International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2021; 9 (3):337-341
ISSN:2320-7817(p) | 2320-964X(o)

Research Article Open Access

Histological changes in the ovary of *Catla catla* exposed to lethal concentration of *B. aegyptiaca* root.

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Manuscript details:

Received: 14.06.2020
Accepted: 27.08.2021
Published: 30.09.2021

Cite this article as:
Kajalkar RR and Jadhao RG (2021) Histological changes in the ovary of *Catla catla* exposed to lethal concentration of *B. aegyptiaca* root, India, *Int. J. of Life Sciences*, 9 (3): 337-341.

Available online on http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

20 fresh water fish *Catla catla* of both sexes were purchased from local fisherman. They were kept in aquaria and well aerated. The differential acute toxicity of water extracts of *B. aegyptiaca* root on fish *C. catla* were carried out under laboratory conditions. The LC_{50} after 96 h of exposure for water extracts of *Balanites aegyptiaca* root were9.00, 11.00 and 13.00 mg/L, respectively. These values showed that water extracts of *Balanites aegyptiaca* root was more toxic. Histological alteration in the ovary tissues showed lesion, necrosis, malignancy, cellular degeneration and inflammation, when the fish were exposed to various concentrations (9.00 mg/L, 11.00 mg/L and 13.00 mg/L) of water extracts of *B. aegyptiaca* root for a period of 96 h revealed that root of *B. aegyptiaca* may be toxic to fish *C. catla*as characterized by severe degeneration of ovary cells.The study concluded that caution must be taken in the disposal of this plant in water bodies as extended exposure time and at higher concentrations could pose adverse effect on the fish *Catla catla*.

Keywords: Histology, *Balanites aegyptiaca*, *Catla catla*.

INTRODUCTION

Water pollution, has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. Urban, agricultural and industrial activities release xenobiotic compounds that may pollute the aquatic habitat. Industrialization and growth of human population have led to a progressive deterioration in the quality of the earth's environment. Schwarzenbach *et al.,* (2006) reported that about 300 million tons of synthetic compounds seep annually into water systems (rivers, lakes and sea) leading to water pollution. Pollution of water sources due to chemicals plays a primary role in the destruction of ecosystems. To improve the quality of aquatic ecosystems, it is necessary to know how the rivers and lakes are impaired and what factors caused the environmental deterioration.

Acute toxicities have been measured for many species in variety of ecological systems and most of the commonly used pesticides against Rainbow trout, Blue gills, Sun fish and the gaps are being filled for other species, such as channel fish, some cyprinids and salmons was reported by some authors (Koprucu *et al*., 2006). Test organisms to be used for acute toxicity test must be ecologically important, occupy trophic position leading to humans or other important species, and have adequate background biology, be widely distributed, be genetically stable, have its early stages (larvae, fry, and juveniles) available throughout the year and be sensitive (Ernest Hodgson, 2004). *Catla catla* (Hamilton) is one of the major fresh water carps native to India, Bangladesh, Myanmar, Nepal, and Pakistan and introduced in many other countries as exotic species. *C. catla* is a very rich source of proteins and is reported to attain a maximum size of 182 cm and weight of about 50 Kilograms. It is a surface and mid-water feeder, mainly omnivorous with juveniles feeding on aquatic and terrestrial insects, detritus and phytoplankton. It has a characteristically large, upturn-ned mouth with a prominent protruding jaw. Because of its high nutritive value, it is a highly priced food fish and of great demand in the market. The physical and chemical changes in aquatic environment often cause some physiological changes in fish, thus, the water quality of an aquatic body is very crucial because it determines the productivity and other parameters necessary for the fish survival (Fafioye, 2001).

Since prehistoric times, various cultures throughout the world have used piscicidal plants for fishing. Plants are regarded as inexhaustible sources of structurally diverse and biologically active substances (APHA, 1976). Fossil record dates back the use of plants by man for various purposes including medicinal use (Bhatt, J.P. 1991). There are various methods to capture fish from water. These include the use of hooks, net, setting of traps with baits, use of chemical substances and the use of plants and plant products (Fafioye*et al.,* 2004). These methods seem cheap and affordable hence commonly practiced by fisher's folk all over the world. Histology can be used as biomonitoring tools for health in toxicity studies. Histological alterations are biomarkers of effect exposure to environmental stressors, revealing alterations in physiological and biochemical function. Histopathology, the study of lesions or abnormalities on cellular and tissue levels is useful tool for assessing the degree of pollution, particularly for sub lethal and chronic effects. Due to residual effects of pesticides, important organs like the kidney, liver, gill are the first organs to be damaged (Rahman *et al.,* 2002).

