia gharaf* (Forssk.) Ehrenb.& Asch.	Gondan	Boraginaceae	Tree
30.	*Parkinsonia aculeata* L.	Vedi-Babhul	Caesalpiniaceae	Tree
31.	*Saraca asoca* (Roxb.)	Sita-Ashok	Caesalpiniaceae	Tree
32.	*Bauhinia Purpurea* L.	Aapta	Caesalpiniaceae	Tree
33.	*Tamarindus indicus* L.	Chinch	Caesalpiniaceae	Tree
34.	*Caesalpinia pulcherima* L.	Shankasur	Caesalpiniaceae	Tree
35.	*Delonix regia* L.	Gulmohar	Caesalpiniaceae	Tree
36.	*Carica papaya* L.	Papai	Caricaceae	Tree
37.	*Garcinia indica* (Du Petit-Thou.) Choisy	Kokum	Clusiaceae	Tree
38.	*Cochlospermum religiosum* (L.)	Ganer	Cochlospermaceae	Tree
39.	*Quisqualis indica (L.)*	Madhumalti	Combretaceae	Climber
40.	*Terminalia chebula* Retz	Hirda	Combretaceae	Tree
41.	*Terminalia bellirica* (Gaertn.) Roxb	Behada	Combretaceae	Tree
42.	*Terminalia catappa* L.	Badam	Combretaceae	Tree
43.	*Terminalia arjuna* (Roxb. Ex DC)	Arjun	Combretaceae	Tree
44.	*Commelina Benghalensis* L.	Kena	Commelinaceae	Herb
45.	*Ipomea obscura* L.	Morning glory.	Convolvulaceae	Climber

46.	*Costus speeciosus* (J. Konig)	Pev	Costaceae	Herb
47.	*Kalanchae pinnata* (Lam.)	Pan-futi	Crassulaceae	Herb
48.	*Citrullus lanatus* L.	watermelon	Cucurbitaceae	Herb
49.	*Elaeocarpus sphaericus* (Gaertn.) K.Schum.	Rudraksha	Elaeocarpaceae	Tree
50.	*Euphorbia heterophylla* L.	Dudhi	Euphorbeaceae	Herb
51.	*Phyllanthus amarus* L.	Bhule- Amla	Euphorbeaceae	Herb
52.	*Euphorbia hirta* L.	Dudhadi	Euphorbiaceae	Herb
53.	*Ricinus communis* L.	Erandi	Euphorbiaceae	Shrub
54.	*Putranjiva roxburghii* L.	Putranjiva	Euphorbiaceae	Tree
55.	*Phyllanthus emblica* L.	Amla	Euphorbiaceae	Tree
56.	*Vigna unguiculata L.*	Cowpea	Fabaceae	Herb
57.	*Abrus precatorius* L.	Kali-Gunj	Fabaceae	Climber
58.	*Gliricidium sepium* L.		Fabaceae	Tree
59.	*Vitiveria zizaniodes* L.	wala	Graminae	Herb
60.	*Cymbopogon citratus* (DC.) Stapf	Gavati- chaha	Graminae	Herb
61.	*Cymbopogon martinii* (Var.safiya)	Tikhati	Graminae	Herb
62.	*Eragrostics tenella* L.	Hawai	Graminae	Herb
63.	*Cynodon dactylon*(L.)Pers.	Durvagrass	Graminae	Herb
64.	*Cymbopogon winterianus* (L.) Sperng	Cintronella	Graminae	Herb
65.	*Bambusa arundinceae* (Retz.)	Bamboo	Graminae	Tree
66.	*Mentha Spicata* L.	Pudina	Labiatae	Herb
67.	*Coleus Amboinicus* L.	Pan-ooa	Labiatae	Herb
68.	*Ocimum basilicum* L.	Sabja	Lamiaceae	Herb
69.	*Urginea indica (Roxb)*	Pan-kanda	Liliaceae	Herb
70.	*Allium sativum* L.	lasun	Liliaceae	Herb
71.	*Asparagus racemosus* L.	Shatavari	Liliaceae	Herb
72.	*Aloe vera* (L.) Burm.	Korpad	Liliaceae	Herb
73.	*Iphiginia indica* (kunth)	Jangali- Lahasun	Liliaceae	Herb
74.	*Chlorophytum tuberosum* (Roxb.)	Safed- musali	Liliaceae	Herb
75.	*Ammania baccifera* L.	Bhar- Jambul	Lythraceae	Herb
76.	*Abelmoschus esculentum* L.		Malvaceae	Annual Shrub
77.	*Hibiscus rosasinesis* L.	Jaswand	Malvaceae	Shrub
78.	*Urena lobata* L.	Van- Bhendi	Malvaceae	Shrub
79.	*Grewia asiatica* L.	Phalsa	Malvaceae	small Tree
80.	*Azardirachta indica* L.	Neem	Meliaceae	Tree
81.	*Tinospora cordifolia* (Thunb.)	Gul-vel	Menispermaceae	Climber
82.	*Tinospora glabra* L.	Gugul	Menispermaceae	Shrub
83.	*Acacia concinna*. L.	Shikekai	Mimosaceae	Tree
84.	*Acacia leucophloea* L.	Hivar	Mimosaceae	Tree
85.	*Mimosa pudica* L.	Lajalu	Mimosaceae	Herb
86.	*Dechrastachys cinerea* weight.	Hivar	Mimosaceae	Small Tree
87.	*Acacia polyacantha* wild.		Mimosaceae	Tree
88.	*Leucenea glanea* L.	Subabul	Mimosaceae	Tree
89.	*Ficus benghalensis* L.	Vad	Moraceae	Tree
90.	*Ficus racemosa* L.	Umber	Moraceae	Tree
91.	*Moringa latifera* L.	Shewga	Moringaceae	Tree
92.	*Syzygium cumuni* (L.)	Jambhul	Myrtaceae	Tree
93.	*Baugoinvallea spectabilis* Willd.	Bogon-vel	Nactaginaceae	Climber
94.	*Jasmium sambac* L.	Mogra	Oleaceae	Shrub

95.	*Oxalis coniculata* L.	Changeri	Oxalidaceae	Herb
96.	*Trigonella foenum* L.	Methi	Papilinaceae	Herb
97.	*Hemidesmus indicus* L.	Anantvel	Periplocaceae	Herb
98.	*Decalepis hamiltonii* Wt.& Arm.		Periplocaceae	Climber
99.	*Piper longum* L.	Gup-pipal	Piperaceae	Herb
100.	*Zizipus jujuba* L.	Bor	Rhamnaceae	Tree
101.	*Zizipus rugosa* L.	Torn	Rhamnaceae	Tree
102.	*Gardenia recinifera* L.	Dikamali	Rubiaceae	Tree
103.	*Neolamarckia cadamba* L.	Kadamb	Rubiaceae	Tree
104.	*Hamelia patens* L.	Fibre –bush	Rubiaceae	Tree
105.	*Ruta graveolens* L.	Satap	Rutaceae	Herb
106.	*Citrus limon* L.	Lemon	Rutaceae	Tree
107.	*Santalum album* L.	Chandan	Santalaceae	Tree
108.	*Sapindus emarginatus* L.	Ritha	Sapindaceae	Tree
109.	*Manilkara hexandra* Roxb.	Khirni	Sapotaceae	Tree
110.	*Mimusops elengi* L.	Bakul	Sapotaceae	Tree
111.	*Manilkara zapota* L.	Chikkoo	Sapotaceae	Tree
112.	*Ailanthus excelsa* Roxb.	maharukh	Simaroubaceae	Tree
113.	*Dhatura metal* L.	Kala-dhotra	Solanaceae	Herb
114.	*Capsicum annum* L.	Red paper	Solanaceae	Shrub
115.	*Solanum melongena* L.	Vangi	Solanaceae	Shrub
116.	*Withania sominfera* L.	Dhor- gunj	Solanaceae	Shrub
117.	*Duranta rapens* L.	Duranta	verbenaceae	Shrub
118.	*Lantana camara* Linn.	Ghaneri	verbenaceae	Shrub
119.	*Vitex nigundo* Linn.	Nirguli	Verbinaceae	Shrub
120.	*Agave angustifolia*	Caribben Ageve	Cactaceae	
121.	*Aloe Juvenna*	Tiger Tooth Aloe	Cactaceae	
122.	*Cansoliea falcate*		Cactaceae	
123.	*Cylindropuatiakleiniae*	Cholla	Cactaceae	
124.	*Eachino cactus*		Cactaceae	
125.	*Florade corrana*		Cactaceae	
126.	*Garolea lapaixii*		Cactaceae	
127.	*Haworthia attenuatta*	Zebra Cactus	Cactaceae	
128.	*Huemia barbuta*		Cactaceae	
129.	*Mammillaria*		Cactaceae	
130.	*Neobus baumia*		Cactaceae	
131.	*Opuntia microdasys (red colour)*		Cactaceae	
132.	*Opuntia microdasys (Yellow color)*		Cactaceae	
133.	*Porodia*		Cactaceae	
134.	*Sansevieria*		Cactaceae	
135.	*Seneciopendulus*		Cactaceae	
136.	*Stapelia Gingantea*		Cactaceae	
137.	*Cereus peruvianus*		Cactaceae	

CONCLUSION

This study is based on diversity of plants in Laling Forest of Dhule district, which provides a preliminary data of the different categories of plants in Laling Forest of Dhule district. It will be helpful to students and researchers related to this field for identification of plants and their specificity. Further study is required for

distribution and quantification of plants for ecological management.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Ahirwar JR and Tripathi JP (2009) Importance value index of some tree species of Bangaun forest. *Biozone,* 1(1): 59-64.

Arjaria A and Chaurasia K (2008) Phytosociological study of some ethno-medicinal plants at Chhatarpur district (M. P.). *Journal of the Botanical Society, University of Saugar*, 43: 125-132.

Athaya CD, Kaushlesh Pathak and Bajpai SP (2006) Ecological biodiversity of some forests of Sagar, Madhya Pradesh. *J. Bot. Soc. Uni. Saugar*, 41: 37-43.

Bisht T, Shah S, Tiwari B and Tiwari A (2004) Study of important medicinal trees, shrubs, and herbs for some vegetational parameters between 300-2000 m elevations. *Ecol. Env. & Cons.,*10(1): 43-46.

Chakraborty K (2009) Vegetation change detection in Barak Basin. *Current Science,* 96(5): 1236 1242.

Choudhary MC and Ravi Upadhyaya (2009) Ecological distribution of family Acanthaceae in Hoshingabad district. *Biozone,* 1(1): 51-54.

Chetty KM, Shivaji K, Tulasi rao K (2008) Flowering plants of chittoor district Andhra Pradesh, students offset printers, Tirupati.

Das MK and BP Chourdhury (2008) Biodiversity: Concepts and Approaches. In: *Plant Nomenclature and Biodiversity Conservation*. Kalyani Publishres, Ludhiana, India. Pp. 79-121.

Dhar U (2002) Conservation implications of plant endemism in high-altitude Himalaya. *Current Science,* 82(2): 141-148.

Jagtap S and Mukherjee S (2013) Plant diversity of Gadchiroli district of Maharashtra , India; a brief survey. Check list the biodiversity data , vol.-9 (1).

Ingalhalikar S (2007) Further Flower of Sahyadri. corolla publication, pune.

Ingalhalikar S (2012) Flower of Sahyadri. corolla publication, pune.

Kandya AK and Prashanth KP (2008) A study of plant habitats in Achanakmar-Amarkantak Biosphere Reserve, India. *Journal of the Botanical Society University of Saugar*, 43: 12-24.

Kshirsagar SR and Patil DA (2008) Flora of Jalgaon District, Maharashtra.

Manilal KS (1998) A Handbook of Taxonomic Training. Department of Science and Technology by Manilal K.S. and M. S. Muktesh.

Mligo C (2015) Conservation of plant biodiversity of Namatimbili forest in the southern coastal forests of Tanzania. *International Journal of Biodiversity and Conservation*, Vol7 (3), pp. 148—172.

Naik VN (1969) *The flora of Osmanabad, Taxonomy and Ecology of Flowering Plants*. Ph. D. Thesis, Marathwada University, Aurangabad.

Naik VN (1998) *Flora of Marathwada*, Vol. I-II. Amrut Prakashan, Aurangabad, M.S. (India).

Parthasarathy N and Karthikeyan R (1997) Plant biodiversity inventory and conservation of two tropical dry evergreen forests on the Coromandel Coast, South India. *Biodiversity and Conservation*, 6 (8): 1063-1083.

Patunkar BW (1976) *Contribution to the Botany of Marathwada-V. taxonomic studies in the grasses of the region.* Ph. D. thesis, Marathwada Univ. Aurangabad.

Prayaga MP and Venkaiah M (2011) Biodiversity of Weed Species in Crop Fields of North Coastal Andhra Pradesh, India. *Indian Journal of Fundamental and Applied Life Sciences* Vol. 1 (2): 59-67 pp.

Rad Eshaghi J, Manthey M, Mataji A (2009) Comparison of plant species diversity with different plant communities in deciduous forests. *Int. J. Environ. Sci. Tech*., 6 (3), 389-394.

Rahman AH, Anisuzzaman MM, Ferdous A, Naderuzzaman ATMand Rafiul IAKM (2007) A floristic study in the graveyards of Rajshahi city. *Research Journal of Agriculture and Biological Sciences*, 3(6): 670-675.

Ramanujam MP and Cyril PKK (2003) Woody species diversity of four sacred groves in the Pondicherry region of South India. *Biodiver Conser,* 12: 289-299.

Ramirez CR (2007) Ethnobotany and the Loss of Traditional Knowledge in the 21st Century. *Ethnobotany Research & Applications,* 5: 245-247.

Retnam, KR and Martin P (2006) *Ethnomedicinal Plants.* Agrobios (India), Jodhpur. pp:05.

Rothe SP (1985) *Flora of Beed District: A floristic study of flowering plants.* Ph.D. Thesis, Marathwada University, Aurangabad.

Sarin YK (2003) Medicinal plant raw materials for Indian drug and pharmaceutical industry: An appraisal for resources. *Indian forester*, 1: 3-24.

Sayeeduddin M (1940) Preliminary observation on a recent botanical tour to Amrabad Forest Reserve.

H. E. H. the Nizam's dominion, Hyderabad Deccan, *J. Bombay Nat. His. Soc*. 41: 907.

Shrikant K, Ramu G, Radhakrishna M and Narasimha Ramulu K (2008) Impact of deforestation on biodiversity of Eturunagaram Wildlife Sanctuary, Warangal, A. P. India. *J. Natcon,* 20(2): 201-211.

Singh A and Saini RG (2014) Plant biodiversity of central university of punjab main campus. city campus , mansa road, bathinda.

Venu P (1998) A review of floristic diversity Inventory and Monitoring Methodology in India. *Pinsa,* 64(5 &6): 281-292.

Yadav SR and Sardesai MM (2002) *Flora of Kolhapur District*, Shivaji University, Kolhapur (India). Pp.1-680.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Antimicrobial potential and phytochemical screening of leaves and fruits of *Solanum thorvum* (swartz). A medicinally important plant

Ugandhar T[1*], Venkateshwarlu M[2], Odelu G[3], Rajendra prasad B[4] and Anitha devi U[5]

[1]Department of Botany, Govt. Degree College Mahabubabad -506101,
[2]Department of Botany University 3 College Kakatiya University W arangal-505006, [3]Department of Botany, Govt. Degree College Parkal 4506164,
[4]Department of Botany, UCS, Saifabad, Osmania University, Hyderabad-500004 [5]Department of Botany Govt. Degree College Peddapally-505172
*Corresponding Author Email: tugandharbiotech@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Ugandhar T, Venkateshwarlu M, Odelu G, Rajendra prasad B and Anitha devi U (2019) Antimicrobial potential and phytochemical screening of leaves and fruits of *Solanum thorvum* (swartz). A medicinally important plant, *Int. J. of. Life Sciences*, Special Issue, A13: 190-195.

ABSTRACT

The present study designed for antimicrobial potential and phytochemical screening of leaves and Fruits of *Solanum torvum* (Swartz) belongs to the family Solanaceae it is an Important Medicinal Plant. The plant has been used in the folklore system of medicine for the treatment of Asthma, Diabetes and hypertension. To evaluate the antimicrobial potential activity, hydrogen peroxide radicals scavenging activity, reducing power, the total phenolic and flavonoids contents, and antioxidant and antifungal activities of methanol, ethanol and water extracts of leaves and fruits of *Solanum thorvum.*(Swartz). Methanol, ethanol and water extracts were evaluated against four Gram positive and Gramnegative bacterial isolates (*Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Bacillus subtilis*) and two fungal strains (*Aspergillus fumigatus* and *Aspergillus flavus*). Methanol extract at different concentrations was tested for antimicrobial potential and phytochemicals were determined by using spectrophotometric method.
The total phenolic content was (40.859±0.017) mg gallic acid/g in the leaves of *L. camara*, while the total flavonoids were (53.112±0.199) mg/g dry weight. Methanol leaves and fruits extract of *Solanum thorvum.*(Swartz) showed maximum antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aeruginosa* and was also effective against other bacterial strains as compared to ethanol and aqueous extracts of leaves and fruits. The methanol leaf extract of *Solanum thorvum.*(Swartz) exhibited significant inhibition (71%) and (66%) against *Aspergillus fumigatus* and *Aspergillus flavus* respectively.
The methanol extract of the *Solanum thorvum.*(Swartz) leaves and fruits effective against selected bacterial and fungal strains. Its phytochemical contents have broad antimicrobial properties and the plant might be a novel source of antimicrobial drug.

Keywords: Methanol, ethanol, Antimicrobial, Phytochemicals *Solanum thorvum*

INTRODUCTION

Medicinal plants have always been used to relieve and cure human diseases (Szopa *et al.,* 2017). Currently, the development of microbial resistance to antibiotics and the toxicity of synthetic antioxidants have led researchers to exploit the plant world in order to search for effective natural molecules that are free of any adverse effects (Silva *et al.,* 2016).

Distemonanthus benthamianus (D. benthamianus) H. Baill (Leguminosae) is a tree distributed in tropical Africa, its bark powder associated with that of red wood (padouk) is used traditionally against skin conditions. It is also administered in enemas for diarrheal diseases (Raponda *et al.,* 1967). This species is rich in phenolic compounds such as oxyayanine, cyanine and alkaloids (Aiyegoro *et al.,* 2008). Certain compounds derived from *D. benthamianus* have anti-antiadrenergic, antioxidant, antitumor and contact dermatitis effects (Yousaf *et al.,* 2013). *Solanum torvum* Sw (S**.** *torvum)* (Solanaceae) is a slender shrub, its fruits and leaves can fight series of microbial diseases. The heated leaves of *S. torvum* are applied to cutaneous infections (Silva *et al.,* 2016). *S. torvum* is rich in phytochemicals such as steroidal saponins, steroidal alkaloids and phenols (Chang *et.al.* 2007). The antimicrobial, antiaggregant, analgesic, anti-inflammatory and cytotoxic activities of this plant have been described by (Yousaf *et al.* 2013) Microbial infections are diseases caused by the development of bacteria or yeasts, some of which are pathogenic (Rahal *et al.,* 2014) In addition to microbial infections, free radicals are implicated in the etiology of a large number of pathologies that are now considered to be one of the major public health problems (Koech *et al.,*2014)

However, plants have an anti-radical and antimicrobial potential that would allow them to play a beneficial role in terms of preventive action, which is very important for human and animal health (Aiyegoro and 2010). The purpose of this work is to determine the medicinal properties of stem bark extracts of *S. torvum* Sw in Gabon by evaluating the phytochemical constituents as well as the antimicrobial and antioxidant activities of the extracts of these plant.

MATERIAL METHODS

Plant material : The Leaves and fruits of *S. torvum* Sw. was made according to traditional medicinal use. Plant samples were collected in Department of Botany Govt. Degree College Mahabubabad in Sept 2019. Identification of the species was carried out at the National Herbarium of the Institute of Pharmacopoeia and Traditional Medicine. The identification numbers of *S. torvum* Sw. were Bourobou 255,respectively.

Treatment of plant material:
The plant samples were freeze-dried, powdered, kept at ambient temperature, and protected from light. Each sample (20 g) was mixed with 250 ml of suitable solvents [water (100%); water-acetone (30:70, v/v); water-ethanol (30:70, v/v)]. The water extracts were boiled for 60 min. All the extracts were filtered and concentrated. The concentrates were lyophilized and stored in sterile vials at 4°C. *Chemical products* Butylated hydroxyanisole (BHA), 2,2'-azino-bis 3-ethylbenzothiazoline-6-sulfonic acid (ABTS), 1,1-diphenyl-2-picrylhydrazyl (DPPH), ethanol, sulfuric acid, hydrochloric acid, sodium chloride, Folin-Ciocalteu, gallic acid and ascorbic acid (vitC) were from Sigma-Aldrich (StLouis,MO,USA).

Preliminary photochemical study
Each extract was tested for the presence of flavonoids, coumarins, tannins, total phenolics, saponosides, triterpenoids, alkaloids and anthracenoids as described by Aiyegoro *et al.,*2013

Quantitative photochemical analysis

Total phenol content
To determine the total phenol content, the Folin-Ciocalteu method was used (Hossain *et al.,* 2013). Absorbance was measured at 735 nm. All experiments were performed in triplicate and the phenolic compounds were expressed in gallic acid equivalents (GAE).

Total flavonoid content:
The aluminum trichloride method was used to determine the flavonoid content and the absorbance was measured at 435 nm. The flavonoid content was expressed in quercetin equivalent (QE) (Angkawijaya2014)

Tannin content:
The reference method by Sima-Obiang *et al* was used to determine the tannin content (Ngoua-Meye-Misso 2018). Absorbance was measured at 525 nm and tannic acid was used as a standard. The tannin contents were

expressed in mg of tannic acid equivalent (TAE)/100g of extract.

Proantho cyanidins content:
The determination of proanthocyanidins was carried out by the HCl-Butanol method (Blois 1958) Absorbance was read at 550 nm and apple procyanidin was applied as standard. Proanthocyanidin levels were expressed in apple procyanidins equivalent (APE).

Antioxidant activity assay DPPH assay: The measurement of the anti-radical activity was conducted according to the method of Blois as described by Brand-Williams *et al* 2017 with some modifications. The principle of this method is based on the measurement of the free radical scavenging of diphenyl picryl hydrazyl (DPPH) dissolved in methanol. The addition of an antioxidant in a solution of DPPH leads to a discoloration of the latter which is directly proportional to the antioxidant capacity of the added product. This discoloration can be followed spectrophotometrically by measuring the decrease in absorbance at 517 nm. It provides a convenient way to measure the antioxidant activity of *D. benthamianus* and *S. torvum* extracts. DPPH solutions were incubated for 30 min in the absence (control) or in the presence of increasing concentrations of plant extracts. Vit C and BHA were used as references.

At the end of the incubation period, the absorbance at 517 nm was read and the antioxidant activity was calculated according to the following formula: %Radical scavenger activity = [(Absorbance of DPPH – Absorbance of sample) / Absorbance of DPPH] x 100
ABT S method: The ABTS test is based on the ability of an antioxidant to stabilize the $ABTS^{\bullet}$ radical by transforming it into ABTS. A mixture of ABTS solution (7 mM) and potassium persulfate (2.4 mM) was incubated for 12 h in the dark at room temperature until formation of the ABTS radical complex ($ABTS^{+}$). To 60 µL of extract, 2.94 mL of $ABTS^{\bullet+}$ solution were added. The mixture was incubated at 37 °C for 20 min in the dark. Vit C and BHA were used as references. After incubation, the absorbance was measured in a spectrophotometer at 734 nm. The percent inhibition (PI) was calculated by the following method:

Percentage inhibition= $[(A_0 - A)/A_0]$ x100 where, A_0 is the absorbance of ethanol, A is the absorbance of sample extractor standard.
Microorganism test: *Microorganisms used in this study included* Escherichia coli (*E. coli*) 0157 ATCC, *E. coli* 105182 CIP, *Listeria innocua* (L. innocua) LMG 135668 BHI, *Staphylococcus aureus* (S. *aureus*), ATCC 25293 BHI, *Enterococcus faecalis* (*E. faecalis*) 103907 CIP, *Bacillus cereus* (*B. cereus*) LMG 13569 BHI, Shigella dysenteriae (*S. dysenteriae*) 5451 CIP, *Pseudomonas aeruginosa* (*P. aeruginosa*), *Salmonella enterica* (*S. enterica*), *Salmonella typhimurium* (S. typhimurium), *Shigella flexneri* (*S. flexneri)*, *S. dysenteriae*, *Neisseria gonorrhoeae* (N. gonorrhoeae), *E. coli*, *E. faecalis, S. aureus, Klebsiella pneumoniae* (*K. pneumoniae)*, *Acinetobacterbaumannii (A.baumannii*),. Gentamicin, ampicillin and tetracycline were used as positive controls for the bacterial strains tested.

Antibacterial sensitivity test:
The diffusion method was used to study the susceptibility of microorganisms to plant extracts. Bacteria and fungi were respectively grown in Muller Hinton and Sabouraud broths. Each culture was then suspended in a solution of sodium chloride (NaCl, 0.9%) to a turbidity equivalent to that of the standard Mac Farland 0.5. The extracts were diluted in dimethylsulfoxide at 100 mg/mL. Each extract (10 µL) was loaded onto each filter paper disc.

The agar was suspended in distilled water, heated to complete dissolution and autoclaved at 121 °C and poured into Petri dishes. Disks were placed on cultures and antimicrobial activity was estimated after incubation at 37°C for 24h by measuring the inhibition diameter.
The relative percentage inhibition (RPI) of the plant extracts relative to the positive control (Gentamicin) was calculate dusing the following formula
RPI=100x(X-Y)/(Z-Y)
Where X is the total zone of inhibition of the plant extract, Y is the total zone of inhibition of the solvent and Z is the total zone of inhibition of the standard drug (Gentamicin).

Minimum inhibitory concentrations (MICs), minimum bactericidal concentrations (MBCs) and minimum fungicidal concent rations (MFCs)
MICs, MBCs and MFCs were determined by the microdilution technique. Briefly, the nutrient broth was dispensed into the wells of a microplate. One hundred microliters of extracts were added to the first well of one row and double dilution was performed in other wells. Ninety microliters of nutrient broth and 10 µL of inoculum were added to the wells. A concentration range of the extract of 0.004 9 to 5 mg/mL was obtained.

The plates were gently shaken and incubated at 37 °C for 24 h; the inhibition was evaluated by the absence of turbidity in the wells.

To determine MBCs and MFCs, 100 µL of each well showing no visible growth were collected and seeded in agar plates containing agar. The plates were incubated at 37 °C for 24-48 h and the number of colonies was counted.

The action of an antimicrobial on a microorganism can be characterized with several parameters such as MIC and MBC or MFC. According to the MBC/MIC or MFC/MIC report, antimicrobials with MBC/MIC ratios of 1 are considered to be microbicides; while those with the MBC/MIC ratio as 2 or greater are considered to be bacteriostatic or fungistatic.

Statistical analyses

The experimental results were expressed as mean ± standard deviation. All measurements were replicated three times. The data were analyzed by the univariate ANOVA test followed by the Dunnet/Tukey test for multiple comparisons and determination of significance rates. Values of $P < 0.05$ were considered statistically significant.

RESULTS

Phytochemical screening

Phytochemical screening of extracts was performed to detect major chemical groupsshows that total phenols, total flavonoids, proanthocyanidins, anthracenosides and coumarins were abundant in the crude extracts of *D. benthamianus* and *S. torvum*.

The total phenolic, total flavonoids, total tannins and total proanthocyanidins contents of *D. benthamianus* and the total phenolic content ranged from (660.2 ± 4.3) to (2 760.7 ± 5.2) mg GAE/100 g of extracts. The water-ethanol extract of *D. benthamianus* had the highest phenolic content and the water extract of *S. torvum* was the lowest in phenolic compounds. The results of the total flavonoids did not show a significant difference between *D. benthamianus* and *S. torvum* extracts. The amount of tannin was highest in the water-ethanol extract of *D. benthamianus* [(1 350.8 ± 9.0) mg TAE/100 g extracts]. *3.2. Antioxidantactivities*.

Sensitivity test of extracts:

Screening of antimicrobial properties of six samples showed that all extracts of *D. benthamianus* and *S. torvum* had antimicrobial activities . The antimicrobial activity of the two plants studied varied from one extract to another. In fact, *B. cereus* LMG 13569 BHI and *S. dysenteriae* were most sensitive among all microbial strains studied. Extracts of *S. torvum* had the higher inhibition diameters compared to extracts of *D. benthamianus*. Several microbial strains such as *B. cereus* LMG 13569 BHI, *S. dysenteriae* 5451 CIP, *S. dysenteriae, N. gonorrhoeae* and *E. faecalis* were more sensitive on the majority of crude extracts compared to standard (gentamicin, tetracycline, ampicillin).

Table 1: Phytochemicals present in aqueous and ethanolic extract of *S. torvum*

Sl.No	Phytochemical	Results	
		Aqueous extract	Ethanolic extract
1.	Anthocyanin	-	-
2.	Diterpenes: Copper acetate test	+	++
3.	Steroids	+	++
4.	Cardial Glycosides: Keller-Killani test	+++	_
5.	Tannin: Lead acetate test	++	_ _
6.	Lead acetate test $FeCl_3$	+	_
7.	Flavonoid Alkaline Reagent Test	+++	+
8.	Phlobatannins	-	-
9.	Phytosterol: Salkowski's test	+	+
10.	Alkaloids Wagner's reagent	+++	+
11.	Phenols: $FeCl_3$ test	+++	+
12.	Leucoanthocyanin	-	-
13.	Coumarin Test		
14.	Saponin: Foam test	+++	+

DISCUSSION

Traditional healers make use of medicinal plants to treat microbial diseases without any scientific basis. This experimental study was used to evaluate the antioxidant and antimicrobial potential of plant extracts rich in phenolic compounds (water-acetone, water-ethanol and water extracts of *S. torvum)*. Phytochemical screening in this study revealed the presence of a few secondary metabolites in the stem bark of *D. benthamianus* and the fruits of *S. torvum*. The work of Mounguengui *et al*. also showed the presence of tannins and flavonoids in the extracts of *S. torvum* The qualitative study of *S. torvum* highlights secondary metabolites in the six extracts studied. Phenolic compounds are active substances that may have biological or pharmacological activities Angiolella *et al*. (2017) also reported that phenolic compounds have antibacterial, antioxidant and anticancer effects. Therefore, the use of *S. torvum* fruit in traditional medicine could be attributed to the high content of phenolic compounds. This content contributes to the antioxidant power of the plant. These antioxidants can act according to two major mechanisms, either by transfer of hydrogen atom or by electron transfer. In the present study, two methods were used to demonstrate the antioxidant activity of the crude extracts of *S. torvum*. Thus, the capacity of the water-ethanol and water-acetone extracts to reduce the free radicals DPPH and ABTS is greater than that of the aqueous extract. The results of our study on the antioxidant activity of *S. torvum* extracts are compatible with the work of Mounguengui *et al* 2006 . However, Kumar *et al* 2007 demonstrated that water extracts of *S. torvum* had a high antioxidant capacity compared to methanol extracts. Antioxidant activity can be directly related to the amount of phenolic compounds present in various extracts[1]. The antimicrobial activity of the crude extracts of *S. torvum* was evaluated by two methods (diffusion and microdilution). The results obtained in this study show that the water-ethanol and water-acetone extracts of both plants have a great inhibitory effect on the growth of all bacterial and fungal strains tested. These observed activities are also explained by the results of the chemical analysis of plants which reveal the presence of phenolic compounds whose antimicrobial properties have already been demonstrated The antimicrobial activity of the stem bark of fruits of *S. torvum* varies from one extract to another and from one microorganism to another

These results support Evina *et al*. which showed the antimicrobial activity *S. torvum* extracts against several Gram-positive and Gram-negative bacteria. This variability of inhibition may be due to the resistance capacity linked to the bacterial groups or to the nature of the compounds present in the plant extracts. The work of Lalitha *et al* 2001 on antimicrobial activity of *S. torvum* also corroborates with the results of our study.

CONCLUSIONS

The methanol extract of the *Solanum thorvum.*(Swartz) leaves and fruits effective against selected bacterial and fungal strains. Its phytochemical contents have broad antimicrobial properties and the plant might be a novel source of antimicrobial drug.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Aiyegoro O, Akinpelu D, Afolayan A, Okoh A. Antibacterial activities of crude stem bark extracts of *Distemonanthus benthamianus* Baill. *J Biol Sci* 2008; 8(2): 356-361.

Aiyegoro OA, Okoh AI. Preliminary phytochemical screening and *in vitro* antioxidant activities of the aqueous extract of *Helichrysum longifolium* DC. *BMC Complement Alter Med* 2010;10(1):21.

Blois MS. Antioxidant determinations by the use of a stable free radical. *Nature* 1958; 181(4617): 1199.

Brand-Williams W, Cuvelier ME, Berset C. Use of a free radical method to evaluate antioxidant activity. *LWT-Food Sci Tech* 1995; 28(1): 25-30.

Chang HH, Cohen T, Grad YH, Hanage WP, O'Brien TF, Lipsitch M. Origin and proliferation of multiple-drug resistance in bacterial pathogens. *Microbiol Mol Biol Rev* 2015;79(1):101-116.

Do QD, Angkawijaya AE, Tran-Nguyen PL, Huynh LH, Soetaredjo FE, Ismadji S, et al. Effect of extraction solvent on total phenol content, total flavonoid content, and antioxidant activity of *Limnophila aromatica. J Food drug Anal* 2014; 22(3): 296-302.

Hossain MA, AL-Raqmi KAS, AL-Mijizy ZH, Weli AM, Al-Riyami Q. Study of total phenol, flavonoids contents and phytochemical screening of various leaves crude extracts of locally grown *Thymus vulgaris. Asian Pac J Trop Biomed* 2013; 3(9): 705.

Koech K, Wachira FN, Ngure R, Wanyoko J, Bii C, Karori S, et al. Antimicrobial, synergistic and antioxidant

activities of tea polyphenols. *Afr Crop Sci J* 2014; 22(4): 837-846.

Ngoua-Meye-Misso RL, Sima-Obiang C, Ndong JDLC, Ondo JP, Abessolo FO, Obame-Engonga LC. Phytochemical screening, antioxidant, anti-inflammatory and antiangiogenic activities of *Lophira procera* a. Chev.(Ochnaceae) medicinal plant from Gabon. *Egypt J Basic Applied Sci* 2018; 5(1): 80-86.

Rahal A, Kumar A, Singh V, Yadav B, Tiwari R, Chakraborty S, et al. Oxidative stress, prooxidants, and antioxidants: The interplay. *BioMed Res Int* 2014; **2014:** 761264.

Raponda-Walker A, Sillans R. Les plantes utiles du Gabon. *Quarterly J Crude Drug Res* 1961;1(1):27

Silva LN, Zimmer KR, Macedo AJ, Trentin DS. Plant natural products targeting bacterial virulencefactors. *ChemRev* 2016;116(16):9162-9236.

Szopa A, Ekiert R, Ekiert H. Current knowledge of *Schisandra chinensis* (Turcz.) Baill.(Chinese magnolia vine) as a medicinal plant species: A review on the bioactive components, pharmacological properties, analytical and biotechnological studies. *Phytochem Rev* 2017;16(2):195-218.

Yousaf Z, Wang Y, Baydoun E. Phytochemistry and pharmacological studies on *Solanum torvum* Swartz. *J Appl Pharm Sci* 2013; 3(4): 152-160.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Biochemical & molecular characterization of *Pseudomonas fluorescence* for divulging its plant growth promoting & biocontrol traits

Paliwal Kiran and Prakash Anil

Department of Microbiology, Barkatullah University, Bhopal – 462026
Email: kiranpaliwal881@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Paliwal Kiran and Prakash Anil (2019) Biochemical & molecular characterization of *Pseudomonas fluorescence* for divulging its plant growth promoting & biocontrol traits, *Int. J. of. Life Sciences*, Special Issue, A13: 196-200.

ABSTRACT

Use of plant growth promoting bacteria for increasing the crop productivity could be an effective viable alternative for organic bio fertilizer. Plant growth promoting rhizobacteria influence the growth of plant by various mechanism. In the present investigation, rhizospheric isolate *Pseudomonas* was investigated for plant growth promoting & biocontrol traits. The isolated *Pseudomonas* was found to produce various biologically active compounds. Some of which are previously reported as effective plant growth promoters such as indole acetic acid (48 ug/ml), gibberlic acid (67ug/ml), extracellular enzymes such as amylase (20mm), lipase (10mm), phosphatase (5.7mm). Some secondary metabolites were also produced by this bacterium. Such as HCN, siderophore(87um/ml), Diacetyl Phloro Glucinol (119mg/lit.) which are recorded as potentially competent to the pathogenic fungi *Fusarium oxysporum* causing wilt of soybean. This dual efficiency of the isolated *Pseudomonas* could be a better alternative for chemical fungicides & fertilizer. This multifactorial potential could give a better result, if the large biomass of bacteria could be produced by modifying the basic media component. in this study it was found that the large amount of biomass could be produced by modifying the media component such as peptone2.5g/100ml, glucose (120Mm), proline (10Mm) along with basic King's Bmedia.

Key words: Secondary metabolites, bacterial antagonists, IAA, HCN PGPR

INTRODUCTION

Madhya Pradesh has a unique identity as the soya producing state of India. It produces 54% of the total production of soya in the country. The western and north-western parts of Madhya Pradesh are major soya producing areas. Comparatively, eastern and southern parts of Madhya Pradesh produce very little of it the rainfed potential of soybean in India is about 2.1 t/ha against the national average productivity of just 1.2 t/ha. Hence, large yield gaps exist between the potential and the actual yields harvested by the farmers. Narrowing of this yield gap may lead to doubling of soybean production.

National Agricultural Research System has so far been successful in meeting the research demands of agrarian and industrial community.

Use of chemical fertilizer is playing a significant role in increasing the crop productivity which fulfills the increasing global food demand. But the imbalanced use of chemical fertilizer & biocidal agents is having negative impact on the human health & environment. The application of chemical fertilizer is reaching to theoretical maximum use, beyond which there will be no further increase in the yield even after increasing the chemical fertilizer (berdiva 2015). Looking to the deleterious effect of agrochemical input, the plant growth promoting bacteria could be a better ecofriendly approach in the present scenario of intensified cropping system. Close association between soil & rhizobacteria is mandatory for proper plant growth & grain yield. Plant diseases account for ~13% of the world's crop production lost, nearly equivalent to $220 billion lost every year (Kandel et al. 2017).Among the crop pests, phytopathogenic fungi are the most common and cause a wide range of diseases to economically important plants (Mehnaz et al. 2013). Fusarium oxysporum, for example, is an important fungal pathogen known to cause vascular wilt diseases in more than 100 different species (Lopez-Berges et al. 2012).Secondary metabolites are low molecular weight compounds, less than 2.5 KDa produced during the idiophase of bacterial growth. Bacteria belonging to Pseudomonas, Bacillus and Streptomyces are prolific producers of secondary metabolites that include a wide array of naturally produced compounds viz., peptides, polypeptides, cyclic lipopeptides, polyketides, pyrroles, phenazines, phloroglucinols, lantibiotics, bacteriocins, lactones, macrolactone, anthracyclines, alkaloids, quinones, polyenes, pyrone, quinolones, isoquinoline, aminoglycosides, macrolides, bithiazoles, isocoumarins, aminosugars, phospholipids, siderophores and volatiles. These metabolites exhibit remarkable antimicrobial, plant growth regulatory, plant enzyme inhibitory, herbicidal, insecticidal and anti-parasitic properties. All these biological properties paved way for the use of these secondary metabolites as biocontrol agents in agriculture. so, in the present research diversified plant growth promoting & antagonistic activities are investigated as well as the optimized media component also used to enhance the biomass of the multipotent *Pseudomonas.*

MATERIAL METHODS

Sample collection & isolation of pseudomonas strains

Microbial strains were isolated by the serial dilution method from the soybean rhizospheric soil. One gram of dried soil was weighed and added to 9 ml of double distilled water (dd H_2O) in a sterile test tube and shaken well using vortex mixer; this stock solution was then diluted serially up to the dilution of 10^{-5} and 0.1 mL of diluted sample was inoculated on surface of selective King's B agar and incubated at 30°C for 2 days. The purified colonies were preserved using standard preservation methods.

Collection of the fungal pathogens

Four potent fungal pathogen of the soybean were used for the study. The fungus *Fusarium oxysporum,* from MTCC Chandigarh. Fungal pathogens were stored in PDA agar & slants at 4°C for further use.

Biochemical characterization & molecular identification of the selected strain

selected strains were isolated on selective King B medium the strains were identified and characterized by morphological, cultural, and biochemical tests using further characterized by Gram staining and biochemical tests as per methodology described by (Krieg and Holf). The various tests performed were Oxidase, MR-VP, Indole, Citrate, Urease, Nitrate reduction and fermentation of various sugar. Identification was also confirmed by 16SrRNA genesequencin by using GAGTTTGATCCTGGCTCAG and AGAAAGGAGGTATCC-AGCC forward and reverse primer sequence, respectively. The amplified PCR product was analysed by neighbour joining method &identified culture shown maximum similarity to *Pseudomonas flouroscence*.

PGPR & biocontrol potential of isolated strain

For PGPR activity of pseudomonas were taken into consideration.

To determine the amounts of IAA produced by each isolate, a colorimetric technique was performed with Van Urk Salkowski reagent using the Salkowski's method (Ehmann, 1977). The isolates were grown in king, B broth (Himedia, India) and incubated at 28 °C for 4 days. The broth was centrifuged after incubation. Supernatant was reserved and 1ml was mixed with 2ml of Salkowski's reagent (2% 0.5 $FeCl_3$ in 35% $HCLO_4$ solution) and kept in the dark. The optical density (OD) was recorded at 530 nm after 30 min.

In this study *Pseudomonas* was examined for exploring antifungal activity of strains by dual culture assay using method described by (idris *et.al*) Ability of bacteria to produce siderophore was examined using method described by (Alexander and Zuberer 1991) Using (Bakker and Schippers 1987) method HCN production was determined. Qualitative cyanide determination were carried out by Lorck method modified by Alstrom. Isolates sub cultured on NA medium were supplemented with glycine (4/4 gl-1). The production of cyanide was detected 48h after inoculation, using picrate/Na2Co3 paper fixed to the underside of the Petri-dish lids which were scaled with parafilm before incubation at 28◦c. A change from yellow to orange, red, brown, or reddish brown was recorded as an indication of weak, moderate, or strongly cyanogenic potential.

For enzymatic analysis special media plate were used starch agar (amylase), tributyrin(lipase), pikovaskya agar for phosphatse.

Optimization of media component for maximum biomass production

Basic media king's B was supplemented with various carbon sources, nitrogen sources in different amount and optical density observed at 600nm. Various carbon sources, nitrogen sources & amino acid were taken into consideration .out of which glucose, peptone & proline showed maximum optical density.

RESULTS & DISCUSSION

Characterization of pseudomonas

The identified Pseudomonas were characterized for biocontrol &PGPR attributes. yellow coloured zone on CAS agar plate showed positive siderophore production. Development of pink colour in media, orange coloured Paper shows the positive results for IAA, HCN production. The bacteria effectively inhibited the growth of *Fusarium* on dual plate assay.

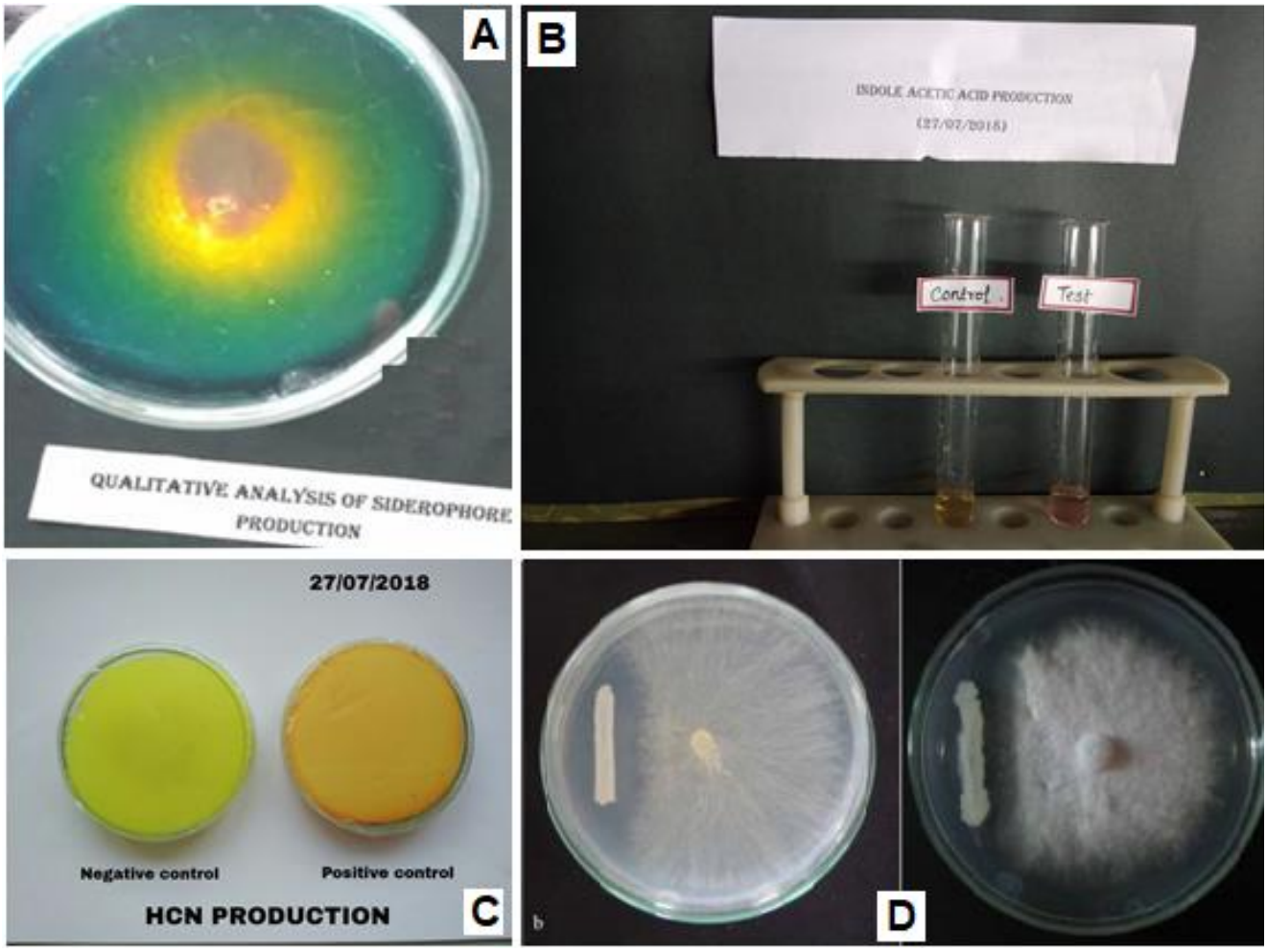
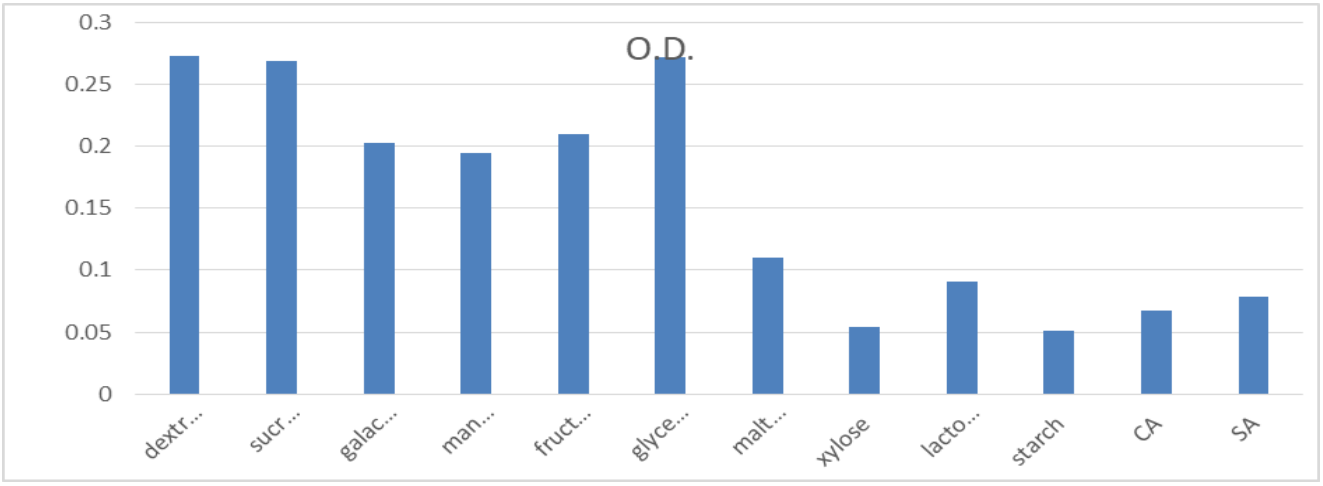
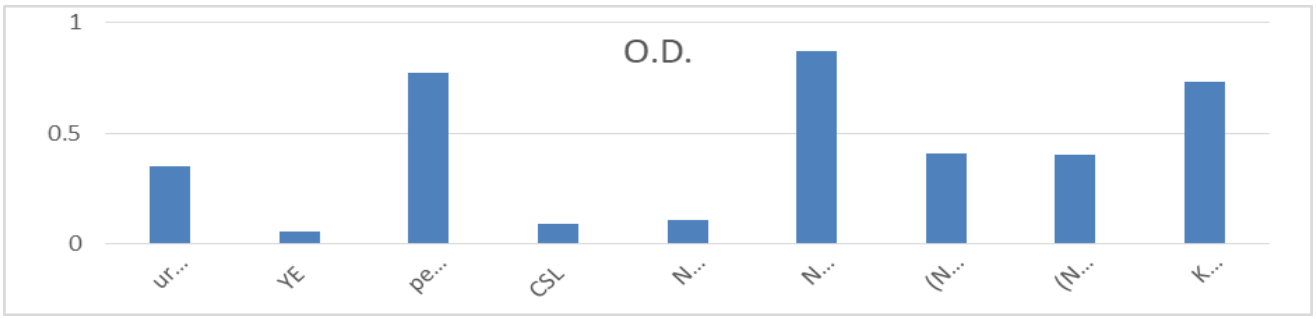


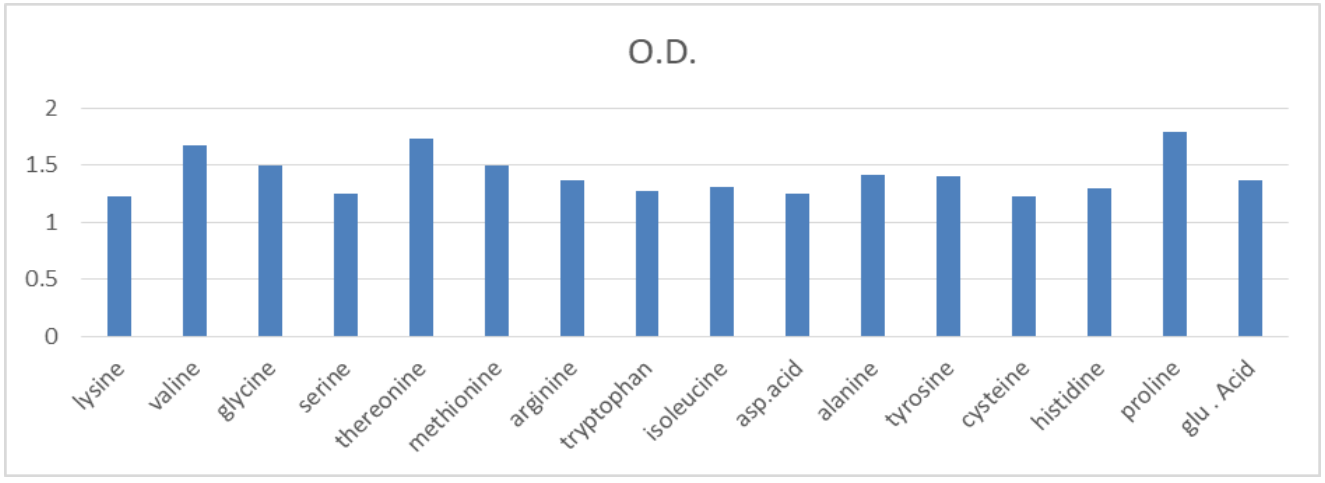
Fig. 1 A: Siderophore production, B. IAA Production, C. Siderophore production, D: dual culture assay

Enzymatic index of *Pseudomonas*: Enzymatic index of *Pseudomonas* shown the maximum enzymatic index for amylase.

Enzymes	Hydrolysis zone diameter (In c.m.)	Growth diameter (In c.m.)	Enzymatic Index
Amylase	3.1	2	**2.5**
Protease	-	0.5	0.5
Cellulase	1	2.2	1.59
Pectinase	-	.8	.8
Chitinase	.8	3.5	1.2
Lipase	-	1.0	1.0







Optimized carbon sources, nitrogen sources & amino acid for growth

Various carbon sources, nitrogen sources & amino acid were taken into consideration .out of which glucose, peptone & proline showed maximum optical density. The results are better depicted in the graphs given below.

CONCLUSION

The multifarious characterstics of *Pseudomonas* could be a better sustainable alternative for the agrochemicals. These characterstics potential of this microbe could give better impact in the field .If the large biomass of these bacteria is increased in the modified media component. The present investigation was based on basic characterization of isolated strain & steps taken for efficient biomass production.

Acknowledgement:

The authors would like to acknowledge NCIM, pune culture identification services. The facilities for experimental analysis by Barktullah university are highly acknowledged

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Alstrom S and Burns RG (1989) Cyanide production by rhizobacteria as a possible mechanism of plant growth inhibition. *Biol. Fertil. Soils*. 7: 232-238.

Brian C Louden, Daniel Haarmann and Aaron M Lynne (2011) Siderophore use of Blue Agar CAS Assay for Siderophore DetectionJ Microbiol Biol Educ. 2011; 12(1): 51–53.Published online 2011 May 19. doi: 10.1128/jmbe.v12i1.249

Ehmann A (1977) The Van Urk-Salkowski reagent-a sensitive and specific chromogenic reagent for silica gel thin-layer chromatographic detection and identification of indole derivatives. Journal of Chromatography. 132, 267-276

Kandel SL, Firrincieli A, Joubert PM, Okubara PA, Leston ND, McGeorge KM, Mugnozza GS, Harfouche A, Kim SH, Doty SL (2017) An in vitro study of bio-control and plant growth promotion potential of salicaceae endophytes. Front Microbiol 8:386

Kreig NR and Holf JG (1984) Bergeys Manual of Systematic Bacteriology. William and Wilkins, Baltimore, USA

Lopez-Berges MS, Capilla J, Turra D, Schafferer L, Matthijs S, Jochl C, Cornelis P, Guarro J, Haas H, Di Pietro A (2012) HapX-mediated iron homeostasis is essential for rhizosphere competence and virulence of the soilborne pathogen Fusarium oxysporum. Plant Cell 24:3805–3822.

Lorck H (1948) Production of hydrocyanic acid by bacteria. Physiol. Plant. 1: 142-146.

Mehnaz S, Saleem RSZ, Yameen B, Pianet I, Schnakenburg G, Pietraszkiewicz H, Valeriote F, Josten M, Sahl HG, Franzblau SG, Harald G (2013) Lahorenoic acids A-C, ortho-dialkyl-substituted aromatic acids from the biocontrol strain Pseudomonas aurantiaca PB-St2. J Nat Prod 76:135–141.

Schwyn B, Neilands JB. Universal chemical assay for the detection and determination of siderophores. Analytical Biochem. 1987;160:47–56. doi: 10.1016/0003-2697(87)90612-9.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Effect of three different storage containers on the Protein Content and Reducing Sugar in four different varieties of Soybean seeds under tropical storage conditions

Dambhare Kirti [1], Gadewar Rajesh[2], Mahajan Ashish[3]

[1 &2] Sewadal Mahaila Mahavidyalaya, Nagpur (India), Email: kirtidambhare@gmail.com | 9422164019
[3] Kamla Nehru Mahavidyalaya, Nagpur (India)

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Dambhare Kirti Gadewar Rajesh, Mahajan Ashish (2019) Effect of three different storage containers on the Protein Content and Reducing Sugar in four different varieties of Soybean seeds under tropical storage conditions, *Int. J. of. Life Sciences*, Special Issue, A13: 201-209.

ABSTRACT

The Biochemical changes such as Protein content and Reducing sugar are occurred in seeds during storage. Literature reported that the total uric acid, nitrogen and free fatty acid of grains increased considerably and non-reducing sugar, reducing sugars and total water soluble sugars decreased during storage. In the present study three different bags Polythene bag (C1), Cloth bag (C2) and Jute bag (C3) of dimensions 20 cm x 30 cm were used for the storage of soybean seed of four different varieties JS-335 (V1), AMS-99-33 (V2), TAMS-38 (V3) and TAMS-98-21 under ambient temperature and relative humidity for a period of 18 months. Portion of the seeds from each container were removed after 3 months (90 days) and examined for Protein content and Reducing sugar observations. In variety (V1), the protein content significantly decreased with increase in storage period. Among the containers Polyethylene bag (C1) showed significantly higher protein content (38.80 %) as compared to Cloth bag (C2) (38.70 %) and Jute bag (C3) (38.25 %) throughout the storage period. The seed protein content was decreased significantly in all four varieties JS-335, AMS-99-33, TAMS-38 and TAMS-98-21 (38.16%, 37.80%, 35.12% and 35%, respectively) after 540 days of storage. It might be due to aging or deterioration of seeds. Loss of germination or viability with increase in moisture content during storage has been found to be closely associated with decrease in protein content of soybean seed by increase in membrane permeability. The reducing sugar content was observed decreasing significantly in all four varieties JS-335 (V1), AMS-99-33 (V2), TAMS-38 (V3) and TAMS-98-21 (V4) during storage. The reducing sugar content was decreased significantly in JS-335, AMS-99-33, TAMS-38 and TAMS-98-21 (0.83 %, 0.80%, 0.78% and 0.76%, respectively) after 540 days of storage. Seeds stored in Polyethylene bag recorded maximum reducing sugar compared to Cloth and Jute bag at the end of storage. This may be due to higher amylase activity that further relates to the moisture content of the seeds.

Key words: Soybean, Stoarge containers, Biochemical studies, Protein content, Reducing Sugar.

INTRODUCTION

An important aspect in any agricultural improvement programme is the maintenance of quality in the storage of seeds. High temperature and high

humidity conditions which are the common ambient feature of subtropical and tropical areas, induced deterioration of seed quality. Although several reviews are available on the loss of seed viability during storage and its assessment has been standardized. Soybean; the raw materials for vegetable oils, occupy a significant place in India's national economy. India is the world's biggest oilseed growing country and, paradoxically, the world's biggest important of edible oils as well, the main reason for this can be traced to low productivity per hector.

In Vidarbha region of Maharashtra State, soybean crop are harvested in October-November. The seeds of soybean crops are stored for 7-8 months prior to sowing. Through sun drying after harvest, followed by storage, has been found to reduce the problem of loss of viability. Even keeping the seeds under ambient conditions in ordinary gunny bags, would result in significant loss of viability (Charjan and Tarar; 1992). However, seed is not dried to a relatively safe moisture content after harvest, its storability will be reduced (Gadewar *et al.*, 2009).

The demand for seed is fluctuating and very often there are large surplus stock of seed which need to be preserved till the time of next sowing. Such left-over seed experience in the hot and humid mansoon months, would significantly decline germinability. By the time of next sowing in June-July, the loss in vigour and viability of carry over seeds, may adversely affect field emergence and productivity (Basu, *et al.*; 1978, Charjan and Tarar; 1992, and Abdullah M. Alhamdan *et al.*; 2011). The oil seeds are poor storer and loose its viability very fast in adverse conditions of temperature and humidity.

Biochemical changes are occurred is seeds during storage. Charjan and Tarar, (1994) reported that the total uric acid, nitrogen and free fatty acid of grains increased considerably and non-reducing sugar, reducing sugars and total water soluble sugars decreased during storage. There are many biochemical changes occurred due to seed deterioration such as cellular, metabolic and chemical alterations including chromosome aberrations and damage to the DNA, impairment of RNA and protein synthesis, changes in the enzymes and loss of membrane structure (Vieira *et al.;*2013).

Sharma *et al*., (2007) reported that the total soluble sugars, sucrose and reducing sugar content decreased up to 90 days of storage. Duranti and Gius, (1997) reported that the decrease in carbohydrates and protein content in deteriorated seeds. Protein and field emergence of groundnut seeds found decreased with advancement of storage period. Fabre and Planchon, (2000) revaluated the influence of nitrogen sources on yield and protein content and found correlation between the symbiotic N2 fixation in yield and seed protein content. Fante *et al*., (2011) observed the same pattern of banding relative to the total protein regardless of the treatment. Ávila *et al*., (2007) observed that polythene bag and metal tin were better storage containers than the bamboo bin and clay pot.

Kaviani and Kharabian, (2008) observed the highest amount of total protein content in seeds of plants grown in the soil treated with 30 g of KCl and 0.02 g of CaHPO4 per 100 kg of soil. Liu *et al*., (2008) studied properties of protein isolates from soybeans stored under various conditions and showed that properties of protein isolates prepared from the three conditions (mild, cold and ambient) does not affected significantly for 12 months of storage. Li *et al*., (2012) showed for every 10 mg/g increase in seed protein was accompanied by 4.3 mg/g decrease in sucrose in soybean seeds. Green *et al*., (1989) demonstrated advantages of the modified assay in Nelson-Somogyi method for reducing sugars estimation. Sharma *et al*., (2013) revealed that the content of starch, total soluble sugars and reducing sugars in soybean seeds decreased during storage for 180 days but it didn't show positional variations in their contents.

MATERIAL METHODS

Seeds of the following kinds and varieties i.e.JS-335, AMS-99-33, TAMS-38 and TAMS-98-21, (Denoted by V1, V2, V3 and V4 respectively) were obtained from "All India Co-ordinate Oil Seed project, College of Agriculture, Nagpur. The seed samples were packed in the respective containers Polyethylene bag 700 gauge (moisture vapour proof), Cloth bag (moisture pervious) and Jute bag (moisture pervious). Polyethylene bag, Cloth bag and Jute bag, are denotes by C1, C2 and C3 respectively.

All the three bags will be of 20 cm x 30 cm. The seeds were closed by stitching in fresh jute and cloth bags, whereas it was heat sealed in case of polyethylene bags. The respective containers were then stored in wire mesh almirah in mesonary building having cemented walls, roof and floor under ambient temperature and relative humidity for a period of 18 months. Portion of the seeds from each container were removed after 3

months (90 days) and examined for Physiological, Biochemical and Mycological observations.

0 Days, 90 Days, 180 Days, 270 Days, 360 Days, 450 Days, and 540 Days intervals are denoted by T1, T2, T3, T4, T5, T6 and T7 respectively.
Estimation of Protein was performed by Kjeldehl method whereas estimation of reducing sugar by Benedict's method.

Statistical analysis:
The data obtained from the experiments were statistically analyzed by using factorial CRD. (Complete Randomized Design), Using Web Portal of CCS Hariyana Agricultural University, Hisar: http://14.139.232.166/opstat/default.asp. The critical differences between the parameters like Soybean seed Varieties, containers and storage period were worked out at five per cent significance.

RESULTS & DISCUSSION

(a) Protein Content (%)
The effect of container and storage period on Protein content in all four varieties V1, V2, V3 and V4 is presented in Table 1.

In variety JS-335 (V1), the protein content significantly decreased with increase in storage period. However the rate of loss in protein content varied with the type of container used. Seeds stored in Polyethylene bag (C1) showed significantly higher protein content (38.16 %) as compared to those stored in Cloth bag (C2) (37.91 %) and Jute bag (C3) (36.75 %) up to 540 days (T7) days of the storage. Among the containers Polyethylene bag (C1) showed significantly higher protein content (38.80 %) as compared to Cloth bag (C2) (38.70 %) and Jute bag (C3) (38.25 %) throughout the storage period.

Table 1: Effect of Varieties (V), Storage Containers (C) and Storage Periods (T) and three factor interaction on Protein content (%) of soybean seeds during storage.

VxCxT	V1			V2			V3			V4		
	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
T1	39.41	39.41	39.41	39.22	39.22	39.22	38.56	38.56	38.56	38.41	38.41	38.41
T2	39.22	39.20	39.15	39.09	39.02	39.00	38.37	38.23	38.11	38.20	38.07	38.02
T3	39.01	38.95	38.81	39.00	38.81	38.69	38.25	38.01	37.74	37.91	37.66	37.49
T4	38.80	38.75	38.52	38.61	38.52	38.41	37.84	37.25	37.03	37.64	37.17	36.80
T5	38.59	38.45	38.19	38.42	38.31	38.00	37.42	36.42	36.24	36.86	36.34	36.14
T6	38.40	38.20	36.89	37.92	37.85	36.80	36.56	35.39	35.20	36.39	35.25	35.02
T7	38.16	37.91	36.75	37.80	36.92	36.40	35.12	34.91	34.53	35.00	34.72	34.22
Mean	**38.80**	**38.70**	**38.25**	**38.58**	**38.38**	**38.07**	**37.45**	**36.97**	**36.77**	**37.20**	**36.80**	**36.59**
SE (m)	**0.719**											
CD(P=5%)	**NS**											

*NS-Non Significant

Table 2: Effect of Varieties (V), Storage Containers (C) and Storage Periods (T) and three factor interaction on Reducing Sugar Content (%) of soybean seeds during storage.

VxCxT	V1			V2			V3			V4		
	C1	C2	C3	C1	C2	C3	C1	C2	C3	C1	C2	C3
T1	1.80	1.80	1.80	1.77	1.77	1.77	1.69	1.69	1.69	1.60	1.60	1.60
T2	1.75	1.65	1.62	1.66	1.60	1.59	1.59	1.54	1.50	1.55	1.50	1.44
T3	1.60	1.54	1.50	1.51	1.50	1.48	1.48	1.39	1.32	1.40	1.38	1.29
T4	1.48	1.41	1.39	1.43	1.40	1.37	1.31	1.09	1.00	1.29	1.01	1.19
T5	1.25	1.20	1.19	1.23	1.20	1.18	1.01	0.91	0.84	0.99	0.89	0.86
T6	1.12	1.01	1.00	0.96	0.92	0.89	0.92	0.88	0.77	0.90	0.86	0.75
T7	0.83	0.80	0.78	0.80	0.78	0.75	0.78	0.73	0.65	0.76	0.65	0.60
Mean	**1.40**	**1.34**	**1.33**	**1.34**	**1.31**	**1.29**	**1.25**	**1.18**	**1.11**	**1.21**	**1.13**	**1.10**
SE (m)	**0.015**											
CD(P=5%)	**0.043**											

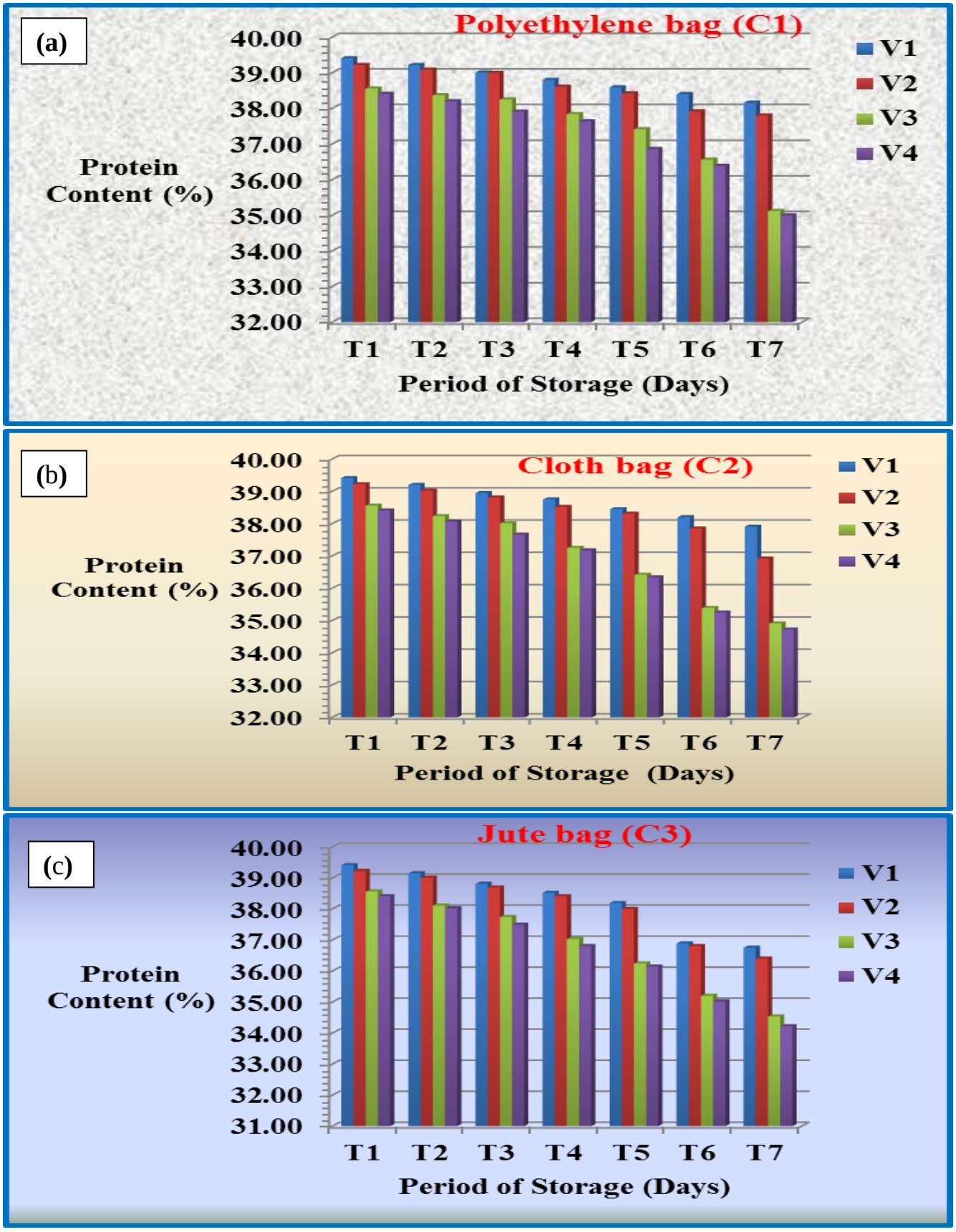


Figure 1: Effect of storage containers on Protein Content (%) in Soybean seed varieties.
(a) Polyethylene bag (C1), (b) Cloth bag (C2) and (c) Jute bag (C3).

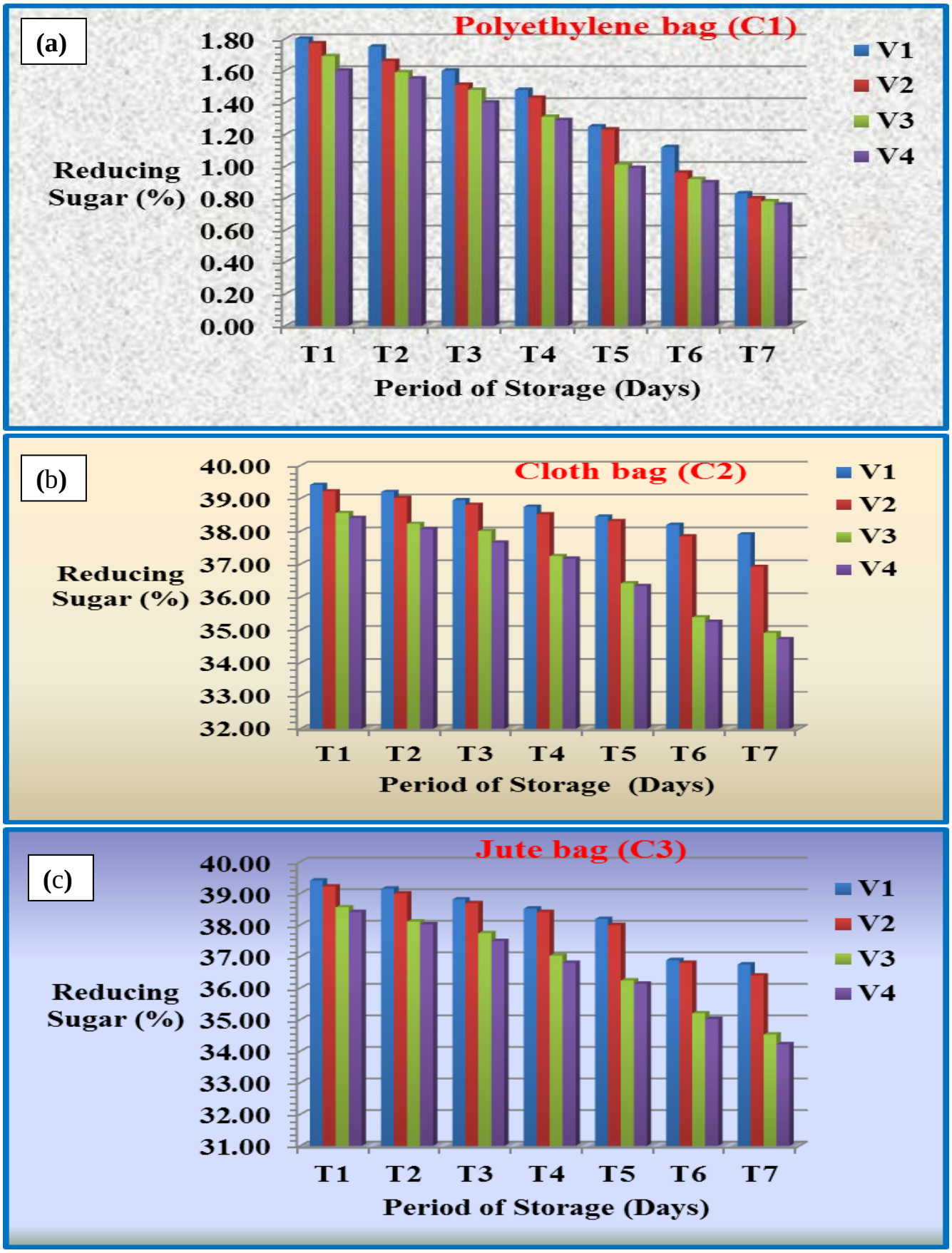


Figure 2: Effect of storage containers on Reducing Sugar (%) in Soybean seed varieties. (a) Polyethylene bag (C1), (b) Cloth bag (C2) and (c) Jute bag (C3).

In variety AMS-99-33 (V2), seed stored in Polyethylene bag (C1) showed significantly higher protein content (37.80 %) as compared to those stored in Cloth bag (C2) (36.92 %) and Jute bag (C3) (36.40 %) upto 540 days (T7) days of storage. Among the containers Polyethylene bag (C1) showed significantly higher protein content (38.58 %) as compared to Cloth bag (C2) (38.38 %) and Jute bag (C3) (38.07 %) throughout the storage period.

In variety TAMS-38 (V3), seed stored in Polyethylene bag (C1) showed significantly higher protein content (35.12 %) as compared to those stored in Cloth bag (C2) (34.91 %) and Jute bag (C3) (34.53 %) up to 540 days (T7) days of storage. Among the containers Polyethylene bag (C1) showed significantly higher protein content (37.45 %) as compared to Cloth bag (C2) (36.97 %) and Jute bag (C3) (36.77 %) throughout the storage period.

Similarly in variety TAMS-98-21 (V4), the seed stored in Polyethylene bag (C1) showed significantly higher protein content (35.00 %) as compared to those stored in Cloth bag (C2) (34.72 %) and Jute bag (C3) (34.22 %) up to 540 days (T7) days of storage. Among the containers Polyethylene bag (C1) showed significantly higher protein content (37.20 %) as compared to Cloth bag (C2) (36.80 %) and Jute bag (C3) (36.59 %) throughout the storage period.

Table 1 also shows that, among four varieties of soybean, seeds stored in Polyethylene bag (C1) exhibited significantly higher protein content percentage as compared to Cloth bag (C2) and Jute bag (C3). The variety JS-335 (V1) exhibited significantly higher protein content (38.58 %) as compared to AMS-99-33 (V2) (38.34 %), TAMS-38 (V3) (37.06 %) and TAMS-98-21 (V4) (36.86 %), irrespective of storage containers up to 540 days (T7) days.

(b) Reducing Sugar Content (%)

The effect of container and storage period on Reducing Sugar Content in all four varieties V1, V2, V3 and V4 is presented in **Table 2.**

In variety JS-335 (V1), the reducing sugar significantly decreased with increase in storage period. However the rate of loss in reducing sugar varied with the type of container used. Seeds stored in Polyethylene bag (C1) showed significantly higher reducing sugar (0.83 %) as compared to those stored in Cloth bag (C2) (0.80 %) and Jute bag (C3) (0.78 %) up to 540 days (T7) days of the storage. Among the containers Polyethylene bag (C1) showed significantly higher reducing sugar (1.40 %) as compared to Cloth bag (C2) (1.34 %) and Jute bag (C3) (1.33 %) throughout the storage period.

In variety AMS-99-33 (V2), seed stored in Polyethylene bag (C1) showed significantly higher reducing sugar (0.80 %) as compared to those stored in Cloth bag (C2) (0.78 %) and Jute bag (C3) (0.75 %) up to 540 days (T7) days of storage. Among the containers Polyethylene bag (C1) showed significantly higher reducing sugar (1.34 %) as compared to Cloth bag (C2) (1.31 %) and Jute bag (C3) (1.29 %) throughout the storage period.

In variety TAMS-38 (V3), seed stored in Polyethylene bag (C1) showed significantly higher reducing sugar (0.78 %) as compared to those stored in Cloth bag (C2) (0.73 %) and Jute bag (C3) (0.65 %) up to 540 days (T7) days of storage. Among the containers Polyethylene bag (C1) showed significantly higher reducing sugar (1.25 %) as compared to Cloth bag (C2) (1.18 %) and Jute bag (C3) (1.11 %) throughout the storage period.

Similarly in variety TAMS-98-21 (V4), the seed stored in Polyethylene bag (C1) showed significantly higher reducing sugar (0.76 %) as compared to those stored in Cloth bag (C2) (0.65 %) and Jute bag (C3) (0.60 %) up to 540 days (T7) days of storage. Among the containers Polyethylene bag (C1) showed significantly higher reducing sugar (1.21 %) as compared to Cloth bag (C2) (1.13 %) and Jute bag (C3) (1.10 %) throughout the storage period.

Table 2 also shows that, among the four varieties of soybean, seeds stored in Polyethylene bag (C1) exhibited significantly higher reducing sugar percentage as compared to Cloth bag (C2) and Jute bag (C3). The variety JS-335 (V1) exhibited significantly higher reducing sugar (1.36 %) as compared to AMS-99-33 (V2) (1.31 %), TAMS-38 (V3) (1.18 %) and TAMS-98-21 (V4) (1.15 %), irrespective of storage containers up to 540 days (T7) days.

DISCUSSION

(a) Protein Content (%)

Table 1 represent the effect of varieties, storage containers and two factor interactions on protein content of soybean seed during storage. The protein content of soybean seed is significantly influenced by different varieties stored in different containers during storage. The protein content decreased with increase in

storage period irrespective of varieties. The protein content was significantly higher in JS-335 followed by AMS-99-33 (V2), TAMS-38 (V3) and significantly lowers in TAMS-98-21 (V4) during all the periods of storage. The protein content of the soybean seed stored in Polyethylene bag (C1) was significantly higher than the seed stored in Cloth (C2) and Jute (C3) bags during all the periods of storage, irrespective of varieties.

The protein content of the soybean declined with slow rate with increase in period of storage. It might be due to aging or deterioration of seed. Loss of germination or viability with increase in moisture content during storage has been found to be closely associated with decrease in protein content of soybean seed by increase in membrane permeability (Hill and Breidenbach, 1974).

Meena *et al*., (2017) observed a decrease in protein content of soybean seeds during storage and concluded that, it is possible to extend the shelf life of soybean seeds up to 18 months without deterioration in biochemical parameters of the seeds viz., protein content under vacuum packaging. Similarly the decrease in protein content with increase in storage period was observed by Braccini *et al*., (2000) and Alencar *et al*., (2011) in soybean.

It has been reported in the literature that seed deterioration rate is strongly influenced by the type of container they are stored in (Singh *et al*., 2017; Orhevba and Atteh,, 2018; Saxena *et al*., 2015). In present study it is observed that decrease in protein content is at faster rate when seeds are stored in Cloth bag (C2) and Jute bag (C3) than Polyethylene bag (C1). It had been reported by Bellaloui *et al*., (2011) and Taski-Ajdukovic *et al*., (2010) that protein content can also be influenced by various genotypes present during storage. The genotype had found a strong effect on the protein percentage of the seed. Protein content was found to be related when a variation of glutamine concentration occurred (Ciabotti *et al*., 2016).
Khan *et al*., (2015) and Malek *et al*., (2012) reported that high yielding soybean genotypes should possess large dry matter weight, higher germination rate and viability at all growth stages. It has been observed that the variety JS-335 (V1) was better storer than the variety AMS-99-33 (V2) and TAMS-38 (V3), which is in agreement with our previous work (Dambhare and Gadewar, 2017). It was also observed that storage of seed in Polyethylene bag (C1) had significantly increased the storability of soybean seed over the seed stored in Jute bag (C3).

The results obtained from estimation of protein content have been illustrated graphically in **Figure 1.**

(b) Reducing Sugar (%)

In the present investigation, from **Table 2**, the reducing sugar content was observed decreasing significantly in all four varieties JS-335 (V1), AMS-99-33 (V2), TAMS-38 (V3) and TAMS-98-21 (V4) during storage. However, the reducing sugar was found more in JS-335 (V1) followed by AMS-99-33 (V2), TAMS-38 (V3) and TAMS-98-21 (V4). With the increase in storage period, reducing sugar in seed declined irrespective of variety, which leads to poor germination and vigour at the end of storage period. This may be due to higher protease activity that further relates to the moisture content of the seed (Shelar *et al*., 2008).

Decrease in reducing sugar over storage was also observed by Sharma *et al*., (2007); Filho et al., (2016) in soybean. The variety JS-335 with more carbohydrates maintained better seed quality as compared to other varieties AMS-99-33 (V2), TAMS-38 (V3) and TAMS-98-21 (V4), this is in agreement with the findings of Samaraha et al. (2009), who reported that sugar content have a positive correlation with seed germination and vigour.

Nitrogen as the main constituent of Proteins and carbohydrates is the major form of carbon, hydrogen and oxygen. During seed storage the proteins decreased and remained undegraded into free amino acids (Filho, 2015) and carbohydrates yield free sugar molecules. Thus, the hydrolysis of protein and carbohydrates could also be considered as one of the reason for loss of physiological vigour in the seeds at storage.

Many researchers reported that the reduction in the viability and vigour was strongly correlated with the decrease in reducing sugar. (Zhao *et al*., 2007; Shaban, 2013; Daniel and Edwin, 1985).

In the present investigation, the seeds stored in Polyethylene bag (C1) showed higher value of reducing sugar compared to Cloth bag (C2) and Jute bag (C3) after 540 days of storage. Decrease in reducing sugar in Cloth bag was also recorded by Saxena *et al*., (2015), Singh *et al*,. (2017), this result may be attributed to seed oxidation and respiration during storage that causes

biochemical change in seeds which ultimately results in decrease in reducing sugar. (Jyoti and Malik, 2013; Panobianco and Vieira, 2007 and Sharma *et al*., 2013).

The results obtained from estimation of reducing sugar content have been illustrated graphically in **Figure 2**.

CONCLUSION

The seed protein content was decreased significantly in all four varieties JS-335, AMS-99-33, TAMS-38 and TAMS-98-21 (38.16%, 37.80%, 35.12% and 35%, respectively) after 540 days of storage. Seeds stored in Polyethylene bag recorded maximum protein content as compared to Cloth and Jute bag. The reducing sugar content was decreased significantly in JS-335, AMS-99-33, TAMS-38 and TAMS-98-21 (0.83 %, 0.80%, 0.78% and 0.76%, respectively) after 540 days of storage. Seeds stored in Polyethylene bag recorded maximum reducing sugar compared to Cloth and Jute bag at the end of storage.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Abdullah MA, Abdullah AA, Safwat OK, Mahmoud AW, Mahran EN, Abdullah AI (2011) Influence of Storage Conditions on Seed Quality and Longevity of Four Vegetable Crops.American-Eurasian Journal Agricultural & Environmental Science, 11 (3): 353-359.

Alencar ER and Faroni LR (2011) Storage of Soybeans and Its Effects on Quality of Soybean Sub-Products. Recent Trends for Enhancing the Diversity and Quality of Soybean Products., Prof. Dora Krezhova (Ed.).IntechOpen, ISBN: 978-953-307-533-4, 47-65.

Ávila MR, Braccini A, Scapim CA, Mandarino JM, Leandro Paiola Albrecht, Filho EP (2007) Isoflavone, protein and oil contents and soybean seed quality. Revista Brasileira de Sementes, 29(3): 111-127.

Basu RN, Chattopadhyay K, Bandopadhyay PK, Basak SL (1978) Maintenance of vigour and viability of stored jute seeds. Seed Research, 6(1) : 1-13.

Bellaloui N, Reddy KN, Bruns A, Gillen AM, Mengistu A, Zobiole LHS, Fisher DK, Abbas HK, Zablotowicz RM, Kremer RJ (2011) Soybean Seed Composition and Quality: Interactions Of Environment, Genotype, and Management Practices. In: Soybeans: Cultivation, Uses and Nutrition. Jason E. Maxwell (Ed.). ISBN: 978-1-61761-762-1: 1-42.

Braccini AL, Reis MS, Moreira MA, Sediyama AS, Scapim AA (2000) Biochemical changes associated to soybean seeds osmoconditioning during storage. Pesq. Agropec, Brasilia, 35 (2): 433-447.

Charjan SKU and Tarar JL (1992) Effect of relative humidity on viability and vigour in soybean (Glycine max L.), Annals of plant Physiology, 6(1): 15-20.

Charjan SKU and Tarar JL (1992) Effect of storage container on germinability and mycoflora of soybean (Glycine max L.) seed. Indian Journal of Agricultural Sciences, 62 (7): 500-502.

Charjan SKU and Tarar JL (1994) Biochemical changes in jawar grains due to infestation of rice weevil and Khapra beetle during storage. Proceeding of National Academy of Science, 64 (B) IV: 381-384.

Ciabotti S, Silva ACBB, Juhasz ACP, Mendonça CD, Tavano OL, Mandarino JMG, Gonçalves CAA (2016) Chemical composition, protein profile, and isoflavones content in soybean genotypes with different seed coat colors. Ciabotti et al./IFRJ ,23(2): 621-629.

Dambhare K and Gadewar R (2017) Physiological Study Of Soybean Seeds Stored In Different Moisture Content And Temperature Conditions. Bionano Frontier. 10 (3): 75-78.

Daniel JH and Edwin EG (1985) The Effects Of Seed Size And Seed Density On Germination And Vigour In Soybean (Glycine Max (L.) Merr.). Can. J. Plant Sci., 65:1-8.

Duranti M and Gius C (1997) Legume seeds: protein content and nutritional value. Field Crops Research, (53): 31-45.

Fabre F and Planchon C (2000) Nitrogen nutrition, yield and protein content in soybean. Plant Science, 152: 51–58.

Fante CA, Goulart PF, Alves JD, Henrique PC, Fries DD (2011) Isoflavone and protein content in soybeans grains submitted to flooding at different stages of development. Ciência Rural, Santa Maria, 41 (12):2224-2229.

Filho CPH, Goneli ALD, Masetto ET, Martins EAS, Oba GC. (2016) The effect of drying temperatures and storage of seeds on the growth of soybean seedlings.Journal of Seed Science, 38(4): 287-295. DOI: http:// dx.doi. org/10.1 590/2317-1545v38n4161866.

Filho JM (2015) Seed vigour testing: an overview of the past, present and future perspective. Sci. Agric., 72 (4): 363-374.DOI: http://dx.doi.org/10.1590/0103-9016-2015-0007.

Gadewar RD, Charde PN, Charjan SKU (2009) Impact of relative humidity on viability and moisture content in some oil seeds during storage, Journal of Phytological research. 22 (1) : 167-169.

Green F, Clausen CA, Highley TL (1989) Adaptation of the Nelson-Somogyi Reducing-Sugar Assay to a Microassay Using Microtiter Plates.Analytical Biochemistry, 182: 197-199.

Hill JE and Breidenbach RW (1974) Proteins Of Soybean Seeds: Accumulation Of The Major Protein Components During Seed Developmen.T And Maturation. Plant Physiol., 53: 747-751.

Jyoti and Malik CP (2013) Seed Deterioration: A Review. Int. J. LifeSc. Bt & Pharm. Res., 2 (3): 374-385.

Kaviani Behzad and Kharabian Ardashir (2008) Improvement of the Nutritional Value of Soybean [Glycine max (L) Merr.] Seed with Alteration in Protein Subunits of Glycinin (11S Globulin) and β-conglycinin (7S Globulin).Turk J Biol., 32: 91-97.

Khan MSA, Karim MA, Haque MM, Karim AJMS, Mian M AK (2015) Growth And Dry Matter Partitioning In Selected Soybean (Glycine Max L.) Genotypes. Bangladesh J. Agril. Res., 40(3): 333-345.

Li Y, Du M, Zhang Q, Wang G, Hashemi M, LIU X (2012) Greater differences exist in seed protein, oil, total soluble sugar and sucrose content of vegetable soybean genotypes [Glycine max (L.) Merrill] in Northeast China.Australian J. Crop Sci., 6(12):1681-1686.

Liu C, Wang X, Ma H, Zhang Z, Gao W, Xiao L (2008) Functional properties of protein isolates from soybeans stored under various conditions. Food Chemistry, 111: 29–37. DOI:10.1016/j.foodchem.2008.03.040.

Malek MA, Mondal MMA, Ismail MR, Rafii MY, Berahim Z (2012) Physiology of seed yield in soybean: Growth and dry matter production. African Journal of Biotechnology, 11(30): 7643-7649.

Meena MK, Chetti MB, Nawalagatti CM (2017) Seed Physiological and Biochemical Parameters of Soybean (Glycine max) As Influenced by Different Packaging Materials and Storage Conditions. Int. J. Pure App. Biosci., 5 (1): 864-875.DOI: http://dx.doi.org/10.18782/2320-7051.2706.

Orhevba BA, Atteh B (2018) Comparative analysis of the effect of hermetic storage models on some quality parameters of soybean seeds. Agricultural Engineering International: CIGR Journal, 20(1): 137–142.

Panobianco M and Vieira RD (2007) Electrical Conductivity And Deterioration Of Soybean Seeds Exposed To Different Storage Conditions. Revista Brasileira de Sementes, 29(2): 97-105.

Samarah NH, Mullen RE, Anderson I (2009) Soluble Sugar Contents, Germination, and Vigour of Soybean Seeds in Response to Drought Stress, Journal of New Seeds, 10(2): 63-73.DOI: http://dx.doi.org/10.1080/15228860902786525.

Saxena N, Rani SKS, Deepika M (2015) Biodeterioration of Soybean (Glycine max L.) seeds during storage by Fungi. Int. J. Curr. Microbiol. App. Sci, 4(6): 1118-1126. DOI: https://www.ijcmas.com/vol-4-6/Neeti%20Saxena,%20et%20al.pdf .

Saxena N, Rani SKS, Deepika M (2015) Biodeterioration of Soybean (Glycine max L.) seeds during storage by Fungi. Int. J. Curr. Microbiol. App. Sci, 4(6): 1118-1126.

Shaban M (2013) Study on some aspects of seed viability and vigour. Int J Adv Biol Biom Res., 1(12):1692-1697.

Sharma S, Gambhir S, Munshi SK (2007) Changes in Lipid and Carbohydrate Composition of Germinating Soybean Seeds under Different Storage Conditions.Asian J. of plant sciences, 6 (3): 502-507. DOI: 10.3923/ajps.2007.502.507·

Sharma S, Kaur A, Bansal A, Gill BS (2013) Positional effects on soybean seed composition during storage. J Food Sci Technol, 50(2): 353–359. DOI 10.1007/s13197-011-0341-0.

Shelar VR (2008) Role of Mechanical Damage In Deterioration Of Soybean Seed Quality During Storage- A Review. Agric. Rev., 29 (3): 177 – 184.

Singh J, Paroha S, Mishra RP (2017) Factors Affecting Oilseed Quality during Storage with Special Reference to Soybean (Glycine max) and Niger (Guizotia abyssinica) Seeds.Int. J. Curr. Microbiol. App. Sci, 6 (10): 2215-2226. DOI: https://doi.org/10.20546/ijcmas.2017.610.262.

Taski-Ajdukovic KDjordjevic V, Vidic M, Vujakovic M (2010) Subunit composition of seed storage proteins in high-protein soybean genotypes. Pesq. agropec. bras., Brasília, 45(7): 721-729.

Vieira B, Barbosa RM, Trevisoli S, Mauro A, Vieira RD (2013) Biochemical alterations in soybean seeds with harvesting time and storage temperature. Journal of Food, Agriculture & Environment, 11(3&4): 887 - 891.

Zhao GW, Sun Q, Wang JH (2007) Improving seed vigour assessment of super sweet and sugar-enhanced sweet corn (Zeamayssaccharata). New Zealand Journal of Crop and Horticultural Science, 35(3): 349-356, DOI: 10.1080/01140670709510201.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Comparison of yield and yield parameter and plant height in *Glycine max (L)* (JS72-44 and JS75-46) in polluted and non-polluted environment

Shrivastava Smita

Assistant Professor of Botany, P.M.B Gujarati Science College, Indore, Madhya Pradesh
E-Mail: sshrivastava8156@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Shrivastava Smita (2019) Comparison of yield and yield parameter and plant height in *Glycine max (L)* (JS72-44 and JS75-46) in polluted and non-polluted environment, *Int. J. of. Life Sciences*, Special Issue, A13: 211-214.

ABSTRACT

India is a land of agriculture, the production of crop depend upon use of agro-technique for crop production, yield is a cumulative characteristic of a crop. The factors which govern the production of crop are quality of seed, fertilizers, irrigation and soil fertility. Soybean oil crop of India, plays in agriculture seed. The aspect of pollution from industry is one of the greatest challenges of environment health problem .In agriculture context the use of effluent for irrigation of crop land is a major concern since it may cause possible harmful effect on soil fertility. Soybean is oil seed crop of India, plays important role in oil economy .It is a cheap source of protein and oil.

Key words: Water Pollution, plant height yield, yield parameter polluted and non-polluted environment.

INTRODUCTION

The basic problem of Indian agriculture is low productivity .To increase the productivity modern techniques should be used. Industrial Development is essential for providing basic human needs, food shelter and health for human beings .Technologically and economically in advanced countries the biological effect of various forms of physical and chemical pollution of the environment is apparent. The effect on health due to the environmental factors are relatively well known in occupational exposure or accidental contamination , the aspects of pollution from industry is one of the greatest challenge of environmental health problem. Parker (1968), willisetal (1975),trivedi (1979) have made significant studies on consumption and conservation of oxygen and effect of industrial waste on river.

MATERIAL METHODS

To understand a research study accurately and the material used in a study and detail description of method used is most essential.

1. Experimental area :

The experimental area is situated south of shivana river.

The raja ram factory is situated up stream on north side of river shivana .The industrial waste water of starch factory is pumped across shivana river to south bank of shivana river to ody farm of factory.

The area of ody farm had been selected for studies as polluted environment. To the south of Shivana River about 1.5 km away situated badhari research farm. This area had also been purposely selected for irrigated by tube well or well as a non-polluted environment.
Both sites had medium black soil .the soil deep and free from water logging condition

2. Study of crop growth in polluted and non-polluted environments :

A field experiment was conducted during 1989-90, 1990-1991, 1991-1992 at ody farm and corresponding set a badhari research farm .Two varieties of maize were sown with uniform conditions in two sites, the differential behaviour of crop responses growth parameters are evacuated in these two environments.

3. Experimental details

a) Plot Size: $2.4*6m^2$
b) Spacing between two plots 50 cm
c) Spacing between rows 30 cm
d) No. of rows 8
e) Varieties Soybean : JS72-44, Soybean JS75-46
f) Symbols used : V_3 - JS72-44, V_4 - JS75-46

g) Field operation: The experimental field at both sites were prepared with the help of bullock drawn equipment.
h) Seed treatment: The seed of maize varieties are treated with fungicide thirum 3gm per kg.
i) Observation: Ten random plants were tagged for observation in each plot, only tagged plant were harvested for recording yield parameter.
j) Characteristics

Soybean JS72-44. This variety is widely adopted and suitable for different agro- climatic zones of Madhya Pradesh. It matures in 100-105 days after sowing .Average yield is 24-26 q/ha.

Soybean JS75-46. It is semi determinate erect type variety. This variety is widely adopted and suitable for different agro- climatic zones of Madhya Pradesh. It matures in 100-105 days.

RESULTS & DISCUSSION

Observation were recorded on randomly selected plant .Mean of these was computed and used for further statistical analysis. Plant height was recorded from ground level to apical leaves, start from30 days up to harvest to obtain idea of extent of plant growth.

Table 1: Characteristics and nature of Industrial Waste water (effluent) M/S Rajaram Brothers, Mandsaur

S.No	Particulars	1989	1990	1991
1.	Raw water flow (m^3/d) (Average)	120	65	65
2.	Treated waste water flow(m^3/d)(Average)	100	55	55
3.	Color/Odor	Dirty white	Dirty alcoholic	Dirty alcoholic
4.	Ph	4.2	4.0	4.5
5.	Temperature(^{0}C)	28^o	29^o	31^o
6.	B.O.D(mg/l)	1095 mg/l	1542 mg/l	1456 mg/l
7.	C.O.D	2310 mg/l	2605 mg/l	2127 mg/l
8.	Suspended solids	8325mg/l	8718 mg/l	9968mg/l
9.	Chloride concen.	-----	------	------
10.	Toxic element	-----	------	-----

Note: Data obtained M.P. Pradushan Niweran Mandal . Discharge monitoring report.

Table 2: Yield and Yield components of different varieties of Soybean in NPE and PE

Treatment		Seed yield (gm./plant)	No. of pods/plant	No. of grains/pod	100 seed weight (gm.)
NPE	V_3	4.51	27.85	1.55	10.36
	V_4	7.17	35.32	1.88	10.95
MEAN		5.84	31.59	1.72	10.66
PE	V_3	3.94	26.65	1.44	10.18
	V_4	6.26	33.96	1.69	10.52
MEAN		5.10	30.30	1.57	10.35

Table 3: Plant height at 45 days crop growth stage of Soybean varieties in polluted and non-polluted environments (cm)

Treatment	V_3	V_4	Mean
NPE	67.17	61.42	64.29
PE	63.75	59.09	61.42
MEAN	65.46	60.25	
	V	E	V X E
SE+-	0.74	0.99	1.49
CD(P=0.05)	2.14	2.86	4.29

Table 4: Plant height at 30days crop growth stage of Soybean varieties in polluted and non-polluted environments (cm)

Treatment	V_3	V_4	Mean
NPE	29.96	30.92	30.42
PE	25.41	25.90	25.65
MEAN	30.42	28.41	
	V	E	V X E
SE+-	0.60	0.80	1.20
CD(P=0.05)	1.73	2.30	3.46

Table 5: Plant height at harvest of Soybean varieties in polluted and non-polluted environments (cm)

Treatment	V_3	V_4	Mean
NPE	105.6	114.92	110.26
PE	102.27	113.15	107.71
MEAN	103.93	114.03	
	V	E	V X E
SE+-	1.30	1.74	2.61
CD(P=0.05)	3.76	5.01	7.52

Table 6: Plant Height at successive crop growth stages of Soybean in polluted and non-polluted enivornment

Treatment	30 days	45 days	60 days	Harvest
NPE V_3	29.92	67.17	75.27	105.60
V_4	30.92	61.42	76.90	114.92
Mean	30.42	64.30	76.85	110.26
PE V_3	25.41	63.75	73.70	102.27
V_4	25.90	59.09	74.55	113.15
Mean	25.66	61.42	74.13	107.71

Effluent was highly acidic with ph ranging from 4.0 to 4.5 with high BOD and COD .Effect of different concentration of effluent as well as varietal responses found evident for growth characteristics. Significantly better seed yield was recorded in NPE as compared to PE. V_4 recorded better yield plants. No. of pods/plant significantly better in V_4 as compared to V_3.. No significant difference was recorded in No. of grains/pod.

The results obtained during the course of investigation depend upon economic yield of a crop plant depend upon number of complex characteristics and influenced by interaction between morphological, physiological and environmental condition of the plant .The responses of characteristics as influenced by effluents irrigation with advancement in age with comparatively at a faster rate in early growth period as compared to later growth period. Soybean variety JS72-44 recorded better height

in experiment no. 1. responses of varieties of soybean was affected by effluent irrigation. It effects on height, dry weight and fresh weight. In experiment no 1 plant height was observed high in non-polluted environment as compared to polluted environment .plant height of soybean depend basically on genetically makeup and climatic condition(Laurete)in 1979.

CONCLUSION

To summarize the result of investigation it is concluded that there was no practically no significant difference observed except plant height and relative growth rate .Yield is a complex characteristic governed by external and internal factors. In the experiment the varietal responses was significantly marked by effluent. Soybean variety JS72-44, JS75-46 practically same yielding variety .No significant differences could be observed.

Effluent was highly acidic with ph ranging from 4.0 to 4.5 with high BOD and COD .Effect of different concentration of effluent as well as varietal responses found evident for growth characteristics.

Plant height increased as faster rate in early growth stages and slowed down in later growth stages .Better plant height was observed in NPE as compared to PE in maize .The concentration of effluent adversely affect the plant height in maize varieties .

To summarize the result of investigation it is concluded that there was no practically no significant difference observed except plant height and relative growth rate .Soybean variety JS72-44 was found to be the best suitable variety, therefore in future studies it may be conducted on group of crops.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Anonymous, Official Methods of Analysis, Association of Official Analytical Communities, Washington, DC, USA, 1980.

APHA (1976) Standard methods for examination of water and waste water. American public health association, New York.

Davison RS and Clymer (1966) the desirability and applicability of simulating ecosystem, New york Academy Science ; 128:790.

Haraman B (1968) Returning west t land , a new role of agriculture , general of soil and water conservation , 23 : 164-168.

Hawkes HA (1963) The ecology of waste water treatment Pergamum press, Newyork :203.

Lauretes D 1979 – Sowing density and distance between the rows .Information agronia 35(23) : 6215-6216;Soybean abstract 3(3): no-263(1980)

Paliwal and Yadav RR (1976) Irrigation water quality and crop management in union territory of Delhi: IARI research bulletin no.2

Seth PN and Venkataraman R, Maheshwari SC (1975) Studies on growth and flowering of short day plant *wallfia microscopia* 1970,90,349-359

Sopper, Willam E (1968) Waste water renovation for reuse , key to optimum use of water resources water research Pergamum press ,New york vol.3,471-480.

Trivedi,, R.C 1979 : Study of Chambal river and surroundings due to Nagda Industrial complex Ph. D thesis , School of studies in botany ,Vikram University Ujjain

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Leafing, flowering and fruiting pattern of some species of caesalpiniaceae from Buldhana district (M.S.), India

Dhore MM and Wakode AV*

Department of Botany, B. B. Arts, N. B. Commerce, B. P. Science College, Digras.
Department of Botany, Smt. G. G. Khadse College, Muktainagar.

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Dhore MM and Wakode AV (2019) Leafing, flowering and fruiting pattern of some species of caesalpiniaceae from Buldhana district (M.S.), India, *Int. J. of. Life Sciences*, Special Issue, A13: 215-218.

ABSTRACT

Phenological study is useful to understand regularities in the course of life of plants depending on external conditions of the environment. It is a valuable source of information for the onset and duration of growing seasons in various climatic regions. The present investigation provides the information regarding the phenological events of family Caesalpiniaceae found in Buldhana district of Maharashtra, India. The phenological Characters such as Leafing, flowering and fruiting behavior of 15 plant species of Caesalpiniaceae were studied. From this study the peak period of leafing was found to be Throughout year (for 4 Species) the peak period of flowering shows Throughout year (for 4 Species) and the peak period of fruiting activity was found to be Throughout year (for 4 Species) followed variedly in other species. Such observation will be useful to the students, researcher and people of this region.

Key words: Leafing, Flowering, Fruiting, Phenology, Caesalpiniaceae,

INTRODUCTION

Plants are very much responsive to the various environmental factors and these responses are shown in the form of externally visible changes which are called as phenophages and the study of such phenophages are called phenology. Phenology is the date and timing of occurrence of the various biological events in the life cycle of plant, which gives valuable information about the on functional rhythms of plant communities. It is the science of studying life-cycle events of plants and animals, and their responses to seasonal and inter-annual variation in climate (Morisette *et al.,* 2008).The phenological events are important in describing and explaining the seasonal aspects of ecological phenomenon (Leith1970).

Study of plant phenology gives the valuable source of information about the onset and duration of growing seasons in various climatic regions and it is essential to understand the dynamics of plant communities, which of course impact animal populations as well.

Plants of family Caesalpiniaceae are cosmopolitan in distribution showing variation in habit and habitat and are distinguished by uni or bipinnate compound leaves with pulvinus leaf base and without stipels. Racemose inflorescence is most common. Flowers are slightly zygomorphic, pentamerous with free sepals and petals, mostly with imbricate aestivation. The odd petal is smaller and posterior.

The stamens are ten in number or fewer by reduction or sterility. The gynoecium is monocarpellary, unilocular and the ovules are arranged in two alternating rows on marginal placentation. The pistil is stalked, perigynous; thalamus cup-shaped and the ovary half-superior.

There is a lot of demand for database of plants all over the world. We cannot fully utilize the plants of any area or region, without knowing the basic data about their availability, Study of plant phenology gives us the exact timing of occurrence of various biological events in plant life cycle, so it will be useful in developing proper management strategy as well as better understanding of forest regeneration potential and community level interactions.

MATERIAL METHODS

Buldhana district came under the Amravati division. It is the western border of the Vidarbha. The district is located at 19.51^0 and 21.17^0 N latitude and 75.57^0 and 76.59^0 E longitude. Buldhana district comprises thirteen tehsils namely, Jalgaon Jamod, Sangrampur, Shegaon, Khamgaon, Nandura, Malkapur, Motala, Chikhali, Mehkar, Deulgaon Raja, Lonar, Sindkhed Raja and Buldhana. The district is bounded by Akola, Buldhana and Amravati district on east, Jalgaon and Aurangabad on west, Madha Pradesh on north, and Jalna district on south. The total area of the Buldhana district is 9640 sq. km. and the forest areas occupy 8.8% of the total area of the district. The forest of the district is a southern tropical dry deciduous forest having hilly region (Champian, and Seth, 1968).

The phenological study for leafing, flowering and fruiting was done on 15 species of the family Caesalpiniaceae of Buldhana district, Maharashtra. The detailed observations were carried out about the leaf initiation, flowering and fruiting behavior of plant species at monthly intervals over a period of one and half year (Jan 2016 to Dec. 2017) as shown in the table 1. and are arranged in alphabetical order.

RESULTS & DISCUSSION

The Phenological observations of leaf initiation, flowering and fruiting were recorded month wise, as shown in the table 1. Total 15 plants species of family Caesalpiniaceae were studied from Buldhana district Maharashtra and arranged with alphabetical order.

Table 1: Phenological observation

Sr. No.	Name of Plant species	Leaf Initiation	Flowering	Fruiting
1.	*Bauhinia purpurea* L.	Feb-Mar	Sep-Nov	Jan-Apr
2.	*Bauhinia racemosa* Lam.	May-Jun	Apr-Jun	Nov-Jan
3.	*Bauhinia vahlii* Wight & Arn.	Jun-Aug	Jul-Aug	Nov-Jan
4.	*Caesalpinia bonduc* (L.) Roxb.	Jun-Jul	Aug-Sep	Sep-Oct
5.	*Caesalpinia pulcherima* (L.) Swartz.	Through-out year	Through-out year	Through-out year
6.	*Cassia auriculata* L.	Through-out year	Through-out year	Through-out year
7.	*Cassia fistula* L.	Apr-Jun	May-Jun	May-Jul
8.	*Cassia occidentalis* L.	Apr-Jun	Aug-oct	Oct-Jan
9.	*Cassia siamea* Lam	Through-out year	Through-out year	Through-out year
10.	*Cassia tora* L.	Jul-Aug	Aug-Oct	Oct-Jan
11.	*Hardwikia binata* Roxb.	Apr-Jul	Jul-Aug	Feb-Mar
12.	*Parkinsonia aculeate* L.	Jan-Mar	Sep-May	Dec-Jun
13.	*Peltophorum pterocarpum* (DC.) Baker	Through-out year	Through-out year	Through-out year
14.	*Saraca asoka* (Roxb.) de Wilde.	Apr-Jul	Feb-Apr	Sep-Dec
15.	*Tamarindus indica* L.	Apr-Jul	May-Aug	Jan-Apr

Table 2: Result Analysis of Leafing Activity of family Caesalpiniaceae in Percentage.

Leafing Activity	Feb-Mar	May-Jun	Jun-Aug	Jun-Jul	Throughout Year	Apr-Jun
	6.66%	6.66%	6.66%	6.66%	26.66%	13.66%
	Jul-Aug	Apr-Jul	Jan-Mar			
	6.66%	20%	6.66%			

Table. 3: Result Analysis of Flowering Activity of family Caesalpiniaceae in Percentage.

Flowering Activity	Sep-Nov	Apr-Jun	Jul-Aug	Aug-Sep	Throughout Year	May-Jun
	6.66%	6.66%	13.66%	6.66%	26.66%	6.66%
	Aug-Oct	Sep-May	Feb-Apr	May-Aug		
	13.33%	6.66%	6.66%	6.66%		

Table 4: Result Analysis of Fruiting Activity of family Caesalpiniaceae in Percentage.

Fruiting Activity	Jan-Apr	Nov-Jan	Sep-Oct	May-Jul	Throughout Year	Oct-Jan
	13.66%	13.66%	6.66%	6.66%	26.66%	13.66%
	Feb-Mar	Dec-Jun	Sep-Dec			
	6.66%	6.66%	6.66%			

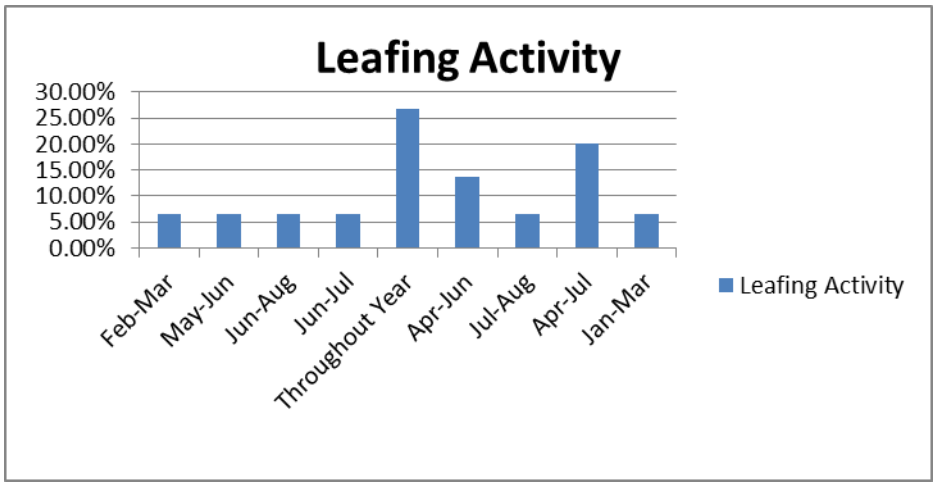


Figure. 1: Leafing Activity of family Caesalpiniaceae

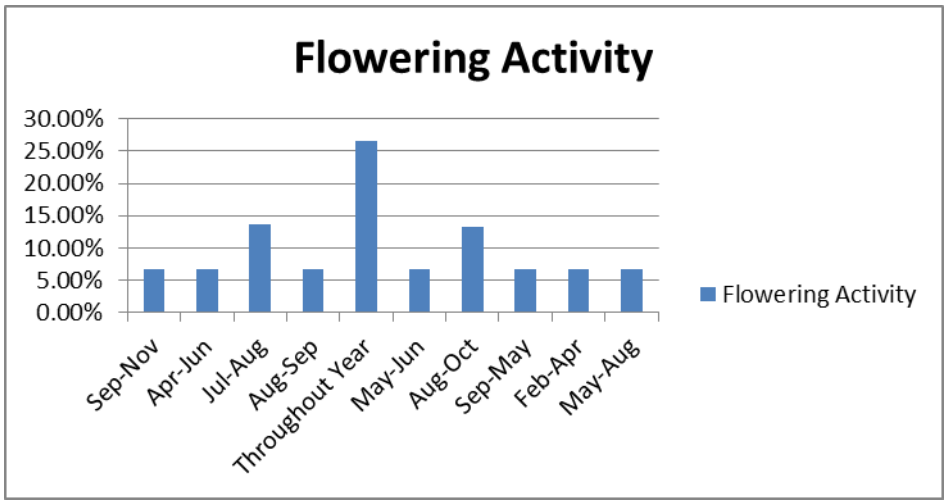


Figure. 2: Flowering Activity of family Caesalpiniaceae

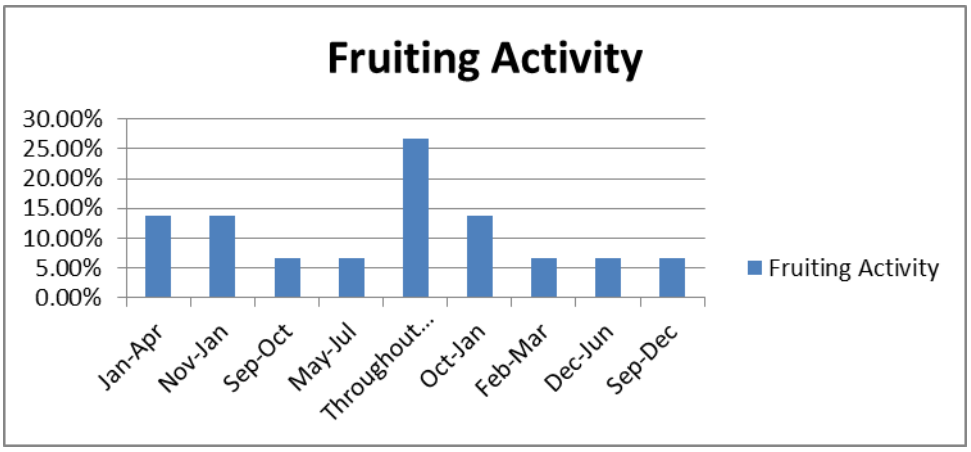


Figure. 3: Fruiting Activity of family Caesalpiniaceae

From the table it is observed that the peak period for leafing in Caesalpiniaceae plant species was found to be Throughout year (04 Species), Apr-Jul (03 species), Apr-Jun (2 species) followed by variedly in other species. Flowering continued in different species in different month and it is observed that Throughout year (04 Species), Jul-Aug (2 Species), Aug-Oct (2 species) and remaining species have shown variation in the month for its flowering. The fruiting period was observed Throughout year (04 Species), Jan-Apr (2 Species), Nov-Jan (2 species), Oct-Jan (2 species) and remaining species have shown variation in the month for its fruiting.

CONCLUSION

The present phenological study is useful to understand regularities in the course of life of plants depending on external climatic conditions of the environment. It provides an important source of information about the onset of different biological events or phenophases, in the life cycle of plants and duration of growing seasons. From this study it is concluded that maximum leafing, flowering and fruiting activities was found Throughout year (4 Species). Such observation will be useful to the students, researcher and people of this region.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Champion HG and Seth SK (1968) A Revised Survey of Forest Types of India, Govt. of India Press, New Delhi, p. 404.

Dhore MA (2002) Flora of Amravati district with special reference to the distribution of tree species. Publisher Amravati university.

Diwakar PG and Sharma BD (2002) Flora of Buldhana district. BSI publication. Geology, Goverment of Maharashtra. Gazetteers Department.

Karthikeyan S and Anand Kumar (1993) Flora of Yavatmal district BSI publication.

Morisette J, Richardson A, Knapp A, Fisher J, Graham E, Abatzoglou J, Wilson B, Leith H (1970) Phenology in productivity studies. In: D. Reichle (eds.). Analysis of Temperate Forest Ecosystems. Heidelberg. Spriner-Verlag.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Study of Snake Species Diversity in Rural and Semi Urban Areas of Buldhana district of Maharashtra, India

Kale GB, Vairale Shiva and Ghait SN

Department of Zoology, G.S. Science, Arts and Commerce College, Khamgaon Dist.Buldana (MS) 444303, India
Email:- shivavairale@16gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Kale GB, Vairale Shiva and Ghait SN (2019) Study of Snake Species Diversity in Rural and Semi Urban Areas of Buldhana district of Maharashtra, India, *Int. J. of. Life Sciences*, Special Issue, A13: 219-225.

ABSTRACT

Snakes plays important ecological role in food chain. Depletion of these animals throughout the globe and their extinction is causing a conscientious and diligent task to the people of all spheres of the society to conserve them. A total number of 25 species of snakes belonging to 6 families, 22 genera were recorded during the study period of six month. Of which 17species belonging to non-venomous, 3 semi-venomous and 5 species were venomous. Among these 2 species were endemic to India and 7 species shows rare status.

Key words: Snake of India, Maharashtra Snakes, Khamgaon, Dyanganga, Snakes.

INTRODUCTION

Snakes are abundant all over the world except Antarctica and some islands. Snakes are extremely well adapted to their habitats and plays important role in food chain and food web. The snakes are integral part of a forest ecosystem as their position in the food chain as predators making them important in the nutrients flow. They play key ecological roles in controlling rodents pests. They maintain the balance of nature. The present study was aimed to determine the diversity distribution and various morphs of the snake species in Khamgaon region of Maharashtra. The study period was August 2018 to January 2019.

MATERIAL AND METHODS

Khamgaon is located in the Buldhana district, Maharashtra. Dyanganga Wild Life Sanctuary is about 22km from Khamgaon. For the collection Pit-fall trap, direct encounter, snake occurrence calls and following the rescue calls of snake friends these type of methods were used. The collected species were identified by using field guide and books. The collected species then released in their natural habitat. If any injured snake species collected then it were treated with Veterinary Doctors and released in forest after some time.

RESULTS ANA DISCUSSION

In the present study total snakes comprises six families Typholopidae, Pythonidae, Boidae, Colubridae, Elapidae, Viperidae. Out of this families

Colubridae family shows a dominance and represented in dominance order as Colubridae> Elapidae> Viperidae>=Boidae>Pythonidae>=Typhlopidae.

There were 22genera recorded out of 25 snake species with 6 families during the study period of six month. Of which 17species belonging to non-venomous, 3 semi-venomous and 5 species were venomous. Among the venomous species, Common krait, slender coral snake, spectacled cobra, Russell's viper and Saw scaled viper were found. Indian cobra-Naja naja was the most abundant followed by Indian krait-Bungarus careuleus. The non-venomous species included Bramhminy worm snake, Indian rock Python, Common sand boa, Red sand boa, Common trinket snake, Indian rat snake, Banded racer, Indian smooth snake, Common kukri, Common bronzeback tree snake, Common wolf snake, Yellow spotted wolf snake, Dumeril's black headed snake, checkered keelback, striped keelback, Green keelback and Russell's kukri. Among the semi-venomous species Indian egg eater, Common cat snake and Common vine snake were recorded.

Among these snake species Indian smooth snake-Corenella branchyura and Yellow spotted wolf snake-Lycodon flavomacutus shows endemic status in India. There were Indian egg eater, Indian Rock python, Yellow spotted wolf snake, Indian smooth snake, Russell's kukri, Dumerill's Black headed snake and Slender coral snake shown rare status. Family Typhlopidae was recorded with single species, Pythonidae with 1, Boidae with 2, Colubridae with 16, Elapidae with 3 and Viperidae 2 species. Family Colubridae showed highest percentage 64% and was species rich. While non-venomous category of snakes recorded with highest number of species and semi venomous category found to be poor in species.

The present study is a trial to guage the data regarding differing kinds of snake species and their incidence, abundance and species richness and any assist within the data, awareness and conservation of snake fauna in this region.