In the present study, an attempt has been made to observe possible toxicity and histological changes in vital organ such as ovary of the fish *Catla catla* (Hamilton) exposed to lethal concentrations of plant *Balanites aegyptiaca* root extract for 96h.

MATERIALS AND METHODS:

Roots of *B. aegyptiaca* are collected from local area near to the Daryapur. After shade drying the plant material was grounded into powder using pestle and mortar. One liter of distilled water was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3-5 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible. The extracted liquid was subjected to water bath evaporation to remove the solvent. The water bath temperature was adjusted to 400^0 C. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening while the rest was use for the susceptibility test.

The adult specimens of *Catla catla* were collected from the local market and brought to the laboratory. So for this experiment, fish are acclimatized in glass aquarium for 10 days. The survived fish are maintained in aerated condition and are fed regularly with fish food. The water is replaced every week and replaced with declorinated water. Faecal material and debris, if any, is also removed as and when necessary.

Lethal concentration of 09.00 mg/l, 11.00 mg/l and 13.00 mg/l was selected for this experiment. Ten fishes were exposed to each concentration. Along with this, appropriate control was maintained for each test. The mortality did not exceed 5% during the test period in control. Survival and mortality percentage were tabulated after 24, 48, 72 and 96 hrs.
For the lethal toxicity test, the fresh water fishes were divided in two groups as follows.

Group I: - Control group of *Catla catla*
Group II: - Fishes *Catla catla* were exposed to lethal concentration of root water extract.
To determine structural changes in internal tissues such as ovary of both control and exposed fishes of lethal concentration were examined histologically.

RESULTS AND DISCUSSION

For lethal concentration at control there are no lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degeneration seen for the 24hrs, 48hrs, 72hrs, and 96hrs (Fig-1.1).While at 9.00mg/l inflammation of epithelial layer for 96hrs while no lesion, no inflammation, no necrosis, no pigments, no malignancy, and cellular degradation seen for the 24hrs, 48hrs and 72hrs(Fig-1.2).At 11.00mg/l inflammation on epithelial layer for 48hrs, for 72hrs lesion occurs on epithelial layer, while for 96hrs lesion occurs in epithelial layer and follicle cells and for 24hrs no lesion, no inflammation, no necrosis, no pigments, no malignancy and cellular degradation seen(Fig-1.3).At 13.00mg/l inflammation occurs on epithelial layer for 24hrs, for 48hrs lesion occurs in epithelial layer and follicle cells while, for 72hrs necrosis occurs in epithelial layer and lesion on follicle cells and oocytes and for 96hrs cellular degradation of epithelial layer and necrosis occurs on follicle cells and oocytes(Fig-1.4).

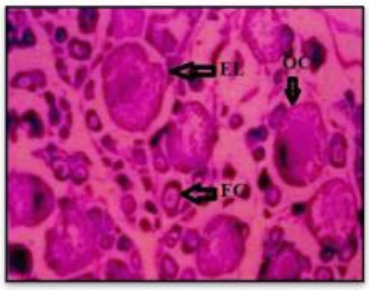

Fig. 1.1: Ovary (Section) of *Catla catla* exposed to lethal concentration (control) of root water extract of *B.aegyptiaca*.
Fig.-Ovary of *Catla catla* **(Control). EL**: epithelial layer, **FC**: follicle cellsand**OC**: oocytes. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration(C).

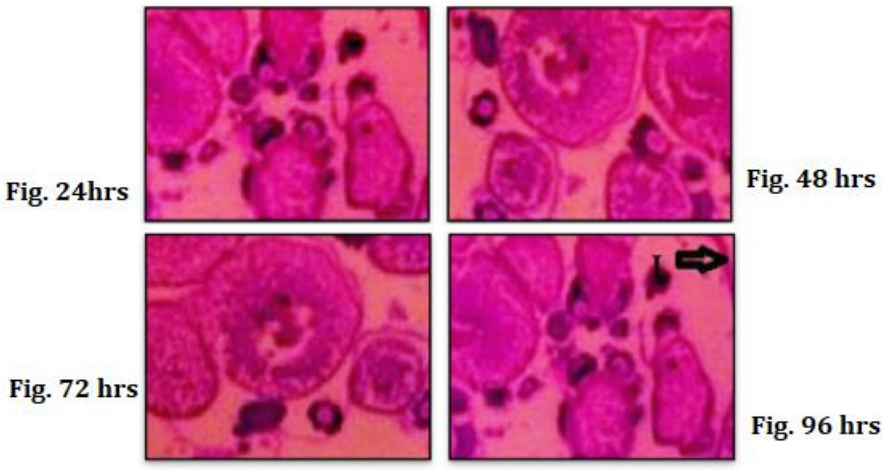

Fig-1.2: Ovary (Section) of *Catla catla* exposed to lethal concentration (9.00 mg/l) of root water extract of *B.aegyptiaca* showing lesion (L).