Data analysis:-

Shannon index (**H**) = - € Pi In Pi = - (-2.4216) ,
H = 2.4216

Simpson index (**D**) = 1/€Pi^2 = 1/0.3976 ,

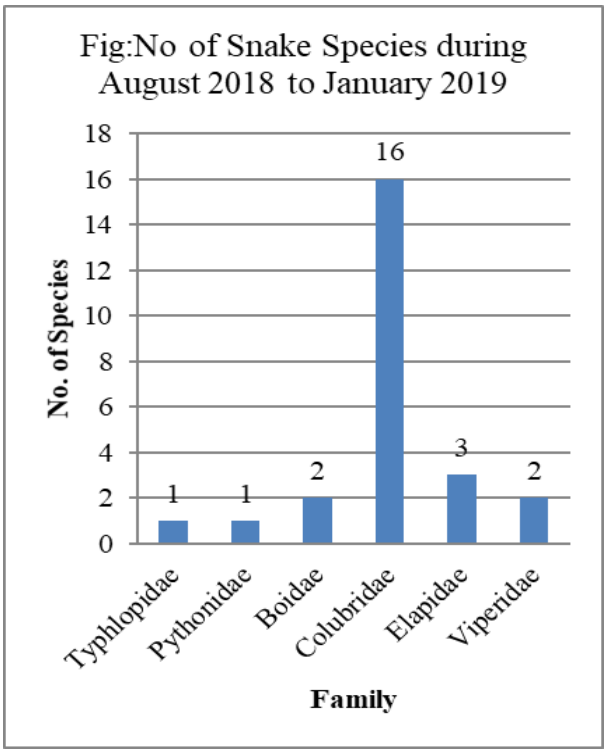
D = 2.5150

Table 1: Data analysis using diversity indices (Shannon and Simpson)

Sr.no	Family name	No. of species	**pi**	**pi2**	**In Pi**	**Pi In pi**
1	*Typhlopidae*	4	0.0243	0.0005	-7.6009	-0.1847
2	*Pythonidae*	3	0.0182	0.0003	-8.1117	-0.1477
3	*Boidae*	11	0.067	0.0044	-5.4261	-0.3635
4	*colubridae*	95	0.5792	0.3344	-1.0924	-0.6327
5	*Elapidae*	37	0.2256	0.0508	-2.9798	-0.6722
6	*Viperdae*	14	0.0853	0.0072	-4.9336	-0.4208
		164		**0.3976**		**-2.4216**

Table 2: Data analysis of No. of species by Family distribution.

Sr.No.	Family	No. of species recorded	Percentage (%)	π chart %
1	Typhlopidae	1	1/25×100= 4	4×3.6=14.4°
2	Pythonidae	1	1/25×100= 4	4×3.6=14.4°
3	Boidae	2	2/25×100=8	8×3.6=28.8°
4	Colubridae	16	16/25×100= 64	64×3.6=230.4°
5	Elapidae	3	3/25×100= 12	12×3.6=43.2°
6	Viperidae	2	2/25×100= 8	8×3.6=28.8°
Total	25	100%	360°	



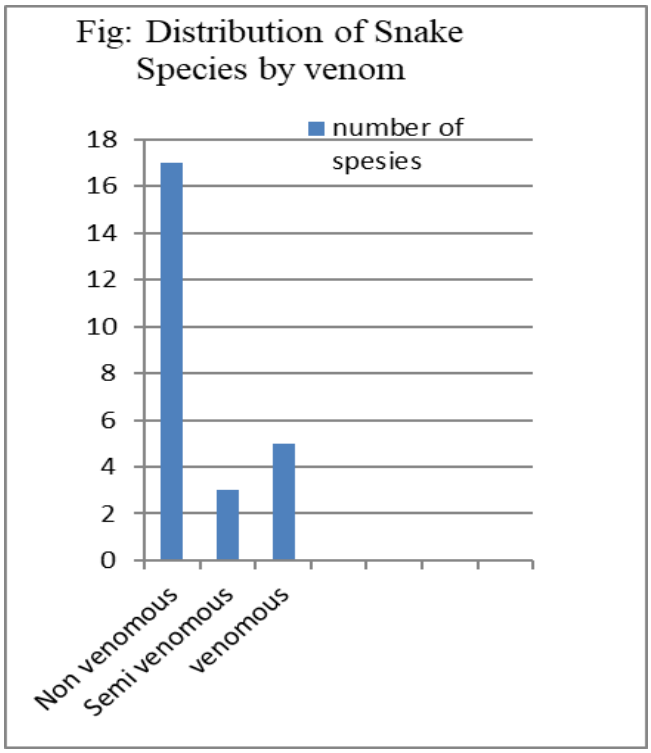


Table.3: Graphical Representation of Data on basis of Family and Venom

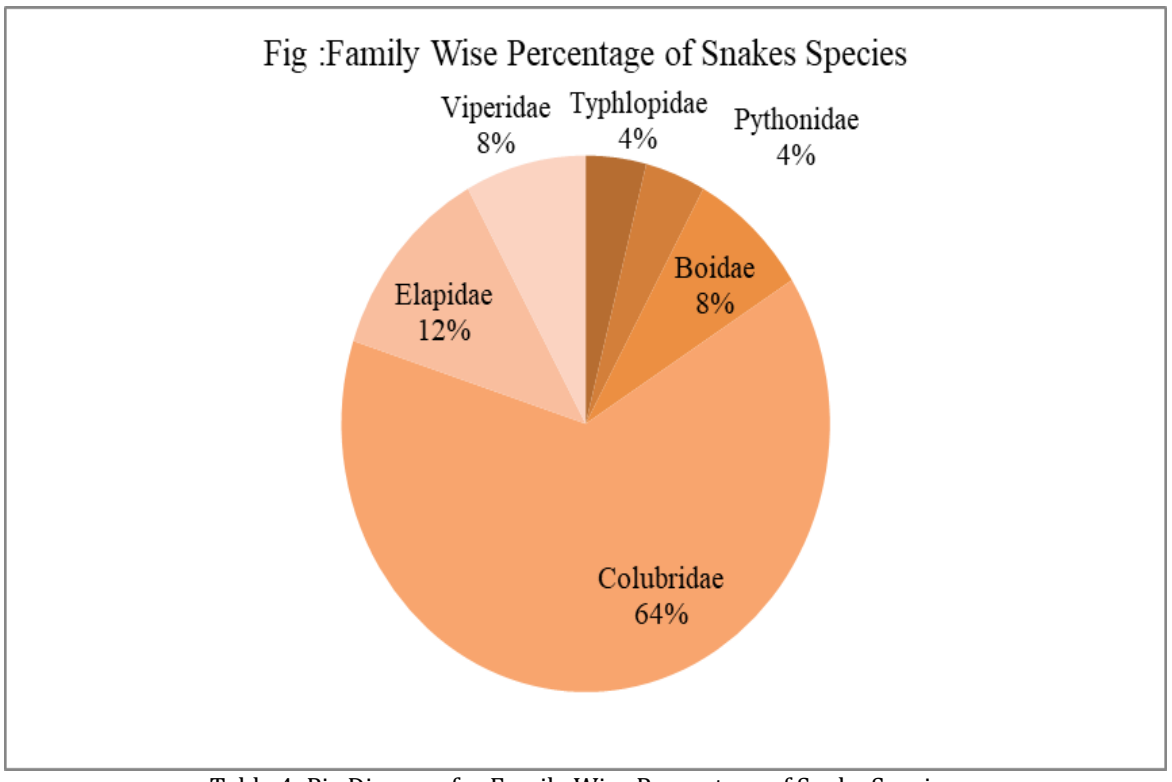


Table.4: Pie Diagram for Family Wise Percentage of Snake Species.

1.Bramhminy worm snake Location:- Garadagaon

2.Indian rock python Location:- Tembhurna

3.Common sand Boa Location:- Sutala Bk.

4.Red sand Boa Location:-Shirajgaon Deshmukh

5.Common trinket snake Locaion:-Area of Garadgaon

6.Indian rat snake Location:-Area of Garadgaon

7.Banded racer Location:- Area of Garadgaon

8.Indian smooth snake Location:-Civil line Khamgaon

9.Indian egg eater Location:- Area of Wadi

10.Common kukri snake Location:- Area of Antraj

11.Common Bronzback snake Location:-Lakkadganj Khamgaon

12.Common wolf snake Location:- Rekha Plot Khamgaon

13.Yellow spotted wolf snake Location:- G.S. college Khamgaon

14.Dumeril's black headed snake Location:- Area of Sutala Khurd

15.Checkered keelback Location:- Area of Garadgaon

16.Striped keelback Location:- Area of Waghali

17.Green keelback Location:-Area of Mathani

18.Russell's kukri snake Location:-Area of Makta

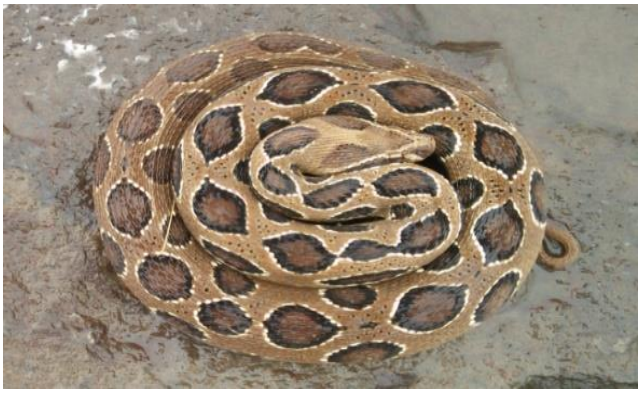
19.Common cat snake Location:-Area of Hiwarkhed

20.Common vine snake Location:-Area of Varna

21.Common krait Location:- Area of Sajanpuri

22.Slender coral snake Location:- Civil lines Khamgaon

23.Spectecled cobra Location :- Vijaylaxmi Petrol Pump Khamgaon



24.Russell's viper Location:- Area of Garadgaon

25. Saw scaled viper Location:- Area of Shelodi

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Das (2003) A Photographic Guide to Snakes and Other Reptiles of India, New Holland Publishers (UK)

Devid Raju and Surya (2016) Photographic field guide wildlife of central India, Notion Press

Tambre and Chavan (2016) Snake species diversity of Swami Ramanand Teerth Marathwada University, Nanded, *Int.J.Curr.Res.Aca.Rev.2016, 4(6): 104-115*

Khaire (2006) A Guide to Snakes Of Maharashtra, Goa and Karnataka, Indian Herpetological Society. 'USANT', India, 2006

Joshi (2011) A preliminary survey on the snakes of the Buldhana district, Maharashtra, *GRT,Vol I, Issue II/Aug11,pp.01-04.*

Bansode (2016) A study on snakes from Mokhada and Jawhar, District Palghar (MH). International Journal of *Fauna and Biological Studies 2016;3(5):103-115*

Raut SR et al (2014) Recent study on biodiversity of snakes in Palghar region,Thane(MH)Adv. *Appl. Sci. Res., 2014, 5(2):373-381*.

Whitaker R and Captain A (2004) Snakes of India -The Field Guide. Draco Books, Tamil Nadu, India

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Bio reduction of water content fluoride by Bat Guano

Bharambe CM[1] and Choudhari Sharda N[2]

[1]Department of Zoology, *Vidnyan Mahavidyalaya, Malkapur Dist- Buldana (MS)
[2]C S Kothari Jr College Nandura, Dist- Buldana (MS)
Email: jscmb0128@rediffmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Bharambe CM and Choudhari Sharda N (2019) Bio Reduction of Water content Fluoride by Bat Guano, *Int. J. of. Life Sciences*, Special Issue, A13: 226-228.

ABSTRACT

Bat guano is an old faecal matter of bat was collected from the old temples located in the rim of Lonar crater of Lonar, Buldana District, Maharashtra (India). It is known for the degradation of pollutants. The various drinking water sources of District Buldana has the characteristics of the presence of fluoride, which is cause serious problems in human beings. In the present study an attempt has been made to employ the Bat guano to reduce the fluoride of the drinking water sources. There was a significant decrease of fluoride against controls. There were 31.88, 22.63, 14.82 10.47, 8.52, 5.5, 2.1, 1.2, 0.7 and 0.6 reduction in the fluoride, at the interval of 10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 days in the water content after the application of Bat guano. The results are discussed with fluoride pollution reduction. Our investigation indicates that bat guano used for degradation of water pollutants and bioremediation of aquatic ecosystems and also for waste water treatments.

Key words: Bioremediation, Waste water, Fluoride, Bat guano etc.

INTRODUCTION

Lonar crater is situated in village Lonar in the Buldhana District of Maharashtra, India. It has an almost perfectly circular shape and accumulated with water in the deeper parts of basin. Rocks in the crater reveal many characteristic features of the moon rocks. There are many old temples on the peripheral boundary of the crater which have now become roosting places for bats. Morache temple (Peafowl's temple) is now famous for existence of thousands of bats and peacocks. Waghache temple (Leopards temple) is also famous for bats and people have seen leopard found in it many times.

Bat guano

The word guano originated from the Quichua language of the Inca civilization and means "the droppings of bat". The bats forage at night for insects over a particular area, and they return to the old temples during the day to sleep and care for their young. They attach themselves to ceiling, and their excrement accumulates on the floor below. In some situations the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance.

BIOREMEDIATION AND BAT GUANO

One of the most serious universal, international problems facing us today is the removal of harmful compounds from industrial and municipal as well as anthropogenic waste. If it is discharged into lakes and rivers, a process called eutrophication occurs (Prince, 2003). Environmental contamination whether it is from industrial or municipal or anthropogenic toxic waste that degrades the various environments is a vital concern to the public. Thus it is crucial to develop and implement accurate means to clean and preserve our precious and deteriorating environment. Although there are many techniques in cleaning environmental contaminations, one process has the most potential, namely bioremediation. Bioremediation, or commonly referred to as biodegradation, is a process in which microbes such as bacteria, fungi, yeast, or micro algae are involved in degrading toxic wastes (Pace, 1997 and Knezevich, 2006).

A marvelous symbiosis exits between the microorganisms and bat guano. Bacteria in the mammalian intestinal tract aid in the breakdown of food during digestion. These organisms synthesize enzymes capable of degrading a vast array of substances. Innumerable microbes are regularly excreted along with waste products and together with other organisms; they constitute the microbial population of a bat guano deposit (Steele, 1989).

Large populations of bat deposit thousands of kilograms of dropping annually. An ounce of bat guano contains billions of bacteria, and a single guano deposit may contain thousands of bacterial species. Guano being rich in bioremediation microbes cleans up toxic substances, (Barry et al., 1997; Bharambe 2008). At present we do not know these species.

MATERIAL METHODS

To study the impact of bat guano on sugar factory effluent, 10 mg bat guano was dissolved in 100 ml of drinking water (10:100 proportions). After addition of bat guano in water, the samples were kept undisturbed and analysis was carried out for 100 days at an interval of 10 days for the change in its fluoride contents. The change in water content fluoride was noted after every 10 days upto 100 days hours. The water was analyzed by using standard methods for water analysis suggested by APHA (1998) and Bharambe (2008).

RESULTS & DISCUSSION

When bat guano was dissolved in water with fluoride (31.88), after 10 days the fluoride was found to be decreased gradually to (0.60) up to 100 days (Table, 1). The water was kept undisturbed till 100 days and the fluoride was noted after every 10 days up to 100 days. After 100 days the fluoride was seen to be remained constant during observations (Table, 1).

Tilak et al. (2005) and Bharambe (2008) reported a number of bacterial species associated with the bat guano belonging to genera, Azospirillum, Alcaligens, Arthrobacter, Acinetobacter, Bacillus, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Pseudomonas, Rhizobium and Serratia. He also suggested that this bacterium has high bioremediation capacity. Hutchens et al. (2004) had demonstrated aerobic methane oxidizing bacteria, Methylomonas and Methylococcus in bat guano.

The bacterial enzymes capable of degrading a number of substances (Martin, 1991; Dvorak *et al*., 1992; Edenborn *et al.,* 1992; Bechard *et al.,* 1994; White and Chang, 1996; Frank, 2000; Kaksonen, *et al*., 2003; Vallero *et al*., 2003; Boshoff, *et al*., 2004; Miranda, 2005; Seena, 2005; Tilak *et al.,* 2005).

Murphy (1989) demonstrated a nutritious broth formation when the bat guano was added in water and further he proved that this broth supported the growth of numerous microbes.

Table, 1: Impact of bat guano on water content fluoride at an interval of 10 days.

Experiment	Sg	Time (days) and Fluoride content of water (mg/l)									
		0	10	20	30	40	50	60	70	80	90
Control	W1	31.88	31.91	31.94	31.95	31.96	31.96	31.96	31.97	31.97	31.97
Experimental	W2	31.88	22.63	14.82	10.47	8.52	5.50	2.10	1.20	0.70	0.60

All values are the mean of five replicates; Sg – Sampling; W1 – Control water from drinking source without bat guano; W2 – Water from drinking source with bat guano.

CONCLUSION

Alley and Mary (1996) stated that an ounce of bat guano contains billions of bacteria and thousands of bacterial species and these bacteria are important to bioremediation. Sridhar et al. (2006) and Pawar *et al.* (2004) examined the fungal fauna of bat guano and used for bioremediation of Lack soil.

Other than municipalities, various industries disposing off the industrial effluents are the worst polluters of the aquatic resources. It is of utmost importance, hence, to prevent the pollution of aquatic resources by all possible means to control its quality from further deterioration. Applying microorganisms for industrial pollution control is an area of interest all over the world.

In the present investigation is an attempt to study the impact of bat guano with its rich microbial flora on bioremediation of industrial effluents. The results revealed that within a period of 100 days, there was a remarkable reduction in the physico-chemical parameters of industrial effluents, thus stabilizing the industrial effluents, suggesting that industrial effluents can be effectively treated by bat guano.

No much work has been carried out on the bat guano in India and hence it was thought to study the impact of bat guano from and to assess the feasibility of the bat guano as supplementary bioremediatant.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

APHA (1998) Standard methods for the examination of water and wastewater, 20th ed. APHA, AWWA and WEF New York, Washington DC.

Bharambe CM (2008) Microbial Ecology of Bat Guano, Ph.D Thesis, SGBAU, Amravati, 35-41.

Churchill, HV. Occurrence of Fluorides in Some Waters of the United States. Industrial and Engineering Chemistry. Sept 1931. 23(9)996-8.

Dilip KM and Markandey NR (2002) Microorganisms in Bioremediation/edited by. New Delhi, Capital Pub., viii, 190 p., tables, figs., ISBN 81-85589-08-9.

EPA. Drinking Water Regulatory Information. https://www.epa.gov/dwreginfo/drinking-water-regulatory-information

Keleher S (1996) Guano: Bats' Gifts to Gardeners. 14(1): pp. 15-17.

Knezevich V, Koren O, Ron EZ, Rosenberg E (2006) Petroleum Bioremediation in Seawater Using Guano. *Bioremediation Journal*, Vol. 10th Issue 3, p83-91, 9p.

National Academies Press. Fluoride in Drinking Water: A Scientific Review of EPA's Standards. 2006;2:25.

Pace NR (1997) A molecular view of microbial diversity and the biosphere. *Science* 276:734-740

Pawar KV and Deshmukh SS (2004) Bioremedition of Lack soil using bat guano. *Indian J. Environ and Ecoplan*. 8(3):699-704.

Petersen PE, Lennon MA. Effective use of fluorides for the prevention of dental caries in the 21st century: the WHO approach. Community Dent Oral Epidemiol. 2004;32:319–21.

Pierce W (1999) Speech on '' Bat guano '' Sept., 1999. Cassette from National Vanguard Books, P.O. Box 330, Hillsboro, WV 24946.

Prince RC (2003) Bioremediation in marine environments. Prince RC. Exxon Research and Engineering, Annandale, NJ 08801. Bioremediation.

Steele DB (1989) Bats, Bacteria and Biotechnology. 7(1):3-4.

Tuttle MD (1986) Endangered gray bats benefits from protection. Bat, Vol. 4(4), 1986.

U.S. Census Bureau. Current Housing Reports, Series H150/07, American Housing Survey for the United States: 2007 [PDF - 642 pages]. U.S. Government Printing Office, Washington, D.C.: 20401, Printed in 2008.

United States Geological Survey. USGS Water Science School. Contamination in US Private Wells. 2009.

World Health Organization. Fluoride in Drinking-water. pp: 5-8.2006.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Impact of Bat guano on the salinity of aquatic ecosystem

Bharambe CM[1] and Autkar Vivek K[2]

[1]Department of Zoology, Vidnyan Mahavidyalaya, Malkapur,Dist.Buldana (MS) India
[2]Jijamata Mahavidyalaya, Buldana (MS) India
Email: vivekautkar@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Bharambe CM and Autkar Vivek K (2019) Impact of Bat guano on the salinity of aquatic ecosystem, *Int. J. of. Life Sciences*, Special Issue, A13: 229-231.

ABSTRACT

The word guano originated from the "Quichua language" of the Inca civilization and means the droppings of bat. The bats forage at night for insect over a particular area, and they return to the old temples during the day to sleep and care for their young's. They attach themselves to ceiling, and their excrement accumulates one floor below. In some situation the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance. Bat guano was collected from the temple of Lonar crater Lonar, Buldana District, Maharashtra. The bat guano, it dissolved in water of Purna River, (10:100) concentration was prepared and kept undisturbed till 30 days and parameters was noted at an interval of 2 hour and thereafter 5 days for about 24 hour and 30 days respectively. Resulted into increasing in the salinity content of Purna water after the addition of bat guano. Our investigation results indicate that bat guano used for bioremediation of aquatic ecosystem.

Keywords: Bioremediation, bat guano, industrial effluents, water pollutants etc.

INTRODUCTION

Lonar crater is situated in village Lonar in Buldana District of Maharashtra, India. It has an almost perfectly circular shape and accumulated with water in the deeper partsof basin. Rocks in the creator reveal many characteristic features of the moon rocks. There are many old temples on the peripheral boundary of thereafter which have now become roosting places for bats. Ramgaya Temple has become the source of sweet drinking water, as this is the only sweet water stream available in the creator; rest of the crater water is highly saline. Kamalja Devi temple is situated at the southern base of the crater. Morache temple (peafowl's temple) is now famous for existence of thousands of bats and peacocks. Waghache temple (Leopards temple) is also famous for bats and people leopard found in it many time (Bharambe, 2008).

BAT GUANO

The word guano originated from the "Quichua language" of the Inca civilization and mean "the dropping the bat". The bats forage at night for insect over a particular area, and they return to the old temple during the day to sleep and care of their young. They attach themselves to ceiling, and their

excrement accumulates on the floor below. In somesituation the guano can reach depth of feet in many years and appeared as guano-hip, and it has a valuable importance (Bharambe, 2008).

BAT GUNO AND BIOREMENDATION

One of the most serious universal, international problems facing us today is the removal of harmful compounds from industrial and municipal waste. If it is discharged in to lakes and rivers, a process called eutrophication occurs (Prince, 2003)

Environmental contamination whether it is from industrial or municipal toxic waste that degrades the various environmental is a vital concern to the public. Thus it is crucial to develop and implement accurate means to clean and preserve our precious and deteriorating environment. Although there are many techniques in cleaning environmental contaminations, one process has the most potential, namely bioremediation. Bioremediation, or commonly referred toes biodegradation, is a process in which microbes such as bacteria, fungi, yeast, or micro algae are involved in degrading toxic wastes (Pace, 1997, Knezevich, 2006).

A marvelous symbiosis exits between the microorganisms and bat guano. Bacteria in the mammalian intestinal tract aid in the breakdown of food during digestion. These organismssynthesis enzymes capable of degrading a vast array of substance. Immumerable microbes are regularly excreted along with waste product and together with other organisms; they constitute the microbial population of a bat guano deposit (Steele, 1989).

Large populations of bat deposit thousands of kilograms ofdropping annually. An ounce of bat guano contains billion of bacteria, and a single guano deposit may contain thousands of bacteria species. Guano being rich in bioremediation microbes cleans up toxic substance, (Barry *et al.*, 1997). At present we do not know these species.

MATERIAL METHODS

To study the impact of bat guano on water, 10mg bat guano was dissolved in 100ml of experimental water (10:100 proportions) for every time. After addition of bat guano in water, then the water was analyzed for the chance in its chloride contents. The change in water parameter was noted after every two hour up to 24 hour. Thereafter, the sample was kept undisturbed and analyses were carried out for 30 days at an interval of 5 days. The water was analyzed by using standard methods for water analysis suggested by APHA (1998), Aaranson (1970) and Bharambe (2008).

RESULTS

When bat guano was dissolved in river water with salinity 5.00. After 2 hour the salinity was found to be changed to 7.13 and after 4 hours increased gradually and it reached to 7.47 after 24 hours (Table, 1). The river water was kept undisturbed till 30 days and the salinity was noted after every 5 days upto 30 days. After 5 days the salinity was seen to be increased upto 30 days and then it remained constant after 30 days of observations (Table, 2).

DISCUSSION

Edenborn, (1992) reported a number of bacteria species associated with the bat guano belonging to genera, *Azospirillum*, *Flavobacteium*, *Pseudomonas*, *Rhizobium* and *Serratia*. He also suggested that this bacterium has high bioremediation capacity and also demonstrated aerobic methane oxidizing bacteria, Methylomonas and Methylococcus in bat guano.

Table 1: Impact of bat guano on salinity of water content at an interval of 2 Hrs.

Ps	Sg	Time (Hrs)												
		0	2	4	6	8	10	12	14	16	18	20	22	24
S	W1	288	288	288	288	288	288	288	288	288	288	288	288	288

All the values are the mean of five replicates. Ps-parameter; Sg-sampling; W1-Water from Purna River

Table 2: Impact of bat guano on salinity of water content at an interval of 5 days

Ps	**Sg**	**Time (Days)**							
		0	1	5	10	15	20	25	30
S	**W1**	288	284	210	188	172	170	160	150

All the values are the mean ±SE of five replicates; Figures in parenthesis indicates percent change over the result

The bacterial enzyme capable degrades a number of substances (Dvorak,*et. al*., 1992; Edenborn,*et. al*., 1992). Keleher, (1996)demonstrated a nutritious broth formation when the bat guano was added in water and further he proved that this broth supported the growth of numerous microbes.

Alley and Mary (1996) stated that an ounce of bat guano contains billions of bacteria and thousand of bacterial species and these bacteria are important to bioremediation. Pawar,*et.al*.(2004) examined the fungal fauna of bat guano and used for bioremediation of Lack soil.

CONCLUSION

Other than municipalities, various industries disposing off the industrial effluents are the worst polluters of the aquatic resources by all possible means to control its quality from further deterioration. Applying microorganisms for industrial pollution control is an area of interest all over the world.In the present investigation to study the impact of bat guano with its rich microbial flora on water content of Purnariver. The results revealed that with a period of 30 days, there was a remarkable change in the salinity of river water, thus stabilizing the river water salinity, suggesting that water can be effectively treated by bat guano because if the salinity of sample was acidic salinitychange to alkaline and vice-versa.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Aaranson S (1970) Experimental Microbial Ecology. Academic Press, New York. Pp.236.

APHA (1998) Standard method for the examination ot water and wastewater, 20th ed. APHA, AWWA and WEF New York, Washington DC.

James BK and Ryan T (2003) Salt impact model: strategic framework and information to indicate biodiversity thresholds to salinity. Arthur Rylah Institute for Environmental Research, Department of Sustainability and Environment. Heidelberg, Victoria, Australia. 84 pp.

Bharambe CM (2008) Microbial Ecology of Bat Guano and Its Impact on Associated Ecosysytems, Ph.D. Thesis, Sgbau Amt. pp 100-200.

Bowen GS and Hinton MJ (1998) The temporal and spatial impacts of road salt on streams draining the greater Toronto area. In: Groundwater in a watershed context – Proceedings. Ontario Ministry of the Environment and Geological Survey of Canada. Burlington, Ontario. Pp. 303 -309.

Brink M and Auen M (2004) "Go light with the salt, please: developing information systems for winter roadway safety." TR News 230: 3 – 9.

Bubeck RC and Burton RS (1989) Changes in chloride concentrations, mixing patterns and stratification characteristics of Irondequoit Bay, Monroe County, New York, after decreased sue 21 of road-deicing salts, 1974 – 1984. U.S. Geological Survey Water Resources Investigations Report 87-4223. Cant,

Demers CL and Sage RW (1990) Effects of road deicing salt on chloride levels in four Adirondack streams. *Water, Air and Soil Pollution* 49:369 – 373.

Dvorak DH, Hedin RS, Mclntire PE (1992) Treatment of metal contaminated water using bacterial sulphat reduction: results from a pilot-scale rector. *Biotechnol. Bioeng*.40:609-616.

Edenborn DH, Hedin RS (1992) Treatment of water by using sulphate reducing bacteria: *Biotech. Bioeng*.30:512-616.

Keleher S (1996) Guano: Bats Gifts to Gardeners. 14(1):pp.15-17.

Kenzevich V, Koren O, Ron EZ, Rosenberg E (2006) Petroleum Bioremediation in seawater Using Guano.

Pace NR (1997) A molecur view of microbial diversity and the biosphere. *Science,* 276:734-740.

Pawar K and Deshmukh V (2004) Bioremendation of Lack soil using bat guano. *Indian J. Environ and Ecoplan*.8(3):699-704.

Pierce W (1999) Speech on "Bat guano" Sept., 1999. Cassette from National Vanguard Books, P. O. Box330, Hillsboro, WV24946.

Prince RC (2003) Bioremendiation in marine environmental. Prince RC. Exxon Research and Engineering, Annandale, NJ 08801. *Bioremendiation*.

Steele DB (1989) Bats, Bacteria and Biotechnology. 7(1):3-4.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Phenological study of *Malvastrum coromandelianum* (L.) Gracke

Hinge Harsha, Billore DK, Vyas Sanjay

Research scholar, Department of Botany, Govt. Holkar Science college, Indore (M.P.)
Email-harshahinge3@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Hinge Harsha Billore DK and Vyas Sanjay (2019) Phenological study of *Malvastrum coromandelianum* (L.) Gracke, *Int. J. of. Life Sciences*, Special Issue, A13: 232-234.

ABSTRACT

The term Phenology is first used by Belgian Botanist Charles Morren in 1894. Phenology is series of periodic plant life cycle events and is affected by seasonal and inter-annual variation in weather. False mallow, Broom weed, Clock plant, Prickly Malvastrum, and kharenti in hindi is all are common name of *Malvastrum coromandelianum* (L.) Gracke belongs to family Malvaceae. It is a weed plant and herbaceous in habit. Its flower opens in noon when the light intensity and temperature is on peak. The present study provide information about phenological stages of these plant has been gathered during a year.

Key words: Clock plant, phenology, blooms, light intensity

INTRODUCTION

Phenological phases and their phonologicsal events were recorded in respect of germination, vegetative growth, flowering, fruiting, seed maturation and death. each phytophase affected by abiotic characters such as rainfall, temperature, day length.

Area of distribution: Indore district (22'45 N latitude and 75'5 E longitude) is located in the western region of M.P.on the southern edge of Malwa plateau at a height of 618 meters above mean sea level on the banks of river.

climatic conditions: climate of indore district is monsoonic and it is favourable for the growth of herbaceous plants.It is mostly uniform all year round. The year is divided in to three seasons namely rainy, winter and summer. The soil of the experimental area is black in colour, commonly known as black cotton soil.

Plant characters: False mallow, Broom weed, Clock plant, Prickly *Malvastrum* ,is common name of *Malvastrum coromandelianum* (L.) Gracke. Vernacular name of *Malvastrum coromandelianum* (L.) Gracke in language hindi – Kharenti and in Bhili – Bairara. It is belongs to family Malvaceae and herbaceous in habit. It is terrestrial plant. It is widely distributed throughout the world in all climatic condition tropical and sub-tropical and also extending in to temperate region. The plant is usually smaller,velvet hairy with characterstic of 4-rayed hairs. Stem herbaceous aerial and erect, cylindrical, branched solid hairy and green. Leaves are simple, petiolate, ovate, acute, unicostate,reticulate. Light yellow flowers occur singly in leaf axils. Flowers

are pentamerous, hypogynous and cyclic and occasionally paired and terminal. Sepals are 5 in number and gamosepalous, Petals are 5 in number, polypetalous, twisted, yellow. Stamens are indefinite and monodelphous, Ovary superior style and stigma as many as carpels.

MATERIAL METHODS

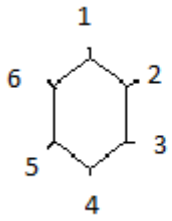
Phenology is commonly described as the art of observing life-cycle phases of plant in their sequential occurrence throughout the year.

Observation

There are critical phase which confines population and ecological life cycle of plant species. The viability, dormancy and conditions essential for germination, set the major limits to the evidence of the species population in different seasons and habitats. It is tempting to assume that the very existence of specificity of variety of germination regulating system and their recurrent complexity that they are eco-physiological adaptation, which increase the potential for the survival of the species, and which have been formed in the normal outline of evolution (Sen, 1976).

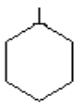
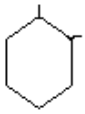
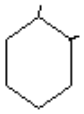
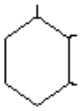
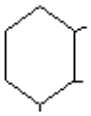
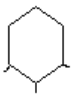
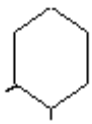
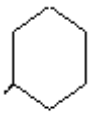
Malvastrum coromandelianum (L.) Gracke.

all phases of *Malvastrum coromandelianum* showing in following phenogram . phytophases are-



1= Germination
2=Vegetative Growth
3=Flowering
4=Fruitng
5=Seed maturation
6=Death

phenology of *Malvastrum coromandelianum* (L.) Gracke

 Mid June	 July	 August
 September	 October	 Nov.- Dec.
 jan.-feb.	 march	 april

RESULTS & DISCUSSION

Round the year observation of *malvastrum coromandelianum* for shows that rainy season were most favourable season for germination. seeds of *malvastrum coromandelianum* shows germination in mid-June. emergence of radicle sign the end of germination and it was the beginning of establishment of seedling. In last week of august plant show vegetative growth and the leaves broad and long than compared to other mature plant. and in late vegetative stage stems are beginning to elongate before flowering. Its flower opens in noon when the light intensity and temperature is on peak. during early rainy season relative humidity were high and temperature decreases. so, *Malvastrum coromandelianum* has shown maximum shoot length, number of leaves and seed production. seed only germinate through rain water and and in fluctuation in temperature germination continuous seen from mid June to September. September October and November all months were suitable for flowering and fruiting and seed maturation but late winter and whole summer season were condition is dry and high difference in day and night temperature which create unfavorable condition for *Malvastrum coromandelianum*.

CONCLUSION

The present study revealed that the abiotic factors can affect the plant growth from germination to seed maturation. The growing season starts with the first germination rains in the fall and ends when soil moisture is depleted at beginning of the dry season.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Chouhan A (2008) Autecological study of *Physalis minima* Linn. (Solanaceae) Ph.D.Thesis, D.A.V.V , Indore M.P. , India.

Sen (1976) Ecophysiological studies in weeds of cultivated fields with special refrence to Bajra(Pennisetum typhoides Rich.) and Til (Seasqmum indicum Linn.) USPL-480 Project , Jodhpur.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

On identities and ethnomedicinal plant parts sold by vendors in North Maharashtra (India) to cure Human diseases

Ahirrao[1] YA and Patil[2] DA

[1]Department of Botany S.S.V.P. Sanstha's Arts, Commerce and Science College, Shindkheda, District Dhule – 425406 (M.S.) India.
[2]P.G. Department of Botany, S.S.V.P. Sanstha's L.K. P.R. Ghogrey Science College, Dhule-424005 (M.S.) India. E- mail : \
E-mail : yaabotany@gmail.com | dapatil-10aug@yahoo.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Ahirrao YA and Patil DA (2019) On identities and ethnomedicinal plant parts sold by vendors in North Maharashtra (India) to cure Human diseases, *Int. J. of. Life Sciences*, Special Issue, A13: 235.-240.

ABSTRACT

The present paper deals with botanical sold by the vendors in Dhule, Nandurbar, Jalgaon, and Nasik Districts of North Maharashtra (India) ethnobotanical survey was carried out few years and information was obtained through open discussions and interviews with tradipracititioners. Presently, 27 plant species belonging to 27 genera and 21 families are communicated. Of these, 07 species are noted for first time from Indian region, as where 04 species although recorded so useful, but their parts are different These are administered in different forms of recipes e.g.- paste, powder, extract, ash, decoction etc. Even they are used raw or sometimes simply warmed. In many cases, they use them as a sole drug or occasionally supplemented by other botanicals or domestic substances like sugar, cow ghee, honey etc. These are used to combat about 22 human disease such as piles, skin, diarrhoea, deafness, bile, leucorrhoea, urination, respiratory track, diabetes, rheumatism, sexual vigour, enflunza, ring worms, tuberculosis, cancer, malaria, tonsillitis, hepatitis, jaundice, constipation, eczema, tetanus etc. The data include some chemical constituents of plants and accrued is assessed by cross-cultural comparisons with other Indian claims to bring out their veracity and uniqueness of the claims. The objective of investigation was to gather and document information in plants on utilization of botanicals by the tradipractitioners in the region. These drugs, if studied further on scientific lines, may yield valuable lead molecules and serve as additional sources of medicine.

Key words : Ethnomedicine, Vendors, North Maharashtra.

INTRODUCTION

Medicinal plants have been crucial in sustaining the health and well-being of mankind. It is generally agreed that major section of population especially in developing and underdeveloped countries seek healthcare from sources other than conventional medicines. They also seek help of some organized systems of medicine like Ayurveda, Unani, Siddha, etc. apart from these, every community or village has a wealth of herbal folklore. Our ancestors possessed a profound understanding of healing powers of plants. They used to try and

test local plants for a range of common health problems. These ancient healing practices are still in vogue in a period when different well-thought and organized systems of medicine are being practiced all over the world. Their knowledge has been passed orally generation-to-generation since long past. India is one such country having the oldest system of healing in the world. Moreover, tribal and rural societies in India still have their own choices of indigenous drug selection and application. A review of literature indicates the Herbal Vendors (Jadibutiwalas) and their traditional knowledge about plant drugs has remained untapped. They have been always ignored in our country. In India, Sinha (1998) attempted on this line and studied Delhi and surrounding areas. The present authors investigated some districts of north-western part of Maharashtra. *viz.* Dhule, Nandurbar, Nashik, Jalgaon. Information of 27 plants species employed for different human afflictions are being presented in this paper.

MATERIAL AND METHODS

Herbal vendors wandering in north Maharashtra are tapped and enquiries *w.r.t.* plant drug, recipe, administration, plant names, precautionary tips and diseases treated are noted and some chemical constituents noted from literature. Plants samples or products are purchased / collected and preserved scientifically. They are identified by using various regional, state and national floras in India. (Cooke, 1958; Hooker 1853; Naik, 1998; Sharma *et al.,* 1996 Singh *et al,* 2000; Patil 2003, and Kshirsagar and Patil 2008) Repeated surveys were conducted in different villages, towns and cities of North Maharashtra. Information regarding remedies related especially to the human diseases was recorded. The data adduced is based on personal interviews, observations and experiences of vendors in the region. The data is compared with the classical literature to point out new reports from India (Anonymous 1948-1976; Ambasta 1986; Jain 1991; Watt 1889-1893; Bhattacharjee,1998; etc.) Asterisk to the plant species indicate reports in classical literature. These are presented in the following Table-1.

Table 1 : Enumaration of identified botanical, chemical constituents and utilities

Sr. No.	Plant Name & Family	Vernacular Name	Plant Part Used	Chemical constituents	Utility
1*	**Abutilon indicum L. (Malvaceae)**	Dabala	Leaves	Tannin, Asparagin, Calcium carbonate	1. Fresh leaves are chewed orally or leaf juice given with butter milk empty stomached in morning for four days to cures piles. 2.Extract of few fresh leaves is mixed in cow ghee in equal quantity about two spoon is administered daily for three days to regularize menstruation. 3.Decotion of leaves is consumed about half cup with honey twice a day for five days to cure diarrhoea.
2**	**Acorus calamus L. (Araceae)**	Vekhand	Leaves Fruit	Asarone, Calamenol, Eugenol, Palmitic acid,	1.Leaves of this plant and leaves of (*Cannabis sativa* L.) and seeds of (*Trachyospermum ammi* (L.) Sprangue) are taken in equal amount and are burnt and fumes are exposed on anus opening to cure piles. 2.Two teaspoons decoction of fruits is advised twice daily for seven days to relieve dry cough. 3.Fruits of this plant and (*Xanthium strumarium* L.) are boiled in water and made into decction two teaspoon of this decoction is advised twice for ten days to get relief from fever.
3	**Aegle marmelos (L.) Corr. (Rutaceae)**	Bel	Fruit Leavs Bark	Marmalosin, Limonene β-phellanderne, Fragrine, Sterols	1.Fruit pulp mixed with cow urine and oil of (*Sesamum orientale* L.) is three drops are administered in ear to reduces deafness. 2.Fresh leaves are kept in water overnight. The infusion 3-4 teaspoons is given at morning to regularise blood pressure. 3.Fruit pulp of this plant about 20 gm. thrice a day for three days is consumed to check dysentery.

4**	**Alpinia galanga (L.) Willd. (Zingiberaceae)**	Kulinjan	Leaves Fruits Rhizo-me	Cineol, Methyl cinnamate, Alpinin, Galanagin	1.Two spoon of leaves decoction is advised twice daily for four days to a person suffering from impotency and erectile disfunction. 2.Two teaspoon of leaf juice is administered to a person suffering from painful burning micturation. 3.Leaves are crushed in water and are applied on body to cure yellow patches on skin.
5**	**Alistonia scholaris R. Br. (Apocynaceae)**	Saptaparni	Stem bark, Root	Alkaloids, Ditaine, Echitenine, Triterpenes, Lupeol	1.Stem bark is burnt and smoke is passed over body and the ash is wrapped over a body of a person suffering from itching. 2.Root powder one teaspoon daily at night for one month is aphordiasic.
6	**Anethum graveolens L. (Apiaceae)**	Bansauf	Seeds	Oil are Carvone, d-llimonene, α-terpinene	1.Seeds powder about 1 gm. is mixed with equal amount of (*Trigonella foenicum-graceum* L.) and is consumed with butter milk or water twice a day for three days to cure diarrhoea. 2.Dried seed powder about 1-2 gm. is consumed with sugar (*Saccharum officinarum* L.) daily to improve breast feeding mothers.
7	**Blumea balsamifera (L.) DC. (Asteraceae)**	Bhangrud	Leaves	Oil L-borneol, d-camphor, cineol	1.The leaves are crushed four teaspoonful of juice is obtained, one teaspoonful of cow's ghee is added. The mixture is advised once a day for four days to cure piles. 2.The leaves are crushed fine. The paste is applied on abdomen and bandaged on swollen tummy in infants.
8**	**Boswellia serrata Roxb. (Burseraceae)**	Salai	Stem bark Seeds	Tannis, Pentosans, lignin, β-sitosterol	1.Stem bark is crushed and warmed, this bark paste is placed in a cloth and is tied around the body part relieves pain. 2.Dried gum is placed on live coal, and allow the fumes to envelop the patient suffering from loss of consciousness.
9	**Cassia angustifolia Vahl. (Caesalpiniaceae)**	Sonamakai	Leaves	β-diglucoside Chrysophanic acid, Flavanols, Emodin	1.Leaves are boiled in water with (*Camellia sinensis* (L.) Kuntze.) one cupful of this decoction is consumed daily at night for four days to cure abdominal pain. 2.One teaspoon of dried leaf powder is consumed with water at night for three days facilitate bowel movement.
10	**Chenopodium album L. (Chenopodiaceae)**	Chill	Leaves Seeds	Leucine, Lysine, Phenylalanine, Threonine, Polypodine	1.Leaf juice about 10 ml. and lump sugar (*Saccharum officinarum* L.) are mixed and given twice daily for two day to relieve painful micturition. 2.Seed powder is mixed with honey and is consumed for three nights to cure bile problems.
11*	**Cyperus rotundus L. (Cyperaceae)**	Nagarmotha	Root, Entire plant	Cyperene, Cyperol, Cineol, Starch	1.Root of this plant 1-2 gm., rhizome of (*zingiber officinale* L.) 2 gm are mixed in 4 gm of Jagerry (*Saccharum officinarum* L.) and is consumed twice a day for one month cures cough and other respiratory problems. 2.Powder of entire plant and dried fruit powder of (*Emblica officinalis* Gaerth.) and (*Curcuma longa* L.) are boiled in water and made in to decoction and is used to drink regularly to cure gout.
12	**Erythrina variegata L. (Fabaceae)**	Pangara	Leaves	Alkaloid, Erythrinalin, Hypaphorine, Saponin	1.Leaf paste 10 gm. and few candy sugar (*Saccharum officinarum* L.) is dissolve in cup of honey. It is consumed twice daily for seven days to treat leucorrhoea. 2.Two to three drops of leaf juice are dropped in ear

					to cure ear ache. 3.Decoction of leaves is used to gargle to cure toothache.
13	**Foeniculum vulgare Mill. (Apiaceae)**	Sauf	Seeds Leaves	Fennel oil, Fenchone, Limonene, Methyl chavicol, α-pinene	1.Seeds are soaked in water overnight. In the morning it is mixed with lump sugar (*Saccharum officinarum* L.) and is consumed to cure burning sensation during urination. 2.Leaves juice about 5 ml. is mixed with 100 ml. cow's milk and is consumed regularly to improve lactation in feeding mothers.
14	**Hyssopus officinalis L. (Lamiaceae)**	Zufah	Flower Leaves	Oil pinocamphone, b-pinenes, a-terpinene	1.Decoction of flowers 10-30 ml. is consumed daily at night and early morning for one month relieves swelling of respiratory tract. 2.Fresh leaves juice about 10 ml. is consumed with honey for seven days helps to kill round worms in the intestine.
15	**Lawsonia inermis L. (Lythraceae)**	Mehandi	Leaves	Lawsone, Arachidic, Stearic, Palmitic, Oleic	1.Leaves 200 gm. are crushed, and made into small tablets 2–5 tablets are advised twice daily for seven days to reduce uterine problems. It also controls excessive bleeding during menstruation. 2.Leves juice one teaspoon is advised with glassful of water daily at right cures diabetes and also helpful against painful micturition.
16	**Moringa oleifera Lam. (Moringaceae)**	Shevaga	Flower Leaves	Carotene, Nicotinic, ascorbic acid, arginine, leucine,	1.Flowers are boiled in sesamum oil *(Sesamum orientale L.)* cooled. The oil 3-4 drops are dropped in ear for twice for three days against ear ache and also cures infection of ear. 2.Extract of leaves about spoonful is given orally daily morning for a week or two against diabetes.
17	**Myristica fragrans Hoult. (Myretaceac)**	Jayfal	Fruit	Myristicin, Linalool, Safrole, Linalyl acetate	1.Fruits are rubbed on rough stone with water and the slurry obtained is applied on forehead to relive headache. This slurry is also applied on joints to relive rheumatism. 2.One teaspoon of fruit powder, with glassful of milk once time for one month helps to increase sexual vigour.
18	**Nyctanthes arbor-tristis L. (Oleaceae)**	Parijaat	Leaves Flower	Tannic acid, Methyl salicylate, Glcoside, Mannitol, d-mannitol, Glycerides, Linoleic, Oleic acids	1.One tea spoon leaf juice and one tea spoon of sugar (*Saccharum officinarum* L.) are mixed throughly. One tea spoon of this mixture is given twice a day for eight days to a patient suffering from enflunza. 2.Leaf juice is applied on affected parts of skin in skin diseases like itching and ring worms.
19	**Origanum vulgare L. (Lamiaceae)**	Sabja	Leaves Root	Tannins, Resin, Sterols, Flavonoids, thymol	1.Root juice about two teaspoon is advised twice daily for one month against Tuberculosis till cure. 2.Dried leaf powder and seed powder are consumed one teaspoon daily at night for seven days to cure stomachache.
20	**Pandanus odoratissimus L. (Pandanaceae)**	Kevada	Leaves Root	Oil is Phenylethyl alcohol, dipentene, Citral, Fatty	1.Leaves smoke is inhaled through mouth to treat throat cancer. 2.The root powder is administrated for three days at night to releves from urinary problems.

				acids	
21	**Plumeria rubra L. (Apocynaceae)**	***Lal*** Champa	Latex, Stem bark	Plumierides, Fulvoplumierin	1.Latex 10 ml. and 10 gm. leaf pulp of (*Aloe vera* L.) mixed together and paste is prepared with coconut oil (*cocos neusifera* L.). This paste is applied on skin to treat itching till cure. 2.One teaspoon dried stem bark powder twice a day for three to five days is to treat malaria. 3.Stem bark powder is given orally in morning and evening for seven days to get relief from tonsillitis.
22	**Ricinus communis L. (Euphorbiaceae)**	Erandi	Root, Leaves Seeds	Beta-amyrin, Carotene, Tannins, cistosterol, Chlorogenic acid, Quinic acid, Glycoproteins, Saponins	1.Roots of this plant and roots of (*Emblica officinalis* L.) is made in to decoction and is applied at night against tumors for seven days till it cure. 2.Extract of young leaves prepared in cow milk, about a cup is given 3-4 days to treet hepatitis. 3.Leaves are rubbed in cows milk one cup of it for three days at morning is given to patient suffering from jaundice. 4.Root extract is mixed in honey. A cup of it is admistred per day to patient suffering from urinary stone. It is followed for a week.
23	**Tabernaemontana divaricata (L.) Br. ex. Roem. & Schult. (Apocynaceae)**	Ananta	Flower Root	Coronaridine, Voacristine, Dregamine, Coronarine	1.Flowers and buds of the plant are crushed and is applied around the eyes reduces burning sensation of the eyes, redness and itching. 2.Dried root powder is used as tooth powder and is useful against, gum bleeding.
24	**Tectona grandis L. f. (Verbenaceae)**	Sag	Seeds	Calcum, Silica, Ammonium, Magnesium phosphate, Resin, Fatty oil	1.Seeds powder half teaspoon is advised orally with water twice a day for fifteen days against painful micturation. 2.Four seeds are soaked in water for ten minutes then rubbed on stone and paste obtained is applied around the navel part once only to get relief against painful urination and in spurts.
25*	**Valeriana jatamansi Jones. (Valerianaceae)**	Tagar	Leaves	Actinidine, Carotene, Valeranone, Jatamansinol, Oroselol	1.Fresh leaves are crushed and paste is applied around the eyes to cure redness, itching and pain in eyes. 2.Decoction of leaves about 30-40 ml is consumed daily at night for seven days it is helpful to regulate menstruation cycle.
26	**Viola odorata L. (Violaceae)**	Banfshah	Flower Stem	Voiline, Ionone, Glucoside, Methol salicylic, Saponins	1.Dried flower powder 2-4 gm. is consumed with warm water in the morning for a week cures constipation. 2.Stem decoction is mixed with wheat (*Triticum aestivum* L.) flour and is applied on affected part to cure swelling.
27	**Vitex negundo L. (Verbenaceae)**	Nirgudi	Leaves Root	Alkaloid, Nishindine, Hydrocotylene	1.Leaf paste is applied on affected skin part to cure eczema. 2.Root powder is mixed with jagerry *(Sesamum orientale L.)* and made into pellates one pill daily for seven days cures leucorrhoea. 3.Leaves juice is mixed with honey and one teaspoon given orally for 2-3 time a day for three days to cure tetanus. 4.Leaf juice mixed with one teaspoon of cows ghee is given orally advised twice for seven days to cure intestinal worms.

RESULT AND DISCUSSION

The present authors noted some botanicals employed by the vendors to cures various human diseases in north Maharashtra. Presently, botanicals belonging to 27 plants species, belonging to 27 genera and 21 families are communicated. All are angiospermic and six plants are exotic such as Alpinia galanga, Alistonia scholaris, Anethum graveolens, Blumea balsamifera, Origanum vulgare, Plumeria rubra. Comparison of ethnomedicinal claims showed that 7 species form additional reports for India. These are administered in the form of decoction, infusion, paste, oil, ash, juice, extract, etc. They are also used raw or sometimes simply warmed. In majority of cases, they administer them as a sole drug or occasionally supplemented by other botanicals or domestics substances like sugar, honey, oil, cow ghee, milk, cow urine etc. They advise these to combat diseases such as piles, skin, diarrhoea, deafness, bile, leucorrhoea, urination, respiratory track, diabetes, rheumatism, sexual vigour, enflunza, ring worms, tuberculosis, cancer, malaria, tonsillitis, hepatitis, jaundice, constipation, eczema, tetanus etc.

Acknowledgements:
Author Y.A.A. is thankful to the authorities of S.S.V.P. Sanstha's Dhule for library and laboratory facilities.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Ambasta SP (1986) The Useful Plants of India Publication and Information Directorate, CSIR, New Delhi India.

Bhattacharjee SK (1998) Hand book of medicinal plants. Pointer Publishers, Jaipur (Raj.) India.

Chopra RN, Nayar SL, Chopra IC (1956) Glossary of Indian medicinal plants. National Institute of Science Communication New Delhi India.

Cooke T (1958) The Flora of Presidency of Bombay. Vol. 1-III, B.S.I. Calcutta (Repr. Ed.) India.

Hooker JD (1872-1897) Flora of British India Vols. I-VII, Reeves & Co., London.

Jain SK (1991) Dictionary of Indian Folk Medicine and Ethnobotany. Deep Publication, New Delhi, India.

Kshirsagar SR and Patil DA (2008), Forest flora of Jalgaon (Maharashtra). Bishen Singh, Mahendrapal Singh, Dehradun, India.

Lakshminarasimhan P and Sharma BD (1991) Flora of Nasik District. Bot. Surv. India Calcutta, India.

Naik VN (1998) Flora of Marathwada Vol. 1-2. Amrut Prakashan, Aurangabad (M.S.), India.

Patil DA (2003) Flora of Dhule and Nandurbra districts (Maharashtra) Bishen Singh, Mahendrapal Singh, Dehradun, India.

Prajapati ND, Purohit SS, Sharma AK and Kumar T (2003) A Handbook of Medicinal Plants, Agrobios (India), Jodhpur.

Sinha Raju K and Shweta Sinha (2001) Ethnobiology, Surabhi Publication, Jaipur.

Sharama BD, Karthikeyan S and Singh NP (1996) Flora of Maharashtra State: Monocotyledons. BSI, Calcutta, India.

Singh NP and Karthikeyan S (2000) Flora of Maharashtra State: Dicotyledons. Vol. II. Bot. Surv. India, Calcutta, India.

Watt George (1889-1893) A Dictionary of Economic Products of India Vol. 1-6 Periodical Expert, Shahadara, New Delhi, India.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Review Article Open Access

A review on- A medicinally important climber plant *Clitoria ternatea* L. and its variants

Yeotkar Swati

Vidya Vikas Arts, Commerce and Science College, Samudrapur, Dist. Wardha
Email: yeotkarswati@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Yeotkar Swati (2019) A review on- A medicinally important climber plant *Clitoria ternatea* L. and its variants, *Int. J. of Life Sciences*, Special Issue, A13: 241-246.

ABSTRACT

India is one of the largest producers of herbal products and reachest country in the world in regard to genetic resources of medicinal plants. Nature around us has provided everything of necessity of mankind. Plants are natural laboratories where a great number of chemicals are biosynthesized and the may be considered the most important source of chemical compounds. Herbal medicines are prepared from variety of plant parts like leaves, stems, roots, barks, seeds and so on. They usually contain many bioactive compounds and are used primarily for treating mild or chronic ailments. Due to the increasing demand in the field of herbal medicines, it has become necessary and pertinent to know in detail about the systematic knowledge of herbal drugs.

Key words: Climber, *Clitoria ternatea* L., varients. Medicinal plants.

INTRODUCTION

India is a varietal emporium of medicinal plants and is one of the richest countries in the world in regard to genetic resources of medicinal plants. It exhibits a wide range in topography and climate, which has bearing on its vegetation and floristic composition (Martins *et al.,* 2001). The nature around us has provided everything of necessity of mankind. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions and to defend against attack from predators such as insects, fungi and herbivorous mammals. The large resources of the vegetables, minerals, vitamins and important phytochemicals are available naturally have beneficial effects on long- term health when consumed by humans and can be used to effectively treat human diseases. Herbal medicines are prepared from variety of plant parts like leaves, stems, roots, barks, seeds and so on. They usually contain many bioactive compounds and are used primarily for treating mild or chronic ailments. Due to the increasing demand in the field of herbal medicines, it has become necessary and pertinent to probe into the area of systematic knowledge about herbal drugs. There is a need for the application of this knowledge in authentification, detailed study and practical utilization of crude drugs (Prathyusha *et al*., 2010). Gianoli (2004) suggested that the climbing habit seems to be a key innovation within flowering plants because of the great diversity of climbing vs. non- climbing sister taxa.

Climbing habit has been accepted for the ecological feature of light capture (Darwin, 1875; Putz, 1984; Putz and Chai, 1987; Hegarty and Caballe, 1991; Niklas, 1992; Ginoli, 2002). Investigations of character displacement have clarified the understanding of several basic evolutionary patterns and processes (Pfennig and Murphy, 2009).

The chemicals are derived from the plants. Along with authentification of species identity and prediction of concentration of active phytochemicals may be required for quality control in the use of plant materials for pharmaceutical purposes (Wikipedia, 2012).

These are chemicals derived from the plants. Along with authentification of species identity and prediction of concentration of active phytochemicals may be required for quality control in the use of plant materials for pharmaceutical purposes (Wikipedia, 2012).

Phytochemistry:

Phytochemistry is inthe strict sense, the study of phytochemicals. These are chemicals derived from the plants. Along with authentification of species identity and prediction of concentration of active phytochemicals may be required for quality control in the use of plant materials for pharmaceutical purposes (Wikipedia, 2012).

Plants continue to be a major source of medicines, as they have been throughout human history. It is estimated that roughly 1500 plant species in Ayurveda and 1200 plant species in Siddha have been used for drug preparation (Jain, 1987; Krishnakumar and Kumar, 1995). Ethanobotany (the study of traditional human uses of plants) is recognized as an effective way to discover future medicines.

Generally quantitative estimation parameter is used to study the total amount of phytoconstituents present in different parts of the plants. The major parameters are crude fibers, proteins, total phenolics, vitamins, micro and macro minerals which in necessary and essential a major part in human nutrition and health.

***Clitoria ternatea* L. and *C. biflora* Dalz.**

The four genotypes/variants of the *Clitoria* used for study were broadly categorized and coded on the basis of well distinguishing character i.e. flower colour (first three), except fourth one which distinguish on the basis of habit, these are

C. ternatea L. (White petalloid) coded as 'A' (Plate I), *C. ternatea* L. (Blue petalloid) coded as 'B' (Plate II), *C. ternatea* L. (Double petalloid) coded as 'C' (Plate III) and *C. biflora* Dalz. (Wild) coded as 'D' (Plate IV) though these all species are belong to the same genus and family but they also shows some other distinguishing morphological characteristics (Dhore, 2002; The wealth of India, 2004; Yeotkar *et al.,* 2011; Yeotkar and Malode, 2013).

Butterfly pea commonly known as Shakupushpam is widely used in traditional Indian systems of medicine as a brain tonic and is believed to promote memory and intelligence. The study conducted on rat revealed that *C. ternatea* root extract increase rat brain acetylcholine content and acetylcholine esterase activity in a similar fashion to the standard cerebro drug pyritinol (Taranalli and Cheeramkuzhy, 2000). This plant is also used as laxative, diuretic, antiulcer, in the treatment of headache and snakebite (Anonymous, 2005). It is also useful in the treatment of severe bronchitis, asthma and hectic fever and is used by the local tribal people to cause abortion; paste is applied for curing abdominal swellings (Dominguez and Alcorn, 1985).

Uses:

In 2001 to 2010, researchers identified near about 198 compounds used in modern medicine which were derived from "ethnomedical" plant sources; 80% of these have an "ethnomedical" use identical or related to the current use of the active elements of the plant (Fabricant and Farnsworth, 2001). At least 12,000 such compounds have been isolated so far; a number estimated to be less than 10% of the total. Chemical compounds in plants mediate their effects on the human body through processes identical to those already well understood for the chemical compounds in conventional drugs; thus herbal medicines do not differ greatly from conventional drugs in term of how they work. This enables herbal medicines to be as effective as conventional medicines but also give them the same potential to cause harmful side effects (Lai and Roy, 2004; Tapsell *et al*., 2006)

The climber yields green fodder throughout the year, particularly during dry period. It can be grown as a forage legume either alone or with perennial fodder grasses in Punjab, Rajasthan Uttar Pradesh, Gujarat,

Maharashtra and Madhya Pradesh. The plant is also suitable as green manure and cover crop. It enriches soil by fixing nitrogen (Idnani and Chibber, 1953; Ratan *et al.,* 1982; The wealth of India, 2004).

C. ternatea is reported to possess antimicrobial and insecticidal (Kelemu*et al*., 2004), nootropic, anxiolytic, antidepressant, antistress and anticonvulsant activities (Jain *et al*., 2003), hepatoprotective activity, antidiabetic, sedative and blood platelet aggregation-inhibiting properties. In Ayurveda, the roots, seeds and leaves of *C. ternatea* have long been widely used as a brain tonic and is believed to promote memory and intelligence. *C. ternatea* has been traditionally used as an anthelmintic (Mukherjee *et al*., 2008, Gomez and Kalamani, 2003).

The roots of *Clitoria* have an acrid and bitter taste and are credited with purgative, laxative and diuretic properties. They are administered with honey and ghee as a general tonic to children for improving mental ability, muscular strength, complexion, in epilepsy and insanity. The root-juice of white-flowered variety is blown up the nostrils as a remedy for hemicranias. A decoction or powder of the root is given in rheumatism and ear diseases. The roots are also demulcent and given in chronic bronchitis and fevers they cause gripe and tenesmus and hence are not recommended as purgative (Banerji and Chakravarti, 1963; Nair *et al*., 1982).

2.3.2 Chemical constituents

The young shoots, leaves, flowers and tender pods of *Clitoria* are eaten as vegetable in Kerala and Philippines. Analysis of young shoots and tender pods from Philippines is as follows- Moisture- 80.0; protein-3.75; ether extract-0.40; crude fiber-4.80 and ash-0.80g/100g; Ca- 40.30; P-24.20; Fe-0.45; carotene-0.67; thiamine-0.04; riboflavin-0.18 and ascorbic acid-247.7mg/100g. Due to the high calcium concentration the plant showed that it can be exploited as a significant source of calcium brewed as herbal drink (The wealth of India, 2004).

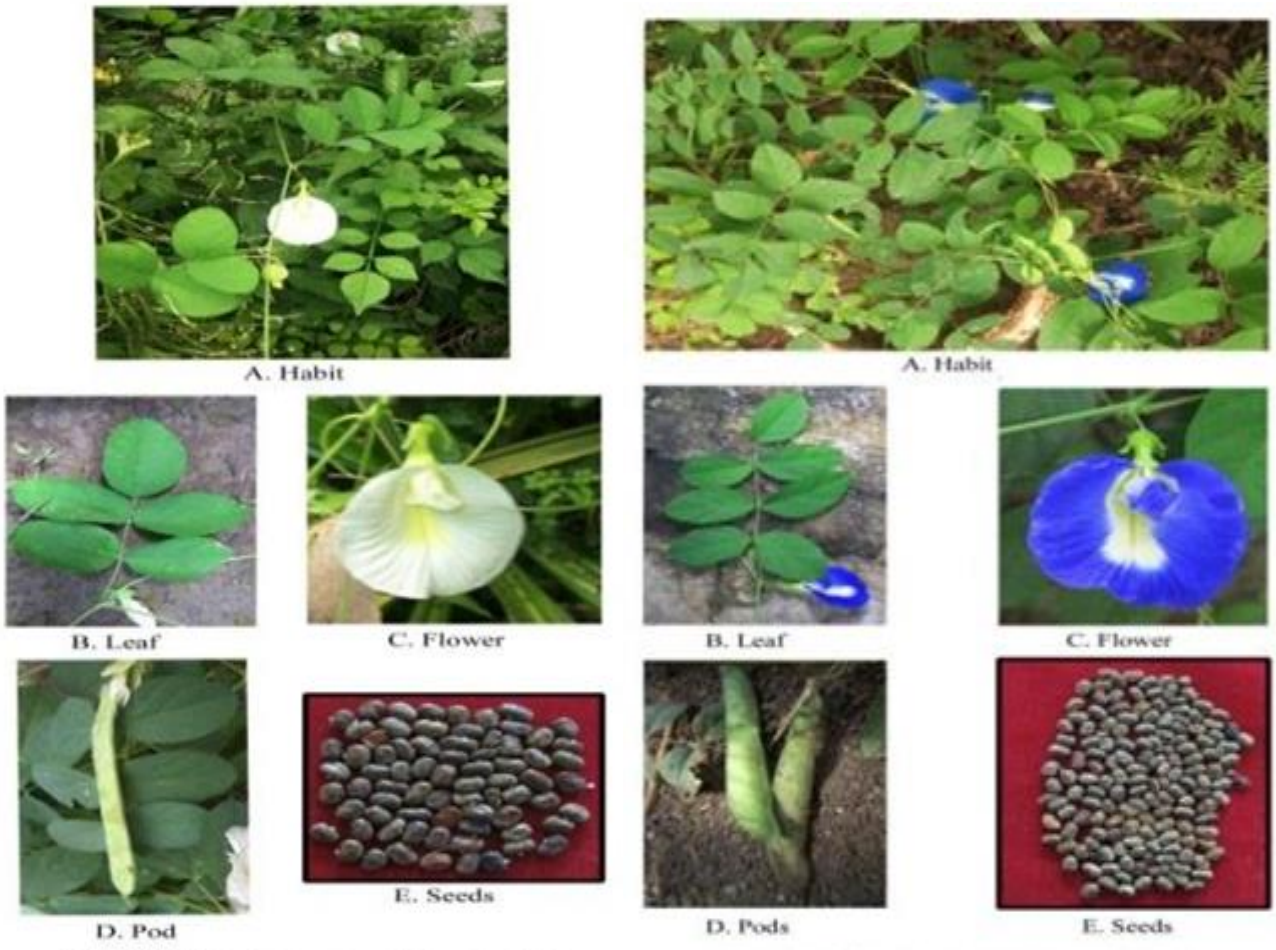


Plate I: *Clitoria ternatea* L. (variant A). **Plate II:** *Clitoria ternatea* L. (variant B).

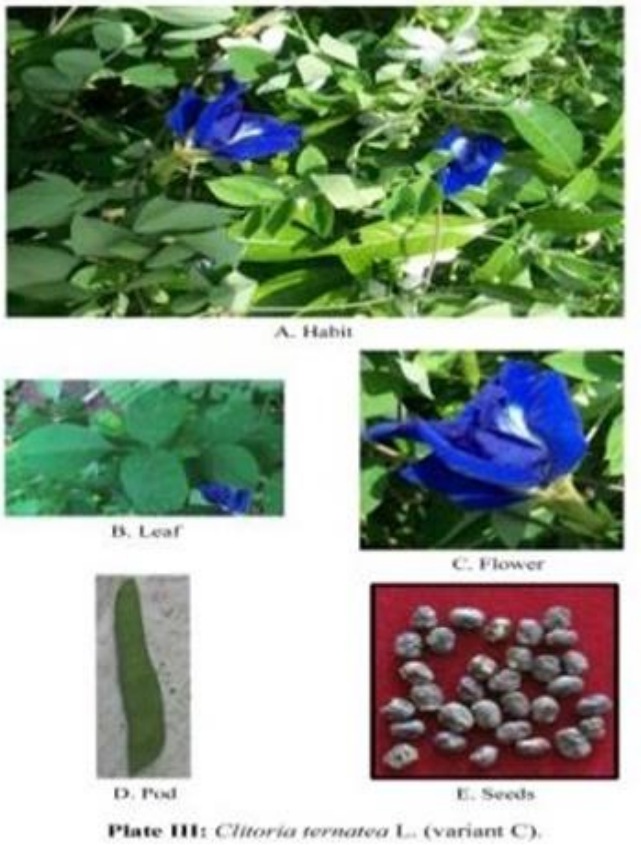


Plate III: *Clitoria ternatea* L. (variant C).

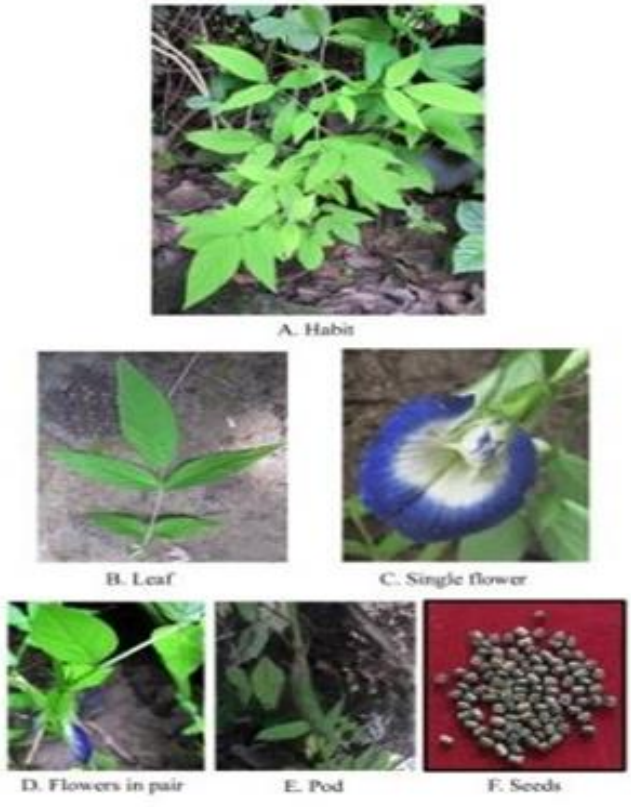


Plate IV: *Clitoria biflora* Dalz. (variant D).

Butterfly pea commonly known as Shakupushpam is widely used in traditional Indian systems of medicine as a brain tonic and is believed to promote memory and intelligence. Taranalli and Cheeramkuzhy (2000) conducted study on rat showed that *C. ternatea* root extract increase rat brain acetylcholine content and acetylcholine esterase activity in a similar fashion to the standard cerebro drug pyritinol. Flavonoids in the petals of several *C. ternatea* lines with different petals were investigated. Delphinidine 3-O (2”-O-alpha-rhamnosy l-6”-O-malonyl)- beta-glucoside was newly isolated from the petals of mauve line together with three known anthocyanins. Ternatins, a group of 15 (poly) acierated delphinidine glucosides, were identified in all blue petal lines. White petal line did not contain anthocyanins.

Analysis of fodder of *Clitoria* from Jhansi and Rajasthan by Katiyar *et al*., 1970; Ratan *et al*., 1982; Barro and Ribeiro, 1983 gave the following values, dry matter-97.64, 94.01%, crude protein- 13.0, 15.34; ether extract-2.45, 2.35; crude fiber-23.63, 32.21 and ash-6.05, 7.36%; Ca-10.4 and P-22mg/100g respectively. The values for digestible crude protein and total digestible nutrients were 8.29, 11.14 and 57.66, 59.67%, respectively.

Kazuma *et al*. (2003) worked on the colour of petals of *Clitoria.* They further stated that total anthocyanine contents in blue petals and double blue were high, while all the lines contained the same set of 15 flavonol and glycosides in similar relative ratios. The change in flower colour from blue to mauve was not due to the change in structure of anthocynidin from delphinidin but due to the lack of (polyacylated) glucosyl group substitutions at both the 3'and 5' positions. This implies that glucosylation of the 3' and 5' positions of anthocyanins cause blue petals in *C. ternatea.*

CONCLUSION

There is a need for the applications of this knowledge in authentification, detailed study and practical utilization of crude drugs. Today, many traditional medicinal practitioner, tribal people uses different plant parts to cure different human diseases without knowing bioactive constitutes or chemical quantity present in it, in such case considerable risk is there as far as human health is consider. Besides these many plants variants looks similar but they differ in their phytochemicals. The present work was carried out to

comparative study of eight different genotypes, of which A, B, C, represent *Clitoria ternatea*, D- *Clitoria biflora*.

Since ancient times, people have been discovering the nature particularly plants in search of drugs. This has resulted in the use of large number of medicinal plants with curative properties to treat various diseases (Verpoorte, 1998). Nearly 80% of world's population relies on traditional medicines. Plant-derived substances have recently become of great interest owing to their versatile applications. Medicinal plants are the richest bio-resource of drugs of traditional systems of medicine, modern medicines, nutraceuticals, food supplements,

Considering the future drug formulations for herbal drug preparations and authentication of plants some of the genotypes with different phytochemicals (qualitatively and quantitatively) obtained in this study hold promise. Since, this study has been successfully achieving the objectives of identification of genotypes morphological, phytochemical and molecular level are now authentically available for the use in pharmaceutical industry for the preparation of new drugs or formulations. Knowledge of the chemical constituents of plants is desirable because such information will be valuable for synthesis of complex chemical substances.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Anonymous (2005). The Wealth of India, New Delhi: Council of Scientific and Industrial Research. 2:71.

Barro C and Ribeiro A (1983). The study of *Clitoria ternatea* L. hay as forage alternative in tropical countries evolution of chemical composition at four different growth stages. J Sci Food Agric. 34: 780- 782.

Banerjee SK and Chakravarti RN (1963). Taraxerol from *Clitoria ternatea.* Bull Calcutta Sch Trop Med. 11:106-107.

Darwin C (1875). On the movements and habits of climbing plants. John Murray, London, U. K.

Dhore MA (2002). Flora of Amravati district with special reference to the distribution of tree species. A Ph. D. thesis published by Amravati university, Amravati. 103, 108, 161.

Dominguez X and Alcorn J (1985). Screening of medicinal plants used by Huastec Mayans of Northestern Mexico. J. Ethanapharmacol. 13:139-156. folk medicines, pharmaceutical intermediates and chemical entities for synthetic drugs (Ncube *et al*.,2008).

Fabricant DS and Farnworth NR (2001). The value of plants usedin traditional medicine for drug discovery. Environ. Health Prospect. Suppl. 109:69-75.

Gianoli E (2002). Maternal environmental effects of on the phenotypic responses of the twinning vine *Ipomoea purpurea* to support availability. Oikos. 99:324-330.

Gianoli E (2004). Evolution of a climbing habit promotes diversification in flowering plants. Proc. R. Soc. Lond. Ser. B. Bio. Sci. 271:2011-2015.

Gomez SM and Kalamani A (2003). Butterfly pea (*Clitoria ternatea*): A nutritive multipurpose forage legume for the tropics - an overview. Pakistan Journal of Nutrition. 2 (6): 374-379.

Hegarty EE and Caballe G (1991). Distribution and abundance of vines in forest communities. In: The biology of vines, edited by Putz, F. E. and Mooney, H. A. Cambridge university press, Cambridge, U. K. 313-337.

Jain NN, Ohal CC, Shroff SK, Bhutada RH, Somani RS, Kasture VS and Kasture SB (2003). *C. ternatea* and the CNS, Pharmacology, Biochemistry and Behavior. 75:529-536.

Jain SK (1987). Endangered species of medicinal herbs in India. Vivekananda Kendra Patrika. (1)16.

Kazuma K, Noda N. and Suzuki M. (2003). Flavonoids composition related to petal colour in different

Katiyar RC, Ranjhan SK and Shukla KS (1970). Yield and nutritive value of *Clitoria ternatea* - a wild perennial legume for sheep. Indian J Dairy Sci. 23(2):79-81.

Krishnakumar PR and Kumar SD (1995). Conservation of plants from Siddha system. Industry meetcum-seminar on Bio-diversity and information on medicinal and Aromatic plants. New Delhi, India.15-17.

Lai PK and Roy J (2004). Antimicrobial and chemopreventive properties of herbs and spices. Curr. Med. Chem. 11 (11): 1451–1460.

Martins AP, Salgueiro L, Goncalves MJ, Proenca, Cunha V, Vila R, Canigueral S and Mazzoni V (2001). Essential oil composition antimicrobial activity of three zingiberaceae from *S. tomee.* Principe J Planta Med. 67: 580-584.

Mukherjee PK, Kumar V, Kumar MS and Micheal H (2008). The Ayurvedic medicine *C. ternatea* - From

traditional use to scientific assessment. Journal of Ethnopharmacology. 120: 291- 301.

Nair KV, Yoganarasimhan SN, Kesavamurthy KR and Mary Z (1982). Studies on some south Indian market samples of Ayurvedic drugs-I. Ancient Sci Life. 2(3):71-78.

Niklas KJ (1992). Plant biomechanics: an engineering approach to plant forms and function. University of Chikago press. Chikago, III.

Prathyusha P, Subramanian MS and Sivakumar R (2010). Pharmacognostical studies on white and red forms of *Abrus precatorius* Linn. Indian journal of natural products and resources. 1(4): 476-480.

Pfennig DW and Murphy PJ (2009). Character displacement: ecological and reproductive responses to a common evolutionary problem. Q. Rev. Biol. 84:253–276.

Putz FE (1984). The natural history of lianas on Barro Colorado Island. Panama. Ecology. 65:1713-1724.

Ratan R, Kundu S and Bhatia D. (1982). Note on nutritive value of *Clitoria ternatea* hey for sheep. Indian J Anim Sci. 52 (4):265-287.

Taranalli AD and Cheeramkuzhy TC (2000). Influence of *Clitoria ternatea* extract on memory and central cholinergic Activity in Rats. Pharmaceutical Biology. Formerly International Journal of Pharmacognosy. 38(1): 51-56.

The wealth of India (2004). A dictionary of Indian raw materials and industrial products. First supplemental series (raw materials). National institute of science communication and information resources (CSIR). 2(1) Cl- Cy: 71-72.

Tapsell LC, Hemphill I, Cobiac L, Patch CS, Sullivan DR, Fenech M, Roodenrys S, Keoqh JB, Clifton PM, Williams PG, Fazio VA and Inge KE (2006). Health benefits of herbs and spices: the past, the present, the future. Med. J. Aust.185 (4 Suppl). S4–24.

Taranalli AD and Cheeramkuzhy TC (2000). Influence of *Clitoria ternatea* extract on memory and central cholinergic Activity in Rats. Pharmaceutical Biology. Formerly International Journal of Pharmacognosy. 38(1): 51-56.

Wlkipedia (2013). From the free encyclopedia: Phytochemistry.

Yeotkar SD and Malode SN (2013). Preliminary phytochemical analysis of *Clitori ternatea* L. genotypes using different solvent systems. Souvenir National conference on Advances in life sciences: Present and future (AILSPF), ISBN: 978-93-82588-05-4. 139.

Yeotkar SD, Malode SN, Waghmare VN and Thakre P (2011). Genetic relationship and diversity analysis of *Clitoria ternatea* variants and *Clitoria biflora* using Random Amplified Polymorphic DNA (RAPD) markers. African journal of Biotechnology. Vol. 10(79):18065-18070.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Studies on taxonomy of some coccoid Cyanophytes from Hartala lake, Maharashtra.

Dhande JS, Jawale AK*, Vanjari SD and Chaudhari NA*

Department of Botany, Smt. P. K. Kotecha Mahila Mahavidyalaya, Bhusawal, Dist. Jalgaon,(M.S.) 425201.
*Department of Botany, Dhanaji Nana College, Faizpur, Dist. Jalgaon, (M.S.) 425503.

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Dhande JS et al (2019) Studies on taxonomy of some coccoid Cyanophytes from Hartala lake, Maharashtra., *Int. J. of. Life Sciences*, Special Issue, A13: 247-250.

ABSTRACT

While exploring algal flora of Hartala lake (21^0 00'20.56" north latitude and 76^0 01' 31.31" east longitude), (M.S.). It includes genera *Microcystis* Kuetz., *Chroococcus* Naeg., *Gloeocapsa* Kuetz., *Aphanocapsa* Naeg., *Aphanothece* Naeg. and *Synechocystis* Sauv. In winter and summer season these algae shows luxuriant growth.

Keywords: *taxonomy, Gloeocapsa, Aphanocapsa*, *Aphanothece.*

INTRODUCTION

Hartala lake is oldest lake located on a small tributary of river Tapi at latitude 21^0 00'20.56" north and longitudes 76^0 01'31.31" east. The lake has a capacity of 140 millions of cubic feet water and commands an area of 584 acres.

Present investigation includes 15 taxa of coccoid Cyanophytes which belongs to 13 species 1 form and 1 variety.

MATERIAL METHODS

The collections were made early in the morning between 7.00 to 10.00 am during 2004 to 2006 from Hartala lake (21^0 00'20.56" north latitude and 76^0 01' 31.31" east longitude), (M.S.). All the collected samples were studied fresh as far as possible and later preserved in 4 % formalin for further studies. Camera Lucida drawings were made with the help of mirror type of camera Lucida. The identification of taxa is based on the monograph Desikachary (1959) and relevant research paper publications. The material is deposited in the Department of Botany, Dhanaji Nana Mahavidyalaya, Faizpur, district Jalgaon, (M.S.).

SYSTEMATIC ENEUMERATION
CLASS –MYXOPHYCEAE
Order –Chroococcales
Family – Chroococcaceae
Genus *Microcystis* Kuetz., 1846

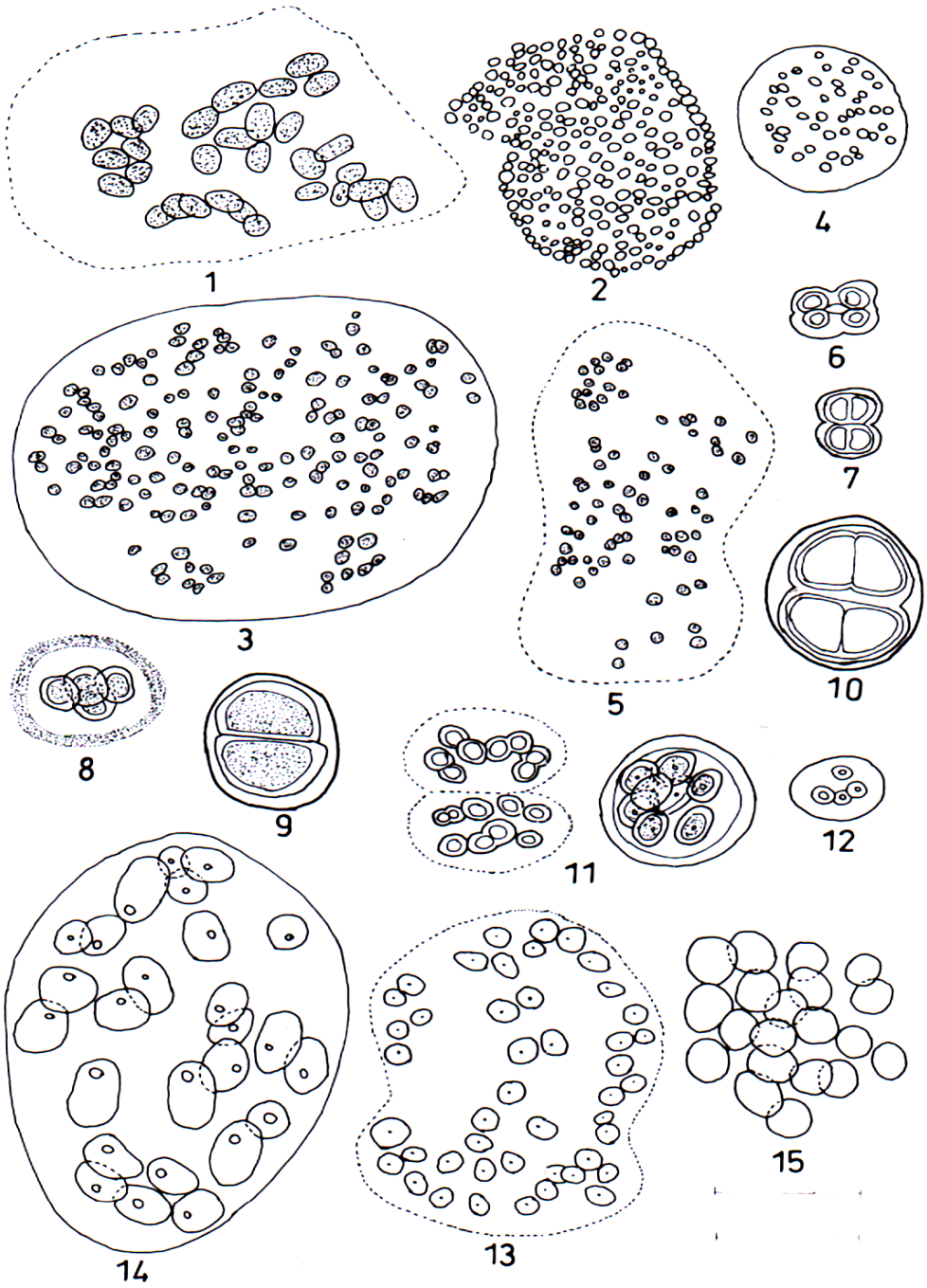


Figure 1: *Microcystis elabens* (Breb.) Kuetz. 2. *Microcystis flos-aquae* (Wittr.) Kirchner 3. *Microcystis lamelliformis* Holsinger 4. *Microcystis pulverea* (Wood) Forti 5. *Microcystis stagnalis* Lemm. 6. *Chroococcus minor* (Kuetz.) Naeg. 7. *Chroococcus minutus* (Kuetz.) Naeg. 8. *Chroococcus montanus* Hansgirg f. *banaresensis* (Rao, C.B.) 9. *Chroococcus tenax* (Kirchn.) Hieron. 10. *Chroococcus turgidus* (Kuetz.) Naeg. 11. *Gloeocapsa punctata* Naeg. 12. *Gloeocapsa stegophila* (Itzigs.) Rabenh. var. *crassa* Rao, C.B. 13. *Aphanocapsa elachista* W. *et* G.S. West 14. *Aphanothece conferta* Richter 15. *Synechocystis aquatilis* Sauv

Scale bar A : 25 µm
Scale bar B : 10 µm
Scale A : Fig. 1,2,3,4,5,6,7,8,9,10,11, 12, 15
Scale B : Fig. 13, 14

***Microcystis elabens* (Breb.) Kuetz. Fig. 1**
T.V. Desikachary, *Cyanophyta*, p.97, Pl. 18, Fig. 12, Pl. 20, Figs. 6,7,1959.
Colony flat and expanding, blue-green, about 50.8µm in diameter; cells oblong, 3.8-5.4µm broad, 7.7 – 8.5µm long, with gas vacuoles. (Coll. No.227).

Microcystis flos-aquae (Wittr.) Kirchner **Fig. 2**
T.V. Desikachary, *Cyanophyta*, p.94, Pl. 17, Fig. 11, Pl. 18, Fig. 11, 1959.
Colonies roughly spherical or subspherical some what elongate, colonical sheath indistinct, colony 38.5 µm in diameter, 52.3 µm long; cells spherical to oblong, 3.1-5.7 µm in diameter, with gas vacuoles. (Coll. Nos.198, 217).

Microcystis lamelliformis Holsinger**Fig. 3**
T.V. Desikachary, *Cyanophyta*, p.91, Pl. 19, Figs. 1,2,1959.
Colony free floating, spherical, lamellate, mucilage envelope thick and wide, colony 56.9 µm in diameter and 73.8 µm long; cells spherical, 2.3 – 3.8 µm in diameter, small and more or less rounded, cells aggregated. (Coll. No.278).

Microcystis pulverea (Wood) Forti**Fig. 4**
T.V. Desikachary, *Cyanophyta*, p.96, 1959.
Colonies rounded to ellipsoidal, often many together, colonial mucilage distinct, colonies 23.8-46.1 µm broad, 26.1-61.5 µm long; cells rounded or spherical, closely arranged, 2.3-3.2 µm in diameter, without gas vacuoles. (Coll. Nos.278, 292).

Microcystis stagnalis Lemm.**Fig. 5**
T.V. Desikachary, *Cyanophyta*, p.95-96, 1959.
Colonies very long, sometimes expanding and clathrate, colonial mucilage indistinct, colonies 26.9-41.5 µm broad, 26.1-74.6 µm long; cells arranged very closely, spherical, 1.5-3.1 µm in diameter, pale blue-green, without vacuole. (Coll. Nos. 220,259,295).
Genus ***Chroococcus*** Naeg., 1849

Chroococcus minor (Kuetz.) Naeg. **Fig. 6**
T.V. Desikachary, *Cyanophyta,,* p.105, Pl. 24, Fig. 1, 1959.
Plant thallus mucilaginous, blue-green; cells spherical, 2.2-3.8 µm in diameter, singly or in pairs or in groups of 4, sheath hyaline, thin. (Coll. Nos. 176,259,295).

Chroococcus minutus (Kuetz.) Naeg. **Fig. 7**
T.V. Desikachary, *Cyanophyta*, pp.103, 105, Pl. 24, Fig. 4, Pl. 26, Figs. 4,15, 1959.
Cells spherical or oblong, in groups of 2-4, blue green, with sheath 6.6-14.5 µm in diameter, without sheath 3.8-8.4 µm in diameter, 4 celled colonies 12.2-22.3 µm long; 8.4-19.2 µm in broad; sheath not lamellated, colourless. (Coll Nos. 176,225,263).

Chroococcus montanus Hansgirg f. ***banaresensis*** Rao, C.B. **Fig. 8**
B.N. Prasad and R.K. Mehrotra, *Geophytology,* **8** (2): 151, 1979; Neelima Mahajan and A. D. Mahajan, *Perspectives in Phycology (Prof. M.O.P. Iyengar centenary celebration volume)*, p. 157, Fig. 1, 1990.
Thallus gelatinous, thick, cells spherical, in groups of 4, 6.9 µm in diameter, slightly elongated colonies, colonies with sheath 16.9 µm long, 16.1 µm in diameter, sheath hyaline. (Coll. No. 265).

Chroococcus tenax (Kirchn.) Hieron. **Fig. 9**
T.V. Desikachary, *Cyanophyta*, p.103, Pl. 26, Figs. 716, 1959.
Cells mostly in groups of 2-4, blue green, without sheath 12.3-16.5 µm in diameter, with sheath 17.6-19.2 µm in diameter, sheath colourless, very thick, distinctly lamellated, 3-4 lamellae. (Coll. Nos.187, 271).

Chroococcus turgidus (Kuetz.) Naeg. **Fig. 10**
T.V. Desikachary, *Cyanophyta*, pp.101-102, Pl. 26, Fig. 6, 1959.
Cells spherical or ellipsoidal, single or in groups of 2-4, blue green, without sheath 8.4-12.3 µm in diameter, with sheath 9.2-13.1 µm in diameter, sheath colourless, distinctly lamellated. (Coll. Nos.231, 288).
Genus ***Gloeocapsa*** Kuetz., 1843

Gloeocapsa punctata Naeg. **Fig. 11**
T.V. Desikachary, *Cyanophyta*, p.115, Pl.23, Fig.2, 1959.
Thallus gelatinous, light blue green, cells spherical or oblong, without sheath 3.2-4.6 µm in diameter, with sheath 3.8-5.4 µm in diameter, sheath hyaline, unlamillated, cells 2-8 in a group, 8 celled colony 24.6-26.6 µm in diameter. (Coll. Nos.177, 239).
In the present taxon the diameter of the cells without sheath is more.

Gloeocapsa stegophila (Itzigs.) Rabenh. var. ***crassa*** Rao, C.B.**Fig. 12**
T.V. Desikachary, *Cyanophyta*, p.119, Pl. 25, Fig. 3, 1959.
Thallus yellowish, cells spherical or subspherical, without sheath 3.8-4.6 µm in diameter, colonies 2-4 celled with sheath 14.6 µm in diameter. (Coll. No. 235).

Genus ***Aphanocapsa*** Naeg., 1849

Aphanocapsa elachista W. *et* G.S. West**Fig. 13**
T.V. Desikachary, *Cyanophyta*, pp.132-133, Pl. 21, Fig. 5, 1959.
Colony small, ellipsoidal, 20.6 µm in diameter, mucilage thin; cells loosly arranged or in pairs, spherical, 1.9-2.5 µm in diameter. (Coll. No. 180).
Genus ***Aphanothece*** Naeg., 1849

Aphanothece conferta Richter**Fig. 14**
T.V.Desikachary, *Cyanophyta*, p.140, 1959.
Thallus gelatinous, dirty green, cells single or in twos, oblong or spherical, 2.2-3.4 µm in diameter, 1 ½ to 2 times as long as broad, pale blue green. (Coll. No. 182).
Genus ***Synechocystis*** Sauv., 1892

Synechocystis aquatilis Sauv**. Fig. 15**
T.V. Desikachary, *Cyanophyta*, p.144, Pl.25, Fig.9, 1959.
Cells spherical, single, in twos or in groups, 2.3-4.7 µm in diameter, pale blue-green. (Coll Nos.182, 297).
In the present material cells are smaller.

ACKNOWLEDGEMENTS
The author is grateful to the Principal and Head of the Botany department, Dhanaji Nana Mahavidyalaya, Faizpur, Dist. Jalgaon, for providing laboratory facilities also thankful to Principal Principal, Smt. P. K. Kotecha Mahila Mahavidyalaya, Bhusawal, Dist. Jalgaon, (M.S.) for constant encouragement.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Prasad BN and Mehrotra RK (1979) Cyanophycean flora of some North Indian crop fields. *Geophytology*,8(2): 147-157

DesikacharyTV (1959) *Cyanophyta*. I. C. A. R. New Delhi, pp. 1-686.

Mahajan Neelima and Mahajan AD (1990) On some fresh water blue green algae from Satpuda ranges in Jalgaon district. (M.S.). *Perspectives in Phycology (Prof. M.O.P. Iyengar centenary celebration volume)*, pp. 157-159.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Studies on Morphologic Evaluations of *Ascaridia galli* from Nandurbar (M.S.), India.

Balde Govind Hanmantrao

P.G.Dept. of Zoology , G.T.Patil College, Nandurbar (M.S), India.
Email:- govindbalde@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Balde Govind Hanmantrao (2019 Studies on Morphologic Evaluations of *Ascaridia galli* from Nandurbar (M.S.), India., *Int. J. of. Life Sciences*, Special Issue, A13: 251-257.

ABSTRACT

As we know that parasitolgy, it had profound influence on man and also on his domestic live stock and birds. Many people attempted to understand the parasitological problems from different angles like morphology, systematic life history, pathology, epidemiology control and management. Here the author has undertaken the studies of roundworm specially in association to the taxonomic aspects from *Gallus gallus domesticus* Much of the interest in parasite morphology comes from the way in which the various pathways have been modified to suit the highly specialized parasitic mode of life. In addition to this intrinsic interest parasite morphology has great practical importance through different production. As the production of vaccines against the nematode parasites necessitates routine in various cultures and for this the morphology knowledge is very important. Parasite morphology can contribute to the development of new drugs and to the elucidation of the mode of action of compounds. Moreover the study to know the mode of biochemical mechanism not only helps to understand the causes of the pathological changes in the hosts but will also help to adapt better prophylactic and epidemiological management. Man being anthropocentric, the accent of number of researchers was to study the pathological effects of nematodes on their hosts particularly himself and animals associated with him. In the present work the author has selected the morphological aspect of nematode {Ascaridia galli,(Schrank, 1778), Freeborn, 1923} parasites from Gallus gallus domesticus (Linnaeus,1758), from Nandurbar region (M.S.) India Present study deals with morphology and taxonomical study of the *Ascaridia galli*, together with the distinguishing characteristics of male & female worms and systematics of host *Gallus gallus domesticus*.

Key words: *Ascaridia galli*, Morphology, Nandurbar.

INTRODUCTION

Parasitology, the study of parasites and their relationship to their hosts is one of the most facing phases of biology. This discipline actually encompasses several approaches to the study of parasitic organisms. Such studies include phylogenetic relationship, ecological, morphological, physiological, biochemical, Histochemical, serological, immunological and chemotherapeutic aspects.

Parasites are causative organisms of many diseases, causing a continual and unacceptable threat to millions of people and domestical animals in all parts of the world parasites have evolved a way of life in nutritionally abundant and immunologically hostile environment of their host. These adaptations make them unique and fascinating to study. The terms infection and disease are not synonymous. While animal must be infected with a parasite to produce disease it does not necessarily follow that all infected animals will show clinical signs of disease. When susceptible animals are infected with viruses, bacteria and protozoa. The hosts lack of immunity usually results in clinically obvious disease. The outcome of these infections will depend on an interaction of factors including the virulence of the organism and how rapidly and successfully the host can mount an effective immune response.

Protozoa are unique among the parasites in that they multiply rapidly in their hosts such that they may overwhelm them. This is particularly true of susceptible animals such as the young or older animals whose immune system has been compromised in some way.

Nematodes are more complicated than protozoa partly because they do not multiply inside their hosts. One nematode egg can only produce one infective larvae that develops into one adult worm. Therefore the development of clinical disease in hosts infected with nematodes depends almost entirely on the actual number of larvae infecting a susceptible hosts other words, the outcome of nematode infections is generally more dependent on the parasite burden and that is, in turn directly related to the infecting dose. Generally there is a direct co-relation between the number of infecting larvae and severity of any disease produced a small number of infective larvae will produce minor pathological changes and generally no obvious clinical disease. It will often take many larvae to incite pathological changes severe enough to produce serious clinical signs.

However, like all general rules there are often exceptions. Within the nematodes there are some whose anatomical locations in a host, are such that even a small number of nematodes will incite pathological changes that can have devastating consequences for a host.

Helminthic infections continue to be a major global public health concern because of their very high prevalence and ill-effects on both nutritional and immunological status of human population. Their prevalence and impact are particularly intense in countries with tropical climate poor sanitation, low standard of living and poorer health education.

Birds are economically important vertebrates and are infected by various kinds helminths. The nematode infection is of considerable importance because it is responsible for reduced weight loss of meat productions, decreased egg production and mortality. The parasites may cause severe effect on energy metabolism the host to compensaite for tissue and other pathological effects.

Host parasite relationship is a complex physiological phenomenon by continual interchange of materials of physiological and immunological importance through the parasite interface a steady state between two elaborate and viable components host and parasite is maintained. For deeper insight into his complex phenomenon the study of chemical composition of parasite is of great value, parasite are emerging as valuable models for the study of fundamental biological phenomenon because during their life cycle many species of parasite undergo remarkable morphological, physiological, cytological and biological adaptation related different environment.

An importance economic source of human population is at danger due to *Ascaridiasis*. Thus *Ascaridia galli* becomes an economic important nematode. It infects the intestine in such a large numbers to cause the complete stoppase the digestive tract detailed studies of intracellular food resource like Carbohydrates, Proteins, Fats, and requirements of inorganic substance vitamins trace elements etc. help a understanding of survivabity of parasites. I hope the discipline of Parasitology continuous to attract students as an their field of research and carrier to find solution of parasitic problems of our economic livestock in the new millennium.

MATERIAL METHODS

TAXONOMY:

For the taxonomic study, the hosts were carried out regularly in each annual cycle. The host was dissected in the mid-ventral line for various organs of the viscera i.e. stomach intestine and caeca to keep separately in the

petridishes containing normal saline. These organs tested with needless and observe under binocular microscope (recorded infected and non-infected examined host.) The worms were first washed thoroughly in warm physiological saline and then killed and fixed in hot 70% alcohol. The worms were later preserved in fresh 70% alcohol to which 10% glycerine was added. [90 ml of 70% alcohol and 10 ml glycerine].

The smaller nematodes were cleared in glycerine. The worms were kept in open cavity blocks containing glycerine and then put in the desiccator. The smaller nematodes were completely cleared within a dry or two. For quick clearing of nematodes, lactophenol was used. This was especially helpful for large sized worms with thick cuticle smaller nematodes were cleared within half an hour or so while larger specimens were kept in lactophenol for 12-24 hours or more as required.

The composition of lactophenol (Gurr, 1962)

Phenol	20 grm
Latic acid	20 ml
Glycerine	40 ml
Distilled water	20 ml

In case of over clearing of specimen in lactophenol or glycerine a few drops of 70% alcohol were allowed run under the coverslips to help the study of smaller papillae and other details (Meyer and Olsen 1975).

Both glycerine and glycerine jelly were used for making semipermanent mounts of nematodes. Composition of the jelly given below Kaiser's glycerine jelly.

Gelatin	10 grm
Phenol	1 grm
Glycerine	70 ml
Distilled water	60 ml

Gelatine was dissolved in distilled water and heated just enough to dissolve it. Phenol and glycerine were then added to it and mixture was stored in a container in a caugulated state. The jelly was heated on a water bath before using. The worm was carefully placed in the medium and cover slip was carefully drawn over it avoiding any air bubbles.

The slide was left like that the jelly-coagulated drawing were made with the aid of camera lucida. All measurements are in millimeters, unless otherwise indicated.

Ascaroidea	Railliet and Henry, 1915.
Heterakidae	Railliet and Henry, 1914
Ascaridia	Dujardin, 1845.
Ascarida galli	(Schrank, 1788), Freeborn, 1923

***Ascarida galli* (Schrank, 1788), Freeborn, 1923**

The genus *Ascarida* is erected by Dujardin, 1845. The types species *A.galli* is described (Schrank, 1788), Freeborn, 1923.

GENERIC DIAGONOSIS

The worms are large in size females are larger than male. Mouth usually bearing three lips, one dorsal and two subventral in position. Oesophagus straight and long. Ventrical and diverticula are absent. Spicules some what equal in size. Male caudal alae poorly developed or absent. Preanal sucker more or less rounded. Female valva near the middle of the body. Oviparous eggs with thick cell. Parasitic in birds.

DESCRIPTION

322 nematodes were collected from the intestine of *Gallus gallus domesticus* from Shahada, Nandurbar region, M.S., India, during September, 2017 to August, 2018. Out of them 5 males and 7 females are used for taxonomic study. These parasites are preserved in glycerol, mounted in glycerin and drawings are made with the aid of Camera lucida. All measurements are recorded in mm.

The worms are medium to large in size, elongated to cylindrical in shape, semi-transparent, creamy white in colour.

MALE:

Males are smaller in size than female, It measures 19.5 (19-20) x 1.45 (1.4-1.5) in length and breath. Buccual capsul is medium in size, present at the anterior end of body and measures 0.0068 (0.0063-0.0074) x 0.0137 (0.0127-0.0148) in length and breath. The nerve ring is surrounding by muscular portion of oesophagus and lies at 0.0487 (0.0477-0.0498) away from the anterior extremity. The excretory pore lies at 8.5 (8-9) from anterior extremity. The oesophagus is muscular and measures 0.2358 (0.2332-0.2385) x 0.0243 (0.0169-0.0318) in length and breath. The posterior end of male bears a narrow bursal memberance on each side. The pre anal sucker is predominant, oval in shape, lies at 0.0614 (0.0604-0.0625) from posterior extrimitly and measures 0.0074 (0.0063-0.0084) x 0.0047 (0.0042-0.0053) in length and breath. The spicules are two in numbers, long, somewhat equal in size and measures

0.2173 (0.2141-0.2204) x 0.0042 (0.0031-0.0053) in length and breath. The caudal end of male bears seven pair of papillae. The positions of papillae are two pair are pre-anal, one pair is para anal and remaining four pair are post anal. The tail is some what curved, pointed at its tips and measures 0.0556 (0.053-0.0583) x 0.0143 (0.0053-0.0233) in length and breath.

FEMALE

The females are longer than males and measures 28 (27-29) x 1.6 (1.5-1.7) in length and breath. The body is elongated, long, semitransparent, wide anterierly and tapring posterierly. Buccal capsule is medium, lies at anterior end and measures 0.0148 (0.0137-0.0148) x 0.0265 (0.0254-0.00275) in length and breath. The nerve ring is surrounded by muscular protion of oesophagus and lies at 0.0402 (0.0392-0.0413) from anterior extremity. The oesophagus is long, muscular and measures 0.2809 (0.2756-0.286) x 0.0238 (0.0159-0.0318) in length and breath. The valva is pre equatorial, lies at 12.5 (12-13) from anterior extremity. The oesophagus is long, muscular and measures 0.2809 (0.2756-0.286)x 0.0238 (0.0159-0.0318) in length and breath. The valval opening is an oval slite at mid dorsal side of the body. The mascular vagina runes posteriely. The vagina gives uterine tubes. The eggs are large in size, oval in shape and measures 0.0054 (0.0051-0.0056) x 0.0040 (0.0037-0.0043) in length and breath. The tail is straight, without caudal alae and measures 0.1007 (0.0954-0.106) x 0.0254 (0.0159-0.0349) in length and breath.

Taxonomic Summary

Type species: *Ascaridia galli,* (Schrank, 1788), Freeborn, 1923.
Host: *Gallus gallus domesticus*.
Habitat : Intestine
Locality: Shahada District Nandurbar M.S., India.
Prevalence: 5 males and 7 females are used for taxonomic study.
Period of collection : September 2017 to August 2018.
No. of Specimen : 12
Accession number : PGZD/GTP/1-12/ September 17- August 18..
Deposition : P.G., Department of Zoology, G.T.Patil College, Nandurbar (M.S.) India.

RESULTS & DISCUSSION

Description of the adult nematode examined in this study, coincide with the known taxonomic characters and diagnostic features of *Ascaridia galli* which is a cosmopolitan species. Measurements of the various organs of the parasite lie in the ranges which have been recorded by previous authors.

Regarding the incidence of infection of *A. galli* in domestic fowl from Nandurbar, it is worthy to notice that it differs from the various incidences recorded from other countries. These differences may be attributed to the different breed susceptibilities. Besides, the other environmental and climatic factors which affect the life cycle of this worm may also play an important role in the incidence of infection.

SHOWING COMPARATIVE MEASUREMENTS (IN MM) OF *A.GALLI,* (Schrank, 1788), Freeborn, 1923.

MALE	ORIGINAL DESCRIPTION	PRESENT MATERIAL
Body length	33.80	19.5 (19-20)
Max. breath	0.49-1.21	1.4-1.5
Oesophagus length	2.1-7.2	0.2332-0.2385
Spicule length	0.54-1.25	0.2141-0.2204
Tail length	0.48-0.85	0.053-0.0583
Caudal papillae	10 pairs	7 pairs

FEMALE	ORIGINAL DESCRIPTION	PRESENT MATERIAL
Body length	60-123	27-29
Max. breath	0.9-1.86	1.5-1.7
Oesophagus length	3.9	0.2809(0.2756 – 0.2860)
Distance of valva from anterior end	Equatorial	Pre-equatorial, 12.5
Tail length	1.56-1.8	0.0954-0.106
Egg size	0.065-0.0088 x 0.04-0.05	0.0054(0.0051-0.0056) x 0.0040 (0.0037-0.0043)

SYSTEMATIC POSITION OF THE HOST THE *GALLUS GALLUS DOMESTICUS,* (Linn, 1758)

Phylum	:	Chordata
Group	:	Craniata
Sub-phylum	:	Vertebrata
Division	:	Gnathostomata
Super class	:	Aves
Sub-class	:	Neornithes
Sub-order	:	Carnatae/Neognathae
Order	:	Galliformes
Family	:	Phasionidae
Sub. Family	:	Phasianidae
Genus	:	*Gallus*
Species	:	*Gallus gallus domesticus*

SYSTEMATIC POSITION OF THE PARASITE *Ascaridia galli,* (Schrank, 1788), Freeborn, 1923

Class	:	Nematoda
Order	:	Ascarididea
Family	:	Heterakidae, Railliet and Henry, 1914
Genus	:	*Ascaridia*, Dujardin, 1845.
Species	:	*galli*, Freeborn, 1923.

The genus *Ascaridia* was erected by Dujardin, 1845, after going through literature the present worm resembles *Ascaridia galli* (Schrank, 1788), Freeborn, 1923 in having all the essential morphological characters i.e. body elongated, semitransparent, creamy white in colour, mouth is surrounded by three lips, oesaphagus is without posterior bulb, spicule equal in size but differs from the same form due to presence of seven pair of caudal papillae, Vs against ten pair of caudal papillae i.e. two preanal as against three pair pre anal and four pair post anal and as against six pair post anal, some variability in measurement in organs.

As characters are minor it is redescribed here as *Ascaridia galli* (Schrank, 1788), Freeborn, 1923.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Akert JE (1931): The morphology and life history of fowl nemtode Ascaridia Lineata (Schneider) Parasitology 13 (3) 360-379.

Ali SM (1957): Studies on the nematode parasites of fishes and birds found in Hyderabad state. Indian J. Helminths 8(1) -1-83.

Anderson RM (1974): Mathematical modes of host helminth parasite interactions Usher M.B. and Williamson MH (eds). Ecological stability London U.K. Chapman and hall Ltd. London (74) 43-69.

Aruna Kumari (1985): "Ecological studies on helminth parasites of common birds." Ph.D. Thesis Osmania University. Hyderabad A. P. India.

Baker AD (1927): Some observation on the development of caecal worms Heterakis gallinae (Gmelin 1790) Freeborn 1923 in domestic fowl. Sci. Agri 13 (35): 356-363.

Baker AD (1936): Studies on Heterakis gallinae (Gmelin 1790) Freeborn 1923 a nematode parasite of domestic fowl. Part II Trans. Canad. Inst. Toronto (21): 51-86.

Baylis HA (1947): Some round worm and flatworm the west Indies and Surinam III Cestode. J. Limnal Soc. London (41): 406-444.

Bueding E (1949): Studies on the metabolism of the filaral worm Litomosoides Carinil. J. Exp. Med. (89): 107-130.

Barret J (1968): Lipid of the infective and parasitol stages of some nematode. Nature (London) (218): 1267-1268.

Bhatanger PK and Ruprah NS (1969): Incidence of helminthes in fowl at Hissar I.

Res. Punjab Agri. Uni. 6()2(: 411-414.

Berdyeva GT and Drychenko GA (1972): The uptake of amino acid by A. suvm from mixtures of essential and non-essential amino acid. Izvestiya Akademr

NavkTurkmen Skoy SSR Ser. Biol Navk No. (3): 28-32.

Barus V, Tenora F, Vesilew I and Wiger R (1980): Differentiations of Ascaridia galli and A. dissimilis (Nematoda) parasitiling domestic gallinaceous birds. Helm. 17(4): 283-290.

Bhonsle HR (1980): Investigations into some metabolic adaptations of Tanqua tiara Linstow 18 in relation to its origin of infection Ph.D. Thesis kakatiya University A.P. India.

Borkakoty MR and Jewaritic (1984): Host specificity of Ascaridia galli. Indian J. Parasitology (27): 137-138.

Chitwood BG (1933): A revised classification of the nematoda.

Chitwood BG (1937): A revised classification of the nematoda. Bull. Soc. Chim. Biol. (40): 177-187.

Chank K (1967): Studies on the incidence of common helminthes in the domestic fowl. J. Res. Punjab. Agri. Uni. (4): 127-135.

Chatterjee RK and Singh KS (1968): Histochemical studies M. Chick ascaridiasis Indian J. Vet. Sci. (38): 509-516.

Chitwood BG (1969): The systematics and biology of some parasite nematode New york and London. Acad. Press. Inc. PP. 223-244.

Dutt SC (1950): A study on the incidence of intestinal helminthes in poultry al Izatnagar Proc. Indin Sci. Conger 3, 243.

Deshmukh PG (1967): Studies on the nematode parasites of vertebrates of Marathwada Ph.D. Thesis Marathwada University Aurangabad (M.S.) India.

Foster M (1865): On the existence of glycogen in the tissue of certain entoza. Proc. Roy. Soc. London (14) PP. 543-546.

Flurg F (1912): Zur. Chemle and Toxikologie der Ascardion. Arch. Exp. Pathol. Pharmakol (67): PP. 275-392.

Glockin VC and Fairbairn D (1952): Biochemistry of parasites. Academic press New York.

Ginger CD and Fairbairn D (1966): Lipid Metabolism in helminth parasites I The lipid of H. diminuta. J. Parasitol (52): 1086-1096.

Gupta NK and Acharya AK (1970): "Some ascarids of poultry from North Indian." res. Bull. Punjab Uni. Sci. 21(3/4): 379-397.

Gupta SP and Jehan M (1970): "Studies on some nematode parasites of birds from Lucknow." Proc. 58th Ind. Sci. Cong. PartIII Abst. 537-538.

Gupta NK (1971): Morphology of Heterakis gallinae (Gmelin, 1790) Freeborn 1923 (Nematoda : Oxyguroidea) Res. Bull. Punjab Uni. Sci. 21(3/4): 285-289.

Gaulu M and et al (2001): Effect and repeatability of Ascaridia galli egg output in coclerels following a single low does infection. Vet. Parasita Apr. 19 96(4): 301-307.

Hamdia H Ramadan and Najwah Y. Abou Znada. (1992) Morphology and life history of *Ascaridia galli* in the domestic fowl that are raised in Jeddah J.K.A.U : Sci., vol.4 pp. 87-99

Hoeppli R (1956): The knowledge of parasites and parasitic infection from ancient times to the 917th century. Experimental Parasitol (5): 308-419.

Hutchinson CW and Fernando MA (1974):Enzymes of glycolysis and the pentosephosephate pathway during development of rabit. Stomach worm Obeliscoides cunicili. J. Parasitol 4(4): 339-395.

Kemp A, Vankites and Haljnin AJM (1954): A colurimetic method for the determination of glycogen in the tissue. Biochem J. (56): 646-648.

Khan MS (1979): Studies on the nematode parasites of Reptiles and Birds Ph.D. Thesis Marathwada University Aurangabad.

Kanshik RK (1982): Histochemical studies in experimental ascaridiasis in poultry. Indian Vet. J. Sci. 490-491.

Kulkarni SB (1982): Some histochemical and Biochemical aspects of Calallanus sp. and subulascaris sp. from Rana tigrina Ph.D. Thesis Marathwada University Aurangabad.

Lane G (1914): Suckered round worm from India and Ceylon Ind. J. Med. Res. 2(2): 655-669.

Lovekar CD (1969): Studies on the nematode parasites of mammals Ph.D. Theis Marathwada University Aurangabad (M.S.) India.

Lee SH, Song CX and Lee KB (1977): A study on the lipids A. Suum ova kore. J. Parasitol 15(1): 43-50.

Mujamdar G (1975): "New recors of nematodes from Indian birds." Vestnik ceskosloven ske Splecnosti. Zoologicks PP. 120-125.

Mattal RP (1980): Studies on Ascaridia galli infection of chick with special reference to its histopathology. Ves. Res. J. 3(1): 23-25.

Mythilli and Rao LN (1982): A bibliographic study of carbohydrate metabolism in helminths. J. Bio. Chem. 233-235.

Narasimha Rao MC (1985): Biochemical and physiological studies on three Important Nematode parasites of Sheep and Goat. Ph.D. Thesis Osmania University Hyderabad (A.P.) India.

Norton CC (1964): A survey of nematode from lower digestive tract of domestic fowls. J. Helminth 38(3/4): 269-282.

Noble ER and Noble GA (1976): Parasitology The biology a Animal parasites 4th Ed. Lea and Febiger, Philadelphia.

Permin A and Ranvigty (2001): Genetic resistance of Ascaridia galli infections in chickens. Vet. Parasita 2 Dec (3) 102(1): 101-144.

Reid WM (1944): The effects of host starvation on worm elimination and glycogen depletion with the nematode A. galli. J. Parasitol (30)PP. 1-12.

Reid WM (1960): Effect of temperature on the development of eggs of Ascaridia galli. J. Parasit 46(1): 63-67.

Rasheed S (1960): "The nematode parasites of birds of Hyderabad Indian." Boil 6(1): 1-16.

Rajeshwar Rao V (1981): Ecological studies on helminth parasites of Amphibians. Ph.D. Thesis Osmania University Hyderabad (A.P.) India.

Rahman and Jaganath MS (1987): Helminth infection in domestic fowls reared on the deep litter and cage system. Mysore J. Agri Sci. 21(3): 338-341.

Roate YV, Joshi MV, Sarde MR and Bhagwat SS (1995):Establishment of Ascaridia galli in immunoshment chicks.J. vet. Parasitology 9(1): 41-44.

Schwatz B (1925): Ascaridia Lineata a parasite of chickens in the Unites States. J. AgriReas (30): 763-722.

Skrjabin KI and Schulz RE (1937): Helminthology Zed. 418 PP. Moskva.

Shorb DA and Shorb MS (1966): Phospholipids of some worm parasites proc. Inter. Congr. Parasitol VolI 59-61.

Shishova A, Kasatochkina OA and Lev NA (1970): Protein uptake zinatne.Gelan, Moscow PP. 103-104 USSR.

Thaper GS (1956): Sustematic survey of Helminth parasites of domesticated animals in India. J. Vet. Sci. and Anim. Husb (26): 211-271.

Thaniyath yasmin (1996): Studies on the Ecology of Helminth parstocoenosis of certain birds. Ph.D. Thesis Osmania University Hyderabad (A.P.) India.

Von Brand T and Otto GE (1938): Some aspects of the carbohydrate Metabolism of the hook worm Ancylostoma Caninum and its host. Amer. J. Hyg. 27, 683-689.

Von Brand T (1950): The carbohydrate metabolism of parasites. J. Parasite 36, 178-192.

Von Brand T and et al (1965): Biochemistry of parasites. Acadamic Press New York.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Analysis of Physico-Chemical water quality to assess environmental degradation of Malapur dam from Jalgaon district (M.S.) India

[1]Sadafule HG, Pathan AV[2], Korde SS[2]

[1]Department of Zoology, Mahatma Gandhi Shikshan Mandal's Art's, Science, Commerce, Chopda, Maharashtra State, India.
[2]Department of Zoology and Fishery science, Azad College, Ausa-413520, (M. S.), India
Email: Sadafule1977c@gmail.Com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Sadafule Pathan AV, Korde SS (2019) Analysis of Physico-Chemical water quality to assess environmental degradation of Malapur dam from Jalgaon district (M.S.) India , *Int. J. of. Life Sciences*, Special Issue, A13: 258-262.

ABSTRACT

The quality of surface water has progressively worse in many countries in the past few decades. As a result of the growing population, urbanization, agriculture, and increasing industrialization, the inland water bodies are confronted with the increasing water demand, as facing with extensive anthropogenic emissions of nutrients and sediments, predominantly the lakes and reservoirs. To resolve this problem, it is necessary to carry out water quality assessment, planning, and management, in which water quality monitoring plays an important role. This study aimed at assessing the water quality of Malapur Dam from Jalgaon District (M.S) India.

Malapur Dam used for irrigation, livestock watering and fish production. This study carries using some selected physico-chemical parameters. The result of water samples shows high pH indicates the basic nature of water samples, sulphate in the dam water was high, the phosphate content of reservoir water were found high which lead to unpleasant taste and odor. The obtained values of each parameter were compared with the standard values set by the World Health Organization (WHO). The values of each parameter were found to be within the beyond safe limits set by the WHO. Overall, the water from all the locations was found to be not safe as drinking water. However, it is also important to investigate other potential water contaminations such as chemicals and microbial and radiological materials for a longer period of time, including human body fluids, in order to assess the overall water quality of Malapur Dam.

Key words: Water Samples, Environmental Degradation, Malapur Dam.

INTRODUCTION

Water is the most important essential component for the living being. Water plays a significant role in maintaining the human health and welfare. Clean drinking water is now considered as a fundamental right of human beings. Life on the earth is never imaginable without water. Water is one of the most vital irreplaceable elements of a basic human need. It is being used for many purposes such as irrigation, water supply, industrial, drinking, propagation of fish and other aquatic systems and generation of hydro-power plants.

Water is the main source of power, energy and executes the evolution on the earth. 71% of earth surface is occupied by water (CIA, 2008), 96.5% of the world's water is marine water which is salty that is not to be directly useful for drinking, irrigation, domestic and industrial purposes.1.7% in groundwater, 1.7% in glaciers. Less than 1% water is present in lakes, ponds, rivers, dams, etc., which is used by man for domestic, Industrial and agricultural purposes. According to an estimate about 70% of all the available water in our country is contaminated water bodies due to the discharge of effluents from industries and the domestic sewage waste.

Water pollution confronting serious problem in India as almost 70 per cent of its surface water resources and a growing percentage of its reservoirs are contaminated by biological, toxic, organic, and inorganic effluents. These resources have been rendered unhygienic for human consumption as well as for other activities, such as irrigation and industrial needs. This shows that degraded nature of water quality can contribute to water scarcity as it limits its availability for both human use and for the ecosystem. Due to growth of increasing population, agricultural usage, and industrialization, demand for domestic water has increased many times during the last few years. Improper waste disposal industrial effluents and over exploitation of resources has affected the quality, not only of tap water but also of ground water. Water pollution has many sources. The most polluting elements are the city sewage and industrial waste discharged into the rivers. The facilities to waste water treatment are not adequate in any city in India. Presently, only about 10% of the waste water is treated; the rest is discharged as it is into our water bodies. Therefore, pollutants enter groundwater, rivers, and other water bodies. The Central Pollution Control Board monitoring results obtained during 2005 indicate that organic pollution continues to be predominant in aquatic resources.

Physico-chemical Parameters:

The availability of good quality water is an contributing characteristic for preventing diseases and improving quality of life. It is necessary to know details about different physico-chemical parameters such as temperature, acidity, hardness, pH, sulphate, chloride, DO, alkalinity used for testing of water quality. Some physical test should be performed for testing of its physical appearance such as temperature, pH, turbidity, while chemical tests should be performed for its dissolved oxygen, alkalinity, hardness and other characters.

MATERIAL METHODS

Water samples were collected in previously cleaned polythene bottles. Water samples were collected during June 2019 to Nov. 2019 from 4 stations decided in the reservoir in the morning (9.00 to 10.00 a.m.). Temperature, EC and pH of water samples were measured in the field immediately after collection with help of thermometer, conductometer and pH meter. Other physic-chemical parameters were analyzed in the laboratory and all other parameters were analyzed by titration methods outlined in standard methods (2002).

RESULTS & DISCUSSION

The average six-month values from June 2019 to Nov. 2019 values of every physico-chemical characteristics are given in the table1. and Grapgh.1.