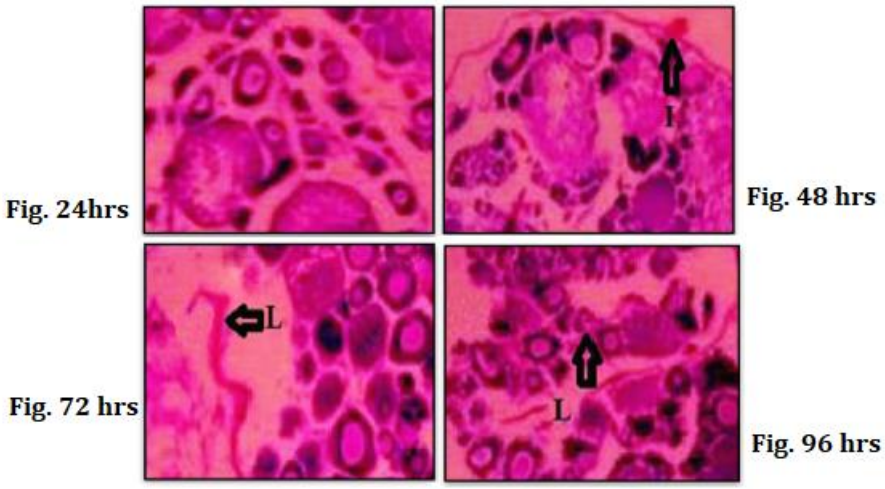

Fig-1.3: Ovary (Section) of *Catla catla* exposed to lethal concentration (11.00 mg/l) of root water extract of *B.aegyptiaca* showing lesion (L) and inflammation (I).

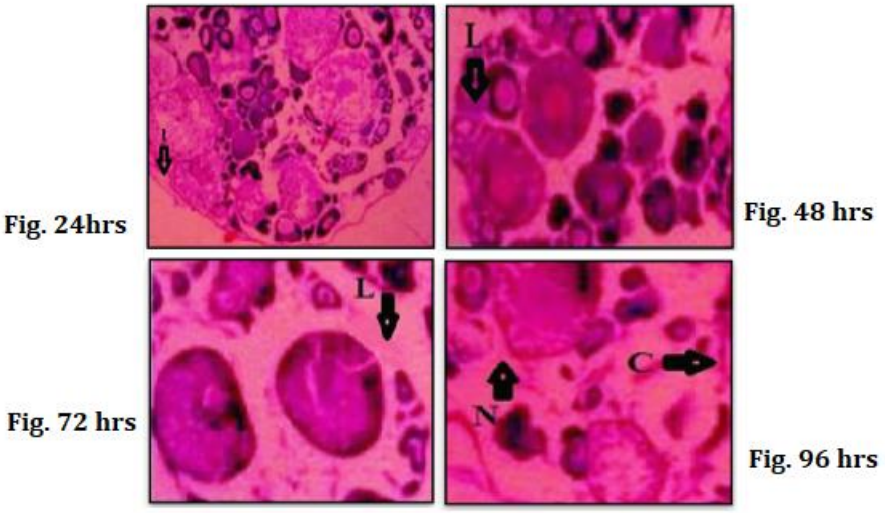

Fig-1.4: Ovary (Section) of *Catla catla* exposed to lethal concentration (13.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L), inflammation (I),necrosis (N), and cellular degeneration(C).

In the present investigation the ovary of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed inflammation and lesion of epithelial layer and follicle cells during low concentration while, increasing concentration for different time exposure showed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes were seen at later time of exposure (Fig-1.2 to 1.4).

In the present investigationshowed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes in lethal and sub-lethal concentration. Similar observations agree with the finding of (Khillare, 1992) observed oocyte maturation and arrest of oocyte development in tertiary yolk stage. Lee and Yang, (2002) observed at the dose of 100 ppm of sumithion, fragmented ova with abnormal shape and arrangement in the experimental fish as compaired to normal.

CONCLUSION

The present study proves the toxic potential of the plant root extract and shows moderate to severe alterations inovary tissues which can lead to metabolic changes in the fish. The results of the present study clearly indicated that piscicides have a direct impact on the structural alterations in *Catla catla*. The plant root extract is known to impair the metabolic and the physiological activities of the organism and through

repeated exposure the piscicides tends to accumulate in its tissues even atlethal concentration.

Conflicts of Interest: The authors declare no conflict of interest.

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