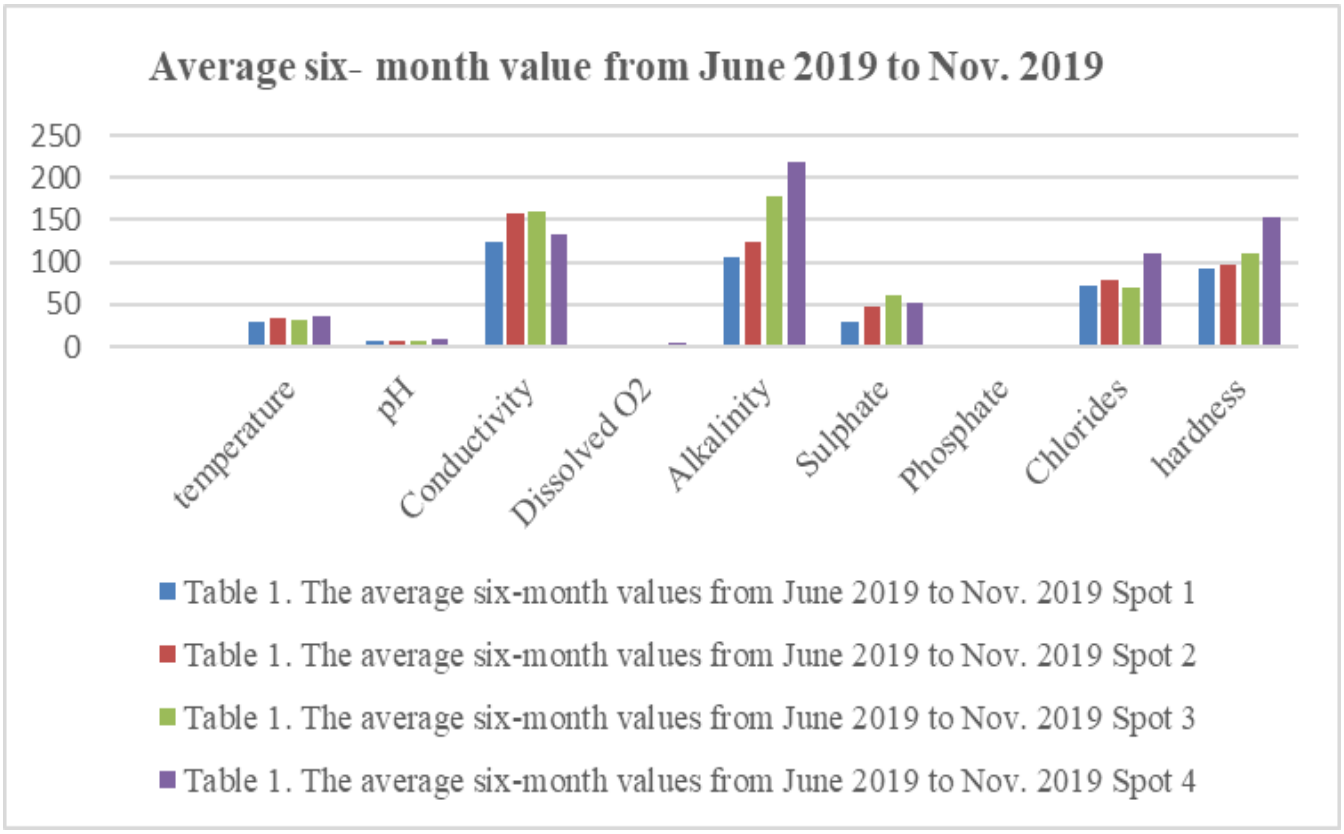
Table 1: showing the average six-month values from from June 2019 to Nov. 2019 values of physico-chemical parameters from Malapur Dam.

Temperature: It is mainly related with atmosphere and weather conditions. Temperature is basically important for its effects on certain chemical and biological activities in organisms attributing to aquatic media. Temperature is in the range from 29^0c to 35^0c. Lowest temperature is at Spot 1 is 29^0c and highest value is recorded at Spot 4 is 35^0c. Temperature effects the seasonal and diurnal variation. It controls the rate of all biochemical and biological reactions including growth, multiplication, mineralization, decay, production etc. Temperature is recorded with the help of maximum minimum thermometer.

pH: It is determined with the help of pH meter. The pH values ranged from 7.5 to 8.2. This indicates the basic nature of water samples. pH is used to express the intensity of acidic or alkaline conditions. It is the appearance of hydrogen ion concentration, more precisely, the hydrogen ion activity. pH is an parameter important in assessing the water quality. Acidic conditions will increase as pH value decreases and alkaline conditions will increases as the pH value increases.

Table 1. The average six-month values from June 2019 to Nov. 2019

Parameters	Spot 1	Spot 2	Spot 3	Spot 4
Water temperature	29^0c	34^0c	31^0c	35^0c
pH	7.5	7.6	7.8	8.2
Conductivity	124	158	159	132
Dissolved O_2	2.5	2.7	2.7	3.8
Alkalinity	106	125	179	219
Sulphate	29	47	61	51
Phosphate	0.12	0.18	0.14	0.25
Chlorides	73	79	69	110.1
Total hardness	92	96	110	153



Graph. 1. Showing the average six-month values from from June 2019 to Nov. 2019 values of physico-chemical parameters from Malapur Dam.

Electrical conductivity: Ground water quality is measured by the method of electrical conductivity. As the salt is more conducive of electricity and if there is more amount of salt in a fixed volume of water the electrical conductivity of the water will be more in comparison to less saline water. The ability of a solution to conduct an electrical current is calculated by the migration of solutions and is dependent on the nature and numbers of the ionic species in that solution. This property is called electrical conductivity. It is a useful parameter to assess the purity of water. Electrical conductivity measures between 124 to 159.

Dissolved Oxygen (DO): It is one of the important parameters in water quality assessment. It shows the physical and biological processes prevailing in the water. Non polluted water is generally saturated with DO. The DO ranges from 2.5 to 3.8 mg/L. Dissolved oxygen is an important parameter that determines the quality of water in rivers and reservoirs. The higher concentration of dissolved oxygen, provide better water quality.

Total Alkalinity: Bicarbonate alkalinity together with carbonate alkalinity are called total alkalinity. Alkalinity, pH and hardness affect the toxicity of many substances in the water. It is determined by simple dil HCl titration in presence of phenolphthalein and methyl orange indicators. Alkalinity of water is its acid neutralizing capacity. The alkalinity of groundwater is mainly due to carbonates and bicarbonates. The acceptable limit of alkalinity is 200 mg/l and in the absence of alternate water source, alkalinity up to 600 mg/l is acceptable for drinking which measures between 106 to 219.

Sulphate and Phosphates: The result of sulphate in the dam water was high (29- 51 mg/L). The source of sulphate may be from mineral rocks and fertilizers. The phosphate content of reservoir water was found in range of 0.12 to 0.25 mg/L. Phosphate lead to eutrophication which could also lead to unpleasant taste and odor. The presence of heavy metals in drinking water higher than a certain concentration can cause detrimental impacts on human health.

Chloride: Chlorides are practically found in all-natural water. This is the most common inorganic anion present in water. Man, and animal excrete have high quantities of chloride. Also salts present in soil are the sources of chloride. Chloride content of water samples was 69 to 110.81 mg/L.

Total Hardness (TH): In groundwater hardness is mainly contributed by bicarbonates, carbonates, sulphates and chlorides of calcium and magnesium. So, the principal hardness causing ions are calcium and magnesium. It is measured by titration method by standardized EDTA sol. using Erichrome black T as indicator. In most of the fresh water TH is important mainly by calcium and magnesium ions found in combination carbonate and bicarbonates. In the present study TH were found to be 92 to 153 mg/L.

CONCLUSION

The six-month survey (from June 2019 to Nov. 2019) has shown that physicochemical parameters of Malapur Dam from Jalgaon District (M.S) India. shows wide range of results. After the analysis of data the present study can be concluded that the effects of water pollution are not only devastating to people but also to animals, fish, and birds also destroys aquatic life and reduces its reproductive ability. Contaminated water is unsuitable for drinking, recreation, agriculture, and industry. It reduces the aesthetic quality of reservoirs and lakes. Eventually, it is a hazard to human health. To minimize the pollution in drinking water we can use modern technologies such as reverse osmosis and ozonation in large scale, which are effective in the Comparison of present study parameter values with the permissible limits prescribed by bureau of Indian Standards and WHO provides the conclusion that the water of Malapur Dam is useful for water supply. But some parameters giving alarm for protection of water from pollution it may be used for drinking purpose for long time.

The present study was undertaken to account to bring an acute awareness among the people about the quality of water. The individual and the community can help minimize water pollution by simple housekeeping and management practices the amount of waste generated can be minimized.

ACKNOWLEDGMENTS

The author thankful to Principal, Mahatma Gandhi Shikshan Mandal's Art's, Science, Commerce, Chopda, Maharashtra State, India for providing laboratory advances and library Facilities.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Adoni AD (1985) Workbook on Limnology, Pratibha Publishers, Sagar, 216pp.

American Public Health Association (APHA) (1995) Standard methods for the examination of water and wastewater, (19th edn). American Public Health Association, Washington DC, USA.

APHA (2012) Standard Methods for Examination of Water and Waste Water, American Public Health Association, Washington DC, 22nd Ed.,

Dickson A and Goyet C (1994) DOE Handbook of Methods for the Analysis of the Various Parameters of the Carbon Dioxide System in Sea Water, Version 2.

Jain P Sharma JD Sohu D and Sharma P (2005) Chemical analysis of drinking water of villages of Sanganer Tehsil, Jaipur District. Int. J. Environ. Sci. Tech., 2(4): 373-379.

Patil PN, Sawant DV and Deshmukh RN (2012) Physicochemical parameters for testing of water – A review, international journal of environmental sciences Volume 3, No 3,

Standard Methods (2002) Standard methods for the examination of water and waste water (21 Edn.). American Water Works Association (AWWA), water publication control Federation (WPCF) and American Public Health Association (APHA), Washington DC, USA.

World Health Organization (WHO, 1993). Guidelines for drinking water quality. World Health Organization, Geneva, Switzerland.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Bio Reduction of Industrial waste water Hardness by Bat Guano

[1]Bharambe CM and [2]Bathe Prajakta N

[1]Department of Zoology,Vidnyan Mahavidyalaya, Malkapur Dist- Buldana (MS)
[2]B.S. Patel Arts, Commerce and Science College, Pimpalgaon Kale Dist. Buldana (MS) India
Email: jscmb0128@rediffmail.com, prajaktabathe12@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Bharambe CM and Bathe Prajakta N (2019) Bio Reduction of Industrial waste water Hardness by Bat Guano, *Int. J. of Life Sciences*, Special Issue, A13: 263-266.

ABSTRACT

Bat guano is an old faecal matter of bat was collected from the old temples located in the rim of Lonar crater of Lonar, Buldana District, Maharashtra (India). It is known for the degradation of pollutants. The sugar factory effluent has the characteristics of hardness due to the presence of Ca^{++} and Mg^{++}. In the present study an attempt has been made to employ the Bat guano to reduce the hardness of the reclaimed water from sugar factory. There was a significant decrease of hardness against controls. There were 10.47, 14.82, 22.63 and 31.88% reduction at the interval of 10, 20, 30, 40 days in the water after application of Bat guano. The results are discussed with hardness pollution reduction. Our investigation indicates that bat guano used for degradation of water pollutants and bioremediation of aquatic ecosystems and also for waste water treatments.

Key words: Bioremediation, Waste water, Lonar crater, Hardness, aquatic ecosystem, Bat guano.

INTRODUCTION

Lonar crater is situated in village Lonar in the Buldhana District of Maharashtra, India. It has an almost perfectly circular shape and accumulated with water in the deeper parts of basin. Rocks in the crater reveal many characteristic features of the moon rocks. There are many old temples on the peripheral boundary of the crater which have now become roosting places for bats. Ramgaya Temple has become the source of sweet drinking water, as this is the only sweet water stream available in the crater; rest of the crater water is highly saline. Kamalja Devi temple is situated at the southern base of the crater. Morache temple (Peafowl's temple) is now famous for existence of thousands of bats and peacocks. Waghache temple (Leopards temple) is also famous for bats and people have seen leopard found in it many times.

BAT GUANO

The word guano originated from the Quichua language of the Inca civilization and means "the droppings of bat". The bats forage at night for insects over a particular area, and they return to the old temples during the day to sleep and care for their young.

They attach themselves to ceiling, and their excrement accumulates on the floor below. In some situations the guano can reach a depth of feet in many years and appeared as guano-hip, and it has a valuable importance.

BIOREMEDIATION AND BAT GUANO

One of the most serious universal, international problems facing us today is the removal of harmful compounds from industrial and municipal as well as anthropogenic waste. If it is discharged into lakes and rivers, a process called eutrophication occurs (Prince, 2003).

Environmental contamination whether it is from industrial or municipal or anthropogenic toxic waste that degrades the various environments is a vital concern to the public. Thus it is crucial to develop and implement accurate means to clean and preserve our precious and deteriorating environment. Although there are many techniques in cleaning environmental contaminations, one process has the most potential, namely bioremediation. Bioremediation, or commonly referred to as biodegradation, is a process in which microbes such as bacteria, fungi, yeast, or micro algae are involved in degrading toxic wastes (Pace, 1997 and Knezevich, 2006).

A marvelous symbiosis exits between the microorganisms and bat guano. Bacteria in the mammalian intestinal tract aid in the breakdown of food during digestion. These organisms synthesize enzymes capable of degrading a vast array of substances. Innumerable microbes are regularly excreted along with waste products and together with other organisms; they constitute the microbial population of a bat guano deposit (Steele, 1989).

Large populations of bat deposit thousands of kilograms of dropping annually. An ounce of bat guano contains billions of bacteria, and a single guano deposit may contain thousands of bacterial species. Guano being rich in bioremediation microbes cleans up toxic substances, (Barry et al., 1997). At present we do not know these species.

MATERIAL METHODS

To study the impact of bat guano on sugar factory effluent, 10 mg bat guano was dissolved in 100 ml of sugar factory effluent (10:100 proportions). After addition of bat guano in sugar factory effluent, the samples were kept undisturbed and analysis was carried out for 40 days at an interval of 10 days for the change in its hardness contents. The change in sugar factory effluent was noted after every 10 days upto 40 days hours. The water was analyzed by using standard methods for water analysis suggested by APHA (1998).

RESULTS & DISCUSSION

When bat guano was dissolved in sugar factory effluent with hardness (47.14), after 10 days the hardness was found to be decreased gradually to (32.11) upto 40 days (Table, 1). The sugar factory effluent was kept undisturbed till 40 days and the hardness was noted after every 10 days upto 40 days. After 40 days the hardness was seen to be remained constant during observations (Table, 1).

All values are the mean of five replicates; values in parenthesis indicates % of reduction; Ps – Parameters; Sg – Sampling; W1 – Control water from sugar factory; W2 – Water from sugar factory.

Tilak et al. (2005) reported a number of bacterial species associated with the bat guano belonging to genera, Azospirillum, Alcaligens, Arthrobacter, Acinetobacter, Bacillus, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Pseudomonas, Rhizobium and Serratia. He also suggested that this bacterium has high bioremediation capacity. Hutchens et al. (2004) had demonstrated aerobic methane oxidizing bacteria, Methylomonas and Methylococcus in bat guano.

Table, 1: Impact of bat guano on sugar factory effluent content at an interval of 10 days.

Ps	Sg	Time (days) and Ca++ content (mg/l)				
		0	**10**	**20**	**30**	**40**
C Hardness	**W1**	47.14 ±1.08	47.14 ±1.03	47.14 ±1.10	47.14 ±1.24	47.14 ±1.32
E Hardness	**W2**	45.20 ±1.45 (4.11)	42.20 ±1.20 (10.47)	40.15 ±1.22 (14.82)	36.47 ±1.05 (22.63)	32.11 ±1.15 (31.88)

The bacterial enzymes capable of degrading a number of substances (Martin, 1991; Dvorak *et al*., 1992; Edenborn *et al.,* 1992; Bechard *et al.,* 1994; White and Chang, 1996; Frank, 2000; Kaksonen, *et al*., 2003; Vallero *et al*., 2003; Boshoff, *et al*., 2004; Miranda, 2005; Seena, 2005; Tilak *et al.,* 2005).

Murphy (1989) demonstrated a nutritious broth formation when the bat guano was added in water and further he proved that this broth supported the growth of numerous microbes.

Alley and Mary (1996) stated that an ounce of bat guano contains billions of bacteria and thousands of bacterial species and these bacteria are important to bioremediation. Sridhar et al. (2006) and Pawar *et al.* (2004) examined the fungal fauna of bat guano and used for bioremediation of Lack soil.

CONCLUSION

Other than municipalities, various industries disposing off the industrial effluents are the worst polluters of the aquatic resources. It is of utmost importance, hence, to prevent the pollution of aquatic resources by all possible means to control its quality from further deterioration. Applying microorganisms for industrial pollution control is an area of interest all over the world.

In the present investigation is an attempt to study the impact of bat guano with its rich microbial flora on bioremediation of industrial effluents. The results revealed that within a period of 40 days, there was a remarkable reduction in the physico-chemical parameters of industrial effluents, thus stabilizing the industrial effluents, suggesting that industrial effluents can be effectively treated by bat guano.

No much work has been carried out on the bat guano in India and hence it was thought to study the impact of bat guano from and to assess the feasibility of the bat guano as supplementary bioremediatant.

Acknowledgement: We wish to acknowledge Vidnyan Mahavidyalaya, Malkapur Dist- Buldana, for providing laboratory facilities for this research work.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Aaranson S (1970) Experimental Microbial Ecology. New York. Academic Press, pp: 236.

APHA (1998) Standard methods for the examination of water and wastewater, 20th ed. APHA, AWWA and WEF New York, Washington DC.

Boyd SA and Patricia EG (2005) An Approach to Evaluation of the Effect of Bioremediation on Biological Activity of Environmental Contaminants: Dechlorination of Polychlorinated Biphenyls**.** *Environmental Health Perspectives*, 113(2): 180-185.

Chapelle FH Bioremediation: Nature's Way to a Cleaner Environment. U. S. Geological Survey. URL: http://water.usgs.gov/wid/html/bioremed.html.

Conde-Costas C (1991) The effect of bat guano on the water quality of the Cueva EL Convento stream in Gauayanilla, Puerto Rico. *Nss. Bull.* 53(1): 15.

Dash MC, Mishra PC, Kar GK and Das RC (1986) Hydrobiology of Hirakund Dam Reservoir. In: Ecology and pollution of Indian Lakes and Reservoirs. Mishra Publishing House, New Delhi: 317-337.

Dilip KM and Markandey NR (2002) Microorganisms in Bioremediation/edited by New Delhi, Capital Pub., viii, 190 p., tables, figs., ISBN 81-85589-08-9.

Dvorak DH, Hedin PE, McIntire (1992) Treatment of metal contaminated water using bacterial sulphate reduction: results from a pilot-scale reactor. *Biotechnol. Bioeng*. 40: 609-616.

Edenborn DH, Hedin RS (1992) Treatment of water by using sulphate reducing bacteria: *Biotech. Bioeng*. 30: 512-516.

Everett JW, Gonzales J and Kennedy L (2004) Aqueous and Mineral Intrinsic Bioremediation Assessment: Natural Attenuation. *Journal of Environmental Engineering,* 130(9): 942-950.

Faison BD and Knapp RB (1997) A bioengineering system for in situ bioremediation of contaminated groundwater. Source: Journal of Industrial Microbiology and Biotechnology, 18 (2-3): 189-197.

Keleher S (1996) Guano: Bats' Gifts to Gardeners. 14(1): 15-17.

Knezevich V, Koren O, Ron EZ and Rosenberg E (2006) Petroleum Bioremediation in Seawater Using Guano. *Bioremediation Journal*, 10 (3): 83-91.

Pace, N. R. (1997): A molecular view of microbial diversity and the biosphere. *Science* 276:734-740.

Pawar KV and Deshmukh SS (2004): Bioremediation of Lack soil using bat guano. *Indian J. Environ and Ecoplan*, 8(3): 699-704.

Pierce W(1999) Speech on 'Bat guano' Sept., 1999. Cassette from National Vanguard Books, P.O. Box 330, Hillsboro, WV 24946.

Prince, R. C. (2003) Bioremediation in marine environments. Prince RC. Exxon Research and Engineering, Annandale, NJ 08801. Bioremediation.

Steele DB (1989) Bats, Bacteria and Biotechnology. 7(1): 3-4.

Tuttle MD (1986) Endangered gray bats benefits from protection. Bat, 4(4), 1986.

Vidali M (2001) Bioremediation. An overview. Dipartimento di Chimica Inorganica, Metallorganica, e Analitica, Università di Padova Via Loredan, 435128 Padova, Italy. *Pure Appl. Chem*, 73(7): 1163–1172.

Walecha V, Vyas V and Walecha R (1993) Rehabilitation of the twin lakes of Bhopal. In: Ecology and pollution on Indian lakes and reservoir. Ashish Publishing House New Delhi :317-337.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

In-vivo Pharmacological activity of Leaf extract of *Cyclea peltata*

Chaudhari RT

Dept. of Zoology Smt. G. G. Khadse College, Muktainagar
Email- rajtchaudhari17@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Chaudhari RT (2019) In-vivo Pharmacological activity of Leaf extract of *Cyclea peltata*, *Int. J. of Life Sciences*, Special Issue, A13: 267-269.

ABSTRACT

India has one of the oldest, richest and most diverse cultural traditions associated with the use of medicinal plants. Medicinal plants are great importance to the health of individuals and communities in general. The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic compounds. In study, we are attempted to found various pharmacological activity such as Anti-inflammatory, anti-diabetic and Anti- microbial, present in *Cyclea peltata*.

Key words: *Cyclea peltata*, Anti Inflammatory, Anti- diabetic, Anti-microbial

INTRODUCTION

Cyclea peltata (Lam) Hook. F. & Thomas also belongs to Menispermaceae family, which is known as Rajpatha in various parts of India. A much-branched, climbing shrub found throughout South and East India and in the Andaman and Nicobar Islands. Roots tuberous; Leaves deltoid or ovate, acute, truncate or slightly sinuate at the base with rounded angles, mucronate, more or less hairy on the nerves and veins, margin often ciliate; flowers in axillary panicles. Male flowers subsessile, interruptedly spicate or collected into heads. Female flowers racemose, sepals oblong, glabrous. Petals orbicular, much shorter than the sepal; ovary pilose; berries drupaceous.

MATERIAL METHODS

A starch solution (0.1% w/v) was obtained by stirring 0.1g of potato starch in 100 ml of 16 mM of sodium acetate buffer. The enzyme solution was prepared by mixing 27.5 mg of alpha-amylase in 100 ml of distilled water. The colorimetric reagent is prepared by mixing sodium potassium tartarate solution and 3, 5 di nitro salicylic acid solution 96 mM. Both control and plant extracts were added with starch solution and left to react with alpha- amylase solution under alkaline conditions at 25°C. The reaction was measured over 3 minutes. The generation of maltose was quantified by the reduction of 3, 5 dinitro salicylic acid to 3- amino-5- nitro salicylic acid. This reaction is detectable at 540 nm (Malik and Singh, 1980).

RESULTS & DISCUSSION

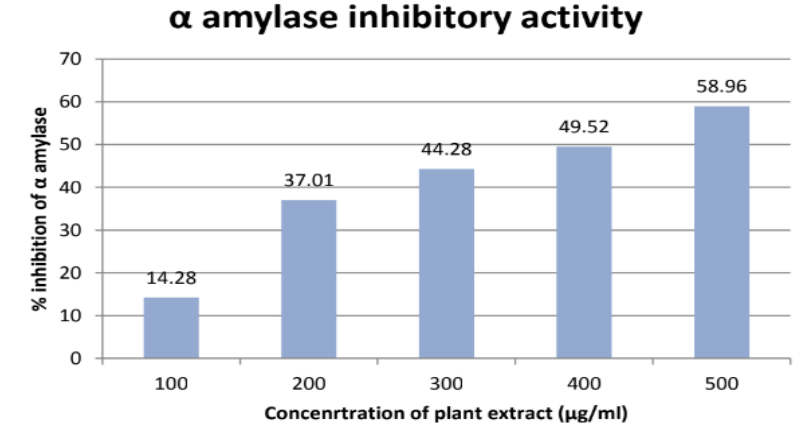
various parts of herbs were used directly as a medication. Clinically effective substances are now being obtained from plants, even those that have not been categorized before as medicinal herbs. Recently, traditional medicine (Phytotherapy) is often used to treat several diseases, besides modern medicine. A lot of natural extracts have been reported to have antidiabetic activities and are utilized for the treatment of diabetes. Herbal extracts have been used perfectly or ultimately for the processing of numerous modern medicines [10-12].

In this work, the inhibition activities of the extracts obtained from leaves of *Cylea peltata* was investigated on the α-amylase enzyme and IC50 values were calculated. As shown in the figure, in vitro α-amylase inhibitory studies demonstrated that the extract of both *Cylea peltata* had inhibitory activity of 58.96% at concentration of 500 µg/ml.

Fig: *Cyclea peltata*

Table: α-amylase inhibitory activity of leaf extract of *Cyclea peltata*

Concentration of plant extract(µg/ml)	Absorbance at 540 nm	Mean	% inhibition of α-amylase
100	1) 0.120 2) 0.094 3) 0.129	0.114	14.28%
200	1) 0.190 2) 0.185 3) 0.158	0.177	37.01%
300	1) 0.211 2) 0.215 3) 0.200	0.208	44.38%
400	1) 0.213 2) 0.225 3) 0.204	0.214	49.52%
500	1) 0.239 2) 0.239 3) 0.285	0.254	58.96%



CONCLUSION

Various parts of herbs were used directly as a medication. Clinically effective substances are now being obtained from plants, even those that have not been categorized before as medicinal herbs. Recently, traditional medicine (Phytotherapy) is often used to treat several diseases, besides modern medicine. A lot of natural extracts have been reported to have antidiabetic activities and are utilized for the treatment of diabetes. Herbal extracts have been used perfectly or ultimately for the processing of numerous modern medicines [10-12]. In this work, the inhibition activities of the extracts obtained from leaves of *Cylea peltata* was investigated on the α-amylase enzyme and IC50 values were calculated. As shown in the figure, in vitro α-amylase inhibitory studies demonstrated that the extract of both *Cylea peltata* had inhibitory activity of 58.96% at concentration of 500 µg/ml.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Acharyya S, Amarendra, P and Prasanta K (2009) Evaluation of antimicrobial activity of some medicinal plants against enteric bacteria with particular reference to multi-drug resistant Vibrio cholera. Trop. J. pharm. Res., 8: 231 237.

Adegboye MF, Akinpelu DA, Okoh AI (2008) The bioactive and phytochemical properties of Garcinia kola (Heckel) seed extract on some pathogens. Afri. J.Biotechnol.7: 3934 3938.

Adesokan, AA, Akanji MA and Yakubu MT (2007) Antibacterial potentials of aqueous extract of Enantia chlorantha stem bark. Afri. J. Biotechnol.,. 6: 2502-2505.

Agboke AA, Udobi CE, Effiong UO (2012) Antibacterial potentials of the ethanolic extract of the stem bark of Combretum micranthum G. Don and its fractions. J. Plant Stud., 1:75 81.

Ahmad I, Aqil F (2006) In vitro efficacy of bioactive extracts of 15 medicinal plants K. Nakachi, Matsuyama S, Miyake S, Suganuma M, Imai K (2000) Preventive effects of drinkinggreen tea on cancer and cardiovascular disease: epidemiological evidence for multiple targeting prevention. Biofactors 13: 49-54.

Alexander R: Maltodextrins: production, properties and applications.In: Schenk F, Hebeda R (1992) Starch hydrolysis products; worldwide technology: production and applications, New York, p. 62–122.

Ashok KT, Madham S, Shaik AB, Amtul ZS, Sachin BA, and Kuncha M (2011) Identification of proglycemic and antihyperglycemic activity in antioxidant rich fraction of some common food grains," International Food Research Journal, 2011; 18: 883–91.

Chevalier A (2000). Natural Health Encyclopedia of Herbal Medicine. 2nd ed. New York: Dorling Kindersley; p. 336. A. Sofowora. Medicinal plants and traditional medicine in Africa. Ibadan: Spectrum Books; 1993,p. 153.

Dineshkumar A, Analava Mitra AB and Manjunatha. M (2010) A comparative study of alpha amylase inhibitory activities of common antidiabetic plants of Kharagpur 1 block. Int J Green Pharm. 4: 115-21

Estrada MJ, Contreras CV, Escobar AG (2013) "In vitro antioxidant and antiproliferative activities of plants of the ethnopharmacopeia from northwest of Mexico," BMC Complementary and Alternative Medicine, vol. 13, article 12.

Lee J, Jiang S, Levine N, Watson R (2000). Carotenoid supplementation reduces erythema in human skin after simulated solar radiation exposure. PSEMB. 2231:170-174.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Qualitative Phytochemical analysis and Pharmacological Studies of *Salvia officinalis* (Linn.)

Khadse PM

Assistant Professor, Department of Botany, Shri R.L.T. College of Science, Akola, India
Email : pramodkhadse12@gmail.com
Mo.No. 9923861996

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Khadse PM (2019) Qualitative Phytochemical analysis and Pharmacological Studies of *Salvia officinalis* (Linn.) *Int. J. of Life Sciences*, Special Issue, A13: 270-272.

ABSTRACT

The use of plants as medicine is as old as human civilization. People of all ages in both developing and developed countries use plants in an attempt to care various diseases and to get relief from physical sufferings. Natural products are a source for a bioactive compounds and have potential for developing some novel therapeutic agents. Hence in the present study pharmacological activity, traditional benefits and phytochemical analysis of *Salvia officinalis* (Linn.) confirms the presence of various phytochemicals like saponin, terpenoids, steriods, flavonoids, tannins, quinones and alkaloids. The result suggests that, this plant have a great potential for curing various ailments and can be source of useful drugs.

Keywords: *Salvia officinalis*, phytochemical screening, pharmacological activities, traditional uses.

INTRODUCTION

Medicinal plants have been used from centuries as remedy for human diseases because they contain the compounds of therapeutic values. The plant kingdom has proven to be the most useful in the treatment of various diseases and they have provides an important source of all the words pharmaceuticals. The most important bioactive constituents of plants are steroids, terpenoids, carotenoids, flavonoids, alkaloids, tannins and glycosides. Plants in a facet of life have served a valuable starting material for drug development. (Singh et. al. 2003). *Salvia officinalis* (Linn.) (Lamiaceae) commonly known as Sage. This plant has been recognized world wide as a multipurpose plant. It is, evergreen subshrub, with woody stems,grayish leaves and blue to purplish throughout the world, it has long history of medicinal and culinary uses and in modern times as an ornamental garden plant. The common name Sage is also used for a number of related and unrelated species. Sutton (2004).

MATERIAL AND METHODS

The plant material were collected from the Akola region and identified taxonomically by using standard floras (Cook 1967, Kambale and Pradhan, 1988, Naik, 1998). The fresh leaves of the plants *Salvia officinalis* (Linn.) were

air dried under the shade. The dried leaves of the plant are crushed to obtain powder. These powdered samples are then stored in air tight polythene bags protected from sunlight until used. The organic solvent like petroleum ether, alcohol, chloroform, acetone, benzene & aqueous extracts of each sample was prepared by soaking as 1 : 10 ratio that is 3 gm of powder sample in 30 ml of organic solvents and distilled water for 18 hr. The extracts are then filtered using whatman filter paper, and used for phytochemical study.

Phytochemical Screening :
Chemical test were carried out on the organic solvents & aqueous extract and on the powdered specimens using standard procedure to identified the constituents as described by Harborne (1973), Edeoga et. al. (2005) and Krishnaiah et. al. (2009).

Test for Alkaloids :
To the 2-3 ml of filtrate, 1 ml of dil HCL and 1 lager's reagent was added and shake well. Yellow precipitate was formed showing the presence of alkaloids.

Test for Flavonoids :
To the small quantity of extract lead acetate solution was added. Formation of yellow precipitate showed the presence of flavonoids.

Test for Steroids :
To 2 ml of extract of chloroform & 2 ml of conc. H_2SO_4 was added. The solution was shaken well. As a result, chloroform layer turned red and acid layer showed greenish yellow fluorescence.

Test for Tannin :
On addition of 5% $FeCl_3$ solution to the extract deep blue black colour appeared.

Test for Saponin :
To 1 ml extract 20 ml distilled water has added and shake well in measuring cylinder. Then 1 cm layer of foam was formed.

Test for Cardiac glycosides :
To the 5 ml of extract 1 ml of conc. H_2SO_4, 2 ml of Glacial acetic acid and 1 drop of $FeCl^3$ solution was added, Appearance of brown ring shows the presence of cardiac glycosides.

Test for Quinones :
To the 2 ml of extract conc. H_2SO_4 was added and shake well for 5 min. shows the Red Colour.

Table 1 : Qualitative phytochemical screening of various extract of *Salvia officinalis* (Linn.)

Sr. No.	Constituents	Chemical Test	Extracts					
			P.E.	B	C	A	E	W
1.	Alkaloids	Mayer's Test	+	+	+	-	+	+
		Wagner's Test	+	+	-	+	-	+
		Dragendroff's Test	-	+	+	+	+	+
2.	Carbohydrates & Glycosides	Fehling's Test	+	-	+	-	+	+
		Benedict's Test	+	-	+	+	+	+
3.	Steroids	Salkowski's Test	-	-	-	-	-	-
4.	Saponin	Foam Test	+	+	-	-	-	-
5.	Phenolics & Tannin	$Fecl_3$ Soln. Test	-	-	-	-	-	-
		Lead Acetate Test	+	+	+	+	+	+
6.	Fixed Oils & Fats	Spot Test	+	-	-	-	-	+
7.	Proteins	Biurret Test	+	+	+	+	+	+
		Millions Test	+	-	+	+	-	+
8.	Anthraquinone glycosides	Borntraggers Test	-	-	+	+	-	-
9.	Cardiac glycosides	Keller – Killiani Test	-	-	-	-	-	-
10.	Flavonoids	Shinoda Test	+	+	+	+	+	+
		Lead Acetate Test	+	+	+	+	+	+
11.	Quinone		+	+	+	-	-	-
12.	Coumarins		+	+	+	+	+	+

(*Note :* '+' = Present and '-' = Absent) where, P.E. = Petroleum ether, B = Benzene, C = Chloroform, A = Acetone E = Ethanol, and W = Water extract respectively.

Phytochemical analysis:

i) ***Qualitative phytochemical analysis***

The qualitative phytochemical screening of *Salvia officinalis* (Linn.) in six different extracts i.e. Petroleum ether, benzene, chloroform, acetone, ethanol and water showed that there is presence of carbohydrates, glycosides, proteins, alkaloids, saponin, coumarins, flavonoids, steroids, tannins, phenolic compounds. However, steroids and Cardiac glycosides were totally absent in all extracts. Ethanol extract of of *Salvia officinalis* (Linn.) was accounted for the presence of alkaloids, carbohydrates, glycosides, proteins, coumarins, flavonoids, phenol and tannin. While acetone and water extract showed the presence of alkaloids, carbohydrates, glycosides, flavonoids, proteins, coumarins, tannins, phenolic compounds. Only Petroleum ether and water extract showed the presence of fixed oil and fats, benzene, acetone and ethanol extract analyzed least number of compounds. All the six extract showed the presence of alkaloids, proteins, flavonoids, phenols and tannins. (Table-1).

This could make, this plant useful for treating diabetes and different ailments as having a potential of providing useful drugs of human use. This is because of pharmacological activity of any plant is usually traced to a particular compound.

Pharmacological Studies

Tender leaves are used since ancient time forwarding of evil, snakebites, increasing womans fertility (Greer, 2017). Decoction of leaves is beneficial in uronogenital diseases, diuretic, haemostatic, emmenagogue and tonic (Kintzios, 2000). Sage is singularly good for the head and brain it quickeneth the senses and memory, strengtheneth the sinews, have the palsy, restoreth health to those that and memory, useful in wound healing and useful in burning sensation. (Herball,1597). In past centuries, it was also used for hair care, insect bites and wasp stings, nervous conditions, mental conditions, oral preperation for inflammation of the mouth, tongue and throat, and also to reduce to fevers (Kintzios and Spiridon, 2000). Experimental studies have proven its antidiabetic, antihypertensive, antispasmodic, antibacterial, antifungal activity, antiplaque, antioxidant, antiviral activity, catalytic and galactagogue. The scientific studies have proven the clames of traditional system of medicine (Farzana et. al. 2014). Extracts of the leaves may have positive effects on human brain function. The *thujone present* in *Salvia* extracts may be neurotoxic (Lopresti, 2017).

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Bairwa Ranjan, Singhal Manmohan, Balwant Singh (2011) Medicinal uses of Trachyspermum ammi : A Review, The pharma Research, 5 (2) : 247 – 258

Chopra RN, Nayar SL, Chopra IC (2002) Glossary of Indian medicinal plants.Ed 6, New Delhi NISCIR,2.

Cok T (1967) The Flora of Presidency of Bombay, Vol. II, B.S.I. Calcutta

Davidson Alan and Tom Jaine (2014) The Oxford Companion to food, Oxford University Press, USA. 805.

Farzana MUZN et al. (2014) A review of ethnomedicine, phytochemical and pharmacological activities of Acacia nilotica (Linn) willd. J. pharm. Phyto.chem.3(1): 84-90.

Greer, John Michael (2017) The encyclopedia of natural magic (first.ed.).Woodbury.MN: Liewellyn Publications.p. 185.

Harborne JB (1973) Phytochemical methods,London, Chapman & Hall Ltd. Pp. 49-188.

Kamble SY and Pradhan SG (1988) Flora of Akola District, Maharashtra (B.S.I.)

Kintzios, Spiridon E (2000) Sage: The genus Salvia, CRC press.pp.10-11.

Lopresti AL (2017) "Salvia (Sage): A review of its potential cognitive-Enhancing and cognitive effects".Drugs in R&D.17(1):53-64.

Naik VN (1998) Flora of Marathwada, Vol. I & II, Amrut Prakashan, Aurangabad

Singh VK, Singh S, Singh DK (2003) Pharmacological effects of spices. In recent progress in medicinal plants, phytochemistry pharmacology, vol. 2, Houston, Texas, USA : Stadium Press.

Sutton John (2004) The Gardeners guide to growing salvias.Workman publishing company.p. 17.

.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Study of fresh water fish diversity of Sanjul Lake, Aurangabad. (M.S). India

[1]Gedam Ajit K, [2]Andhle AV and [3]Phulwade Durgesh N

[1]Jijamat College of Arts and Sciences Tq. Bhenda Dist. Ahmednager.
[2]Nowrosjee Wadia College, Pune.
[3]Shri Sant Savta Mali Gramin Mahavidyalya, Phulmabri, Aurangabad.
Email: durgeshphulwade@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Gedam Ajit K, Andhle AV and Phulwade Durgesh N (2019) Study of fresh water fish diversity of Sanjul Lake, Aurangabad. (M.S). India, *Int. J. of. Life Sciences*, Special Issue, A13: 273-275.

ABSTRACT

Sanjul Lake water resource for human consumption and also helpful for the agriculture and fisheries in Taluka Phulambri, District Aurangabad. Investigation was carried out during the study period from Jun 2018 to May 2019. The present paper deals with the variety and abundance of fresh water fishes in Sanjul Lake, Taluka Phulambri, District Aurangabad (M.S) India. The results of present investigation reveal the occurrence of 15 fish species belonging to 3 orders, 4 families and 12 genera.

Keywords: Fish diversity, Sanjul Lake, fresh water fish.

INTRODUCTION

Fish constitutes half of the total number of vertebrates in the world. They live in almost all conceivable aquatic habitats. 21,723 living species of fish have been recorded of and Commercial fishes of importance were found in vertebrates out of these 8,411 are freshwater species and 11,650 are marine. India is one of the mega biodiversity countries in the world and occupies the ninth position in terms of freshwater mega biodiversity (Burton *et al* 19926) In India there are 2,500 species of fishes of which 930 live in freshwater d 1,570 are marine (Kar *et al* 2003).

The species diversity of an ecosystem is often related to the amount of living, nonliving and organic matter present. In the field of ichthyology there is valuable were given an incision in their abdomen and preserved. As per economic importance and scope of fish and fisheries especially in Maharashtra, but it is natural to study the distribution and availability of fish from fresh water. Present investigation was undertaken to study the fish diversity from Sanjul Lake is the first effort in this direction. Various indigenous and commercial fishes of importance were found in this area. Cyprinid fishes are one of the most important groups of vertebrates for man and influencing his life in various ways. The nutritive and medicinal value of fish has been recognized from ancient time to recent era.

MATERIALS AND METHODS

Fishes were collected from Sanjul Lake, Taluka Phulambri, Aurangabad (M.S). India with the help of local fishermen using different type of nets namely gill nets, cast nets, dragnets. Immediately photographs were taken with help of digital camera. Fishes brought to laboratory were preserved in 10% formalin solution in separate specimen jar according to the size of species. Small fishes were directly placed in the 10% formalin solution. While large fishes were given an incision in their abdomen and preserved. The Meristic and morphometric characters measured and fishes were identified up to the species level, with the help of standard keys and books (Shinde *et al 2009* and Ubarhande *et al* 2011).

RESULTS AND DISCUSSION

In the present fish diversity study, species of 14 different genera belonging to 04 families and 03 orders recorded from the Sanjula Lake Taluka Phulambri, Aurangabad and number of catches carried out during June 2018 to May 2019. The members of Order Cypriniformes were dominated by 10 species followed by Siluriformes with 01 species, Perciformes 03 species. Cypriniformes with 10 species was dominant group in the assemblage composition in which *Catla-caltla, Lebeo rohita, Cyprinus carpio* and *Cirrinus merigala* were found most abundant. Fishing practices are carried out throughout the year. The average catch is more in winter and summer as compared to rainy season (Ubarhande *et al* 2011). Fishing operations were carried out for nine months with low in monsoon compared to high in post monsoon (Rankhamb SV 2011). Scientific fishing standard and fishing quotas are to be worked out; this will play an important role in protection of the reservoir biodiversity. Thus it is duty of every individual to play an important role to conserve biodiversity at this place and handover the resources in healthy conditions to the future generations (Shinde *et al* 2009). The work will provide future strategies for development and fish fauna conservation at Sanjula Lake Taluka Phulambri, Aurangabad (M.S).

Catla catla

Labio rohita

Cirrhinus mrigala

Cyprinus carpio

Oreochromis mossambica

Claris batrachus

Channa punctatus

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Burton PJ, Balisky AE, Coward LP, Cumming SG and Kneshwaw DD (1992) The value of managing biodiversity. The Forestry Chronicle 68(2): 225-237.

Day F (1967) The fishes of India vol. 1 and 2 Jagamander agency New Delhi.

Jayaram KC (1981) The fresh water fishes of India. ZSI, 1-438.

Jayaram KC (1999) The fresh water fishes of the Indian Region, Narendra Publisting house. Delhi-551.

Jayaram KC and Sanyal Anuradha (2003) A taxonomic revision of the fishes of the genus Mystus scopoli (Family: Bagridae) Records of the Zoological survey of India occasional paper no 207 ZSI Culcutta 141 pp.

Kar, Kumar DA, Bohra C and Singh LK (Eds) (2003) Fishes of Barak drainage, mizaram and Tripura; In: Environment, pollution and management, APH Publishing Corporation, New Delhi, 604: 203-211.

Mittermeier RA and Mitemeir CG (1997) Megadiversity Earth's biologically wealthiest Nation. In mc Allister, D.E. A Lttamiltion and B. Harvery (Eds). Global fresh water Biodiversity sea wind cemex, mexico city," pp: 1-140.

Rankhamb SV (2011) Ichthyofaunal Diversity of Godavari River at Mudgal Tq. Pathri, Dist. Parbhani. Recent Research in Science and Technology 2011, 3(12): 11-13.

Shinde SE, Pathan TS, Bhandare RY and Sonawane DL (2009) Ichthyofaunal Diversity of Harsool Savangi Dam, District Aurangabad, (M.S.) India. World Journal of Fish and Marine Sciences 1 (3): 141-143, 2009 ISSN 1992-0083. IDOSI Publications, 2009.

Talwar PK and Jhingran A (1991) In land fishes of India and adjacent countries oxford and I.B.H publishing co. New Delhi, 12: 115-6.

Ubarhande SB, Jagtap JT and Sonawane SR (2011) Ichthyofanal Diversity from Ambadi Dam, Taluka Kannad, District - Aurangabad (M.S.). Recent Research in Science and Technology 2011, 3(6): 34-37.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Assessment of physical parameters of Dedargaon Dam, Dist- Dhule, Maharashtra, India

Sonawane Deepali and Patole SS

Department of Zoology, A.D.M.S. P's. Late. ANnasaheb R.D. Deore Arts and Science College Mhasdi, Tal. Sakri, Dist Dhule, MS, India.
Email: deepalibagal21@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Sonawane Deepali and Patole SS (2019) Assessment of physical parameters of Dedargaon Dam, Dist- Dhule, Maharashtra, India *Int. J. of. Life Sciences*, Special Issue, A13: 276-282.

ABSTRACT

The present study is carried out during the study period Jan 2014 to Dec 2015. It deals with the assessment of water quality in terms of physical parameters. The water samples were collected from three sites of Dedargaon dam which supplies water to Dhule city of Maharashtra state, India. Certain physical parameters like colour, odour, temperature, pH, turbidity, total dissolved solids (TDS), etc. were assessed. The results were compared with the standards prescribed by National and International agencies like World Health Organization (WHO), International Standard Institute (ISI) and Bureau of Indian Standards (BIS). The results reveal that the values of physical parameters tasted were found to be in the prescribed permissible limit. Thus, the water is suitable for human use.

Key words:- Dedargaon dam, WHO, ISI, BSI, Water quality, Physico-chemical parameters.

INTRODUCTION

"Water is a liquid of life", as there can be no life possible without water. Water is the key compound and indispensable for life. The superiority of water requires for all living organisms which includes plants and animals. Man consumes water for various purposes like cooking, drinking, washing, etc. Every aquatic body is able to absorb some amount of contamination without any serious impact attributable to dilution and self purification factors. The water resources are supportive or potentially helpful for human being (Patil *et al*., 2012).

Water is God's creation and Pollution is man's contribution

Pollution makes changes in physical, chemical, radiological and biological factors of the resources. It happens due to various activities of human beings. As a result of these various anthropogenic performances, the water quite often becomes in poor condition for various uses like domestic, drinking purposes, industrial, irrigation purposes etc. the water bodies are also polluted by the release of sewage or industrial wastes. Mostly pollution begins from the removal of wastewater following the use of water for a wide variety of purposes. India is still rendering polluted water day by day and the circumstances are declining gradually due to careless performance of its

society (Sivalingam, 2018). The increased use of metal-based fertilizer in agricultural revolution of the government could result in continued rise in concentration of metal pollutions in fresh water reservoir due to the water run-off. Also faucal pollution of drinking water causes water born disease which has led to the death of millions of people. (Adefemi and Awokunmi, 2010).

Description of study Area:

India is a vast country; it measures the area of about 806 million acres. The area which was undertaken for investigation is rural districts of Maharashtra (India). The Dhule district is also known as West Khandesh and categorized as district head quarters since 1960. Dhule district was Situated between 73°47' and 75°11' East of longitude and 20°38' and 22°3' North latitude, is the westernmost of the districts of Northern border area of Maharashtra State.

Dedargaon Storage Dam

The Dedorgaon dam was situated on Anwar nala which was joined by River of Panzara. The construction of the dam was completed in 1885. The basement of dam water storage capacity elevation extended on 350 meters. The live water srorage capacity of the dam is 152.37. The overflow (maximum) water storage capacity of the dam is 346.70 meters. As well as the minimum water storage capacity of the dam is 338.10 meters. But intake capacity is 342.30 meters. The Dedorgaon dam is comparatively small reservoir; it supplies water to dhule city. It covers 18 % of city area and it is 15 km away from the city. From this source, water supplied at the rate of 5 MLD. The capacity of Dedargaon water works after increasing the capacity of Dedargaon tank. The pure water is stored at Malegaon GSR and from this storage tank the water is supplied to various regions i.e. Malegaon Naka, Mohadi, Mahada wasti, Dedargaon.

MATERIAL AND METHODS

For the collection of water samples three sites were selected from the dam site. Monthly collection of samples was taken in morning time. The water samples were collected in sterilized glass bottle with screw cap. After the collection, the samples were labelled as per date of collection, site number, timing of collection etc. Temperature was recorded immediately on site after collection of samples.

After collection, the sample were immediately transferred to laboratory for analysis of EC Turbidity, TDS etc. These parameters were measured in laboratory by different methods are shown in table-1A. The analytical methods were followed are described by NEERI (1981), Trivedi and Goel (1986) and Kodarkar (2006).

RESULTS & DISCUSSION

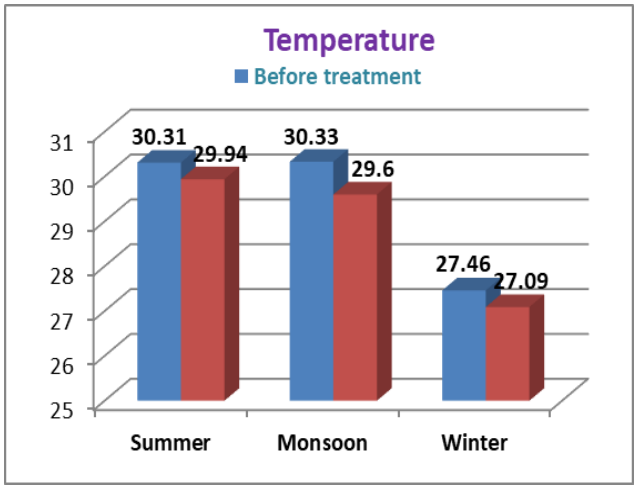
The statistical analysis of variation in physical parameters during study period i.e. Jan 2014-Dec 15 is presented in table-1; likewise seasonal variation also shown in graphs. From table and graphs, it is observed that the fluctuation of all these parameters was due to seasonal and environmental changes.

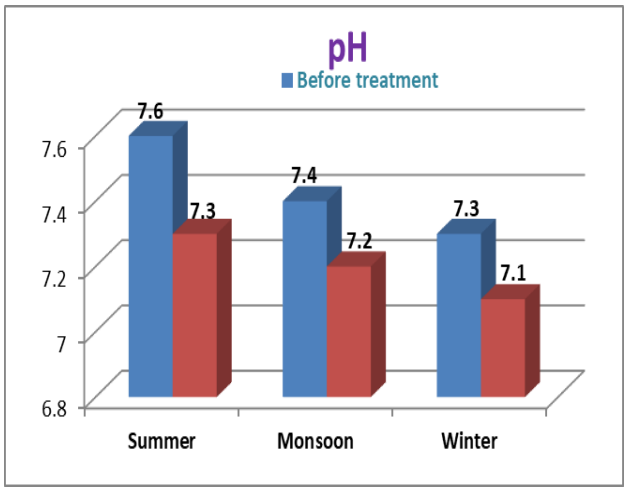
Plate-1: Dedargaon dam

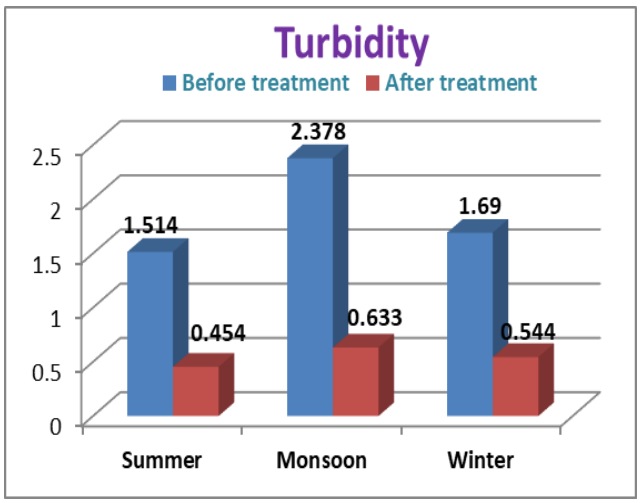
Colour:
The pure water has no colour. Throughout the study period the before treatment colour of water body i.e Dedargaon dam seen greenish in the winter season, in summer it appear a yellowish colour and in the monsoon season it has muddy to brownish colour. Whereas the after treatment water is colourless during the study period.

Odour:
In the present study the Dedargaon dam before treatment water has odour free in the winter season. In the summer season the odour of the water body has fishy and obnoxious smell while in the monsoon it gives muddy and soapy smell. The after treatment water which Supplied by municipal corporation is odourless and somewhat chlorinous smell throughout the study period.

Temperature:
The before and after treatment values of water temperature was recorded in summer i.e. (30.31 ± 0.89 ºC) and (29.94 ± 0.84 ºC) respectively. It was slightly decreased in monsoon (30.33 ± 0.53 ºC) and (29.6 ± 0.45 ºC) whereas during winter season, it was (27.46 ± 0.81 ºC) and (27.09 ± 0.76 ºC) with significant seasonal variations ($P< 0.05$, $F_{2\ 21}$ 4.789 before and 4.968 after treatment) during study period. The water temperature shows significant positive correlation with alkalinity, BOD, Chloride, CO_2 at $P< 0.05$ level while at $P< 0.01$ level with hardness, pH and TDS. It showed negative significant correlation with COD, turbidity at $P< 0.05$ level while at $P< 0.01$ level with DO and nitrates before treatment. Whereas after treatment it shows positively significant correlation at $P< 0.05$ level with alkalinity, BOD, Chloride, and hardness while at $P< 0.01$ level with CO_2, pH, TDS. Negative significant correlation at $P< 0.05$ level with EC and turbidity while at $P< 0.01$ level with COD, DO, nitrates.







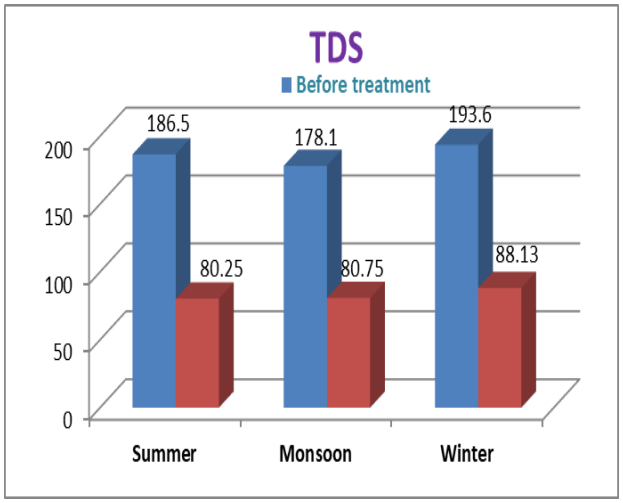


Table-2: Pearson co-relation table of Dedargaon dam (Before treatment)

	AL	BOD	Cl	CO_2	COD	DO	EC	HARD	NO	pH	TDS	TEMP	TURBID
AL	1.000												
BOD	.008	1.000											
Cl	.468*	.239	1.000										
CO_2	.181	-.005	.472*	1.000									
COD	-.145	.534**	.138	.016	1.000								
DO	-.601**	-.175	-.317*	-.646*	.109	1.000							
EC	-.332*	-.494*	-.648*	-.288	.472*	.484*	1.000						
HARD	-. 265	.443*	.484*	.365*	-.606*	-.416*	-.140	1.000					
NO	-.851**	-.399*	-.333*	-.022	-.038	.592**	.478*	-.480*	1.000				
pH	.692**	.466*	.395*	.616**	.028	-.666**	-.318*	.417*	-.703**	1.000			
TDS	.178	-.229	.401*	.429*	-.025	-.410*	-.446*	.450*	.059	.431*	1.000		
TEMP	.425*	.345*	.364*	.695*	-.651*	-.731**	-.091	.560**	-.546**	.436**	.583**	1.000	
TURBID	-.297	-.488*	-.875**	-.471*	-.041	.435*	.419*	-.107	.676**	-.114	-.284	-.336*	1.000

Table- 3: Pearson co-relation table of Dedargaon dam (After treatment)

	AL	BOD	Cl	CO_2	COD	DO	EC	HARD	NO	pH	TDS	TEMP	TURBID
AL	1.000												
BOD	.252	1.000											
Cl	.376*	.122	1.000										
CO_2	.369*	.337*	.395*	1.000									
COD	-.168	-.610**	-.125	-.497*	1.000								
DO	-.319*	.170	-.395*	-.698**	.691**	1.000							
EC	-.204	-.436*	-.423*	-.480*	.345*	.482*	1.000						
HARD	.650**	.372*	.478 *	.348*	-.344*	-.442*	-.367*	1.000					
NO	-.345*	-.688**	-.349*	-.351*	.444*	.339*	.350*	-.375*	1.000				
pH	.472*	.648*	.529**	.331*	-.556**	-.680**	-.425*	.601*	-.405*	1.000			
TDS	.426*	.049	.264	.367*	-.396*	-.617**	-.334*	.666**	-.085	.323*	1.000		
TEMP	.652*	.485*	.444*	.778**	-.744**	-.847**	-.498*	.633*	-.806**	.759**	.549**	1.000	
TURBID	-.553**	-.433*	-.394*	-.182	.423*	.451*	.423*	-.398*	.365*	-.313*	-.051	-.383*	1.000

**Correlation is significant at 0.01 level (2-tailed)
*Correlation is significant at 0.05 level (2-tailed)

Bhagde *et al* (2016 a) measured temperature 25 ^{0}C to 34 ^{0}C at two sampling stations from Aadhala River in Ahmednagar District. Bhagde *et al* (2016 b) recorded minimum temperature 30 ^{0}C in the month of December, 32 ^{0}C in August and 37 ^{o}C in the month of March from Devtale Lake in Sangamner Taluka of Ahmednager District of Maharashtra State, India. Dahegaonkar (2016) reported seasonal variation in physico-chemical parameters like water temperature the maximum water temperature (35.1 ^{0}C) in summer season and minimum (24.4 ^{0}C) in winter season, for a period of June, 2005 to May, 2007. Fule *et al* (2017) recorded the temperature range between 22.00 ^{0}C to 36.50 ^{0}C i.e. lowest in winter and highest in summer during the year 2008-09, from Sarangpuri Lake, Dist-Wardha.

pH:

The maximum before and after treatment mean values of pH was recorded in summer i.e. (7.4 ± 0.054) and (7.3 ± 0.032) respectively. It slightly decreased in monsoon i.e. (7.4 ± 0.057) and (7.1 ± 0.042) respectively, whereas during winter season it was (7.3 ± 0.043) and (7.1± 0.046) respectively, with significantly significant seasonal variations ($P< 0.05$, $F_{2\ 21}$ 0.9545 and 4.019) before and after treatment during study period. Before treatment it shows positive correlation significant level at $P< 0.05$ with alkalinity, BOD, Chloride, CO_2, hardness and TDS and at $P< 0.01$ with temperature only while it shows negative significant correlation at $P< 0.05$ level with DO, EC and nitrates. Whereas after treatment it shows significant positive correlation at $P< 0.05$ with alkalinity, Chloride, CO_2, hardness and TDS and

correlation at P< 0.01 level with temperature. While it shows negative significant correlation at P< 0.05 level with EC and nitrates and at P< 0.01 with DO.

Prasad *et al* (2014) observed the maximum pH (8.8) at site Kadiyampalli and the minimum (7.7) at Voddipalli village. Tandale and Mujawar (2014) reported that lowest pH value was noticed in the september (6.68) and high in November (7.36). They noticed that the values of pH are within the range of permissible limit of drinking water quality standards (WHO). Bhagde *et al* (2016 a) studied physico-chemical parameters of Aadhala River. They observed that the changes occur in pH and recorded pH 6.2 to 7.5. Bhagde *et al* (2016 b) observed minimum pH 7.67 in the month of August, 7.3 in December and maximum pH was noticed in the month of March i.e. 8.1. Dahegaonkar (2016) recorded maximum pH (8.15) in the month of August, 06 and minimum (7.62) in October, 2005.

Turbidity:

The maximum before and after treatment values of turbidity was recorded in monsoon i.e. (2.378 ± 0.16) and (0.633 ± 0.067) respectively. It was slightly decreased in winter i.e. (1.69 ± 0.092) and (0.544 ± 0.022) respectively, whereas it recorded minimum in summer i.e. (1.514 ± 0.17) and (0.454 ± 0.039) respectively. It was noticed with significantly significant seasonal variations (P< 0.01 and P< 0.05) F_{221} 10.66 before treatment and 3.731 after treatment during study period. Before treatment it shows significant positive correlation with DO and EC at P< 0.05 level and with nitrates at P< 0.01 level. It shows negative significant correlation with BOD, CO_2, Temperature at P< 0.05 level and at P< 0.01 level with Chloride. While after treatment it shows significant positive correlation with COD, DO, EC and Nitrates at P< 0.05 level whereas negative significant correlation at P< 0.01 with alkalinity and correlation at P< 0.05 with BOD, Chloride, hardness, pH and temperature etc.

Table – 4: Statistical Analysis of physical parameters during (2014/15)

	Season	Mean	Std. Dev.	Std. Error	F-Value	P-Value	R-Square	P value summary	Significant difference Among means (p<0.05)
Temperature									
Before Treatment	Summer	30.31	2.492	0.881	4.789	0.0193	0.3132	*	Yes
	Monsoon	30.33	1.498	0.5297					
	Winter	27.46	2.275	0.805					
After Treatment	Summer	29.94	2.361	0.8347	4.968	0.0171	0.3212	*	Yes
	Monsoon	29.6	1.266	0.4476					
	Winter	27.09	2.13	0.753					
pH									
Before Treatment	Summer	7.6	0.1808	0.0639	11.52	0.0004	0.5231	***	Yes
	Monsoon	7.4	0.1309	0.0463					
	Winter	7.3	0.119	0.042					
After Treatment	Summer	7.3	0.1195	0.0423	10.23	0.0008	0.4935	***	Yes
	Monsoon	7.2	0.0535	0.0189					
	Winter	7.1	0.141	0.05					
Turbidity									
Before Treatment	Summer	1.514	0.4693	0.1659	10.66	0.0006	0.5038	***	Yes
	Monsoon	2.378	0.4261	0.1506					
	Winter	1.69	0.259	0.0916					
After Treatment	Summer	0.4538	0.1112	0.0394	3.731	0.0411	0.2622	*	Yes
	Monsoon	0.6325	0.1881	0.06651					
	Winter	0.544	0.06	0.0216					
TDS									
Before Treatment	Summer	186.5	23.9	8.449	1.134	0.3407	0.09746	ns	No
	Monsoon	178.1	14.41	5.094					
	Winter	193.6	22.26	7.869					
After Treatment	Summer	80.25	24.05	8.504	0.5422	0.5894	0.04911	ns	No
	Monsoon	80.75	6.649	2.351					
	Winter	88.13	15.42	5.453					

Tali *et al* (2012) studied the alterations of turbidity within Aug-2010 to Jul-2011 the values of turbidity ranges from 3.9 NTU and 22.8 NTU at sitte I and from 3.5 NTU and 23.8 NTU at site II, which was lowest in summer 2011 at site II and highest in the monsoon at site II of the River Narmada at Madhya Pradesh India. Dhale and Pachkore (2012) recorded the values of turbidity ranges from 0.1 to 0.4 NTU which fall under the desirable limits prescribed by WHO. Sahu *et al* (2015) showed the lower turbidity i.e. 3 NTU at station S1 and higher turbidity i.e. 21 NTU at station S2. It was noticed due to the disturbance by anthropogenic activity.

TDS:

The maximum before and after treatment values of water TDS was recorded in winter i.e. (193.6 ± 7.87) and (88.13 ± 5.46) respectively. It was slightly decrease in summer i.e. (186.5 ± 8.45) and (80.25 ± 8.51) respectively, while it was recorded in monsoon i.e. (178.1 ± 5.094) and (80.75 ± 2.356) respectively, with significantly significant seasonal variations ($P< 0.01$ and $P< 0.05$) $F_{2\ 21}$ 1.134 before treatment and 0.542 after treatment during study period. Before treatment it shows significant positive correlation at $P< 0.05$ with Chloride, CO_2, hardness and pH whereas correlation at $P< 0.01$ with temperature. It shows negative significant correlation with DO and EC at $P< 0.05$ level. While after treatment it shows significant positive correlation at $P< 0.01$ with hardness as well as temperature and at $P< 0.05$ level with alkalinity CO_2 and pH. It shows negative significant correlation at $P< 0.01$ with DO and at $P< 0.05$ level with COD and EC.

Lubal *et al* (2012) recorded the fluctuation of TDS values in the range of 178 mg/ L to 290 mg/ L. They noticed the maximum values of TDS in May and minimum in December from at Mhaswad water reservoir of Satara. According to Aggarwal and Arora (2012) of Kaushalya River TDS values ranged between 152mg/ L to 252 mg/ L and stated that the water with TDS can be considered to be good. Dhale and Pachkore (2012) recorded Total Dissolved Solid (TDS) noted from 552.00 mg/ L to 1183.00 mg/ L. Tali *et al* (2012) recorded the TDS values ranged as 230 mg/ L to 345 mg/ L from site I and 190 mg/ L to 360 mg/ L at site II, Which was minimum in January, 2011 and maximum in the month of July, 2011.

CONCLUSION

According to observations, considering the physical analysis the water samples were found to permissible limit. Related recommended standards assessment of the dam water quality parameters values, it was observed that 06 parameters i.e. Color, Odor, Temperature, pH, Turbidity, TDS during study period all the samples were found within desirable limit for domestic as well as drinking water. It was observed that the maximum possible concentration of Turbidity in the rainy season. As compare to after treatment water samples, before treatment water samples found unpleasant, that may be polluted due to flooding, agricultural runoff, anthropogenic activities etc.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Adefemi SO and Awokunmi EE (2010) Determination of physico-chemical parameters and heavy metals in water samples from Itaogbolu area of Ondo-State, Nigeria, African J. Environ. Sci. Technol., 4(3), 145-148.

Aggarwal R and Arora S (2012) A study of water quality of Kaushalya River in the submountaneous Shivalik region. International Journal of Scientific and Technology Rerearch,1(8): pp.52-68.

Bhagde R, Suryavanshi A, Karpe D and Dama LB (2016a) Hydrobiological study of Devtale Lake in Sangamner Taluka of Ahmednager District of Maharashtra State, India. *Trends in Life Sci. DAMA Int. J.*, 5(2): pp.1-5.

Bhagde R, Suryavanshi A, Khan S and Dama LB (2016b) Study of physico-chemical parameters and faunal diversity of Aadhala River in Ahmednagar District of Maharashtra State India. *Trends in Life Sci. DAMA Int. J.,* 5(2): pp.6-11.

Dahegaonkar NR (2016) Studies on pollutional status of Lohara Nullah in Chandrapur (Maharashtra), India. *Int. J. Res. Biosci. Agri. Tech.* (Special Issue): pp.13-18.

Dhale DA and Pachkore GL (2012) Assessment of physico-chemical status of ground water samples of Parbhani District (M.S., India). Int. J. Pharma. Sci. Res., 3(5): pp.1367-1370.

Fule UW, Nimgare SS and Telkhade PM (2017) Study of physico-chemical characteristics of Sarangpuri Lake, Dist-Wardha (M.S.). Int. J. Res. Biosci. Agri. Technol., 5(1): pp.1-5.

Lubal MJ, Sutar AU and Pawar KW (2012) Studies on physico-chemical aspects of Mhaswad water reservoir of Satara District (Maharashtra) India.*Int. J. Plant, Animal Environ. Sci.* 2(3): pp.12-15.

Patil PN, Sawant DV and Deshmukh RN (2012) Physic chemical parameters for testin of water-A review. Int. J. Environ. Sci. 3(3): 1194-1207.

Prasad M, Reddy B, Reddy Muralidhara, Ramakrishna M and Sunitha V (2014) Studies on physicochemical parameters to assess the water quality in Obulavaripalli Mandal of YSR (Kadapa) District, Andhra Pradesh, India.*Int. J. Curr. Res. Academic Review,* 2(12): pp.31-41.

Sahu P, Karad S, Chavan S and Khandelwal S (2015) Physicochemical analysis of Mula Mutha River Pune. Civil Engineering and Urban Planning: *An Int. J.* 2(2): pp.37-46.

Sivalingam P (2018) Physico-Chemical Parameters and Plankton Diversity of Manchiryal Town Lake Adilabad District, Andra Pradesh, India.*J. Biotech. Biores.,* 1(2): pp.1-3.

Tali I, Pir Z, Sharma S, Mudgal LK and Siddique A (2012).Physico chemical properties of water of river Narmada at Madhya Pradesh, India.*Researcher*, 4(6): pp.5-9.

Tandale SM and Mujawar HA (2014) Assessment of surface water quality in the vicinity of an industrial area near village Datav of Raigad, Maharashtra. *J. Res. Enginee. Technol.,* 3(4): pp.31-35.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Ethnoveterinary plants used against different ailments from West nimar region of M.P. India

Parashar Preeti and Ray Sudip

Department of Botany, P.M.B. Gujarati Science College Indore, Madhya Pradesh, India.
Email: preetiparashar25@gmail.com, subot@yahoo.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Parashar Preeti and Ray Sudip (2019 Ethnoveterinary plants used against different ailments from West nimar region of M.P. , *Int. J. of. Life Sciences*, Special Issue, A13: 283-288.

ABSTRACT

Study was carried out in West nimar region is located in the south western region of M.P.Ethnoveterinary data were collected from year 2016-2017 Bhil, Bhilala ,Gond,Nayika and Tadwi are dominant tribe of the region .They are dependent on plant based medium and other for recovery of their ailment.A total 28 plant species belonging to 23 families were documented in the area. The most frequently used plant parts were leaves (30%) followed by seeds and roots (16%), fruits (9%), whole plant (7%),tubers, bark and stem (5%), latex (3%),flower and rhizomes(2%) are used in against different 21 ailments.

Keywords: Ethnoveterinary, Nimar, Khargone, Bhil, Bhilala, Gond, Nayika and Tadwi.

INTRODUCTION

The history of ethnoveterinary medicine is as old as the evolution of man on earth. Human and animal relationship was so close from the beginning. Veterinary science was developed in India as early as the Vedic period. The Rig-Veda (4500 - 1600 B.C.) mentions the uses of medicinal plants in the treatment of man and animals. Atharveda (3500 - 500 B.C.) provides information about healing herbs and drugs. West nimar presently consists of two district Khargone and Barwani is the south western region of Madhya Pradesh state in West Central India was formerly known as West nimar.The region lies south of the Vindhya range and consists of two portions of the Narmada and Tapti river valleys separated by a section of the Satpura range. It is situated between 21°22' and 22°35' north latitudes ,74°25'and 76°14' east longitudes. It is famous for its cotton and chilly production. The district is divided into 08 tehsils and has1407 villages. About 40% of the population consists of tribal people. Bhil, Bhilala, Gond, Nayika and Tadwi are most common tribes. Tribals mostly rear cow, goats, buffaloes and bullocks as livestock.

MATERIAL METHODS

Ethnoveterinary survey was carried out and ethnoveterinary data collected from different villages of West nimar of M.P. covering 09 Tehsil (Khargone, Segaon, Bhagwanpura, Jhiranga, Bailgaon, Barwah, Kasrawat, Barwani, Thikri, Niwali). Bhil, Bhilala, Gond, Nayka and Tadvi are most common tribes.

The information was gathered through questionnaire method and interviews. Field observations and discussions with tribal, local medicine men known as Ojha,Bumka,Bagwat , elderly persons, cattle owners was held during survey.Details of medicinal plants used, mode of treatment, methods of preparation and types of administration doses were recorded by interacting with them .The plants are arranged alphabetically, the botanical name , local name and family.Identification of plants done with the help of flora and other taxonomic literature.

Observation Table

1.*Abrus precatorius* L.
Family: Leguminosae
Local name: Ratti and Guraj.
Plant Part Used: Seeds
Ethnoveterinary Uses:
- 10 gm paste of seeds is fed to cattle in bone fracture.
- Paste of seed powder in coconut oil is used for wound healing.

2. *Acacia nilotica* (L.)Willd.
Family:Leguminosae
Local name: Babul, Kikar, Desi babool.
Plant Part Used: Leaves and bark.
Ethnoveterinary Uses :
- Fresh leaves are crushed and mixed with 100 ml of water is given orally in dysentery of cattle.
- Decoction of bark is applied over the hooves to cure foot and mouth diseases.

3.*Acanthospermum hispidum*DC.
Family: Compositae
Local name: Bada gokhru.
Plant Part Used: Leaves and seeds.
Ethnoveterinary Uses:
- Leaf ash mixed with coconut oil applied around horns of animals suffering from worms.
- Smoke produced by burning seeds is used to treat hemorrhagic septicemia.

4.*Achyranthes aspera* L.
Family: Amaranthaceae
Local name: Aandhi jhada, Apmarg.
Plant Part Used: Leaves and seeds.
Ethnoveterinary Uses:
- 50 gm leaves mixed with 100 ml mustard oil are given orally to cure gastritis.
- Seeds are burnt and the animals are exposed to smoke to treat hemorrhagic septicemia.

5.*Ailanthus excelsa* Roxb.
Family: Simoroubaceae
Local name: Maharukh, Addoo, Papdi.
Plant Part Used: Leaves.
Ethnoveterinary Uses:
- Leaves juice is used to kill lice and ticks on the skin of cattle.
- Decoction of leaves is applied to remove maggots from the wound.

6.*Albizia procera* (Roxb.) Benth.
Family: **Leguminosae**
Local name: Karak, Safed siris.
Plant Part Used: Roots and leaves.
Ethnoveterinary Uses:
- Leaves juice is dropped in to eyes to cure eye trouble.
- Root paste in cow's urine is applied in eyes against night blindness.

7.*Alangium salviifolium* (L. *f*.) Wang.
Family: Cornaceae
Local name: Ankol
Plant Part Used: Leaves and stem.
Ethnoveterinary Uses:
- Leaves paste or extract used in washing and healing of wounds.
- Stem bark juice is mixed with *Citrus limonia* (Lemon) juice given orally, 2-3 times a day to cure cough and sneezing in cattle.

8.*Asparagus racemosus* Willd.
Family: Asparagaceae
Local name: Shatavari, Sevariya, Shatmul, Musli.
Plant Part Used: Roots.
Ethnoveterinary Uses:
- Roots mixed with fodder given to the milching animals to increase lactation.
- Root paste mixed with the paste *of Allium cepa* (Onion) and jaggery given orally to cure mastitis

9.*Azadirachta indica* A.
Family: Meliaceae
Local name: Neem, Neemdo.
Plant Part Used: Leaves and seeds.
Ethnoveterinary Uses:
- Leaves paste is used for killing ectoparasites.
- Seed oil or decoction of leaves is applied on hooves of cattle in foot and mouth disease.

10.*Balanites aegyptiaca* (L.) Delile
Family: Zygophyllaceae

Local name: Hingot, Hinganbet.
Plant Part Used: Seeds
Ethnoveterinary Uses:
- Paste of seedsis fed to cattle for expulsion of placenta.
- Seeds paste mixed with water is given to animal twice aday to cure neck inflammation.

11.*Capsicum annuum* L.
Family: Solanaceae
Local name: Lal mirch, Marchaya.
Plant Part Used: Roots, leaves and fruits.
Ethnoveterinary Uses:
- Crushed leaves are used for wound healing and swelling of body parts.
- Root extract (two cups) is given twice a day for snake bite.
- Fruit powder with jaggery given to cattle in stomach disorders and to improve digestion.

12.*Catunaregam spinosa* (Thunb.) Tirveng.
Family: Rubiaceae
Local name: Purput, Kalapendra.
Plant Part Used: Fruits, wholeplant and leaves.
Ethnoveterinary Uses:
- Fruits or leaves are boiled in water, cooled and applied on wounds of cattle.
- Plant extract mixed with fodder is used to treat diarrhoea.

13.*Cleome viscosa* L.
Family: Cleomaceae
Local name: Hulhul or Machundi.
Plant Part Used: Leaves and whole plant.
Ethnoveterinary Uses:
- Leaf paste mixed with tobacco leaves is applied to remove ectoparasites from the skin of animals.
- Whole plant powder is given to animal along with bread two times a day to cure 'black quarter' disease.

14.*Crinum viviparum* (Lam.) Ansari & V. J. Nair.
Family: Amaryllidaceae
Local name: Sudarshan, Govel, Nagadamani.
Plant Part Use: Roots.
Ethnoveterinary Uses:
- The extract of bulbous root is slightly warmed and applied externally to cure stomach pain.
- Juice of bulbous root is given to cattle in fever.

15.*Cucumis melo* L.
Family: Cucurbitaceae
Local name: Phoot, Kharbooj.
Plant Part Used: Fruits.
Ethnoveterinary Uses:
- Fruit paste mixed withwhey is given orally to cattle for 3 days to cure dysentery.
- Fresh fruits are fed with fodder to expel placenta after delivery.

16.*Euphorbia hirta* L.
Family: Euphorbiaceae
Local name: Thaur, Dudhai.
Plant Part Used: Leaves and latex.
Ethnoveterinary Uses:
- Crushed leaves mixed with fodder given to cattle to increase lactation in cattle.
- Latex is applied on wounds for quick healing.

17.*Gloriosa superba* L.
Family: Colchicaceae
Local name: Kaliharikand, Kallavi, Karkari.
Plant Part Used: Roots and tuber.
Ethnoveterinary Uses:
- Tubers are crushed and paste is applied over the hooves of cattle to cure foot and mouth disease.
- Tuber is rubbed and applied on swelling of neck of cattle.
- Root paste is applied on uterus to cure prolapsed uterus.

18.*Grewia hirsuta* Vahl, Symb.
Family: Malvaceae
Local name: Gadsatri, Gursakri.
Plant Part Used: Roots.
Ethnoveterinary Uses:
- Dried root powder mixed with water is given to cattle to treat bone fractures.
- 50 ml of roots decoction is given to cattle after delivery for quick removal of placenta.

19.*Madhuca longifolia* var.
Family: Sapotaceae
Local name: Mahua, Moho.
Plant Part Used: Flowers and stem.
Ethnoveterinary Uses:
- Flower decoction is given to calves to expel intestinal worms.
- Decoction of stem bark is applied on hooves and bandaged in foot rot disease.

20.*Pueraria tuberosa* (Roxb. *ex* Willd.) DC.
Family: Leguminosae

Local name: Bhui kola, Bidari kand, Gajua.
Plant Part Use: Tubers.
Ethnoveterinary Uses:
- Tubers are fed to cows and buffaloes with fodder to increase secretion of milk.
- Tubers are crushed and mixed with jaggery. The decoction along with *Curcuma amada* (Amba haldi) sendha salt and *Triticum aestivum* (Wheat) flour is fed to animals to get strength.

21.*Riccinus communis* L
Family: Euphorbiaceae
Local name: Arand, arandi, Aandi.
Plant Part Used: Leaves and seeds.
Ethnoveterinary Uses :
- Seed oil and decoction of *Capparis zeylanica* (Hur hur) is applied to reduce pains in joints of cattle.
- Leaves are slightly warmed and bandaged over bone fracture.

22.*Sapindus emarginatus* Vahl, Symb.
Family: Sapindaceae
Local name: Aritha, Reetha.
Plant Part Used: Fruits.
Ethnoveterinary Uses:
- Fruit powder and seeds stirred in water and administered to cattle to cure in snake bite.
- Decoction of fruits given orally in asthma and dysentery.

23.*Sesamum indicum* L.
Family: Pedaliaceae
Local name: Til.
Plant Part Used: Seeds.
Ethnoveterinary Uses:
- Seeds with jaggery (20 mg) are given to cows and buffaloes to increase lactation.
- 200 gm. seed oil is given orally to domestic animals to cure foot and mouth disease.

24.*Tephrosia purpurea* (L.) Pers.
Family: Leguminosae
Local name: Sarpenkha, Sarphonka.
Plant Part Used: Leaves and whole plant.
Ethnoveterinary Uses:
- Leaves crushed and applied on wounds of cattlefor quick healing.
- Plantis boiled in water, filtered and given orally to cure haematuria.

25.*Terminalia arjuna*(Roxb. *ex* DC.) Wight & Arn.
Family: Combretaceae
Local name: Kau, Kahu.
Plant Part Used: Bark
Ethnoveterinary Uses:
- Bark paste is plastered over bone fracture and bandaged for fast recovery.
- Paste of fresh bark is given to cows for removal of placenta after delivery

26.*Trachyspermum ammi* (L.) Spraguein Kew Bull.
Family: Apiaceae
Local name: Ajwain.
Ethnoveterinary Uses:
- Decoction of seed powder with sugar and *Ferula asafoetida* (Heeng) is given orally to buffaloes to cure stomach disorders and bloat.
- 80-100 gm. seeds are powdered and mixed with jaggery and paste is given orally to cow and buffaloes twice a day for removal of placenta.

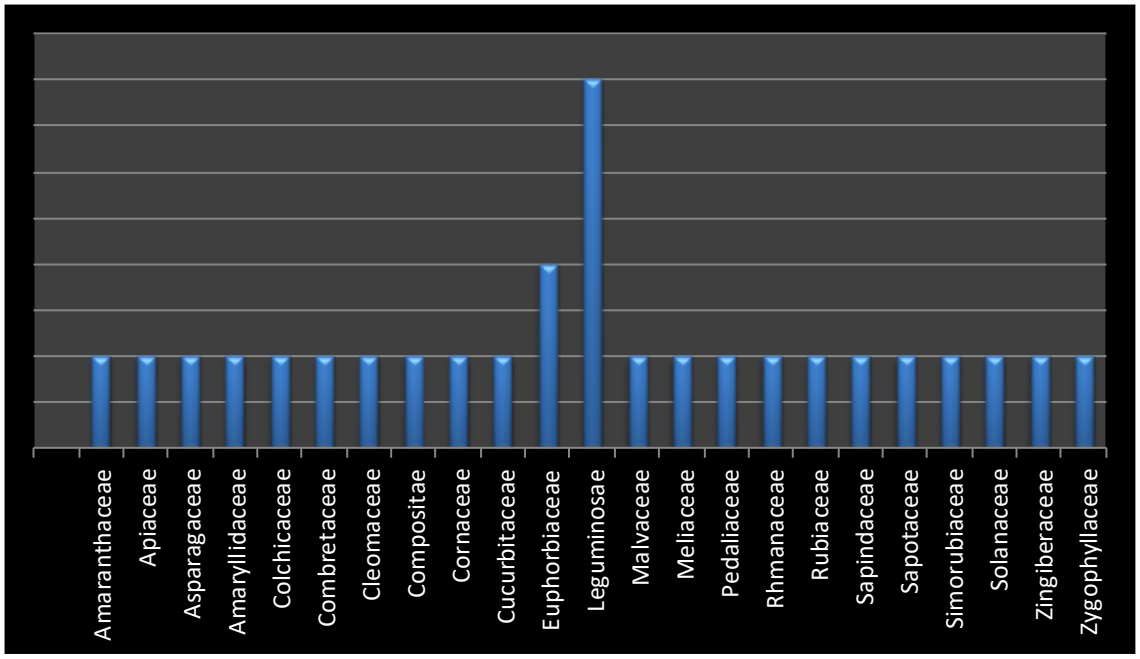
27.*Zingiber officinale* Roscoe.
Family:Zingiberaceae
Local name: Adrak.
Plant Part Used: Rhizome.
Ethnoveterinary Uses:
- Rhizome paste with leaf paste of *Aloe vera* (Guar patha) applied on swelling of udder in cattle.
- Dried rhizome mixed with black salt is given for three days to cure indigestion.

28.*Ziziphus nummularia* (Burm. *f.*) Wight & Arn.
Family: Rhamnaceae
Local name: Chinya bor, Jharbari, Jharbar.
Plant Part Used: Leaves and roots.
Ethnoveterinary Uses:
- Leaves pounded finely in *Linum usitatissimum* (Alsi) oil to form a paste. It is applied on burnt parts of animals till cure.
- Root crushed and mixed with water is applied on the shoulder pain of the bullocks.
- Decoction of root is applied on hooves and oral cavity in foot and mouth disease of cattle.

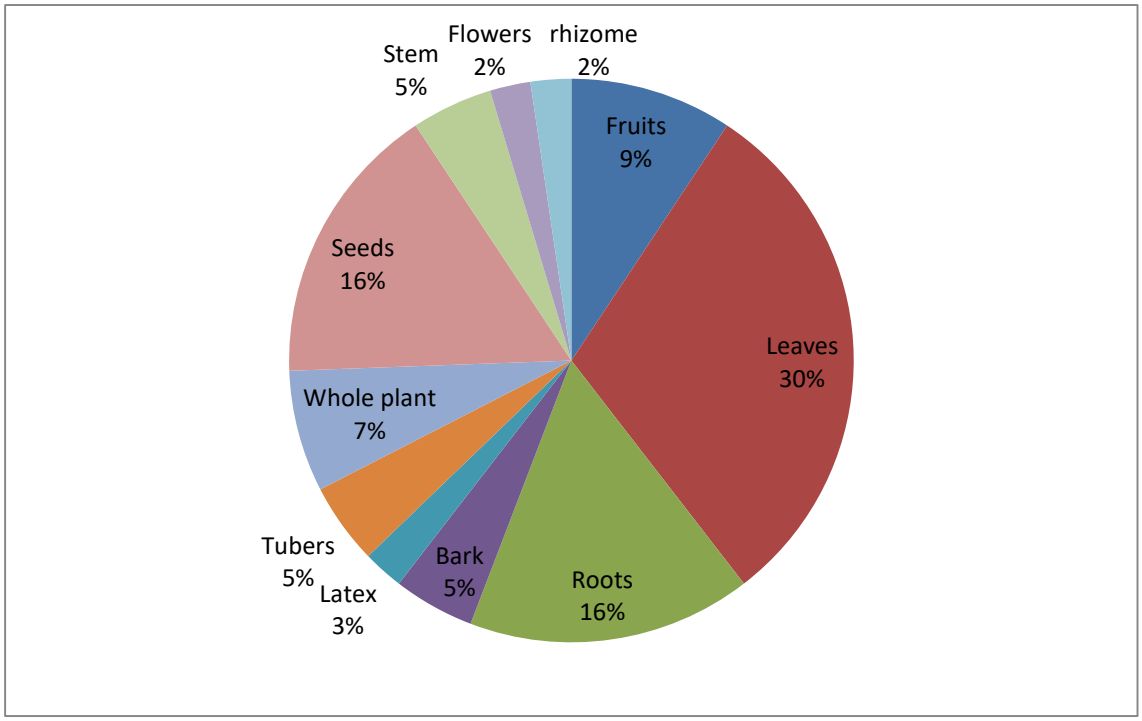
RESULTS & DISCUSSION

Present study reveal that 28 plant species are used in 21 different ailments of cattle in West nimar of M.P. Total 28 plant species belonging to 23 families were documented in the area.Common diseases of cattle are wound healing, swelling, expulsion of placenta, mastitis, gastritis, foot and mouth disease. Leguminosae is

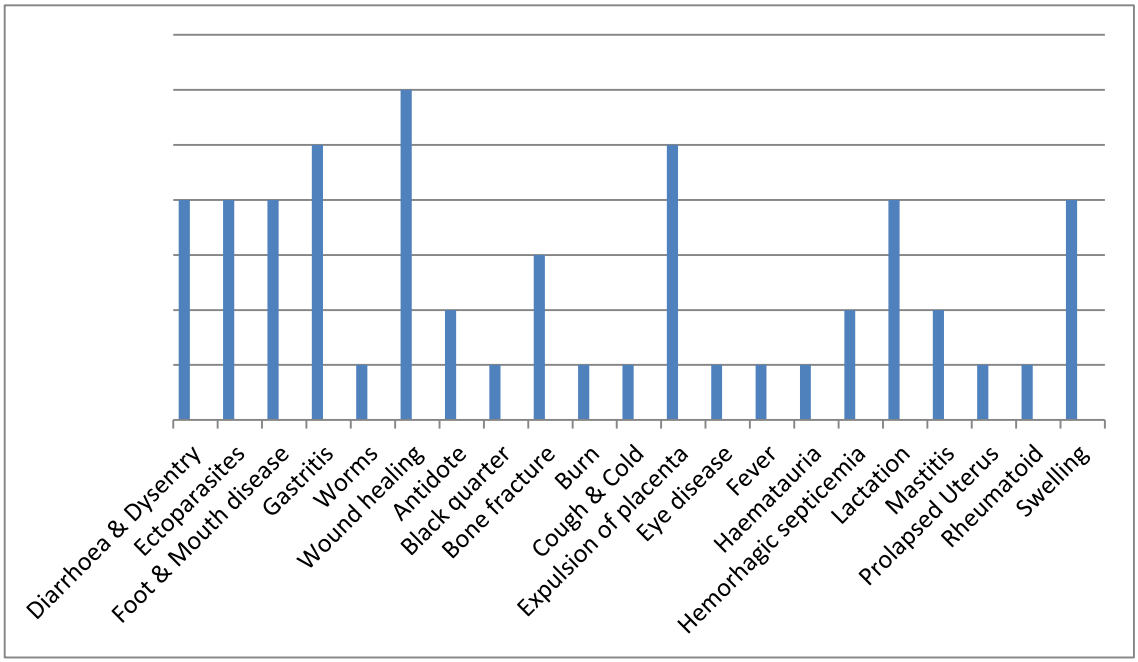
dominant among the families. The most frequently used plant parts were leaves (30%), followed by seeds and roots (16%), fruits (9%), whole plant (7%),tubers, bark and stem (5%),latex (3%), flower and rhizomes (2%) Single and combination of different plant parts is used to treat various ailments.Tribals used to cure single disease of animals by using different plant species.These study indicates that tribals have sufficient knowledge about the therapeutic uses. The low cost and almost no side effects of these preparations make them sustainable by the local community.



Different Families used in the treatment of Cattle.



Different Plant parts used in the ailments of Cattle.



No. of Plants used in different diseases of Cattle.

Acknowledgement: The author's is grateful to Head of Botany Department, P.M.B. Gujarati Science College, Indore for research, library facilities. We are very much thankful to Dr.C.M.Solanki for encouragement and valuable suggestion. We thankful to veterinary doctors, informant person for providing the necessary information.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Bandyopadhyay SR Sobham & Mukherjee KR (2005) Ethnoveterinary medicine from Kochar district, West Bengal. *Indian Journal of Traditional Knowledge* Vol. 4. pp. 456 - 461.

Chouhan SS & Ray S (2012) Ethnoveterinary plants used for wounds healing by Bhil, Bhilala and other tribes for Alirajpur district, M.P. *International Journal of Science and Research*. Vol. 3. 3. 358.

Das SK & Tripathi, H (2009) Ethnoveterinary practices & socio - cultured values associated with animal husbandry in rural Suderban, West Bengal. *Indian Journal of Traditional Knowledge* Vol. 8 (2) pp. 201 - 205.

Galav P, Katewa S et al. (2013) Ethnoveterinary medicine used by tribals of Tadgarh - Raoli wild life sanctuary, Rajasthan India. *Indian Journal of Traditional Knowledge.* Vol. 2(1) 56 - 61.

Jain, S.K. & Rao, R.R. 1977. A handbook of field and herbarium method, today and tomorrows. (Oxford and IBH Publishing company, New Delhi).

Kadel C & Jain AK (2006) Plants used in ethnoveterinary practices in Jhabua dist. M. P. *Ethnobotany* Vol. 18. pp. 149 - 152.

Kumar, A. Bharti.&Sharma,B.L. 2012. Plants used as ethnoveterinary medicine in Sikkim Himalayas. *Ethnobotany Research & Application* Vol. 10. pp. 339 - 356.

Mudgal,V.,Khanna,KK.&Hajara,P.K.1977.Flora of Madhya Pradesh (BSI Publication, Calcutta, India)

Patil, U.S. & Deshmukh, O.S. 2015. Traditional ethnoveterinary practices in Betul district (M. P.) India. *International Journal of Current Research in Life Sciences* Vol. 4.no. 10, pp. 423 - 428.

Pranjale, A.& Dube K.G. 2016. Ethnoveterinary traditional knowledge of some plants used in Wardha district (Maharashtra) *International Journal of Science and Research.* Vol. 5. pp. 1279 - 1282.

Reddy, C.H.S. et al. 2003. Plants used in Ethnoveterinary practices by gonds of Karim Nagar dist. A. P., India. *Journal of Economic& Taxonomic Botany.* Vol. 27 pp. 631 - 634.

Satya, V.L. & Solanki, C.M. 2009. Indigenous knowledge of veterinary medicine by Bhils & Bhilalas of West Nimar, M. P. *Journal of Economic & Taxonomic Botany*. Vol. 33 no. 4. pp. 896 - 902.

Selvaraju et al. 2011. Plant used in ethnoveterinary medicine by Malayali tribals in Salem district of Tamilnadu, India. *Medicinal plants.*Vol, 3 (3) pp. 1 - 5.

Tiwari L and Pande PC (2010). Ethnoveterinary medicine in Indian perspective reference to Uttarakhand,Himalaya, *Indian Journal of Traditional Knowledge*. Vol. 9, (3) pp. 611 - 617.

Verma D, Balakrishnan M and Dixit RD (1993). Flora of Madhya Pradesh. BSI Publication, Calcutta, India

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

On the occurence of *Athyrium* genus from Bhandardara hills, Akole taluka, Ahamednagar Maharashtra, India.

Rathod VN*, Patil NH, Garud GD, Patil SN, Shinde PS and Mathew Dinu

P.G. Dept. of Botany, Zulal Bhilajirao Patil College, Deopur, Dhule, Maharashtra, India

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Rathod VN et al (2019) On the occurence of *Athyrium* genus from Bhandardara hills, Akole taluka, Ahamednagar Maharashtra, India., *Int. J. of. Life Sciences*, Special Issue, A13: 289-291.

ABSTRACT

Bhandardara region comes on the highest plateau of Western Ghats. Survey of fern was carried out from Bhandardarahills. It is a rich biodiversity area. The present attempt was undertaken to give a detailed account of non- flowering plants, especially ferns in these hills. During the survey authors collected 15 species of ferns.belonging to 10 genera and the most important genera are: *Adiantum, Chelianthus, Pteris, Athyrium, Tectaria* etc. three species of the genus *Athyrium* is described here for the first time from the area.

Key words: Bhandardara, Fern, Western Ghats, Biodiversity, Non- Flowering Plants.

INTRODUCTION

Bhandardara is a village near Igatpuri, lies in the highest plateau of Western Ghats of India. The village is located in the Akole taluka, Ahamadnagar district of the state Maharashtra state. Geographical location of Bhandardara 19^{0}31'45N73^{0}45'5''E.,

The average height of the hills is 1400mts. That makes the forest deep and evergreen on the western sides. The main pteridophytic species those are seen in this area are *Adiantum, Chelilanthus, Pteris, Athyrium, Tectaria, Lepisorus, Microsorium* etc. Athyrium is the most dominant generaamong these.

The vegetation in general is mixed deciduous type of forest. The forest department occupies an area of 3682 hectares. Different types of vegetation are found here. Ahamadnagar district is a placeof attraction to many ayurdedic drug dealers and 'Vaidus' of the neighbouring areas for their locally available materials.

Bhandardara hills is surrounded by hilly ranges and receivedheavy rainfall during rainy season. Climate of Bhandardara is monsoon type.
Athyrium (lady-fern) is a genus of about 180 species of terrestrial ferns, with a cosmopolitan distribution. It is placed in the family Athyriaceae, in the order Polypodiales.

Various species of *Athyrium* are common in the Western Ghats of South India,

Especially in Anamalais,Ponmudi hills, Munnar hills, Sabarimalai and rare on the Tirunelveli Hills. (Beddome 1863, Manickam & Irudayaraj 1992, Nayar&Geevarghese 1993, Chandra 2000, Neel et al, 2018.) Fern flora of Maharashtra have not been botanically explored at all or very cursorily explored as can be judged from the works of Dalzell and Gibson (1861), Blatter and Almeida (1922), Mahabale and Kamble (1981), Manickam and Irudayaraj (1992) Rathod et al.(2009) Pardeshi (2009), Rathod and Pardeshi (2010), Neel et al, (2018)etc.

Three species of *Athyrium viz;Athyrium falcatum, Athyriumlanceum, Athyrium nigripes*collected from the area is described here.

MATERIAL METHODS

The present study was undertaken to identify the Pteridophytic flora of Bhandardara Hills. The area was visited many times during different seasons of the year 2018, especially rainy season. Field notes were taken at the time of collection to observe habit, habitats and localities. During the survey photographs of plants were taken and selected specimens were brought to the laboratory in sealed bags and pressed in standard herbarium sheets. The specimens were deposited in the herbarium of the department of Botany, Z. B. Patil College, Dhule. The fern species were identified using the standard floras, like The Ferns of British India (Beddome 1976), Pteridophytic Flora of the Western Ghats- South India (Manikam and Irudayaraj, 1992), The Ferns of Bombay (Blatter &d'Almeida 1922).

Taxonomical account

*Athyrium falcatum*Bedd.,FSI t.151,1863 & Handb.164,1883; Nayar & Kaur, Comp. Bedd., Handb.40,1974;Dixit, Census 126,1984;Bhuskute,Indian Fern. J.7: 128,1990; Chandra S.,FI 126,2000.*Asplenium drepanophyllum*Bak., in Hook. &Bak., Syn. Fil. 2: 226, 1874 non Kunze 834.*Athyrium drepano-phyllum*(Bak.) Bedd., Handb. Suppl. 32, 1892.*A.keralensis* Manickam & Irudayaraj, Pterid. Fl. West. Ghats, 238-239 t. 185, 1992. *A.puncticaule*sensu Manickam & Irudayaraj, Pterid. Fl. West. Ghats, 234 t.180,1992.

Plant erect, ca 30-35 cm. Rhizome erect, scaly, scales dark brown, lanceolate, 4 x1 mm, acute, entire. Fronds bipinnatly compound, tufted; stipes dark brown, abaxially grooved, ca10-12 cm, sparsely scaly at base, glabrous; rachis light brown, winged, ca 20 - 24 cm; leaflet alternate, sessile, 20 pairs, basal two pairs shorter than middle, linear- lanceolate, acuminate, 2-3.5 x 0.5-1 cm, glabrous on both surface, apex obtuse or acuminate,, base broadly cuneate, margin lobes, pinnatifid at the apex, venation forked once or twice, reaching the margin. Sori indusiate, sori linear along the veins in two rows, indusia straight; sporangia 84.1x44.9 µ.

Distribution: in moist shady places.

Exsiccate: Bhandardara-V.N.Rathod-22,39.

Athyrium lanceum (Kze.)Moore Index Fil.185,1860; Manickam & Irudayaraj, Pterid. Fl. West. Ghats, 38,1992; Chandra S.,FI 129,2000. *Aspidiumlanceum* Kunze, Bot. Zeit. 1846: 473,1846. *Aspidiummacrocarpum* Bl.,Enum. Pl.Jav. 162, 1828 *pro-parte*. *Athyrium macrocarpum*sensuBedd., FSI t.153,1864 & Handb165, 1883 *pro-parte*; Nayar & Kaur, Comp. Bedd., Handb. 40,1974; Dixit, Census 127,1984.

Plant erect, ca 25-48 cm. Rhizome erect, scaly, scales dark brown, lanceolate, 3 x1 mm, acute, entire. Fronds bipinnatly compound, tufted; stipes palaeceous – below, abaxially grooved, ca 8-13 cm, glabrous; rachis pale brown ca 30 - 40 cm; leaflet alternate, shortly stalked, 18 – 25 pairs, basal two- three pairs is shorter than middle, trapezoid -oblong- lanceolate, 2 – 4.5 x 0.9 – 2 cm, glabrous on both surface, pinnules pinnatifid, apex acute, base crenated, pinnules rhomboid, pinnae upper base sub – rotundo – auriculate, base acroscopic, apex rounded, margin inciso-crenate, venation twice or thrice forked, not reaching the margin, clevate at end. Sorisubmedian on the veins, indusia more or less lacerate - fimbriate; sporangia 81.2x30 µ.

Distribution: along road side and fully shaded stream bank.

Exsiccate- Bhandardara-V.N.Rathod-60.

Athyrium nigripes(Bl.)T.Moore, Index Fil.49,1857; Bedd.,FSI t.157,1864 &Handb 166, 1883; Nayar & Kaur, Comp.Bedd., Handb.41,1974;Dixit, Census 128, 1984; Manickam & Irudayaraj, Pterid.Fl West.Ghats,235,1992; Chandra S., FI 130,2000. *Aspidiumnigripes* Bl., Enum.Pl.Jav.II:162,1828. *Athyrium solenoptris*(Kze.) Moore in Handb.166,1883 *pro-partenon* T. Moore in Bedd., Handb. Suppl. 33,1892.

Plant erect, ca 30-50 cm. Rhizome erect, scaly, scales pale brown, lanceolate, 8x1 mm, acute, entire. Fronds bipinnatly compound, tufted; stipes light green, abaxially grooved, ca 10-15 cm; rachis light green, abaxially grooved, cylindrical, ca 20 - 24 cm; leaflet alternate, shortly stalked, 24 pairs, basal two pairs

shorter than middle, oblong - lanceolate, 2-3x0.8-1.5cm, glabrous on both surface, pinnae sub – decurrent, crenato – oblong, pinnatifid, apex acute, base broadly cuneate, margin sharply serrate lobes one- fourth to the costa, venation forked once or twice, reaching the margin. Sori indusiate, sori situated at two rows close to the costules, indusia usually hooked (J- shaped); sporangia 81.2 x 42 µ.

Distribution: along shady streams, deep in forests, hill slopes.

Exsiccate: Bhandardara-V.N.Rathod- 13, 17.

Acknowledgment: We are thankful to Principal JET's Zulal Bhilajirao Patil College Dhule for giving us opportunity to do research in our interesting area. We are also thankful to Dr. Neelima H. Patil Head of Botany Department, JET's Zulal Bhilajirao Patil College Dhule for encouraging us to study in given area. Their support and guidance is very important for our research. We are thankful to our friends and colleagues for help and support.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Blatter and Almeida (1922) 'The ferns of Bombay'. DB Taroporevala Sons and Co., Bombay.

Dalzell and Gibson (1861) 'The Bombay Flora, Bombay'. In "Ferns of Bombay" Blatter and Almeida (1922).

Jenkins (2008) Taxonomic revision of three Hundred Indian Subcontinental Pteridophytes with a revised Census List. Bishen Singh Mahendra Pal Singh, Dehra Dun. Pp. 679.

Jenkins, et al. (2017) An Annotated Checklist of Indian Pteridophytes Part - 1 (Lycopodiaceae to Thelypteridaceae). pp. 562. Bishen Singh Mahendra Pal Singh, Dehra Dun.[Released on 28-12-2016].

Manickam and Irudayaraj (1992) Pteridophytic flora of the western ghats South India B.I. Publication pvt. Limited.

Pardeshi (2009). The Manual of Ferns of India. (Treatise on Beddome's ferns of British India). Saraswati publication house, Aurangabad.

Neel, et al. (2018) Fern Flora of Maharashtra, Bioinfolet 15 (2): 114-122.

Rathod, et al. (2009) The occurrence of *Bolbitissubcrenatoides*Fras.-Jenk. in the Sahyadri hills of the western ghats, Maharashtra. Indian Fern J. 26: 60-64

Rathod, and Pardeshi (2010) Occurence of *Bolbitisappendiculata* (Willd.) Iwats. In Sahyadri hills of western ghats, Maharashtra. Bioinfolet. S7(1) 54-56.

Verma, S.C. And Jenkins (2008) *Adiantum philippense*L. The correct name for *A. lunulatum*Burm. F., and its subspecies. *Perspectives in pteridophytes*, pp. 65-92, Bishen Singh Mahendra Pal Singh, Dehradun, India.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Biodiversity of Forest Plants of Powdery Mildew on Jalgaon, Maharashtra, India

Pawar Vasantrao P[1], Wankhede CV[2] and Chaudhari Nitin A[3]

[1]Department of Botany, Arts and Science College, Bhalod
[2]Department of Zoology Art's and Science College, Bhalod
[3]Department of Botany, D.N.College, Faizpur
Email: vasantrao.pawar@rediffmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Pawar Vasantrao P, Wankhede CV and Chaudhari Nitin A (2019) Biodiversity of Forest Plants of Powdery Mildew on Jalgaon, Maharashtra, India, *Int. J. of. Life Sciences*, Special Issue, A13: 292-293.

ABSTRACT

Present Paper Deals with the study of Powdery mildew disease have been known to various crops every year throughout India and across the world keeping this in view, a through survey was carried out in Jalgaon district (M.S.) Powdery mildew fungi can grow superficially on leaves. Stem petal, sepal and fruits of host plants and at severity of infection causes morphological, anatomical and physiological damages of plants.

Key words: - Forest Plant, family, Powdery mildew fungi.

INTRODUCTION

Powdery mildew disease is a common occurrence on variety of cultivated and wild plants across the world causing significant damage both indoor and outdoor cultivated plants. The fungal order to erysiphales plant pathogens have a worldwide. Powdery mildew on about ten thousand angiosperm plants (Amano 1986, Branu 1988). The biodiversity of erysiphales is less explored in tropical and subtropical region compared with temperate regions of Northern Hemisphere (Hitata 1976) this study revealed that there are still many undescribed and unique powdery mildew species in this region. In this research article diversity of powdery mildew fungi is reported on some wild and cultivated plants.

MATERIAL METHODS

Survey was carried out at different localities in of Jalgaon district of Maharashtra (India). The collected samples were packed separately in sterilized polythene bags and noted with their locality, host name, date of collection, time and brought to laboratory for further analysis. Powdery mildew fungi were identified by macroscopic and microscope analysis of infected plant material. The leaf scraping was taken and slides were prepared by using cotton blue stain and lactophenol as mounting medium.

Slides were observed under light microscope and micro-photography was done. Powdery mildew fungal genera were identified on the basis of morphological characters of conidia and conidiophores and by using standared literature (Hosagoudar and Agrawal, 2009 Paul and Thakur 2006)

The interesting results were noticed form present investigation. Total 16 forest plant species were noticed as the hosts of powdery mildew fungi. Present study reported tremendous diversity of host plants. *Aegle marmelos Acacia nilotica, Kirganellia reticulate and Baliospermum montanum infected on Oidium* sp Link Ex.Fr.

RESULTS & DISCUSSION

Sr. No	Name of Host plant	Host Plant family	Local Name in Maharashtra	Powdery mildew fungus
01	*Aegle marmelos*	Rutaceae	Bel	*Oidium* sp Link Ex.Fr
02	*Ailanthus excels*	Simaroubaceae	Maharukh	*Oidium ailanthic*
03	*Azadirachta indica*	Meliaceae	Neem	*Oidium azadirachatae*
04	*Butea monosperma*	Fabaceae	Palas	*Erysiphe polygoni*
05	*Dalbergia sissoo*	Fabaceae	Sheesam	*Phyllactina dalbergiae*
06	*Acacia nilotica*	Mimosaceae	Babhul	*Oidium* spLink Ex.Fr
07	*Acacia pennata*	Mimosaceae	-	*Erysiphe acacia*
08	*Lawsonia innermis*	Lythraceae	Mehndi	*Ovulariopsis lawsiniae*
09	*Ixora paveta*	Rubiaceae	Lokhandi	*Erysiphe cichoracearum*
10	*Bidens biternata*	Asteraceae (Compositae)	-	*Sphaerotheca fuliginea*
11	*Hemidesmus indicus*	Periplocaceae	Anantmul	*Oidium hemidesmis*
12	*Cordia rothii*	Ehretiaceae	Gondani	*Phyllactinia thirumalachari*
13	*Tectona grandis*	Verbenaceae	Sagwan	*Uncinulla tcetonae*
14	*Santalum album*	Santalaceae	Chandan	*Oidium santalacearum*
15	*Kirganellia reticulate*	Euphorbiaceae	Kanguni	*Oidium* spLink Ex.Fr
16	*Baliospermum montanum*	Euphorbiaceae	Danti	*Oidium* spLink Ex.Fr

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Amano, K.1986, Host Range and Geographical Distribution of Powdery Mildew .*Japan Scientific Press, Tokyo,,* pp741.

Branu, U.1988-Genera of Erysiphaceae-a brief note Systema Ascomycetum, 7(1):57-58

Hitata K. 1976-Notes on the host range and geographical distribution of powdery mildew fungi VI .Distribution of the hosts of powdery mildew fungi in the families of angiosperms.Transaction of the *Mycological Society of Japan* 17, 35-62.

Hosagoudar, V.B. and Agrawal D.K. 2009-Powdery mildew of India: check list *Associated Publishing Company*, New Delhi, India Mycological information- IV. Dept. of Myco and Pl.Path.J.n.Agri.Univ.Jabalpur.India Pp204.

Paul, Y.S., and Thakur, V.K 2006- Indian Erysiphaceae. Scientific Publishers, Jodhpur India

Sharma, N.D.and Khare, C.P. (1995). Powdery mildew fungi of India. A check list of selected bibliography.

Zheng, R.Y. (1985) Genera of the erysiphaceae. Mycotaxon. 22:209-263

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Rust diseases and trees of forest of Jalgaon District

[1]Kamble Vijay Mahadeorao and [2]Firdousi SA

[1]Dr. A. G. D. B. M. M. College, Jalgaon
[2]H. J. Thim College, Jalgaon

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Kamble Vijay Mahadeorao and Firdousi SA (2019) Rust diseases and trees of forest of Jalgaon District, *Int. J. of. Life Sciences*, Special Issue, A13:294-295.

ABSTRACT

During the survey of rust fungal diseases of trees of the forest and Jalgaon district, ten rust diseases were found with different host. The rust fungi were Ravenila sessilis, R. indica, R. emblicae, Uredo sp, Cerotelium, fici, Koechneola flacourtia, Olivea, tectonae, olivea terminaliae, Ravenalia hobsonii and Marvelia archoo.

Key words: Forest, Ravenila sessilis, Uredo sp., Olivea tectonae and O. terminaliae.

INTRODUCTION

The forest of Jalgaon in tropical dry deciduous types. The vegetation various with changes in altitudes, topography and rainfall. There are various subtype of forest in this area. These are many parasitic fungi causing various types of foliage disease in the forest of this area.

The Geographical area of Jalgaon in 11765 Sq. kms. and the total forest, area is 1991 Sq. Kms. The most of the forest of Jalgaon lies on the satpuda range in the Jalgaon district.

The Fungi play important role in various diseases and responsible for great loss. Many diseases like leaf spot, leaf blight, leaf rust, shot hole, and marginal infection. They cause yearly leaf fall. Most of the fungi-are follicolous belong to cercospora allied complex and coelomycetes.

MATERIAL AND METHODS

A frequent, extensive and intensive survey was made to collect the phytopathogenic fungi infecting the leaves in the different forest site of Jalgaon forest. The symptomology and other information such as place of the collection, locality, local name of the plants their families, date of collection were noted in the field dairy. The sample were kept in the polythene bags and carried to the laboratories for identification. The pathogen were identified with the help of various monographs, review, books and research papers. Monograph of Cercospora and dematacious hyphomycetes.

Table 1:

Sr. No.	Host	Pathogen	Symptom	Place
1	Albizzia Lebbeck	Ravenelia sessilis	Brown rusty spot with lower side	Road side plantation Jalgaon
2	A. procera	R. indica	Brown rusty spot with lower side	Road side plantation Jalgaon
3	Emblica officinalis	Ravenclia emblica	Brown rusty spot with lower side	Manudevi forest
4	Emblica officinalis	Uredosp	Brown rusty spot with lower side	Manudevi forest
5	Ficus carica	Cerotelium fici	Brown rusty spot with lower side	Yawal forest
6	Flacourtia Indica	Kochneola flacourtiae	Brown rust spot in the lour	Manudevi forest
7	Tectona Grandis	Olivea techonae	Brown rust spot in the lour	Yawal forest
8	Terminalia Arjuna	Uredo terminaliae	Brown rust spot in the lour	Pal forest
9	Pongamia Pinnata	Ravanelia hobsonii	Black rust spot with lower side	Road side plantation Jalgaon
10	Dalber gia sisso	Marvalia achroo	Black rust spot with lower side	Road side plantation Jalgaon

CONCLUSION

In the present study ten types of rust disease of different host are collected and identified. Ravenelia has four species, Uredo, two species, Cerotelium one species, Kochneola one species, Marvalia one species. In Manudevi forest four rust diseases, Yawal forest two diseases, Pal forest one disease and Road side plantation in Jalgaon four diseases had been investigated. Most of the diseases occur in winter season.

Acknowledgement: Authors are thankful to the principal of the respective college for providing laboratory facilities and support.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Bakshi, BK (1976) forest pathology principal and practice I forestry, controller of publisher Delhi.

Chupp C. (1953) A. monograph of the fungus genous cercospora, Ithaka, New Yark.

Elis MB (1971) Dematacous Hyphomyeets. CMI, Kew, England.

Firdosi. SA and Khan TA (2015) Two New fungal diseases of trees of Manudeis forest of Jalgaon district.

Firdousi. SA (2014) New Species of Sligmina from India, Flora and Foun; 20 (1): 20-30.

Flora and facina; 21(2): 158-160.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Survey of Amphibian fauna from Poladpur tehsil, Western Ghats, Maharashtra, India

Tinagre BP

Department of Zoology, Dr.Babasaheb Ambedkar College, Mahad, Dist- Raigad- 402301, (Maharashtra), India.
E-mail: drbptingare@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Cite this article as:
Tinagre BP (2019) Survey of Amphibian fauna from Poladpur tehsil, Western Ghats, Maharashtra, India, *Int. J. of. Life Sciences*, Special Issue, A13:296-298.

ABSTRACT

We surveyed the selected spots of western part of Poladpur Tehsil of Raigad district from June to November 2016 to 2017 during rainy season. Western Ghats of India is well known for biodiversity hotspot. These was preliminary survey of Poladpur tehsil of Raigad district of Western Ghats. The selected spots, Karje, Umarath, kapda, Poladpur and Kangori are well known biodiversity hotspots in Poladpur Tehsil. These are located in the western ghat and the ecological parameters viz. rain fall, temperature, humidity etc. are favorable for inhabitations of amphibians. We reported 15 species of amphibians belongs to 5 families 6 genera in Poladpur Tehsil of 342 species of amphibian found in India belongs to 15 families.

Key words: Survey, Amphibian fauna, Poladpur tehsil.

INTRODUCTION

India has two well-known biodiversity hotspots amongst the 25 biodiversity hotspots of the world. Out of two, Western Ghats is one of the well-known biodiversity hotspot in India. As far as biodiversity is concerned the southern part of Western Ghats is more explored then the northern Western Ghats, Maharashtra. As far as Estern part of Poladpur Tehsil is concerned Karje,Umarath, kapada and Poladpurare well known biodiversity hotspots. Due to abundant endemic and endangered species of wild fauna reported inPoladpur tehsil ,Kangori and Lohare from Poladpur Tehsil are well known for the endemic and endangered wild life faun a especially for amphibians.

Poladpur Tehsil in Raigad district of Maharashtra lies between latitude 17^0 55' and $18^0$05' N and longitude $73^0$50' and $74^0$30' E. The famous Karje located at latitude $17^0$55'N and longitude 73^0 05'E, Umarath and kapada situated at laitude$17^0$20' N and longitude 73^0 15' E . The Poladpur and Kangori located at latitude $17^0$55' and 18^0 00'N and longitude$73^0$25'E and $73^0$30'E respectively. The selected spots covered with grassland, semi evergreen forest and deciduous forest. Altitude of Kangori is 754 m above the sea level and an average rainfall 30380mm/year. Average temperature was 26^{0c}. Biodiversity of frogs and caecilians were least known. Hence, the attempt has been made on fauna of amphibian from Poladpur Tehsil.

Survey carried out in Poladpur Tehsil of Raigad district from June to November 2016 to 2017 during rainy season. Karje, Umarath, kapda, Poladpur and Kangori are well known biodiversity hotspots in Poladpur Tehsil. The ecological parameters viz. rain fall, temperature, humidity etc. are favourable for inhabitations of amphibians. We reported 15 species of amphibians belongs to 5 families 6genera in Poladpur Tehsil of 342 species of amphibian found in India belongs to 15 families.

Western Ghats of India is one of the 25 biodiversity hotspots in world. The current status of India's biodiversity suggests that amongst vertebrate's highest endemism in amphibians and reptiles. The Western Ghats with heavy rainfall, moderate temperature, well grown vegetations with short dry season, provide the ideal environment for the occurrence of the amphibians. Frogs, toads and. Caecilians are more explored in South and Central Western Ghats of India than northern Western Ghats of Maharashtra, might be enrich the frogs, toads and caecilian diversity. The survey on Indian amphibian fauna has been developed by many herpetologists such as Taylor (1968), Danial (2002), Sekar (1999), Pillai (1990), Pillai and Ravichandran (1999), Daniel (1996), Mayer et al (2000), Padhye et al (2000), Giri (2004), Gururaja (2011), Dinesh et al(2011) and Dinesh et al (2012).

MATERIALS AND METHODS

Surveys were carried out in different parts of Poladpur tehsil Western Ghats to study of amphibian fauna, mostly Karje, Umarath, kapada, Poladpur and kangori at fifteen days interval mostly during night in rainy season in 2016-2017. Surveyed various habitats such as open land, dense forest, mixed forest and cultivated fields such as groundnut, paddy and nachani. Studies diversity of amphibians especially Frogs, Toads and Caecilians particularly during night at ponds, shallow streams, hilly waterfalls, and moist places nearby rivers, brooklets, ponds, swamps and its nearby moist and shadow places. Only sample specimen of unknown species carried out in laboratory for further identification.

During survey used the Nikon Camera for photographs of frogs, toads and caecilians; Head torches for light, Plastic bottles for only collecting unknown sample specimen. After getting photographs frogs, toads and caecilians were released in their natural habitat. Caecilians especially Ichthyophis, was encountered by digging the soil up to depth 10 to 30 cm, rolling the stones, logs, leaf litters and also surveyed the road accident specimens.

RESULTS AND DISCUSSION:

During this survey, we reported 15 species of amphibians belongs to 5 families 6 genera in Poladpur Tehsil of 342 species of amphibian found in India belongs to 15 families. Padhye and Ghate (2002) reported 43 species which are distributed in six families from the Maharashtra.

Table 1:Checklist of Amphibian Fauna of Poladpur Tehsil of Raigad district, Maharashtra.

S.N.	Amphibian species	
	A) Family :-Ranidae Gray 1825	
I	Genus:*Rana* Linnaeus 1758	
	1. *Ranatigerina*Daudin,1802	Least Concern
	2. *Ranahexadactyla*Lesson ,1834	Least Concern
	3. *Ranqbeddomi*	Least Concern
	4. *Ranacyanophlyctis*Schneidr ,1799	
	5. Rananilagirica	
	6. *Rana temporalis*Gunther,1864	Least Concern
	B) Family:-Rhacophoridae Hoffman 1932	
II	Genus:*Polypedates*Tschudi 1838	
	7. *Polypedatesmaculatus*Gray, 1834	Least Concern
	8. *Polypedatesleucomystax*Gravanhorst, 1829	
	C) Family:-Bufonidae Gray 1825	
III	Genus:*Bufo*Laurenti 17 68	
	9. *Bufometanosticus*Schneider,1799	Least Concern
	10. *Bufostomaticus*Lutken ,1862	Least Concern
	11. *Bufobeddmii*Gunther1799	Least Concern
	D) Family:-Microhylidae Gunther 1858	
IV	Genus: *Microhyla*Tschudi 1838	
	12. *Microhylaornate* Dumeril and Bibron, 1843	Least Concern
V	Genus : Uperodon 13. Dumeril and Bibron ,1843	Least Concern
	14 .*Uperodon globulosus*Gunter ,1864	Least Concern
	F) Family:-Ichthyophide Taylor 1968	
VI	Genus:*Ichthyophis* Fitzinger 1826	
	15 .*Ichthyophis bombayensis*Taylor ,1960	Least Concern

Sawarkar and kasable (2009) reported 10 species from Nagpur city Maharashtra. Padhye and Ghate (2002) reported 30 species which are distributed in six families from the Pune district, Maharashtra. Prasad, salvi and Jadhav(2013) reported 37 species distributed in 8 families and 14 generas from satara district .

Acknowledgement:
The authors are thankful to Dr.Danaji Gurav, Principal, Babasaheb Ambedkar College, Mahad for providing infrastructural facilities. BPT is thankful to UGC, Pune for providing financial support for minor research project.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Chanda SK (2002) Handbook of Amphibians. Zoological Survey of India, Kolkatta, 1-350

Daniel JC (2002) The Book of Indian Reptiles and Ambhibians.Bom. Nat. Hist. Soc. 1-238.

Daniel RJR (1996). Biogeography and taxonomic uncertainties as illustrated by Indian amphibians.Cobra. 24: 2-6.

Dinesh KPC, Radhakrishnan KV, Gururaja K Deuti and G Bhatta (2011) A Checklist of Amphibia of India.Online version. Zool. Survey India 1-11.

Dinesh KPC, Radhakrishnan KV, Gururaja K Deuti and G Bhatta (2012) A Checklist of Amphibia of India with IUCN red list status. Online version.Zool.Survey India.1-11.

Gururaja KV (2012) Pictorial guide to Frogs and Toads of Western Ghats.Gubbi Labs LLP. http//www.gubbilabs.in. 1-153.

Gururaja, KV (2011) Sahyadri Western Ghats Biodiversity information system- A Revised list of Amphibian of the Western Ghats. http//wgbis.ces.iisc.ernet.in/biodiversity/sahyadri_enews/news.1-10.

Myers NRA, Mittermeier CG, Mittermeier GAB da Fonescaand and Kent J (2000) Biodiversity hotspots for conservation priorities.Nature. 403: 853-858.

Padhye AD and Ghate HV (2002) An overview of Amphibian fauna of Maharashtra state. Zoos Print J. 17(4): 757-763.

Padhye AD, Mahabaleshwarkar M and Ghate HV (2002) An overview of Amphibian fauna of Pune district with special reference to their status. Zoos Print J. 17(3): 735-740.

Pillai RS and Ravichandran MS (1999) Gymnophiona (Amphibia) of India: A Taxonomic Study. Record of Zoological Survey Of India. Occasional Papers.72: 1-172.

Prasad V, Salvi RC and Jadhav BV (2013). Survey of amphibian fauna from satara district, northern western ghats ,Maharashtra,India.Trends in Life science Vol-2 (2):34-37,72: 1- 172

Ravichandran MS and Pillai RS (1996) Present status of Indian caecilians (Gymnophiona: Amphibia). Zoo's Print. 11:1-3.

Sawarkar DB and Kasambe R (2009). A survey of thr amphibian fauna of Nagpur, Maharashtra.BIONOTES11(3): 84-85.

Sekar AG (1999). Key of the Amphibian fauna of Goa.Herpeton. 4:3-4.

Taylor E. H., (1968). Caecilians of the World: A Taxonomic Review. University of Kansas Press, Lawrence. 1-846.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

A New Pseudophyllidian Worm From A Freshwater Fish At Velhane, Parola, Jalgaon, M.S., India

Kalse AT and Patil JR

P.G. & Helminth Research Laboratory, Department of Zoology,
Nanasaheb Y. N. Chavan ASC College, Chalisgaon, Dist. Jalgaon, (M.S.), India
Email-dr.ajit_kalse@yahoo.co.in

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Kalse AT and Patil JR (2019) A New Pseudophyllidian Worm From A Freshwater Fish At Velhane, Parola, Jalgaon, M.S., India, *Int. J. of. Life Sciences*, Special Issue, A13: 299-304.

ABSTRACT

Senga besnardi was the type species obtained from the aquarium fish *Betta splendens* and included under the genus *Senga* established by Dollfus (1934). From then till present, 43 new species have been added to it. The present communication deals with the description of a new species, viz. *Senga mastacembelae sp.nov*. collected from the small intestine of the fresh water fish *Mastacebllus armatus* obtained from Velhane, Tq. Parola Dist. Jalgaon. *S. mastacembelae sp. nov.* is characterized by a distinctly triangular scolex which is broad posteriorly and narrows anteriorly. The rostellum at the narrow end is quadrangular and bears 57 to 59 hooks arranged in 4 quadrants. The hooks are stout, single pronged and pointed at both ends. They are of unequal length. A distinct neck lies below the scolex. The mature segments are two times as broad as their length. The testes are large and rounded, 18 to 21 in number, distributed densely on either side of the ovary. The ovary is large, distinctly bilobed, placed antero-posteriorly, in the posterior region of the segment. The eggs are oval in shape

Keywords: *Senga mastacembelae n.sp., Mastacebllus armatus,* Velhane..

INTRODUCTION

Dollfus, 1934 established the genus *Senga* based on the type species *S. besnardi* from *Betta splendens* of France. *S. ophiocephalina* Tseng, 1933 from *Ophiocephalus argus* at Taimen, China and by Southwell, 1913 from *Ophiocephalus striatus* in Bengal, India. *S. pcynomera* Woodland, 1924 *as S. pcynomera* from *ophiocephalus marulius* at Allahabad, India. *S. lucknowensis* from *Mastacembellus armatus* reported from India by Johri, 1956 *a*t Malacca, Fernando and Furtado,1963 recorded *S. malayana* from *Channa striata, S.parva and S. filiformis* from *Channa micropeltes.* RamaDevi and Rao, 1966 reported the presence of plurocercoid of *Senga sp.* From *Panchax panchax.* Tardos synomised the genus *Senga* with the genus *Polyonchobothrium* and proposed a new combination for the species. Furtado and Chauhan, 1971 reported *S. pahangensis* infecting *Channa micropeltes* at Tesak Bera. *S. besnardi* was redescribed by Shinde in 1972 from *Ophiocephalus gachua* in India. Rama Devi and Rao, 1973 reported another species of *S.visakhapatanamensis* from India. RamaDevi and Rao, 1973 also described

the life cycle of *S. visakhapatnamensis* from *Ophiocephalus punctatus* collected from Andhra Pradesh, India. But they did not agree with Tadros. Wardle et.al., 1974 McLeod and Radinovsky placed *Senga* as a distinct genus in the family Ptychobothridae. Deshmukh and Shinde, and Deshmukh, 1980 reported the presence of *S. khami* from *Ophiocephalus marulius,* a fresh water fish from Kham River at Aurangabad. Jadhav and Shinde, 1980 reported *S. godavarii* infecting *M. armatus* at Nanded, M.S. India. One more species i.e. *S. aurangabadensis* was added by Jadhav and Shinde, 1980 from *M. armatus* at Aurangabad M.S. India. An addition was made by Kadam et al. 1981 to the genus *Senga* as *S. paithanensis* from *M. armatus. S. mastacembali* and *S. indica* were reported by Gupta and Sinha, 1980 and Gupta and Parmar, 1985 respectively from *M. armatus.*at Lacknow*. S. raoi and S.jagannathae* were added to the genus by Majid and Shinde,1984 from *Channa punctatus. Jadhav et al., 1991* erected two new species namely *S. maharashtrii and S. gachuae* from the intestine of *M. armatus.* M. Hasnain, 1992 added *S.chauhani* from *Channa puntatus* at Jamshedpur. Tat and Jadhav,1997 added *S.mohekarae* from the intestine of the *M. armatus* from M.S. India. Wongsawad and Jadhav,1998b added *S. chaingmaiensis* from the intestine of the *M. armatus.* Patil and Jadhav,2003 reported *S. tappi* from *M.armatus* at Shirpur M.S. India. Hiware 1999 added *S. armatusae* from the intestine of the *M. armatus* at Pune. Jadhav *et al.2005* made a review article on the genus *Senga* infecting the freshwater fishes of Maharashtra, India. Pande *et al.,2006* identified two new species *S.ayodhensis* from *Amphinuous cuchia* and *S.baugi* from *Rita rita. Khadap et al.,2007* added *S.chandikapurensis* from *M. armatus.* Shrivastav et al.,2007 identified *S. tictoi* from *Puntius ticto* at Jhansi. Kankale, 2008 describe *S. nathsagarensis* from freshwater fish *M. armatus.* Wankhede and Reddy, 2009 reported *S. kaigaonensis* from freshwater fish *M. armatus.* Mulla and Kharde, 2009 added *S. bhauraoae* from freshwater fish *M. armatus* at Kolhapur, M.S. India. Bhure & Nanware, 2011 describe *S. sataraensis* from *M. armatus. Dhole et al., 2011* identified two new species *S. rostellarae* and *S. chandrashekhari* from freshwater fish *M. armatus.* Jadhav et al., 2012 reported *S. govindii* from *M.armatus.* Sawarkar,2012 describe *S. maharashtrii* from freshwater fish *M. armatus* in Chandrabhaga River at Daryapur, M.S. India. Nanware et al., 2016 describe *S. triangulata* from *M. armatus* at Hadgaon, Dist. Nanded, M.S. India. Ruma Koiri and B. Roy, 2017 added *Senga* sp. in *Monopterus cuchi*a from Tripura. Recently Kaul and Kalse, 2018 identified two new species of the genus *Senga i.e. S. shindei* from *Ophiocephalus punctatus* in Pawana river and *S. oreochromisae* from *Oreochromis mozambica* in Pashan Lake of Pune region respectively.

Fish is an excellent and cheap source of protein having low in saturated fats and high in essential minerals and vitamins. The amount of protein in fish muscles ranges between 15% and 20% and that of carbohydrate content between 18% and 21%. However, the progress in the fish production is hindered by the parasitic infections, mainly in the tropical region. The parasites of edible fishes affect the economy of decreasing or rejection of the edible fish products leading to subsequent loss of interest in the aquaculture industries.

This communication reports the occurrence of the cestode parasites in the fresh water fish *Mastacebllus armatus* collected from Velhane, Tq. Parola Dist. Jalgaon.

MATERIALS AND METHODS

The cestodes were collected from the intestine of fresh water fish *Mastacembellus armatus* at Velhane Tq. Parola, Dist. Jalgaon, M.S., India, in the month of February, 2018. Parasites were washed in saline solution. Some of them were flattened and preserved in 70% ethanol while others were preserved in 10% formalin. The flattened specimens were stained in Harris-Haematoxylin, dehydrated and processed for whole mount preparations. Drawings are made with the aid of camera lucida. Microphotographs were taken by using the digital camera. All measurements are in millimeters. The detailed observation from the above aids was recorded for the purpose of determining the taxonomical status of the cestode worms under study. "Systema Helminthum" by Yamaguti (1959) was used for the purpose of identification.

RESULTS

All the cestodes are medium to long in size and with scolex, immature, mature and some gravid proglottides. The scolex is triangular, narrow anteriorly broad posteriorly and measures 0.680 to 0.756 in length and 0.234 to 0.611 in breadth. The scolex bears, overlapping two bothria, which extend from the anterior end to the posterior end of the scolex. The bothria measure 0.54 to 0.638 in length and 0.079 to 0.186 in breadth. The anterior end of scolex terminates in quadrangular shape of rostellum, which is armed and measures 0.132 to 0.159 in length and 0.138 to 0.164 in breadth. The

rostellum bears circularly arranged hooks and they are 57 to 59 in number. The hooks are stout, single pronged of unequal length, pointed at both ends. The longer hooks measure 0.5 in length and 0.12 in breadth while shorter hooks measure 0.175 in length and 0.075 in breadth. The neck is short. The mature segments are broader than long, about two times broader that long and measure 0.29 to 0.33 in lengths and 0.59 to 0.61 in breadth. The testes are large in size, rounded in shape 18 to 21 in number, and distributed densely on the either side of the ovary and measure 0.079 to 0.132 in diameter. The cirrus pouch is medium, elongated, obliquely placed, in middle to anterior half of the segment and measures 0.74 in length and 0.026 in breadth. It opens at its distal end by common genital opening at the middle of the segment. The cirrus is thin, present within the cirrus pouch and measures 0.079 in length and 0.007 in breadth. The vas deferens is short, thin extends anteriorly and measures 0.053 in length and 0.007 in breadth. The genital pore is small in size, oval in shape; it opens in middle of the segment and measures 0.014 in length and 0.007 in breadth. The ovary is large in size, distinctly bilobed, placed antero-posteriorly, in the posterior region of the segment and measures 0.159 to 0.170 in length and 0.053 to 0.063 in breadth. The vagina is thin tube, slightly curved, arises from the genital pore runs posteriorly, obliquely and opens into the ootype and measures 0.106 in length and 0.010 in breadth. The ootype is medium in size, round in shape, present between the ovarian lobes and measures 0.021 in diameter. The vitellaria are granular, on each lateral side from anterior to posterior margin of the segment, arranged in 5 to 6 rows on lateral side. The eggs are oval in shape, the larger eggs measure 0.94 in length and 0.5 in breadth, smaller eggs measure 0.72 in length and 0.32 in breadth.

Genus - *Senga mastacembelae n.sp.*
Host- *Mastacebllus armatus*
Habitat – Intestine
Locality - Velhane, Tq. Parola, Dist. Jalgaon. M.S., India.
No of specimens – 09 in 9 slides
Holotype- Deposited in Helminth Research Laboratory
Paratype – P.G. & Helminth Research Laboratory, Department of Zoology,
Nanasaheb Y. N. Chavan ASC College, Chalisgaon, Dist. Jalgaon, (M.S.), India
Date – 16 February, 2018.

Etymology - *Senga mastacembelae n.sp.* is proposed after the genus name of the host.

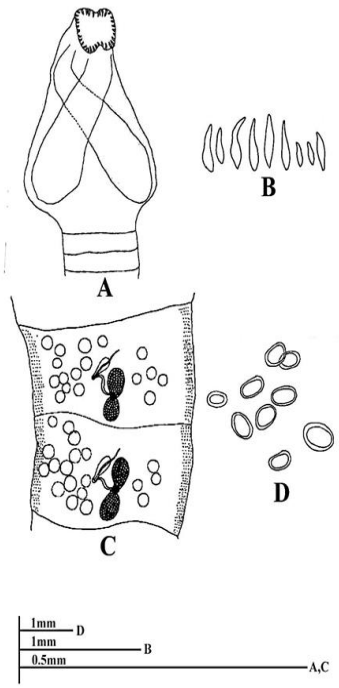


Fig. 1: Camera Lucida sketch of *Senga mastacembelae* n.sp. **A:**Scolex; **B.** Hooks; **C.** Mature segments; **D.** Eggs

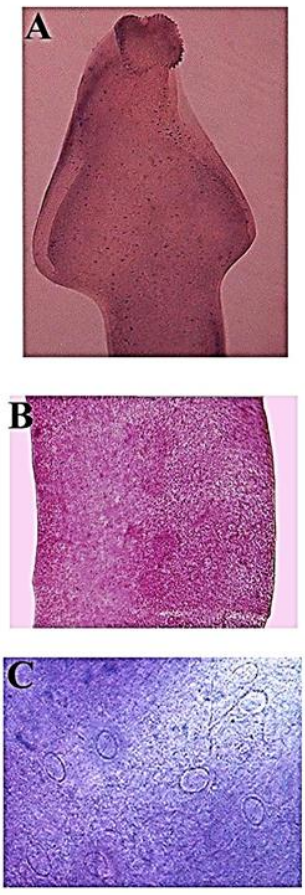


Fig. 2: Microphotographs of *Senga mastacembelae* n.sp. **A: Scolex (X 150); B. Mature segments (X 600); C. Eggs (X 600)**

DISCUSSION

The triangular shaped scolex of the parasite shows resemblance with *Senga pahangensis,* Furtado and Chaulan, 1971; *S. paithanensis,* Kadam and Shinde, 1981; *S. chaingmaiensis,* Wongsawad and Jadhav, 1998; *S. armatusae,* Hiware, 1999, *S. tappi,* Patil and Jadhav, 2003; *S. baughi,* Pande et al., 2006; *S. kaigaonensis,* Wankhede and Reddy, 2009; *S. panzaraensis,* Mangale and Kalse, 2009; *S. madhavae,* Bhure et al., 2010; *S. govindii* Jadhav et al., 2012 and *S.triangulate* Nanware et al., 2016 in its shape i.e. being triangular shaped however the same differs from *Senga pahangensis in* the num,ber of hooks (57 to 59 vs. 52), in vitellaria (granular vs. lobulated and in host (*M. armatus* vs. *C. micropeltes*).

The present form differs from, *S. paithanensis* in the num,ber of hooks (57 to 59 vs. 54) and in the number of testes (18 to 21 vs. 130 to 135).

The present parasite differs from, *S. chaingmaiensis,* in the number of hooks only (57 to 59 vs. 28).

The present tapeworm differs from, *S. armatusae,* in the num,ber of hooks (57 to 59 vs. 32 to 40); in the neck (present vs. absent); in the number of testes (18 to 21 vs. 230 to 240) and in the vitellaria (granular vs. follicular).

The present worm is differs from, *S. tappi ,* in the num,ber of hooks (57 to 59 vs. 42 to 44); in the number of testes (18 to 21 vs. 285 to 295) and in the vitellaria (granular vs. follicular).

The present form differs from, *S. baughi,* in the number of hooks (57 to 59 vs. 50 to 54); in the number of testes (18 to 21 vs. 310 to 320); in the shape of ovary (bilobed vs. unilobed) and in the vitellaria (granular vs. follicular).

The present parasite differs from, *S. kaigaonensis,* in the number of testes only (18 to 21 vs. 285 to 295). The present worm differs from*, S. panzaraensis* in the mature segment (2 times broader than long vs. 5 times broader than long) and in the number of testes (18 to 21 vs. 40 to 45).

The present tapeworm differs from *S. madhavae* in the number of hooks (57 to 59 vs. 40 to 44); in the mature segment (2 times broader than long vs. 5-6 times broader than long) and in the number of testes (18 to 21 vs. 200 to 225).

The present form differs from *S. govindii* in the number of hooks (57 to 59 vs. 45 to 50); in the mature segment (2 times broader than long vs. 3 times broader than long) and in the number of testes (18 to 21 vs. 100 to 130).

The present parasite differs from *S.triangulate* in the number of hooks (57 to 59 vs. 28 to 30); in the neck (present vs. absent); in the mature segment (2 times broader than long vs. 4-5 times broader than long); in the number of testes (18 to 21 vs. 50 to 60) and in the vitellaria (granular vs. follicular).

Granular vitellarium of the present parasite resembles *S. besnardi,* Dollfus, 1934 , *S. jagennathae,* Majid and Shinde,1984 , *S. raoi,* Majid and Shinde,1984 , , , , *S. sataraensis,* Bhure & Nanware, 2011 *, Senga sp.* Ruma Koiri and B. Roy, 2017 and *S. shindei* Kaul and Kalse, 2018. however, different from *S. besnardi* in the shape of the scolex *(*triangular vs. Rectangular); in the number of hooks (57 to 59 vs. 44 to 47); in the neck (present vs. absent); in the number of testes (18 to 21 vs. 160 to 175) and in the host (*M. armatus* vs. *B. splendens*).

The present worm differs from *S. jagennathae* in the shape of the scolex *(*triangular vs. pear shaped); in the number of hooks (57 to 59 vs. 44); in the number of testes (18 to 21 vs. 240 to 250) and in the host (*M. armatus* vs. *C. punctatus)*

The present parasite differs from *S. raoi* in the shape of the scolex *(*triangular vs. pear shaped); in the number of hooks (57 to 59 vs. 46); in the neck (present vs. absent); in the number of testes (18 to 21 vs. 65 to 70) and in the host (*M. armatus* vs. *C. punctatus)*

The present cestode differs from *S. sataraensis* in the shape of the scolex *(*triangular vs. pear shaped); in the number of hooks (57 to 59 vs. 28 to 30); in the neck (present vs. absent) and in the number of testes (18 to 21 vs. 175 to 200).

The present tapeworm differs from *Senga sp.* in the shape of the scolex *(*triangular vs. pear shaped); in the number of hooks (57 to 59 vs. 53 to 131); in the number of testes (18 to 21 vs. 200 to 300) and in the host (*M. armatus* vs. *M. cuchia).*

The host *Mastacembllus armatus* is similar to most of the members of the genus except, *S. ophicephaliana,* having host *Channa arga; S. pycnomera,* having host *Channa marulius; S. malayana,* having host *Channa striata; S. filiformis, and S. parva,* having host *Channa micropeltes; , S. visakhapatnamensis,* having host *Ophiocephalus punctatus; S. khami,* having host *Ophiocephalus marulius; S. gachuae,* having host *Channa gachua; S. chauhani* having host *Channa punctatus, S. ayodhensis* having host *Ophiocephalus marulius; S. tictoi,* having host *Puntius ticto; S. rupchandensis* ,having host *Channa striatus S. shindei* having host *Ophiocephalus punctatus* and *S. oreochromisae* having host *Oreochomis mozambica.*

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Banerjee S, Chaubey, Ak & Malhotrask (1990) Cestode fauna of hill stream fishes in Garhwal Himalayas, India IX. *Senga teleostei* n. sp. from *Channa punctatus*. Indian Journal of Parasitology, 14 (2): 153-156.

Banerjee S, Manna B & Sanyal Ak (2017) Description of four new species of *Senga* (Platyhelminthes: cestoidea) from freshwater fishes of India. Flora and Fauna, 23 (1):189-214.

Bhure Db.& Nanaware Ss (2011) Systematic observation of new Pseudophyllidean tapewarom *Senga satarensis* from *Mastacembelus amatus.* International Multidiciplinary Research Journal, 1 (10): 25-28.

Bhure Db. Nanaware Ss, Pathandm & Dhondge Rm (2010) Morphotaxonomic observation of new pseudophyllidean tapeworm *Senga* (Dollfus 1934) from *Mastacembelus amatus* Asian J. Animal Sci.,5(2):149-152.

Bhure Db, Padwal N D & Jadhav Bv (2007) A new tapeworm *Senga Jadhavae* n.sp. (Cestoda: Pseudophyllidea) from *Mastecembelus amatus* at Augangabad. Proceeding of the Zoological Society of India, 6 (2): 45-52.

Chincholikar Ln & Shinde Gb (1977) Studies on Indian Cestodes redescription of *Senga ophiocephalina* Tseng, 1933. Nat. Sci. J. Mara. Univ. Vol.16 Sci. 9:181-182.

Dhole Js, Sonune Bv, Reddy Yr & Chavan Rj (2011) Two Pseudophyllidean Tapeworms from Fresh Water Fish, *Mastacembelus armatus* of Maharashtra State (India) with Revised Key to Species of Genus *Senga*. ACta Parasitologica Globali, 2(2):25-33.

Dollfus R Ph (1934) Surun cestode pseudophyllidae parasite de poiss onornament. Bull.Soc. Zool. France, 69: 476-490.

Duggal Cl & Bedi H (1989) On *Senga pathankotensis* sp. Nov. and *S. lucknowensis* Johri 1956 (Cestoda: Ptychobothridae) infecting freshwater fishes of Punjab, India. Research Bulletin of the Panjab University Science, 40(12):35-37.

Fernando Ch & Furtado Ji (1963) Helminth parasites of some Malayan freshwater fishes. Bull. Nat. Mus. Singapore., 32:45-71.

Fernando Ch & Furtado Ji (1963) A study of some Helminth parasites of fresh water fishes in Ceylon Zeit. F.Parasitenkunde 23, 141-163.

Furtado Ji & Chaulan L (1971)Two new helminth species from the fish *Channa micropeltes* Cuvier (Ophiocephalidae) of Malasiya. Folia Parasitol. (Prana) 18(4): 365-372.

Gairola D & Malhotra Sk (1986) Cestode fauna of fishes in River Ganges around an Indian subhumid region I. *Senga gangesii* n.sp.from *Mystus vittatus*. Japanase J. Of Para., 35(6) 471-474.

Gairola D & Malhotra Sk (1987) Cestode fauna of fishes in river Ganges in a subhumid region of India *Senga vittati* n.sp. from *Mystus vittatus*, Acta. Parasitologia Lutaanica 22, 93-96.

Gupta Sp & Sinha N (1980) Two new species of *Senga* Dollus, 1934 (Cestoda: Ptychobothriidae from fresh water fishes of Lacknow. Ind. Joum. Helminth. 32(2): 124-128.

Gupta V & Parmar S (1985) On a new cestode *Senga indica* sp. Nov. from the intestine Of a freshwater fish, *Mastacembelus armatus* (Lacepede 1800) from Lucknow. Indian J. Helminth., 37 (2): 96-99.

Hasnain M (1992) On a new cestode *Senga cha*uhani n.sp. from fish host *Channa punctatus* from Jamshedpur. National J. Helminthol. 44(1): 123-127.

HIWARE CJ (1999) On A New Tape Worm *Senga Chauhani* N.Sp. From Freshwater fish, *Mastacembelus armatus* at Pune (M.S) India. Riv.Di Parasitol., 16(LX): N1: 9-12.

JADHAV BV (1980) *Senga Paithanensis* (Cestoda: Ptychobothridae) from *Mastacembellus armatus.* Bioresearch 5(1):95-96.

Jadhavbv, Bhure Db & Padwal, (2005) A survey of cestode parasites of freshwater fishes from Pune and Ahmadnagar District (M.S.) India. Proceedings of the Recent Trends in Parasitology, 30, 48-51.

Jadhav Bv Deshmukh Sb & Gavhane Ab (1991) A New tapeworm *Senga gachua* n.sp. from the fish *Channa gachua* at Aurangabad, India. J. Inv. Zool and Aqua Biol.3(1): 39-41

Jadhav Bv Gavahne Ab & Jadhav Ap (1991) On a new Pseudophyllidean cestode from *Mastacembelus armatus* at Daryapur (M.S.) India. Rivista Di Parasit Vol.VIII (1): 19-22.

Jadhav Bv & Shinde Gb (1980) On a new cestode *Senga aurangabadensis* n.sp. from the fish *Mastecembelus armatus*, Bioreserch, 43(2) : 25-27.

Jadhav S, Borde S, Jadhav D & Humbe A (2012) Occurrence of a new piscine tapeworm *Senga govindii* in *Mastacembelus armatus* (Lacepede, 1800) from Sina Kolegaon Dam. Journal of Experimental Sciences, 3 (5): 1- 4.

Johri Gn (1956) A new cestode *Senga lucknowensis* from *Mastacembelus armatus*(Lacep).Curr. Sci., 25(6): 193-195.

KADAM SS, JADHAV BV & SHINDE GB (1981) On a new cestode *Senga paithanesis*n. sp.(Cestoda:Ptychobothriidae) from *Mastecembelus armatus*, Bioresearch, 5(1): 95-96.

Kankale Nm (2008) A New Species Of The Genus *Senga Nathsagarensis* From Freshwaterfish, *Mastacembelus Armatus*. National J. Life Sci., 5 (3): 81-84.

Kaul S & Kalse At (2018) Morphotaxonomic Observation Of Two Pseudophylidean Cestodes, From Fresh Water Fishes Of Pune Region, (Ms), India. Aayushi International Interdisciplinary Research Journal Special Issue No. 26 445-453

Khadap Rm, Jadhav Bv & Suryawanshi Nv (2007) Anew Species Of The Genus *Senga* (Dollfus, 1934 (Cedtoda: Ptychobothridae) From Fresh Water Teleost *Mastecembelus Armatus.* Nat. J. Of Life Sci 4(3):77-79.

Majid Ma & Shinde Gb (1984) Two New Species Of The Genus *Senga* Dollfus, 1934 (Cestoda:Pseudophylidea) From Fresh Water Fishes At Jagannathpuri, Orissa. Indian J. Parasitology. 8(1): 169-172.

Malhotra Sk (1988) Cestode Fauna Of Hill Stream Fishes In Garhwal Himalayas, India.Vi *Senga Nayari* Sp. Nov. From *Mastacembelus Armatus* (Lacep). Ind. Journ. Helminth., 40 (1): 55-57.

Mangale A J & Kalse A T (2009) On A New Cestode *Senga Panzarensis* From *Mastacembelus Armatus* At Dhule, India. Uttar Pradesh J Zool. 29(1): 105-108.

Monzee H (1992) On A New Cestode *Senga Chauhani* N.Sp. From Fish Host*, Channa Punctatus* From Jamshedpur. National Journal Of Helminthology, 34(1), 123-127.

Nanware Ss, Deshmukh Vs & Bhure Db (2016) Bio-Systematic Studies On Cestode Genus *Senga* (Dollfus, 1934) Ptychobothridae, Luhe, 1902) From *Mastacembelus Armatus* (Lacepede, 1800) With Description Of A New Species. World Scientific News 45(2): 224-238.

Pande Pn Mamta Tripathi And Neetu Mittal (2006) On Two New Species Of Genus *Senga* Dollfus, 1934 (Family-Ptychobothridae, Luhe, 1902) From The Intestine Of Freshwater Fishes. India J. Hel. (N.S.) Vol. 24 Pp 6-10.

Pande Pn Mittal N & Singh S R (2006) On A New Cestode Of The Genus *Senga* Dollfus, 1934 From The Intestine Of Freshwater Fish *Mastacembelus Armatus* (Lacepede) From Kanpur, U.P. India. Journal Of Helminthology 17, 5-8.

Pardeshi Pr & Hiware Cj (2011) A New Pseudophylidean *Senga Rupchandensis* N. Sp.From *Channa Striatus* (Bloch, 1973) At Jalna District (M.S.) India. Rec. Res. Sci Tech, 3(12):17-22.

Patil Dn & Jadhav Bv (2003) On A New Species Of *Senga* Dollfus, 1934 Cestoda Ptychobothridae Luhe, 1902 As *S.Tappi* N.Sp. From Shirpur Dist. Dhule (M.S.) India. J. Comparative Toxicol. Physiol. 1(1):68-72.

Ramadevi P (1973) On *Senga Vishakhapatnamensis* N.Sp. (Cestoda: Pseudophylidae) From The Intestine Of Fresh Water Fish, *Opheocephalus Punctatus* (Bloch.). Rivista Di Parasitol., 34(4): 281-286.

Ramadevi P & Rao Kh (1966) Plerocercoid Of *Senga N.Sp.* (Pseudophyllidea Ptychobothriidae) From Freshwater Fish, *Panchax Panchax* (Ham And Buch). Current Sci. 35(247):626-627.

Ruma Koiri & Broy (2017) The Occurrence Of A New Piscine Tapeworm *Senga* Dollfus, 1934 (Pseudophyllidea: Bothriocephalidae) In *Monopterus Cuchi* (F. Hamilton, 1822) From Tripura. Imperial Journal Of Interdisciplinary Research Vol. 3(2): 864-870.

Sawarkar Bw (2012) Occurrence Of Pseudophyllid Cestode, *Senga Maharashtrii* N.Sp. In *Mastacembellus Armatus* From Chandrabhaga River At Daryapur In Maharashtra. International Journal Of Scientific And Research Publications, Vol. 2(11):1-3.

Shinde Gb (1972) Studies On Indian Cestode, Redescription Of *Senga Besnardi* Dollfus, 1934,Marathwada University Jornal Of Sci. 11(4): 39-40.

Shinde Gb & Deshmukh Ra (1980): On A New Cestode *Senga Khami* N.Sp. (Cestoda: Ptychobothridae) From A Fresh Water Fish. India. J. Zool., 8(1): 28-32.

Shinde Gb & Jadhav Bv (1980): A New Tapeworm *Senga Godavarii* N.Sp. From *Mastacembelus Armatus* At Aurangabad India. Biology, 2(4): 46-48.

Southwell T (1913) On Some Indian Cestoda, I, Rec. Ind. Mus. 9:279-300.

Srivastavak, Kharerk, Sahu Vk& Singh Ra (2007): A New Species Of Genus*senga* Dollfus (1934) From *Puntius Ticto* At Jhansi (U.P.). National Journ. Life Sci., 4(3):129-132.

Tat Mb &.Jadhav Bv (1997) *Senga Mohekar*ae N.Sp. (Cestoda: Ptychobothridae) From *Mastacembelus Armatus* At Pune (M.S.) Riv. Di Para., Vol. Xvii (Lviii) N 2:203-296.

Tseng's (1933) Study On Some Cestode From Fishes. J. Of Sci. National Univ. Shantuma. Tsingtao, Chiina (2): 1-21.

Wankhede H & Reddy Y (2009) On A New Species Of Genus *Senga* (Dollfus 1934) (Cestode Ptychobothridae Luhe, 1902) From Freshwater Fish *Mastacembelus Armatus*. Environmental Conservation J. 10(3):63-66.

Wardle R A,Mcleod J A & Radinovsky S (1974) Advances In The Zoology Of Tapeworms, 1950-1970. University Of Minnesota, Minnesota Press, Minneapolis, 1-274

Wongsawad C, Marayong T & Jadhav Bv (1998b) A New Ptychobothriidae Tapeworm From Maesa Stream, Chiang Mai, Thailand. Rivista Di Parasitol. Vol. Xv No.3:295-298.

Yamaguti S (1934) Studies On The Helminth Fauna Of Japan, Part Iv. Cestodes Of Fishes. Jap. J. Zool 6:1-112.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Microbial Synthesis of Gold and Silver Nanoparticles and their Characterization

Bhangale HG[1], Rane Nikita D [2] and Sonawane SM[3]

[1,3]JDMVP A.C.S. College, Yawal, Maharashtra, India.
[2]QC Chemist, Dikora Bulk Drug Pvt Ltd., Bhusawal, India.

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Bhangale HG, Rane Nikita D and Sonawane SM (2019) Microbial Synthesis of Gold and Silver Nanoparticles and their Characterization, *Int. J. of. Life Sciences*, Special Issue, A13: 305-309.

ABSTRACT

We report the novel biological route for the synthesis of gold and silver nanoparticles using naturally grown mushroom species which is the facile, rapid cost effective and environmentally benign approach. The formation of nanoparticles was observed by change in colour of the reaction medium and then confirmed by using UV-visible spectroscopy. The SPR peak appeared at 530 nm for gold and for silver at 415 nm confirm the formation of the gold and silver nanoparticles respectively. PSA characterization was performed for size and distribution of the formed nanoparticles. The study identifies mushroom species as a potential candidate for biosynthesis of metal nanoparticles in large scale production.

Key words: Microbial synthesis, Gold and Silver nanoparticles, UV-visible spectroscopy, FTIR, PSA.

INTRODUCTION

Particles in the size range between 1 to 100 nm are identified as the nano-particles. Metal nanoparticles found many applications in various fields like medicine (Nakamura *et al*., 2019), agriculture (Anand and Madhulika, 2019), electronic (Wyatt *et al*., 2000), industries due to their unique antimicrobial (Qasim *et al*., 2018), optical (Huang *et al*. 2010), electrical properties (Diantoro *et al*., 2018). Gold, silver and copper nanoparticles exhibit the surface plasmon resonance in the visible range. Gold and silver have shown a great microbial activity for a wide range of microorganisms. Conventional physical and chemical methods were used for the synthesis of these nano-particles. But these methods involve the use and release of toxic chemicals during the synthesis process and causes the environmental pollution. Also, these methods are energy consuming and costly for the production of nano-particles. Biosynthesis of the nanoparticles involve the use of microorganisms, plants and templates which is the green approach. Fungi have shown their potential for the reduction of silver and gold ions form their nanoparticles (Birla *et al*., 2013; Jain, 2011). Mushrooms are the group of fungi which are widely used as a food and medicine in different parts of the world since long time (Manzoor-ul-haq, 2014). In the present study the mushroom extract was screened for its potential in the synthesis of the gold and silver nanoparticles and the formation was confirmed by UV-visible spectroscopy.

MATERIALS AND METHODS

Chemicals $HAuCl_4$ and $AgNO_3$ were used of analytical grade.

Collection of Mushroom Species

Mushrooms were collected in the agriculture region of Bhusawal in Jalgaon district. Mushrooms were collected in the rainy season when the conditions for their growth are favourable and easy availability. Photographs of the specimens were taken in their natural habitat on the shabby grass.

Preparation of extract

Fresh 10 gram of mushroom species were putted in 100 ml deionized water contained in Erlenmeyer flask. The flask was incubated in an orbital shaker at 110 rpm for 72 h at temperature 30 ^{0}C. The biomass was then filtered through Whatmann No. 1 filter paper and the filtrate was used for the synthesis of gold and silver nanoparticles.

Biosynthesis of Gold and Silver nanoparticles

For the synthesis of gold nanoparticles 1mM solution of $HAuCl_4$ was prepared. Equal amount of mushroom extract was challenged with 1mM Auric chloride and the flask was incubated in an orbital shaker at 110 rpm at temperature 30 ^{0}C for 12 h.

For the synthesis of silver nanoparticles equal amount of 1mM silver nitrate solution was added in mushroom extract contained in a flask. The flask was then incubated in an orbital shaker under the conditions that used for the synthesis of gold nanoparticles.

Characterization of Gold and Silver nanoparticles

The formation of the metal nanoparticles was detected visually from the change in colour of the reaction medium. UV-visible spectroscopy is used for the confirmation of the formation of the metal nanoparticles. The size of the prepared silver nanoparticles was determined using particle size analyser (Malvern Zetasizer ver. 6.34).

RESULT AND DISCUSSION

The preliminary indication for the synthesis of gold and silver nanoparticles is the change in colour of the reaction medium to pink and brown for gold and silver respectively from its original colour.

UV-visible spectroscopy

UV-visible spectroscopy is the characterization technique used to study the surface plasmon resonance exhibited by the metal nanoparticles. The UV-visible spectra of the prepared gold and silver nanoparticles are shown in fig. 4 and fig. 5 respectively. The SPR peak appeared at 530 nm in fig.4 confirm the formation of gold nanoparticles and the occurred at 415 nm in fig. 5 indicate the formation of silver nanoparticles. The single peak appeared in the UV-visible spectra indicates that the formed particles were spherical in shape [Desai R].

Figure 1. Photograph of mushroom species.

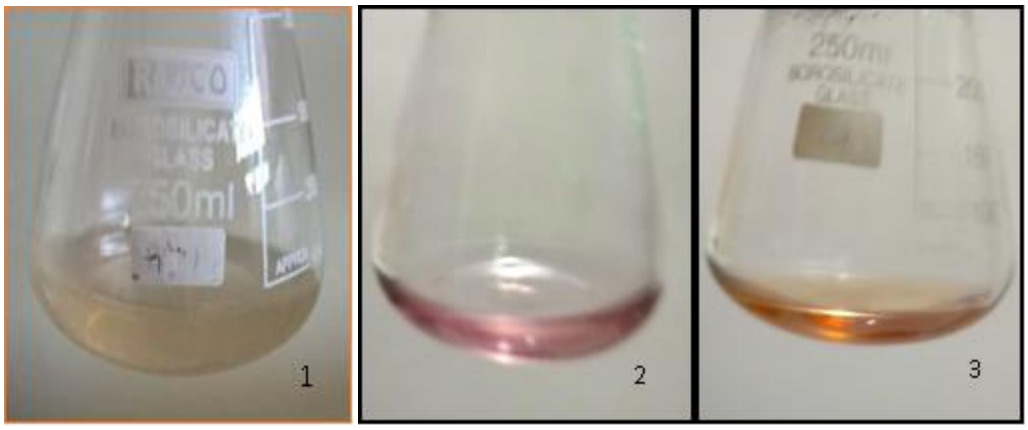


Figure 2. Mushroom extract. Figure 3. Flask 2 showing gold NPs and flask 3 showing silver NPs.

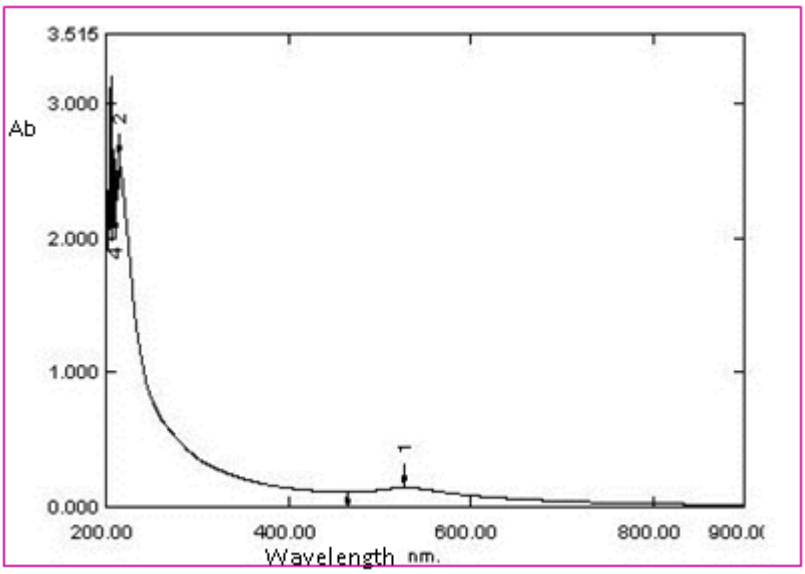


Figure 4. UV-visible spectra of Gold NPs

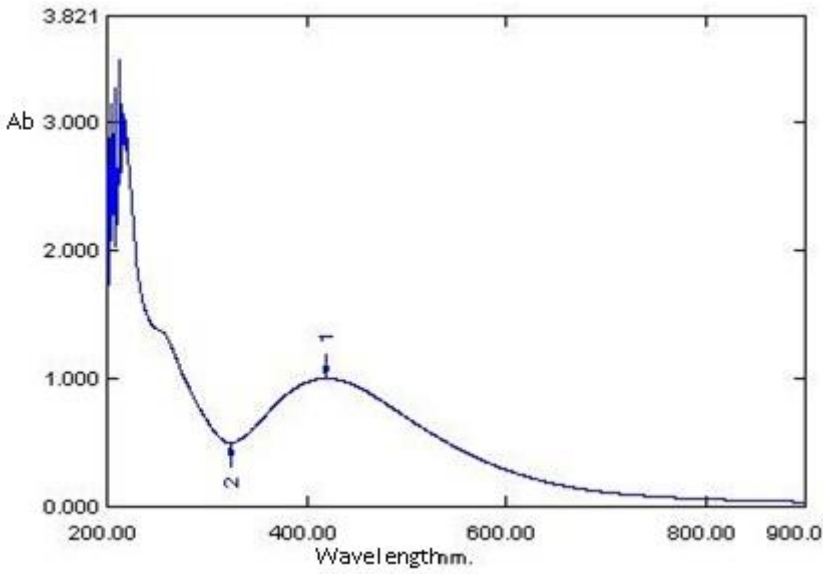


Figure 5. UV-visible spectra of silver NPs.

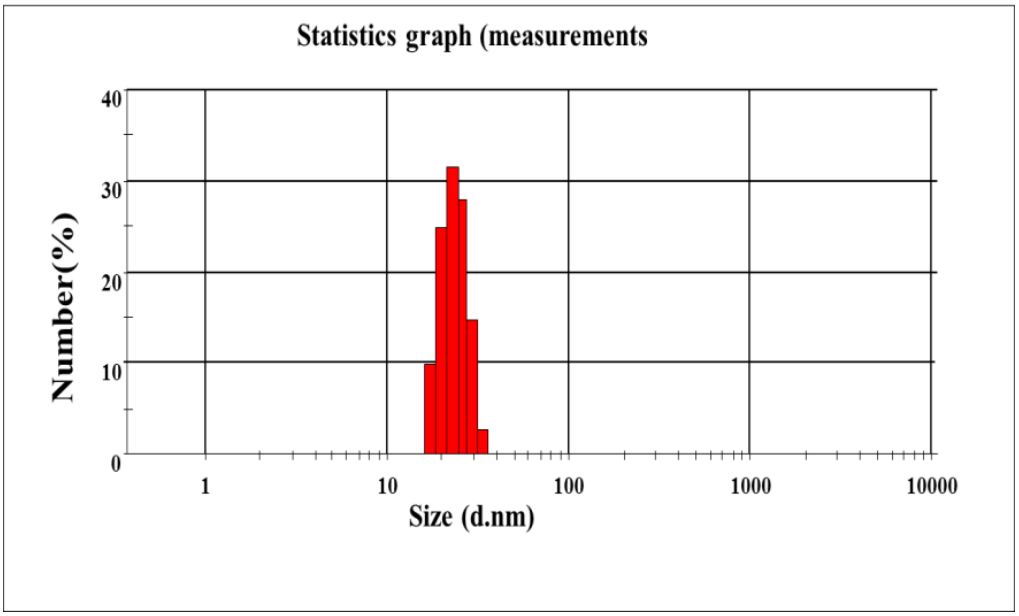


Figure 6. PSA histogram for gold nanoparticles.

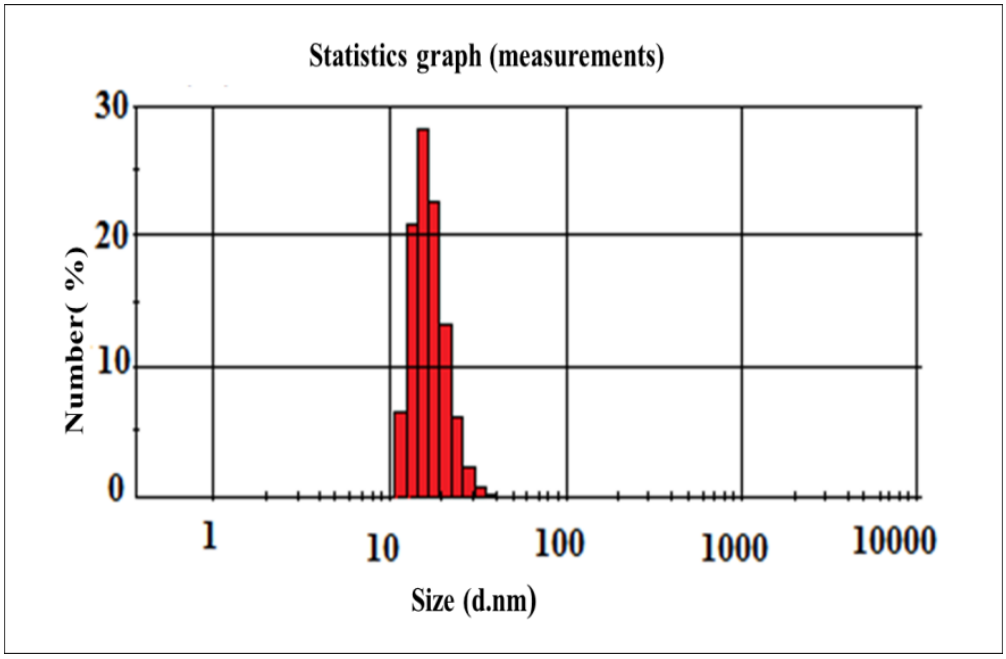


Figure 7. PSA histogram for silver nanoparticles.

CONCLUSION

Mushroom species found in the agriculture have shown their potential for the reduction of gold and silver ions and form their nanoparticles. The formed nanoparticles were spherical in shape and in the size range 10 nm to 50 nm. The method is best suited for large scale production in industries.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

1. Anand R and Madhulika B (2019), Silver nanoparticles (AgNPs): as nanopesticides and nanofertilizers, MOJ Biol Med,4(1):19–20.
2. Birla S *et al.* (2013) Rapid Synthesis of Silver Nanoparticles from Fusarium oxysporum by Optimizing Physicocultural Conditions, The Scientific World Journal, (2013): pages 12.
3. Desai R *et al.* (2012) Size Distribution of Silver Nanoparticles: UV-Visible Spectroscopic Assessment, Nanoscinece and Nanotechnology Letters, 4: 30-34.

4. Diantoro M *et al*. (2018), Modification of Electrical Properties of Silver Nanoparticles, Silver Nanoparticles - Fabrication, Characterization and Applications, Khan Maaz, Intech Open, pp:233-248.
5. Huang X and Mostafa A (2010), Gold Nanoparticles: Optical properties and implementations in cancer diagnosis and photothermal therapy, Journal of Advanced Research 1:13–28.
6. Jain N *et al*. (2011), Extracellular biosynthesis and characterization of silver nanoparticles using *Aspergillus flavus* NJP08: A mechanism perspective, Nanoscale, 3: 635-641.
7. Manzoor-ul-haq *et al*. (2014) Isolation and Screening of Mushrooms for Potent Silver Nanoparticles Production from Bandipora District (Jammu and Kashmir) and their characterization, Int. J. Curr. Microbiol. App. Sci ,3(9):704-714.
8. Nakamura S, *et al*. (2019) Synthesis and Application of Silver Nanoparticles (Ag NPs) for the Prevention of Infection in Healthcare Workers, International Journal of Molecular Sciences: 20(15): 3620.
9. Qasim M *et al*. (2018). Antimicrobial activity of silver nanoparticles encapsulated in poly-*N*-isopropylacrylamide-based polymeric nanoparticles, Int. J. Nanomedicine,3(13):235-249.
10. Wyatt P. *et al*. (2000) Electronic and Optical Properties of Chemically Modified Metal Nanoparticles and Molecularly Bridged Nanoparticle Array,*J. Phys. Chem. B.* , 104, (38): 8925-8930.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Original Article Open Access

Outbreak of Dengue and Malaria in Maharashtra, India and Globe

Ahirrao IS

S.S.V.P.S.L.K.Dr. P. R. Ghogrey Science College, Dhule-424001
Email: drisahirrao2468@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Ahirrao IS (2019) Outbreak of Dengue and Malaria in Maharashtra, India and Globe, *Int. J. of. Life Sciences*, Special Issue, A13: 310-314.

ABSTRACT

Dengue is by transmitted by viruses through the bite of tiger – mosquitoes. Dengue is also known as Dandy-fever. In India Globe and all over Maharashtra. Its spreads through the bite of female anopheline Aedes aegypti mosquitoes. Malaria is also mosquito borne infectious in disease of humans and other animals caused by vector transmitting a micro organism Plasmodium, P. vivaz, P. ovale, P. Malariae, P. falciparum all these species are fatal to the if malaria is spread on large scale while the zoonotic species P. knowlesi, is prevalent is South-East Asia, causes malaria in macaques but can also cause severe infections in humans. WHO (2010) estimated that there were 216 million documented cases of malaria. Around 655,000 people died from the disease near about 2000 per day. Mostly children in Africa number may be higher, as precise are unavailable in many rural areas which are undocumented. Malaria Action Programme – 1995 – Govt. of India Guidelines to Control Malaria. Ministry of Health – (M.S.) in Mumbai – Abont 39 cases were recorded 2 – were died. This is a Govt. Hospital figures Private is not recorded.

National Malaria Control Programme – 1953 – Govt. of India for malaria eradication.Communicable disease control programmes in India." Dr. Atanu Sarkar, M.B.B.S., MCH (JNU), Doctor Fellow (JNU), Program Officer, Catholic Health Assn. of India 1st floor, NIIT centre, 7 Ansari Road, Daryaganj New – Delhi – 110002. Health – action – Vol. 13-12 Dec. 2000. District malaria Officer, Nandurbar, year 2003-04.

Key words: Dengue, Malaria, Aedes aegypti, Dhule and Nandurbar Districts.

INTRODUCTION

Dengue is by transmitted by viruses through the bite of tiger – mosquitoes Aedes aegypti. Incubation period is 5-7 days and illness lasts about for 2-7 days. It causes fever, headache and muscle and joint pains in patients of dengue. Anopheles stephensi (Liston), Aedes aegypti (Lin) and Culex quinquefasciatus (Say) are vectors of Malaria (Diptera-Culicidae).

Geographic Distribution :
This is found in India, Asian Countries, Colder Country Queensland, Georgia and many other countries of the world or globe.

Symptoms of Dengue :-

1.Fever, headache and pain in muscles and joints.
2. Patient's may suffer swollen glands and rashes.
3. Acute dengue fever could be bleeding gums, eye pain, palms turning red.
4. The above symptoms with sign of circulatory failure, manifested by rapid and weak pulse and restlessness, could mean the patient is going into shock-syndrome.

Symptoms of Malaria :-

1.Central nervous system – Headache
2. Systemic – Fever
3. Muscular – Fatigue and pain
4. Back – Pain
5. Skin – Chills and Sweating
6. Respiratory – Dry cough
7. Spleen – Enlargement
8. Stomach – Nausea and Vomiting

The signs and symptoms of malaria typically being 8-25 days following infection;[2] however, symptoms may occur later in those who have taken antimalarial medications as prevention.[3] Initial manifestations of the diseases – common to all malaria species – are similar to flu-like symptoms.[4] The presentation may include headache, fever, shivering, arthralgia (joint pain) vomiting, hemolytic anemia jaundice, hemoglobinuria, retinal damage,[5] and convulsions. Approximately 30% of people however will no longer have a fever upon presenting to a health care facility.[3]

Preventive – measures :-

1.Keep mosquitoes away use mosquito nets.
2.Prevent mosquito – breeding, filling up of the ponds, lakes, puddles etc. with soil.
3. Avoid collection of dirty or fresh water.
4. Spray / fumigate the breeding places of mosquito with kerosene or with hydrogen cyanides.

Medical prophylaxis :-

1)Do not take paracetamols to treat fever, visit a specialist.
2) Avoid going in for intravenous therapy before the patient shows signs of hemorrhage / bleeding.
3) Avoid blood transfusion unless the patient suffers severe bleeding.
4) Avoid using steroids.

Health- education: - to increase awareness among community of people. So as to enlist their active participation and co-operation for implementing control- activities, the health education activities were intensified in school and colleges and society of peoples, municipal corporations, slum areas etc.

It is reported that the civic body has upped surveillance to tackle 56% increase in dengue cases as compared to last year. More than 300 people in and around city of Mumbai have been affected by dengue in month's time.
Dengue claimed 3- lives in city after monsoon began. Health department and city Executive health officer Dr. Arun Bamne visiting the place areas like Prabhadevi, Kurla, Haji Ali and By culla, Yash Chopra's house and studio in Goregaon.

The civic body was aware of the rise in cases and was keeping a close watch. All private practitioners as well as hospitals have been told to inform the epidemiology cell of the Bombay Municipal Corporation, about any dengue case. For the current month, 143 confirmed dengue cases have been reported in August and September respectively.

Materials and Methods – Reports from various cities, the civic body said the machinery that, was used for malaria surveillance has been pressed to look into dengue situation as well. They have also given attention towards malaria. Only here diagnosis cannot be alone at our levels as it is different from malaria diagnosis.

In malarial cases, the civic body collects blood samples on glass slides and carries out tests in its own setup.

Physicians from across the city claimed they are treating at least 2 or 3 cases in a day and that it was definitely not restricted to island city wards. Intersivist Dr. Ganesh Menon from Andheri's criticare Hospital said that they have admitting at least four dengue patients at least four dengue patients everyday.We have been seeing more cases since the last 2-3 weeks and patienlarly after rains have stopped. Most of cases are from Versova and Santa Cruz said Dr. Menon.

A doctor attached to the civic run Cooper Hospital said they are treating quite a few dengue cases in the department. "We are seeing case quite regularly. But, not many of them have required admission so far". He said A doctor who runs a clinic in Andheri said he has treated over 40 cases in the last month and most of them has developed liner problems. Bamne however, said there was no need to panic as better surveillance is at the bottom of more cases being reported.

*Only one private diagnostic lab has been included here.
September – 2012:-
Dhule city and Tahsil – Reports :-
According to Government statistical data from Hospital, in city 13 cares were recorded while in rural areas 43 cases were recorded.

District civil Hospital and Primary health centers reports 5th September to 25th October 2012.

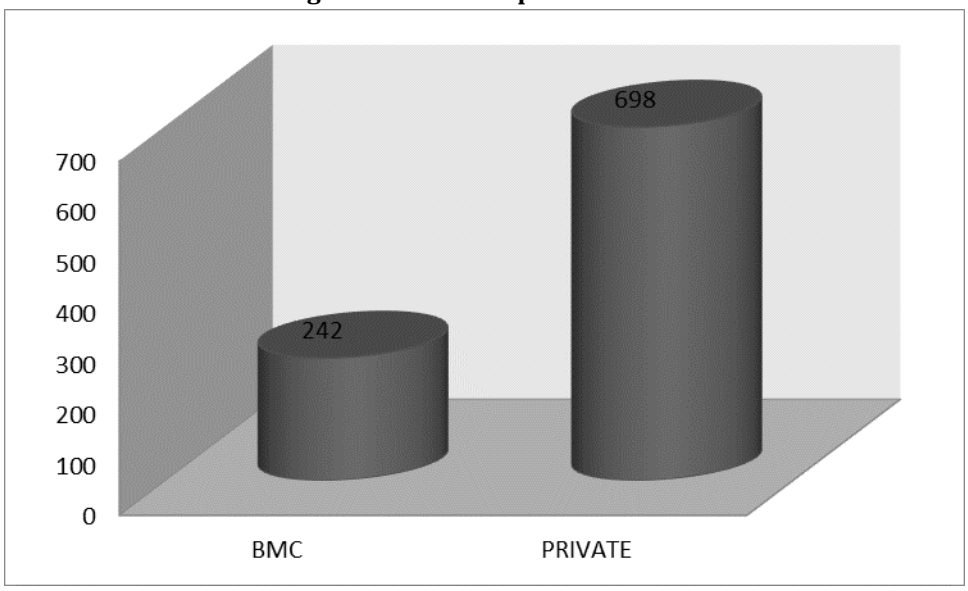
1) Dhule rural – PHC : Nane – 5,Ner – 6, Behed – 13, Wadi Budruk – 11, Tarwade – 7, Kokale-3, Total – 45 cases of Dengue had been reported.
2) Dhule Municipal corporation hospital has – 13 cases of Dengue.
3) As well as Dhule city child hospitals as private hospitals records are as below

a)	Hari Chhaya child hospital	:	20
b)	Chirantan Child hospital	:	25
c)	Meher Child care hospital	:	15 to 20
d)	Akshdeep child care hospital	:	09
e)	Keemay child care hospital	:	10
f)	Chirayu child care hospital	:	05
	Total	:	89

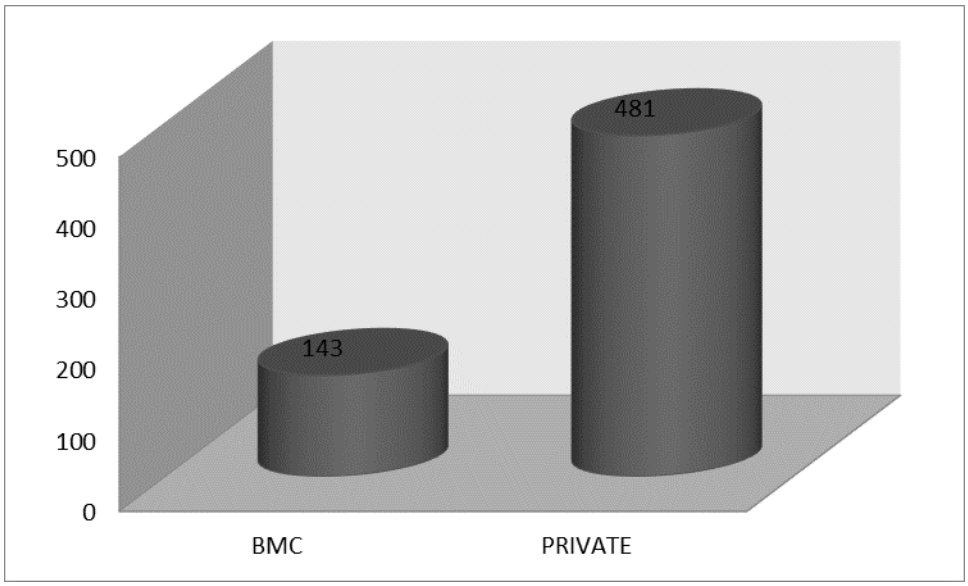
Number of Cases during Month of September to October 2012

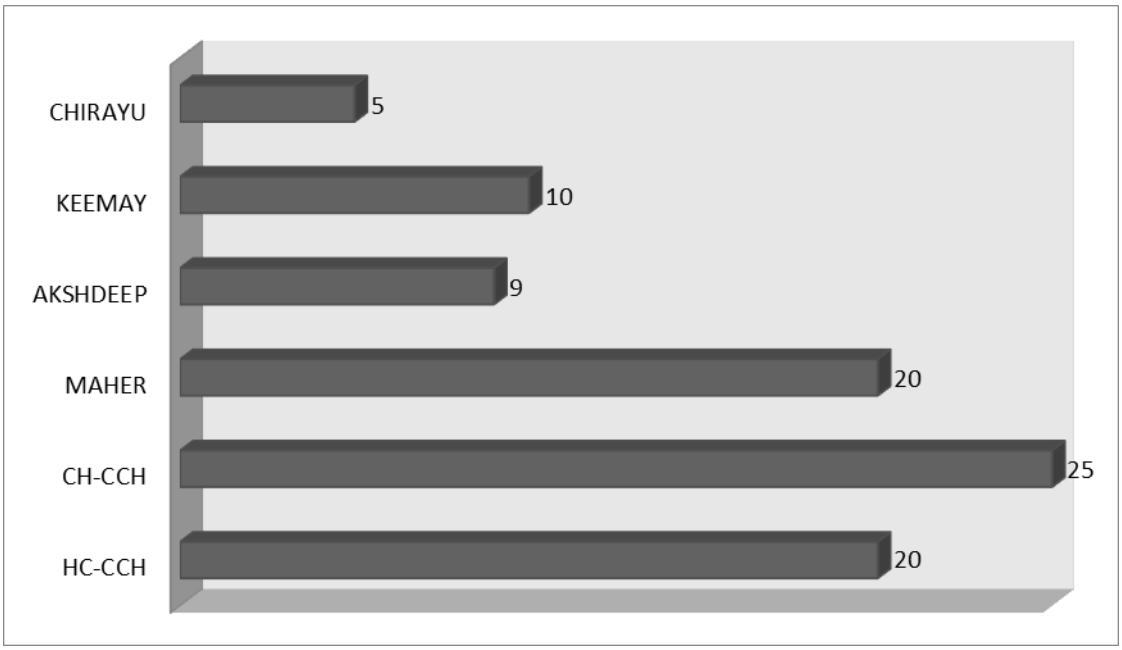
Table

Dengue Statistics:- September – 2012



October – 2012





DISCUSSION

Mosquitoes aedes and culex are belongs to order diptera. These species known to transmit viral encephalitis, dengue, filasiasis, fever etc. Due to less rainfall, there I drought like situation, tension due to earth -quacks etc. Man's immunity and power of tolerance is less. There lation of wastes water inn ponds and dirt etc (140 C to 320 c) there is peak population of mosquitoes. Culex and aedes mosquito survive on blood and lays eggs in dirty water ponds. Cattle, Buffallows, pig's blood is snaked by aedes and culex. Aedes viruses number increases due to fite of aedes weak immune peoples are get infected spreads these disease like Eneephalitis, dengue Elephantiasis, fever, etc. in 8-10 days.

In certain people it may takes 10-40 days time for spreading viral eneephalitis, Immunoglobin or antibodies level decreases such weak people are easily susceptible to this disease. Some people shows allergic-symptoms.

In the globe there are about 20-30 million people are living in hot temperate zone in which such people are very severly infected by dengue, viral encephalitis, malaria etc.

There are 3000 species of mosquitoes in the world. Mosquitoes that spreads diseases mostly people organisms live in hot, moist places near the equator. Mosquitoes are around this world for about as hundred million years of jurassic period due to mosquitoes finding their mates keeps reproducing. The mother cannot protect it's young ones after birth. Dr. Atanne Sarkar (2000), DMO Nandurbar (2003-2004), Health action (2000) MAP (1999), NMCPE (1953), Tanushreetal (2009) Ahirrao etc (1996-2008). Umar et (2008) etc given their opinion according to environmental conditions inn which they grow and causing infections to man and his domestic animals through various causative agents like protoanparasites, insect, Viruces etc.

CONCLUSION

Mosquitoes are therefore, number one enemy of human and his domesticated animal from ancient times. They cause huge economic loss to various contries and man on medical grounds.

Acknowledgement :- I am very much thank to my Guide, Principal, Pratap College, Amalner. Principal, Dr. M.V. Patil, Management of S.S.V.P.S's Dr.P.R.Ghogrey Science College, Dhule

Conflicts of interest: The authors stated that no conflicts of interest.

References

"Communicable disease control programmes in India". Dr. Atanu Sarkar, M.B.B.S., MCH (JNU), Doctoral Fellow (JNU), Program Officer, Catholic Health Assn. of India 1st floor, NIIT centre, 7 Ansari

Road, Daryaganj New- Delhi- 110002. Health – Action Vol.12-13 Dec. 2000.

District malaria Officer, Nandurbar, year 2003-04.

Journal of Health -action Vol. 13. NO. 12 Dec. 2000 (ISSN No. 0970-471x)

Malaria action programme – 1995 – Govt. of india Guidelines to control malaria.

Ministry of Health – (M.S) in Mumbai – Abont 39 cases were recorded 2 – were died. This is a Govt. Hospital figures Private is not recorded.

National Malaria Control Programme – 1953 – Govt. of India for malaria eradication.

Effect of Medium pH of some aspects of life of culex fatigens (Diptera : Culicidae) – Tannu Shree1 and Ajit Kumar Sinha2 – Int. J. Mendel, Vol. 26 (1-4), 55-56, 2009.

The effect of Medium pH on the larvae of Aedes aegypti and culex quinquefasciatus. International Journal of Pure and Applied Sciences – Umar A. and Don Pedro, K.N. 2008. Vol. 2 : 58-62.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Research Article Open Access

Analysis of water quality using physico-chemical parameters in Samudrapur, Wardha District, Maharashtra, India

[1]Gajbhiye RG and [2]Shirbhate NS

[1]Department of Chemistry, Vidya Vikas Arts, Commerce & Science College, Samudrapur Dist- Wardha 442305
[2]Department of Botany, Vidya Vikas Arts, Commerce & Science College, Samudrapur Dist- Wardha 442305

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Gajbhiye RG and Shirbhate NS (2019) Analysis of water quality using physico-chemical parameters in Samudrapur, Wardha District, Maharashtra, India, *Int. J. of. Life Sciences*, Special Issue, A13: 315-319.

ABSTRACT

Ground water samples were taken from different locations of Samudrapur region, Wardha District, Maharashtra. Studies of Physico-chemical characteristics of ground water quality based on Physic-chemical parameters have been taken up to evaluate its suitability for different purposes. Total 11 samples were collected. The quality analysis has been made through the Temperature, Turbidity, P^H, Electrical Conductivity, Alkalinity, Total Hardness, TDS, Dissolved Oxygen, Chloride, COD, Iron, Fluoride and Nitrate. All Parameters were within the Permissible limits except few locations. The results indicate that the ground water is Non-polluted and can be used for Domestic, Irrigation and Pisciculture. The results were compared with standards prescribed by WHO, BIS and ICMR. However, there is always need for proper protection and management of ground water

Key words: Physico-Chemical Parameters, TDS, COD, BIS, WHO, ICMR, Ground water, Irrigation, Pisciculture, Domestic.

INTRODUCTION

Water is an essential component for survival of life on earth, which contains minerals, important for humans as well as for earth and aquatic life (Versari et al., 2002). Lakes and surface water reservoirs are the planet's most important freshwater resources and provide innumerable benefits. They are used for domestic and irrigation purposes, and provide ecosystems for aquatic life especially fish, thereby functioning as a source of essential protein, and for significant elements of the world's biological diversity. They have important social and economic benefits as a result of tourism and recreation, and are culturally and aesthetically important for people throughout the world. They also play an equally important role in flood control (An 2002).

Ground water is the principal source of drinking water in our country and indispensable source of our life. The problem of ground water quality is acute. Groundwater is particularly important as it accounts for 88 % of the drinking water in rural areas (Kumar, 2004).

In India, there are over 20 million private wells in addition to the government tube wells. The wells are generally considered as the worst type of ground

water sources in the term of physio-chemical contamination due to the lack of concrete plinth and surrounding drainage system (WHO, 1997).

Life is not possible on this planet without water. It exists in three states namely solid, liquid and gas. It acts as a media for both; chemical and biochemical reactions and also as internal and external medium for several organisms (Kumar and Yadav. 2011). According to Central Pollution Control Board, 90% of the water supplied in India to the town and cities are polluted, out of which only 1.6% gets treated. Therefore, water quality management is fundamental for the human welfare (Gupta ,1991) and Madhuri, 2004).

Hence, there is always a need for and concern over the protection and management of ground water quality. Any imbalance in its physical or chemical properties beyond permissible limit would be harmful for the whole eco-system.

MATERIALS AND METHODS

Sample Collections

Ground water sample were collected in polythene bottle of 2.5 lit and 2 lit from different location of Samudrapur tehsil. The samples were collected from well as well as from hand pump. The polythene bottle have been previously washed with 10% HNO_3 and 1:1 HCl and rinsed with same sample water taken in that bottle and labeled them serially. Immediately add few drops of HNO_3 were added in order to prevent bacterial and fungal growth.

The sample are collected from different location of Samudrapur region are listed below as

GWS_1 – Samudrapur
GWS_2 – Sujatpur
GWS_3 – Sawangi
GWS_4 – Sakuli
GWS_5 – Dhondgaon
GWS_6 – Govindpur
GWS_7 – Hirdi
GWS_8 – Narayanpur
GWS_9 – Dahegaon
GWS_{10} – Wagheda
GWS_{11} – Wasi

The result of ground water sample from different location in Samudrapur region were noted and listed below in table B.

Sample Analysis

The ground water sample were analyzed as the water sample was taken immediately at the site of collection using a simple thermometer calibrated in degree Celsius, pH was measured using pH meter and also other parameter were measured later in preserved water as shown in table A.

RESULT AND DISCUSSION

The quality of water sample from different location of Samudrapur tehsil are collected and analyzed by different method and fine out some physicochemical parameter such as pH, Total dissolved solid, Total hardness, Chemical Oxygen Demand, Dissolved Oxygen, Alkalinity, Chloride, Fluoride, Iron and Conductivity. The Status of water quality of these water sources are presented in table 2.

Temperature:

The temperature of ground water sample of Samudrapur tehsil from different location varied between 20.1 to 23.2^{o}C. It was found that the temperature of ground water is maximum in Govindpur area. However, the variation of the water temperature affects directly or indirectly all life processes.

Turbidity:

The turbidity of water fluctuates from 0.18 NTU to 0.91 NTU. The maximum values (0.91 NTU) was recorded in the Narayanpur village water and minimum value (0.18NTU) in the Sujatpur village of Mandgaon Grampanchayat. It should be noted that the value of turbidity are within the permissible limit of WHO.

pH

P^H is the measurement of the potential activity of hydrogen ions in the sample. P^H of the water body is affected by several factors. One of the most important factors is the bedrock and soil composition through which water the water moves, both in its bed and as groundwater. P^H is not a static, it changes over time, and in fact it changes over the course of a single day.

The pH of ground water sample varied from minimum of 8.01 to a maximum of 8.7 of Narayanpur village and Hirdi village respectively. The factors like air temperature bring about changes the pH of water. Most of bio-chemical and chemical reactions are influenced by the pH. The reduced rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH. However, the analyzed water sample values are within the permissible limit of WHO.

Table 1: Methods Used for Analysis of water Sample

Sr. No	Parameters	Methods	Units
1	Temperature	Digital Thermometer	℃
2	Turbidity	Nephelometric	NTU
3	pH	pH – Meter	--------
4	Conductivity	Conductivity meter	umhos/cm
5	Alkalinity	Titrimetric Method	mg/l
6	Total Hardness	Titrimetric Method	mg/l
7	TDS	Gravimetric Method, drying at 105℃	mg/l
8	DO	Titrimetric Method	mg/l
9	Chloride	Argiometric Method	mg/l
10	COD	Open reflux method	mg/l
11	Iron	Colorimetric Method	mg/l
12	Fluoride	SPAND Method	mg/l
13	Nitrate	UV- Spectrophotometric Screening Method	mg/l

Table 2: Reading of water quality parameters at different location in Samudrapur Region.

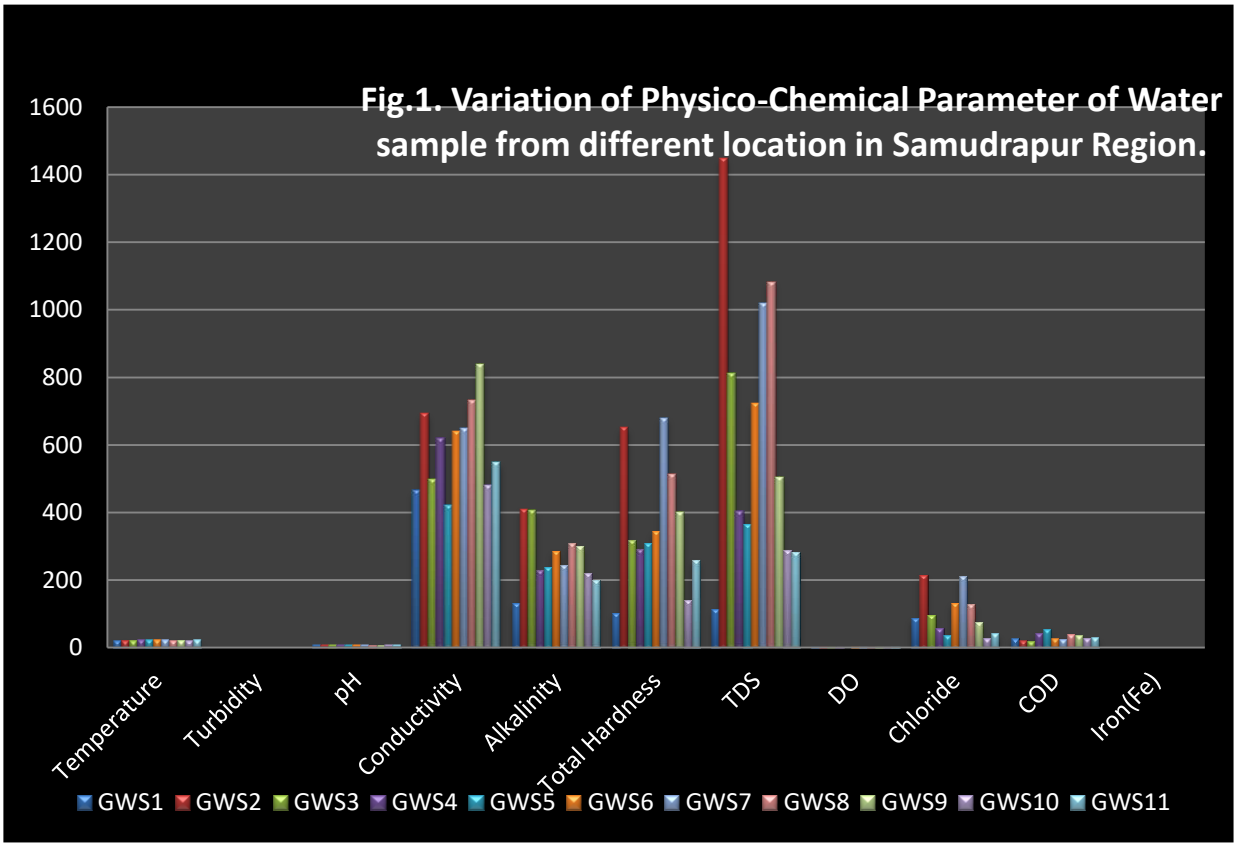
Sr. No	Parameter	GW_1	GW_2	GW_3	GW_4	GW_5	GW_6	GW_7	GW_8	GW_9	GW_{10}	GW_{11}
1	**Temperature**	21.1	22	21.5	23.1	23.2	23	22.8	21.3	22.3	20.1	22.4
2	**Turbidity**	0.52	0.18	0.40	0.41	0.33	0.55	0.64	0.91	0.31	0.57	0.54
3	pH	8.3	8.42	8.47	8.29	8.28	8.30	8.7	8.01	8.08	8.64	8.52
4	Conductivity	465	694	497	620	420	642	649	733	839	479	549
5	Alkalinity	130	409.8	406	229.3	236.8	285.7	244.4	308.3	300	220	200
6	Total Hardness	102	652	316	292	308	344	680	512	400	140	260
7	TDS	112	1450	811	403	366	723	1020	1083	505	288	282
8	DO	2.24	1.89	3.03	2.44	1.02	2.06	2.09	3.26	3.82	1.94	2.1
9	Chloride	86.5	213.4	96.5	55.7	37.1	131.8	209.7	126.6	73.7	27.6	40.5
10	COD	26.5	21.3	19.1	42.5	54.5	26.5	24.8	38.5	35.2	28.5	29.3
11	Iron(Fe)	0.094	0.171	0.051	0.086	0.103	0.115	0.047	0.030	0.516	----	0.089
12	Fluoride (F^-)	0.401	0.101	0.140	0.210	0.338	0.511	0.546	0.271	0.040	0.421	0.274
13	Nitrate(No_3^-)	65.7	336.8	81.8	39.9	35.3	64.2	319.6	5.71	55.48	0.57	12.0

Electrical Conductivity:

Electrical conductivity (EC) is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts. EC values were in the range of 420 umhos/cm to 839 umhos/cm. High EC value observed for Dahegaon village and low EC value for Dhondgaon village water sample indicating the presence of high amount of dissolved inorganic substances in ionized form.

Alkalinity:

The alkalinity of water is caused mainly due to OH, CO_3, HCO_3 ions. Alkalinity is an estimate of the ability of water to resist change in pH upon addition of acid. Total alkalinity ranges from 130 mg/l to 409.84mg/l the maximum value (409.84mg/l) was recorded in the Sujatpur Village and minimum value (130mg/l) was recorded in the Samudrapur. However, all the values from different sample are within the permissible limit of BIS.



Total Hardness:

Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water. Hardness of water mainly depends upon the amount of calcium or magnesium salts or both. The hardness values varied from 102 mg/L to 680 mg/L. However, the value of water sample from Sujatpur and Hirdi were 652mg/l and 680 mg/l respectively over the permissible limit of ICMR

Total Dissolved Solid:

In water, total dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, phosphates and nitrates of calcium, magnesium, sodium, potassium and manganese, organic matter, salt and other particles.

Total Dissolved Solids (T.D.S.) value were ranging from 112 to 1450 and the water samples of Sujatpur, Hirdi, Narayanpur have maximum value and not within permissible limit of ICMR which is not acceptable for drinking purpose. While Sawangi, Govindpur have high value but within permissible limit of ICMR.

Dissolve Oxygen:

The value of DO fluctuates from 1.02 mg/l to 3.82 mg/l. The maximum value (3.82 mg/l) was recorded in the Dahegaon Village and the minimum value was recorded in the Dhondgaon. However, the value of DO is within the permissible limit of BSI and WHO.

Chloride:

The chloride content of ground water varied from a minimum of 37.12 mg/lit to a maximum of 213.44 mg/lit of Dhondgaon Village and Sujatpur village respectively.

The higher content of chloride in water may be due to animal origin like human faces and sewage inflow. Chloride increases with the increasing degree of eutrophication. Sujatpur and Hirdi village water sample have high chloride contents i.e. out of permissible limit of BIS and WHO.

Chemical Oxygen Demand:

Chemical oxygen demand determines the oxygen required for chemical oxidation of organic matter. COD values convey the amount of dissolved oxidisable

organic matter including the non-biodegradable matters present in it. The COD of dug well water ranged from a minimum of 19.1 mg/lit to a maximum of 54.5 mg/lit of Sawangi Village and Dhondgaon Village respectively. Chemical Oxygen Demand is changed with seasons and also with the release of chemical substances from agricultural waste and sewage. All the water sample values are out of maximum permissible limit of BIS and WHO.

Iron:

Iron is an essential element in human nutrition. Estimates of the minimum daily requirement for iron depend on age, sex, physiological status, and iron bioavailability.

The minimum value of ground water sample of Wasi village is 0.089 mg/l and maximum value recorded for Dahegaon is 0.516 mg/l which is out of permissible limit of BIS and WHO.

Fluoride:

Fluoride at a lower concentration at an average of 1 mg/lit is regarded as an important constituent of drinking water. Surface water generally contains less than 0.5 mg/lit fluoride.

However, when present in much greater concentration, it becomes a pollutant. Excess intake of fluoride through drinking water causes fluorosis on human being. The minimum values were recorded in Dahegaon (0.040mg/l) while the maximum values were recorded in Hirdi (0.546mg/l).

Nitrate:

Nitrates represent the final product of the biochemical oxidation of ammonia. Monitoring of nitrates in drinking water supply is very important because of health effects on humans and animals. Surface water contains nitrate due to leaching of nitrate with the percolating water.

The nitrate content was minimum in Narayanpur Village and found to be 5.71 mg/l while the maximum nitrate content in Sujatpur Village was found to be 336.8mg/l which is out of maximum permissible limit of ICMR.

CONCLUSION

The study assessed the evolution of water quality in ground water of Samudrapur region, Wardha district. A study of ground water was carried out by taking certain important parameters like temperature, pH, total dissolved solid, alkalinity, dissolved oxygen, chemical oxygen demand, Nitrate, Chloride, Iron, Electrical Conductivity and Turbidity.

Hence, the present study shows that the proper protection and Management of quality of ground water is required for the healthy eco – system and selecting proper treatment to minimize ground water pollution.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

An YJ, Kampbell DH and Sewell GW (2002) *Environ. Pollut.,* 118;331.

Gupta SC (1991) *Indian J. Environ. Hlth*., 33(3):341.

Kim KH, Kim SH (1999) *Water, Air, and Soil Pollution*, 1999,111, 109–122.

Kumar A (2004) Water Pollution. Nisha Enterprises, New Delhi-1.

Kumar Rajesh, and Yadav S. S. (2011) *Int. J. Chem. Sci*.: 9(1):440.

Madhuri U (2004) *Poll. Res.*, 23(3):565.

Versari A, Parpinello GP and Galassi S (2002) *J. Food Compos. Anal.,* 15;251.

Vogel I (1970) A text book of inorganic analysis published by Harley and Sons, 4th Ed.p.148.

WHO (1986) World health organization working group, health impact of acidic decomposition, science of the total environment 52, 157-187.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Short Communication Open Access

Effect of inorganic fertilizers, organic manure alone and in combination with or without biofertilizers on physical properties of soil at harvest of Rajma

Andhale AV[1], Chate Shakuntala[2] and Valvi SR[3]

[1]Department of Zoology, Nowrosjee Wadia College, Pune, MS, India.
[2]Vasantrao Naik Marathwada Agricultural university Parbhani, MS, India.
[3]Department of Botany, Nowrosjee Wadia College, Pune, MS, India.
*Corresponding author Email: atmabiotech@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Andhale AV, Chate Shakuntala and Valvi SR (2019) Effect of inorganic fertilizers, organic manure alone and in combination with or without biofertilizers on physical properties of soil at harvest of Rajma, *Int. J. of Life Sciences*, Special Issue, A13: 320-323.

ABSTRACT

A field experiment was conducted in rabi 2005-2006 on experimental farm of Department of Agriculture Chemistry and Soil Science, College of Agriculture, Parbhani. The field experiment was carried out to study, "Integrated nutrient management for Rajma". Nutrient sources were inorganic fertilizers (NPK and micronutriets). Organic manure and biofertilizers. The effect of these nutrient sources along and in combination was studied on nutrient availability at harvest in soil and other physico-chemical properties of soil, growth attributes, yield, and uptake of nutrients and quality parameters of Rajma.

Keywords: *Phaseolus vulgaris*, Physical properties of soil, Organic manure, Bio-fertilizers

INTRODUCTION

French bean (*Phaseolus vulgaris* L. Halics) is an important pod vegetable and short duration crop. It belongs to the family leguminaceae. It is popularly known as field bean, green bean, kidney bean, dry bean, common bean, garden bean, snap bean etc. French been is an important source of dietic protein for more than 500 million persons in latin America and other countries. Rajma is quite nutritious containing 20.69 to 25.81 per cent crude protein 1.72 per cent fat and 72.42 per cent carbohydrates beside this 5.89 mg of iron 20.02 to 9.62 mg of methionine per 100 gm of protein 381 mg calcium, 425 mg phosphorus per 100 gm of edible parts. Ali and Khushwanta (19.87) reported that Rajama contain 3.84 mg zinc per 10 gm.

In Maharashtra, Pune, Satara, Ahemadnagar, Sangli, Nashik and Solapur are the leading district for growing french bean (Sravanghevda) in *rabi*season. Similarly in Mahabaleshwar and Ratnagiri region, it is grown as a *kharif* crop. It provides direct economic returns in form of pod used as a vegetable and grain for human beings as well as fodder for animals. In India french bean is grown on an area of 42.68 ha and producing 24778 tonnes with productivity 5-8 t/ha (Anonymous, 2003).

Looking for economical condition of farmer and cost of fertilizers, it is essential to adopt new techniques and management practices as integrated nutrient management. The combined use of organic and inorganic manures not only increases the crop yield but also improves the physical and biological properties of soil. Use of organic manures with optimum rate of fertilizers under intensive farming system increased the turnover of nutrients in the soil plant system (Nambiar, 1989). The organic manures such as FYM and vermicompost are not just source of nutrients but also have profound effect on physical properties resulting in a better soil structure, greater water retention in soil and more favorable environment for root growth and better infiltration of water.

MATERIAL AND METHODS

The experiment was conducted in *rabi* season of 2005-2006 at experiment farm of Department of Agricultural Chemistry and Soil Science, College of Agriculture, Parbhani.

Collection of soil samples

Collection and preparation of soil samples for chemical analysis

Representative surface soil sample (0 to 15 cm) was collected before sowing i.e. prior to application of manures and fertilizers. Surface soil samples were also collected at 7 days after harvesting of the crop. These samples were air dried in shade then crushed and sieve through 2 mm sieve and were stored in brown paper bags.

Collection of soil samples for physical properties

Core samples (0-15 cm depths) were collected from each plot and were dried in shade. The undisturbed soil samples were used for some physical properties.

Laboratory studies:

Soil analysis

Physical properties of soil

a) Particle size analysis

It was carried out by adopting International Pipette method as described by Piper (1950) using NaOH as dispersing agent.

b) Bulk density

It was determined by Core method given by Piper (1950).

$$\text{Bulk Density} = \frac{\text{Weight of oven dry soil}}{\text{Volume of soil (solids + pores)}}$$

Pore space

The total porosity was calculated from an expression relating porosity with bulk density and particle density as under.

$$\text{Porosity \%} = \left(1 - \frac{\text{Bulk density}}{\text{Particle density}} \text{ X100}\right)$$

d) Maximum water holding capacity

The maximum W.H.C. was estimated by keen Reczkawski Box method.

RESULTS AND DISCUSSION:

Physical properties as bulk density, per cent porosity and maximum water holding capacity of soils before application of the treatments and at harvest of the crop were studied. The results obtained are given in Table 1.

Table 1 : Effect of inorganic, organic nutrient sources and biofertilizers on physical properties of soil

Treatments	Bulk Density (mg m^{-3})	Porosity (%)	Maximum water holding capacity (%)
T_1	1.26	49.45	56.85
T_2	1.25	49.60	56.85
T_3	1.24	50.20	57.00
T_4	1.29	48.50	56.12
T_5	1.24	52.50	58.81
T_6	1.24	51.50	58.92
T_7	1.26	52.00	58.31
T_8	1.28	49.00	57.15
T_9	1.23	53.25	58.96
S.E. ±	0.04	0.009	0.03
CD at 5%	NS	0.02	NS

Initial values of bulk density, porosity (%) and maximum water holding capacity (%) at sowing were as below :

Bulk density.28 (mg m^{-3})
Porosity 51.69 (%)
Maximum water holding capacity 56.32 (%

Effect on bulk density (mg m^{-3})

The data from Table 1 indicated that higher bulk density was observed when NPK was applied to soil only through inorganic fertilizers. High dose of NPK (180:90:90 kg/ha i.e. 150% RDF) application through inorganic fertilizers recorded highest bulk density i.e. 1.29 mg m^{-3} in T_4 treatment, which was highest among all the treatments. It was followed by T_8, T_7, T_1 and T_2 treatments. The treatments where 2-5 t vermicompost and 50% N through urea either at sowing or at flowering with or without micronutrients and biofertilizers recorded decreased the bulk density as compared to T_1 and T_2 treatments. The lowest bulk density was observed in treatment T_9 i.e. 1.23 mg m^{-3} where only 5 t vermicompost per hectare was applied. However, the differences in bulk density among all the treatments were non-significant. Palaniappan (1975) has also reported that the humic substances penetrate the interlameller spaces of clay minerals and influence the interaction of clay with other soil constituents. Similar observations were recorded by Mishra and Sharma (1997), Bellakki*et al*. (1998), Babhulkar*et al*. (2000).

Effect on percent porosity

The data from Table 1 showed that, higher porosity was observed when 5 t of vermicompost only per hectare was applied as organic manure. The highest porosity in this treatment recorded as 53.25 per cent which was highest among all the treatments. The treatments where 2.5 t vermicompost per hectare and 50% N through urea either at sowing or at flowering with or without micronutrients and biofertilizers recorded comparatively more porosity as compared to NPK application as per soil test values 100% RDF and 150% RDF through inorganic fertilizer sources. The lowest porosity i.e. (48.50%) was observed in T_4 treatment where 150% RDF i.e. 180:90:90 kg/ha NPK was applied only through inorganic fertilizers.

The data from Table 1 indicated that per cent porosity was maximum (53.25%) due to T_9 treatment where only 5 tonnes vermicompost per hectare was applied with biofertilizers. Similar observations were reported by Palaniappan (1995) who noted that addition of organic matter improved soil aggregation and thereby more porosity of soil. Venkateshrlu (1989) also showed that, the combined application of FYM and inorganic fertilizers increased the pore space in soil. Bhatia and Shukla (1982) observed that continuous addition of organic manures, resulted in soil aggregation and favourable change in total porosity of soils. Similar findings were recorded by Sarkar *et al*. (1989).

The minimum porosity i.e. 48.60 per cent was recorded where 150% RDF of NPK/ha was applied through inorganic fertilizers. Minimum porosity due to deterioration of soil structure by use of inorganic fertilizers was shown by Biswas *et al*. (1971). Similar results were found by Gattani*et al*. (1996). They reported that continuous use of NPK fertilizers decreased the porosity due to absence of organic matter. Sarkar *et al*. (1989) found that, the continuous use of inorganic fertilizers decreased the porosity of soil.

Effect on per cent maximum water holding capacity

The highest water holding capacity was recorded i.e. 58.96 per cent in T_9 treatment followed by T_7, T_6 and T_5. The treatment 2.5 t vermicompost per hectare and 50% N through urea either at sowing or at flowering with micronutrients and biofertilizers recorded comparatively more water holding capacity as compared to 100% RDF. The lowest maximum water holding capacity i.e. 56.12 per cent was observed in T_4 treatment where 150% RDF was applied followed by T_8 treatment where NPK was applied as per soil test through inorganic source. It was also observed that differences in per cent maximum water holding capacity due to different treatments were non-significant.

Bhatnagar*et al*. (1992) noted that higher water holding capacity of soil was ascribed due to the improvement in structural condition of the soil, brought about mainly by the application of FYM. Similar results were found by Bellakki*et al*. (1998), Babulkar*et al*. (2000).

Water holding capacity was lowest (56.12%) in T_4 treatment where was applied. Similar results were found by Biswas *et al*. (1971). They reported that application of inorganic fertilizers lowered down water holding capacity due to deterioration of soil structure. Gattani*et al*. (1996) also found that the continuous use of N, P, K i.e. inorganic fertilizers caused hard pan and hence decreased the water holding capacity. Sarkar *et al*. (1989) found that continuous use of inorganic fertilizers with fixed rotation decreased the water holding capacity of soil.

CONCLUSION

Lowest bulk density of soil was observed due to application of only vermicompost. Wherever the highest

bulk density was observed when only inorganic fertilizers were applied. Maximum water holding capacity of soil and porosity was recorded where vermicompost at 5 tonnes ha^{-1} only was applied. While these characters of soil were recorded minimum when only inorganic fertilizers were applied.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Anonymous (1999) The Hindu Survey of Indian Agriculture, pp.16-17.

Babhulkar RM (2000) Residual effect of long term application of FYM and fertilizer on soil properties and yield of soybean. J. Indian Soc. Soil.Sci., 48 : 89-92.

Bellakki MA, Badanur VP and Shetty RA (1998) Effect of long term integrated nutrient management on some important properties of a Vertisol. *J. Indian Soc. Soil Sci.,* 46 (2) : 176-180.

Bhatia KS and Shukla KK (1982) Effect of continuous application of fertilizers and manures on some physical properties of Alluvial soil. J. Indian Soc. Soil, 30 (1) : 33-36.

Bhatnagar GS, Parwal MK and Nanawati GC (1992) Effect of nitrogen and mixtalol on french bean (*Phaseolus vulgaris*) during winter. *Indian J. agric. Sci*., 62 (4) : 280-281.

Biswas TD, Jain BL and Mandal SL (1971) Cumulative effect of different levels of manures on the physical properties of soil. *J. Indian Soc. Soil Sci*., 19(1) : 31-37.

Guttani PD, Jain SV and Seth SP (1996) Effect of continuous use of chemical fertilizers and manures on soil physical and chemical properties. *J. Indian Soc. Soil Sci.,* 24(3) : 284-289.

Mishra VK and Sharma RB (1997) Effect of fertilizers along and in combination with manure on physical properties and productivity of entisol under rice based cropping system. *J. Indian Soc. Soil Sci*., 41(1) : 84-88.

Nambiar KKM and Abroal IP (1989) Long term fertilizer experiments in India. *Fert. News*, 34 (4) : 11-20.

Palaniappan R (1975) Reported that the humic substances penetrate the interlandlar spaces of clay minerals and influence the interaction of clay with other soil constituents. Ph.D. Thesis submitted to Univ., of Madras Coimbatore.

Piper CS (1950) Soil and Plant Analysis. Univ. of Adeladide, Australia.

Sarkar AK, Mathur BS, Lal S and Singh KP (1989) Long term effect of manures and fertilizers on important cropping system in subhumid red and lateritic soils. *Fert News,* 34(4) : 71-80.

Venkateswarlu B and Wani SP (1999) Bio- fertilizers an important component of integrated plant nutrient supply in dry lands. Dry land Agric. Res. in India Central institute for dry land Agriculture - Hydrabad, pp. 379-394.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Short Communication Open Access

Beaumontia longituba Craib (Apocynaceae): new exotic record for Maharashtra, India

Jogdand Vinod R[1*] and Bhosale Yuvraj M[2]

[1]Department of Botany, RFNS,Senior science college Akkakuwa ,Dist Nandurbar. (MS) India.
[2]Department of zoology, N.Y.N.C.Arts, science &Commerce college chalisgaon Dist.Jalgaon (MS) India.
*Email: jogdandvinod82@gmail.com

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Jogdand Vinod R and Bhosale Yuvraj M (2019) *Beaumontia longituba* Craib (Apocynaceae): new exotic record for Maharashtra, India, *Int. J. of Life Sciences*, Special Issue, A13: 324-325.

ABSTRACT

Identified as *Beaumontia longituba* Craib. It has been found that, in the floristic studies of Maharashtra this species has not been reported earliar (Rudjiman 1987) This species has not been considered from the recently Therefore, this species is a new exotic record to Maharashtra. The present paper deals with update citation, detail description, flowering and fruiting season, locality and field of the species.

Key words: Apocynaceae, Akkalkuwa, new record, *Beaumontia longituba*

INTRODUCTION

***Beaumontia longituba,* Craib,** Repert.Spec. Nov.Regni veg. 12 : 393.1913. Kajila & Das Fl .. Assam3: 264.1939, Radjimam, Agric . Univ. Wagenim. Papers 86-5 (1986) :22: 1987.

Large Climbing Shrubs 15 feet. Leaves narrowly , ovate-elliptic, 11x15x3.2.6 cm long, acuminate @ apex glabrous maney black dot petils 8-10 mm long inflorescence, one branced 5-6 flowered 8 cm long , peducles 9 mm long dark brown barts –ovate 5- 7 x1.2 -3 mm flowers white, sepals ovate 6-10 x 1 mm acute at apex corolla white tabe abot 40 mm long stamens filaments inserted at 20 -22 mm corolla base 9-10 mm long, antoehers 8 x1.50 mm long 1 mm sterial, at apex, pistil 45 long overy superior densely pubesecrent style 32 fruits unknown.

It is distributed in china , Thailand countries.

Flowers and fruiting : Nov to Dec.

Exsiccata: Akkalkuwa (VRJ 3001)

Native: China

Acknowledgement
The authors are thankful to principal Dr.B.N.Patil and Dr.Yogesh Dushing the Head, Department of Botany, RFNS Senior science collage Akkalkuwa,nandurbar.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Wallich N (1824) Tentamen Florae Napalensis Illustrate 14, pl.7.

Govaerts R et al. (2016) beaumontia in World Checklist of Selected Plant Families. The Board of Trustees of the Royal Botanic Gardens, Kew. Published on the internet.

Intertional Plant Names Index. 2016. Beaumontia. Published online.

Rudjiman (1987) A revision of Beaumotia Wallich, Kibatalia G. Don and Vallariospis Woodson (Apocynaceae) Agricultural University of Wageningin Papers 86-5:36. 1987.

International Journal of Life Sciences
International Peer Reviewed Open Access Journal

Special Issue A 13, December 2019
ISSN:2320-7817(p) 2320-964X(0)

Short Communication Open Access

Grasses Diversity of Mandav region (M.P.) India

Mujalde [1], Dwivedi HS[2] and Dwivedi Pinky[3]

[1]Asst. Prof. Botany, Gov. Girls College Dhar (M.P.), India
[2]Prof. of Botany, Govt. Madhav Science P. G. College, Ujjain (M.P.) India
[3]Prof. of Botany, Govt. Madhav Science P. G. College, Ujjain (M.P.) India

Manuscript details:

Available online on
http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Mujalde, Dwivedi HS and Dwivedi Pinky (2019) Grasses Diversity of Mandav region (M.P.) India, *Int. J. of. Life Sciences*, Special Issue, A13: 327-332.

ABSTRACT

The sky seems to go on forever! You can look in any direction for miles and see no trees or bushes. It might just seem like a lot of grass, but this place is teeming with life. You are in a grassland biome, grasslands have many names-prairies, pampas, steppes, and savannas. They are all areas where rain isn't predictable. Grasslands receive more rain than deserts and less rain than forests. The rainfall in a grassland doesn't support many trees. Grassland has unique plants and animal. To keep grassland healthy plants and animals work together. Indian grassland have been classified into eight major types and two types Sehima Dichanthium and Dichanthium Cenchrus are present in M.P. Research area - Mandva is situated in the Vindhyanchal Range at 2,000 feet above sea level. There is a deep ravine which separates it from the Malwa Plateau in Central India. In Dhar District is located at western part of M.P. and lies between latitude 22.3271° N, 75.4053° E at 35 km from Dhar city. Its belong to semi-arid zone and it is bounded villages are Nalcha, Tarapur, Panala, Sulibaedi, Kalighati, Sarai, lunhera khurd, Golpura and faraspura. Grasses are a great economic potential some being very highly ornamental. Over dairy industries dependent on grasses and plays crucial roll in world and eco system and bio-diversity perusual of literature reveals that grass flora of study area is little known major. Hence through the study of grasses in study area is necessary to know the occurrence and distribution of grasses and their economically potentioly.

Keywords: Grasses Diversity, Malwa Region, Economic Potentiality, Frequency of Grasses, Species of Grasses

INTRODUCTION

The sky seems to go on forever! you can look in any directions for miles could see no tree and bushes. It might seems like lot of grass but this place is teeming with life surrounded by a grassland biomes. Grassland have many types prairies pampas, steppes and savanna. There are all area were rain is not predictable. Grassland receives more rain than desert and less rain than forest. The rainfall in a grassland does not support many trees grassland has unique plants and animals to keep grassland healthy, plants and animal work together Indian grassland have been classified into eight major types and two types Sehima Dichanthium and Dichanthium Cenchrus are present in M.P.

Mandav located on the Vindhyachal Mountain at the height of 2000 feet above Sea level. Even though a small city now thousand years ago it was considered as one of the largest city in the world. The city culture and its historic buildings made it a destination for architecture. There is a deep ravine which separates it from the Malwa Plateau in Central India in Dhar District is located at western part of M.P. and lies between latitude 22.3271° N, 75.4053° E at 35 km from Dhar city. Its belong to semi-arid zone and it is bounded villages are Nalcha, Tarapur, Panala, Sulibaedi, Kalighati, Sarai, lunhera khurd, Golpura and faraspura. It has got avride range of grassland with a major population of tribals which surrounds the area- it fall semi-aridzone of India which cover the area behind the forest and deserts.

The various types of grasses have not been studies yet research are going interest search variety of grasses that is available in the local part of the area. Which has have some additional values in this grasses semi-arid area support the wild life of the area with a large bio-mass. The area of mandav is covered with a hilly terrain spread with grassy plan track. Geographically the area is diveded into Malva Plateu and Vindhya scarps in Makhaani valley and Hathini valley and there tribut aries.

Various types of grasses found in Mandu region like *Cyperus rotundus (Nut Grass), Cymbopogon martinii, Cynodon dactylon, Dichanthium annulatum, Eleusine Indica, Eragrostis pilosa, Eragrostis tenella, Heteropogon contorius, Ishaemum pilosum, Penicum virgatun (Switch Grass), Pennisetum pedicellatum, Saccharum arundinaceae, Saccharum spontaneum, Sehima nervosum, Sorghum vulgare, Themeda caudata, Themeda quadrivalvis, Themeda triandra, Vetiveria zizanoides, Typha latifolia.*

Grasses are a great economic potential some being very highly ornamental. They are considered to be of important groups that provide grains which are valuable for human being and nutrition for animals the staple crops like rice, wheat, oat, barle, sorghum, millets are also grasses sugarcane, bamboos are also came under grasses and the economy of the country dependent on this groups. Many grasses are known for their fodder, medicinal and other value like thatching matting making ropes and paper production. Over dairy industry is dependent on grasses and plays crucial role in world and eco system and bio diversity perusal of literature reveals that grass flora of study area is little known major. Hence through the study of grasses in study area is necessary to know the occurrence and distribution of grasses and their economically potentially.

Fig. 1: Map of Research Area: Madhav grass land area

The Grass family (Poaceae) is a diverse and ecologically dominant group of monocotyledonous plants. The grasses form a natural homogenous group of plants with remarkable diversity playing a significant role in the lives of human beings and animals. Grasses are wide spread than other families of flowering plants and the existence of human life and quality would be impossible without grasses. It is estimated that 10,000 to 11,000 species of grasses belonging to 700 genera are distributed in the world.

MATERIAL METHODS

1. Study area will be surveyed regularly by well planned schedule to collect and record the grasses. Field records will be maintained. Grasses will be collected from all habitats. Grasses found on bunds, cultivated fields and on wall will also be recorded. Plant collection and preservation will be carried out by customary methods.
2. Qualitative and quantitative distribution method.
3. Latest up-to-date nomenclature of ICBN will be incorporated for correct and changed name. Tropicos, IPNI and plant list, www.organization will be clicked and consulted.
4. Threatened taxa will be assessed through IUCN category.
5. Seeds of wild cultivated crops will be collected and send to NBPGR, New Delhi.

Brief Review of the work already done in the field:

Pioneer works on grasses of India have been carried out by several work (Duthie, 1883; Symonds, 1886; Gamble, 1896, Fischer, 1934). "Grasses of Burma, Ceylon and Pakistan" by N.L.Bor (1960) is the main standard reference work on Indian grasses. Later on several workers have contributed to grass flora of India. Important works include that of Tiwari (1954), Patunkar (1980), Kartikeyan *et al.*(1989), Moulik (1997), Yadav (2010), Kabeer and Nair (2009). Recently several research papers have also been published on grasses. (Patel et al, 2012; Ray and Sainkhediya, 2012; Reddy and Rao, 2009; Singh et al, 2009; Purohit and Sharma, 2012; Ravi Prasad, 2011. The flora of Madhya Pradesh has been published in three volume and one supplement by Verma *et al.*(1993), Mudgal *et al.*(1997), Singh *et al.*(2001) and Khanna *et al.*(2001).Verma and Chandra (1981) published cyperaceae of M.P. and Roy (1984) documented grasses of MP Flora of western Tribal Madhya Pradesh by Sanvatsar (1996) deals with 1156 plant species of flowering plants. Perusual of literature reveals that grass flora of study area is little known and meager. Hence thorough study of grasses in the study area is necessary to know the occurrence anddistribution of grasses and their economic potentiality.

Observation:

List of grasses will be very helpful for botanist, Planner, Researchers, Economic potential of different grass species will be very much helpful for grassland management, restoration of degraded soil and ecosystem. Survey of wild relatives of cultivated crops will be of great significant in crop protection and improvement. Various type of grasses present in mandu region like Cyperus rotundus (Nut Grass), Cymbopogon martinii, Cynodon dactylon, Dichanthium annulatum, Eleusine Indica, Eragrostis pilosa, Eragrostis tenella, Heteropogon contorius, Ishaemum pilosum, Penicum virgatun (Switch Grass), Pennisetum pedicellatum, Saccharum arundinaceae, Saccharum spontaneum, Sehima nervosum, Sorghum vulgare, Themeda caudata, Themeda quadrivalvis, Themeda triandra, Vetiveria zizanoides, Typha latifolia.

Table1 – List of grasses studied around the area of Mandav region

S.N.	Local Name	Vernacular Name	Botnical Name	Family
1	Kamrond	Punaai	Apluda mutica	Poaceae
2	Fulera Karamron	Fulera	Bothriochloa pertusa	Poaceae
3	Chendi	Chendi	Brachiaria eruciformis	Poaceae
4	Phopati	Phopati	Bouteloua rigidiseta	Poaceae
5	Bharbhusi	Bharbhusi	Eragostis Tenella	Poaceae
6	Rosa	Rosa	Cynodon martinii	Poaceae
7	Duub	Duub	Cynodon dactylon	Poaceae
8	Dhman Ghass	Dhman Ghass	Cenchrus ciliaris	Poaceae
9	Rosa	Rosa	Cymbopogan schoeanthus	Poaceae
10	Aakhrot Ghass	Aakhrot Ghass	Cyperus rotundus	Poaceae
11	Sinka	Choti Marveli	Dichanthium annulatum	Poaceae

12	Chinyari	Chinyari	Digitaria sanguinails	Poaceae
13	Makra	Makra	Desmotacnya aegyptium	Poaceae
14	Kusha	Kusha	Desmotacnya Bipinnata	Poaceae
15	Fuler	Fuler	Eragrostis pilosa	Poaceae
16	Bhabhushi	Bhabhushi	Eragrostis tenella	Poaceae
17	Jungli rice	Jungli rice	Echinoch'oa Colonum	Poaceae
18	Sukli	Sukla	Heteropogon contorius	Poaceae
19	Kunda	Kunda	Ishaemum pilosum	Poaceae
20	Reghass	Reghass	Lolium perenne	Poaceae
21	Dinnanath	Dinnanath	Pennisetum pedicellatum	Poaceae
22	Guli Danda	Guli Danda	Phalaris minor	Poaceae
23	Munj	Munj	Saccharum arundinaceae	Poaceae
24	Kans	Kans	Saccharum spontaneum	Poaceae
25	Puniya	Puniya	Sehima nervosum	Poaceae
26	Baaru	Baaru	Sorghum vulgare	Poaceae
27	Junwari	Junwari	Sorghum halepense	Poaceae
28	Durra	Durra	Sorghum bicoour	Poaceae
29	Jungli Ganna	Jungli Ganna	Saccharum spontaneum	Poaceae
30	Jungli Rai	Jungli Rai	Sawa Echinochloa colonut	Poaceae
31	Muniyari	Gunar	Themeda caudata	Poaceae
32	Gunher	Gunher	Themeda quadrivalvis	Poaceae
33	Guned	Guned	Themeda triandra	Poaceae
34	Khas	Khas	Vetiveria zizanoides	Poaceae

Name of Villages Maximum/Minimum representation of the grasses around research area- Mandav region

S.N.	Name of the Village	Grasses Species found
1	Avaliya	**********
2	Bharudpura	**********
3	Faraspura	**********
4	Golpura	**********
5	Hugli	**********
6	Jirapur	**********
7	Kalighati	**********
8	Kakad Khoo	**********
9	lunhera khurd	**********
10	Nalcha	**********
11	Nilkhanteswar	**********
12	Panala	**********
13	Sarai	**********
14	Sulibaedi	**********
15	Tarapur	**********
		**********

Note - *Numbers of Grasses species present in Mandav region local villages.

In Grassland area of Mandu region (M.P.) Sehmia dichanthium type. Dominant species are Sehmia sulcatum, Sehmia nervosum, Dicnanthium annulatum, Chryspogan monatanus, Themeda quadrivalvis. Other common species are like Ischaemum rogosum, Iseilema laxum, Heteropogon c ontortus.

There are some grasses are present in nearby water bodies in mandu region Dactyloctenium aegyptium, Setaria verticillata, Lolium perenne, Panicum virgatum, Eleusina indica, Cyperus esculentus, Bothriochloa ischaemum.


Fodder Grass


Grazing Grass for animals


Grasses provide shelter for tribal pepole

RESULTS AND DISCUSION

The grass family is undoubtedly the most important plant family to mankind, agriculturally, economically and ecologically. It provides the major cereal crops and most of the grazing for wild and domestic herbivores. Various type of grasses found in Mandu region like Cyperus rotundus (Nut Grass), Cymbopogon martinii, Cynodon dactylon, Dichanthium annulatum, Eleusine indica, Eragrostis pilosa, Eragrostis tenella, Heteropogon contorius, Ishaemum pilosum, Penicum virgatun (Switch Grass), Pennisetum pedicellatum, Saccharum arundinaceae, Saccharum spontaneum, Sehima nervosum, Sorghum vulgare, Themeda caudata, Themeda quadrivalvis, Themeda triandra, Vetiveria zizanoides, Typha latifolia.

Present studies helpful for conservation of rare and less frequent species screening of economically important grasses like fodder essential oil will be helpful for industrialists which are directly related to the economy for upliftment of tribals and ruler people. Grassland are fragile. But why by working together, we will be able to enjoy the benefits of grasslands for years to come.

CONCLUSION

To conclude with the research paper the work of variety of grasses available area of the nearby the area of Mandav. Brought in a great amount of knowledge that this grasses had a lot of medicinal values and many were use as fodder for animals. Some as use of as thatched roof for the houses of the tribal people. Still research are going on various aspects of the grasses available in the Mandav region, This study was a small attempt to wider range of the properties available in tribal area.

Acknowledgment : I owe gratitude to my Guide **-** Dr. H. S. Dwivedi, & Prof. of Botany, Govt. Madhav Science P. G. College, Ujjain (M.P.),who guided me to making this paper I laso thank Dr. Pinky Dwivedi, Prof. of Botany, Govt. Madhav Science P. G. College, Ujjain (M.P.) to support me. I am specily thankful to forest department and my institutional staff Pro. Sushama Bhubvanedran Govt. Girls College Dhar (M.P.) helping me get information through their source which help me too write the paper with full information. I also owe my gratitude to all the villagers and tribal peoples during field survey to give me the information about the specialties of the grasses available in there region. Once again I thank each and everyone for helping me to write this research paper.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Ahmed Althaf K, Kabeer and Nair V J(2009) Flora of Tamilnadu, Grasses, BSI, Kolkata.

Ambastia Nirbhay (2016) Flora of Gautam Buddha Wildlife Sanctuary, Hazaribag, Jharkhand

Bor, N.L. 1960 The Grasses of Bwima, Ceylon, India and Pakistan, Pergamon Press, London.

Bor N.L. 1993 Common Grasses of the united provinces.

Clayton W.D. and Renvoize S.A. (1989). Genera Graminum : Grasses of the world Kew Ball. Addit. Ser. 13.

Chirstensen G. Victoria (2019) Grassland Biomes around the world.

Duthie, J.F. (1883). A list of the grasses of N.W. India, Indigenous and cultivated Roorkee.

Fischer CEC (1934). Gramineae, in J.S. Gamble's flora of Madras. Pt. X PP 1689 - 1864.

Gamble, J.S. (1896). The Bambuseae of British India, Anna Roy Bot. Gard. Calcutta 7 : XVII, 133.

Kabeer, K.A. and V. J. Nair (2009). Flora of Tamilnadu - Grasses, BSI Kolkata.

Kartithikeyan S, Jain S.K., Nayar MP and M. Sanjappa (1989). Flora IndicaeEnumeration :Monocotyledonae, BSI, Colcutta.

Moulik, S. (1997). The Grasses and Bamboos of India. Vol. 1 and 2 Scientific Publishers, Jodhpur.

Mudgal V, KhannaKK and Hajra PK. (1997): Flora of Madhya Pradesh, BSI Publication, Calcutta, India 2.

Naik, V.N. (1998). Flora of Marathwada District, AmrutPrakashan, Aurangabad MS Vol. 1 - 2.

Patel Yatin, DabgarYB and Joshi DN (2012); Distribution and diversity of Grass species in Banni Grassland, Kachh Dist. GujratIJSRR, 1 (1) 43 - 56.

Patunkar,B.W. (1980) Grasses of Marathwada, Scientific Publishers, Jodhpur.

PurohitChandan Singh and SumanC.Sharma, (2012).A Checklist of Grasses of North West Rajasthan. J.E. Co. Tax. Bot. Vol. 36, No 1, 166 - 176.

Rao, Ravi Prasad, B.P. Priyadarshine and K.V. Subbaihali (2011). Andropogonlividus (Poaceae) : A new distribution record for Andhra Pradesh. J. Eco. Tax. Bot. Vol 35, No. 3.

Ray S, and Saikhediya J. (2012). Diversity of Grasses in Nimar region, Madhya Pradesh Indian. J of plant sciences Vol. 1, 144 - 152.

Roy,G.P. (1984). Grasses of Madhya Pradesh Series - 4, Botanical Survey of India, Colcutta.

Samvatsar, S. (1996). The flora of Western Madhya Pradesh, Jodhpur.

Sing NP, KhannaKK, Mudgal V and Dixit RD (1997). Flora of Madhya Pradesh, BSI Publication, Calcutta, India 3.

Singh Ajay, Priyanka Singh, Yogini Devi, Ansari A.A. (2009). Grass weeds of cultivated fields in South Eastern Uttar Pradesh, J. Eco. Tax. Bot. Vol. 33 No. 1.

SinhaBK and ShuklaBK (2007). Synoptic flora of Khargone district Madhya Pradesh. Journal of Economic and Taxonomic Botany India 31 (2).

SinhaBK and ShuklaBK (2009). Synoptic flora of Khargone district Madhya Pradesh. Journal of Economic & Taxonomic Botany India 33 (1).

Mandu Tourism Pramotion Council, (2019). Mandav Kal ka Kolahal Aaj ki Khamoshi

Sharma P. D. (2016). Ecology and Environment

BOR N.L. (1993) Common Grasses of the united provinces.

IJLSCI INSTRUCTION FOR PREPARING THE MANUSCRIPT:

International Journal of Life Sciences publish research papers, case studies and short communications containing original research work of good standard and review papers of contemporary relevance from all over the world. Following types of contributions are considered for publication:
RESEARCH PAPERS (Full Length - Maximum of 12 pages-A/4 size).
CASE STUDIES
SHORT COMMUNICATIONS
REVIEW PAPERS including Mini Reviews

Author can send manuscript as an attachment on email to editorilsci@gmail.com OR editor@ijlsci.in. Manuscript format should be in MS word only. Charts, Tables and Diagrams should be in MS Excel or MS Word and images in JPG format using maximum possible 150 dpi resolution. All the matter should be typed in Times New Roman Font size - 12 point with single spacing.

AUTHORISATION AND DECLARATION

Authors must accept full responsibility for the content of their articles. The Members of the Editorial Board and the Publisher of the journal are not responsible for the statements and opinions expressed by the authors in their articles/write-up published in the journal. To use the copyrighted material (for example table, figure etc.), the author/s must seek the permission from the Author/s and Publisher of the material and send the copy of the permission letters via e-mail to the Administrative Editor for records. In case, if it is not possible than do not use that material.
While submitting the paper the author (s) must give a declaration that "the article has not been published or sent for publication elsewhere".

INSTRUCTIONS FOR MANUSCRIPT-FORMAT

a) Page Layout: A4 (21cm × 28 cm) leaving 2 cm margin on all sides of the text. All the text Should be single spaced and the pages should be numbered consecutively.
b) Use MS word (2003-2007) for text and TIFF, JPEG or Paint for figures.
c) The first page should contain:
Title-bold, 16 point size
Name/s of author/s-bold, 10 point size (Surname or Family name first in bold) Affiliation/s-address of all the author/s followed by email of corresponding author in 10 point size,
Abstract: up to 200 words in 10 point size
Keywords: at least 5 keywords in 10 point size
d)Main Text- The paper should be divided into the following sections:
Introduction, Material and Methods, Results and Discussion, Conclusion, Acknowledgement and References.
Tables and Figures of good resolution (150 dpi) should be numbered consecutively and given alphabetically by surname or family name in the order of their appearance in the text.
e) Reference style
Text: All citations in the text should refer to:
1. Single author: the author's name (without initials, unless there is ambiguity) and the year of publication;
2. Two authors: both authors' names and the year of publication;
3. Three or more authors: first author's name followed by "et al." and the year of publication.
Citations may be made directly (or parenthetically). Groups of references should be listed first alphabetically, then chronologically.
Examples: "as demonstrated (Baig, 2004a, 2004b, 2010; Chavhan and Pawar, 2011). Jadhao et al., (2000) have recently shown…

Reference to a journal publication:
Chavhan AB, Pawar SS, Jadhao RG and Patil KG (2013) Distribution of CC-chemokine receptor-5-Ä32 allele among the tribal and caste population of Vidarbha region of Maharashtra state, *Indian J Hum Genet*., 19 (1) 65-70.

A Book:
Durbin R, Eddy SR, Krogh A, Mitchison G (1999) Biological Sequence Analysis: Probabilistic Models of Proteins and Nucleic Acids. Cambridge University Press.

A Chapter in a Book:
Leach J (1993) Impacts of the zebra mussel (Dreissena polymorpha) on water quality and fish spawning reefs of Western Lake Erie. In Zebra mussels: biology, impacts and control, Eds., Nalepa, T. and D. Schloesser. Ann Arbor, MI: Lewis Publishers. pp: 381-397.

Report:
Makarewicz JC, Lewis T, Bertram (1995) Epilimnetic phytoplankton and zooplankton biomass and species composition in Lake Michigan, 1983-1992. U.S. EPA Great Lakes National Program, Chicago, IL. EPA 905-R-95-009.

Conference Proceedings:
Chavhan AB (2012) Biomedical Waste Management: Awareness and Practices among Healthcare Providers in Amravati". Proceeding of national conference on Recent Trends and Innovative Development in the Frontiers of Life Science. pp- 148-153. (ISBN-978-93-81733-04-2).

A Thesis:
Chavhan AB (2012) Genetic polymorphism of Chemokine receptors in some tribes of Vidarbha, Maharashtra. Ph. D. Thesis, RTM University, Nagpur,India;.

Web references:
As a minimum, the full URL should be given and the date when the reference was last accessed.

PROOFS

Proofs will be sent to the corresponding author via e-mail as an Acrobat PDF (Portable Document Format) which should be returned to the Editorial office within 2 working days.

PROCESSING FEES

Please send the Membership subscription or processing fees. Processing fees (Rs. 2500/- for India & US$ 125/- for Overseas) has to be paid every time when one submits the manuscript. Life members need not pay processing fees. If one is Annual member, then one can submit two manuscripts during the annual membership. If one submits more than three manuscripts in a year, one has to pay processing fees from fourth manuscript onwards.

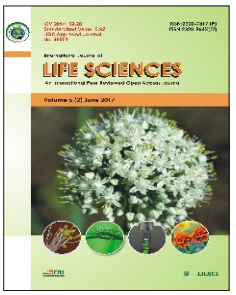
ISSN: 2320-7817 (Print) ISSN: 2320-964X (Online)
Journal home page : www.ijlsci.in

Contact : +91-997 055 9438
+91-942 077 5527

Since 2013

INTERNATIONAL JOURNAL OF LIFE SCIENCES

An international Peer Reviewed Open Access Journal
UGC Approved Journal No. 48951
46, Guruwandan, Jawahar Nagar, VMV Road,
Amravati- 444604



Membership form

The Editor,

I wish to be a member of **International Journal of Life Sciences (IJLSCI)** and agree to abide by the rules setup by you. The filled in proforma is:

(1) Full Name (in block letters) : .....
(2) Gender : .....
(3) Nationality : .....
(4) Working status and Department : .....
(5) Field of Research : .....
(6) Mailing Address : .....
(7) City:.....State: ..... Country:..... Pin:.....
(8) Phone (O):..... (R): ..... (M): .....
(9) E-mail : .....
(10) Nature of Subscription: Annual / Life / Fellow Membership.

MEMBERSHIP	ANNUAL		LIFE		FELLOW	
	Indian	Overseas	Indian	Overseas	Indian	Overseas
Individual :	INR. 3,500/-	US $ 250	INR. 15,000/-	US $ 550	INR. 25,000/-	US $ 850
Institutional :	INR. 4,500/-	US $ 350	INR. 25,000/-	US $ 850	INR. 35,000/-	US $ 1700

Mode of Payment

INRs./US$/Euro can be remitted by online payment/E-Money Transfer/Western Union Money Transfer/Cash mentioning Receipt No. and date.

DETAIL OF TRANSFER PROCESS IS AS FOLLOWS:

A/C NAME : **ARVIND CHAVHAN** MICR Code : **444002976**
A/c No. : **31033988127** Branch Code : **003866**
IFS Code : **SBIN0003866**
Branch Address : **State Bank of India, Old Biyani College Road Tapowan Road, Amravati Maharashtra 444602, India**

[For E-money transfer, please add INRs. 125/- (US$ 10) extra towards collection / service charges.
Payments should be made in the name of "**ARVIND CHAVHAN**"" **"My WU℠ #: 761786640"**]
Detail about Western Union Money Transfer Services is as follows:
Full Name of Receiver ARVIND BHIMRAO CHAVHAN
Full Address (Including City, Street & Postal Code)46, Guruwandan, Jawahar Nagar, VMV, Road, Amravati- 444604, India

Date: / /20 **Signature:** .....
Name : .....

Email this Membership form along with Scan copy of Fees deposit receipt to editorijlsci@gmail.com / editor@ijlsci.in

International Journal of Life Sciences

8th Year of Glorious Publication

Our Other Refereed Peer Reviewed Online Journal

International Research Journal of

SCIENCE & ENGINEERING

An International Peer Reviewed Open Access Online Journal

ISSN - 2322 0015

IMPACT FACTOR SJIF : 6.705

Published in Feb., April, June, Aug., Oct., Dec.

Editor-in-Chief :

Dr. Arvind Chavhan

https://www.ijlsci.in editor@ijlsci.in | info@ijlsci.in

+91-9420775527 +91-9970559438

/Irjse

International Journal of Life Sciences

ISSN- 2320-7817 | eISSN :2320-964X

46, Guruvandan, Jawahar Nagar,VMV Road

Amravati - 444 604.

https://www.ijlsci.in editor@ijlsci.in | info@ijlsci.in

+91-9420775527 +91-9970559438

Follow us: /ijlsci

ISSN : 2320 - 7817