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RESEARCH ARTICLE

AN OVERVIEW OF AEROBIOLOGY OVER GROUNDNUT CROP AT PATAN (M.S)

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ABSTRACT

An aerobiological investigations have been carried out over groundnut crop field for two consecutive seasons from (July2011 to November 2011) kharif and from (January2012 to May 2012) summer, using Tilak air sampler. Comparative study of these two seasons revealed abundant total airspora during kharif (rainy) (447594) as compared to summer season (178430) comprising 95 spore types which exhibited monthly variation during both the seasons. Observations of Kharif season revealed that the total spore load was maximum during October 2011(248122) as compared to the total of remaining three months (165396) which may be due to heavy rain fall during October 2011, other congenial conditions and incidence of 24 types of ascospores released due to rains. Thus ascospores acted as bio indicator of heavy rainfall.Highest spore count has been recorded on 13 th October 2011 (88270) which was due to 655,2mm rainfall, 250C temperature and 65% RH on preceding day 12th October 2011 and 25 mm rainfall on same day, which was responsible for release of ascospores. Thus environmental parameters have played significant role on the spore load; this was coincided with maximum incidence of foliar diseases like Tikka disease and Rust of Groundnut and higher percentage contribution of pathogens of these diseases. Deuteromycotina has been found to be dominant class (58.19%) followed by Ascomycotina(18.81%), Basidiomycotina (10.89%), other types (9.19%), Phycomycotina (2.26%) and Myxomycotina (0.62%). Dominant spore types in descending order have been found to be *Cladosporium* (15.53%), *Aspergillus* (9.19%) and *Nigrospora* (6.23%) and least in occurrence have been found to be *Ceratosporium* (0.004%) and others in between. These investigations may be helpful in laying down some basic principles required for disease forecasting system of important diseases of groundnut to save crop losses and yield of crops due to diseases at Patan.

Keywords : Aerobiology, Groundnut, Environmental parameters, Diseases, Patan

INTRODUCTION

Patan is located in the vicinity of Koyana Dam and is earthquake prone area situated at 17022'30"North latitude and 73054'10" Longitude and above 2200-feet from main sea level having heavy rainfall around 3000 mm per annum. Gregory (1952) proposed the term Aerospora to describe airborne pollen grains and fungal spores. Agarwal (1969), elaborated significant role of fungal spores on plant diseases. Vegetation as well as biogeographical zone determines the fungal spores of respective area. The concentration of fungal spores is determined by time, day, weather parameters and seasons.Aerobiological studies have been selected due to its lack in this region, for qualitative and quantitative estimation of general and pathogenic airspora over an oil seed and fodder cash crop like groundnut as extramural investigation have been carried out from 11th July 2011 to 18 th November 2011 and summer season from 1 st January 2012 to 18 th May2012 over groundnut crop fields. (Table.1)

Groundnut (*Arachis hypogaea* L.) belongs to family Fabaceae is an important oil seed cash crop in tropical and subtropical countries of the world. India is major country in groundnut production 4.19 million hector of land under groundnut production in India. Gujarat, Rajasthan, Maharashtra are major groundnut producing states in India. Groundnut crop is affected

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by some airborne fungal diseases. The present investigation deals with study of concentration of aerospora over groundnut field at Patan.

Many scientists studied diseases of groundnut thoroughly. (Chahal et al.1971), Shanta.P, (1960), Quazi, ((1985), Sulaiman and Agashe (1965), Woodroof (1933), Mahajan and Pande (2002), Kadam.et al (2008) Mali and Gaikwad (2011) and focused aerobiological investigations over groundnut crop and its diseases. Aerospora of groundnut with various parameters has been studied by many Kalkar and Patil (1997), Mallaiah (1989), Aher et al. (2002), Arsule and Pande (2011), Jadhav et al (2010).

Crop is affected by many pathogens which are mainly uneven in distribution irrespective of vegetation cover and climatic conditions. The Tikka disease and Rust disease are caused by *Cercospora arachidicola* (Hori) and *Cercospora personatum* (Berk and Curt) *Deighton*, and *Puccinia arachidis speg* respectively. Rust disease was first reported by Chahel and Chahan (1971).The pathogen attacks the leaves of crop, other important but less frequent diseases of groundnut are leaf spot caused by *Leptosphaerulina crassica* (sechet) Jackson and bell, *Alternaria alternata* (FY) *Keissler* and *Myrothesium* rode ex. The disease is spread only through the air by outbreak of epiphytotics.

MATERIAL AND METHODS

Aerobiological investigation has been carried out over groundnut (variety S.B.11) field at two different sites at Kaloli and at Meshtewadi of Patan. Sampling was carried by using continuous volumetric Tilak Air Sampler, installed in groundnut field at 1.5 meter height from Ground at Patan. Slides have been prepared and scanned. Identification was done by using authentic literature, photographs, reference slides etc. Daily meteorological data has been maintained.

RESULTS & DISCUSSION:

During both the seasons, total 95 bio components including various types of fungal spores of saprophytic fungi, pathogenic fungi, and other biocomponents like pollen grains, plant parts, fungal hyphae, algal filaments, mites, protozoan cyst, insect parts and other unidentified fungal spores were observed. Two types from Myxomycotina , four types from Phycomycotina,25 types from Ascomycotina , 5 types from Basidiomycotina, and 51 spore types Deuteromycotina types while 8 different types of biocomponents have been recorded over groundnut crop field. Table .3. Class wise percentage contribution during both seasons revealed the group Deuteromycotina has been found to be dominant with 54.80% and 66.70%. Followed by Ascomycotina with 23.40% and 7.29%. Basidiomycotina with 11.34% and 9.76%, other types 7.48% and 13.49%. Phycomycotina 2.28% and 2.21% and Myxomycotina 0.60% and 0.52% spore contribution to the total air spora of two seasons have been encountered respectively.

Percentage contribution of airspora was more during Kharif (71.49%) as compared to summer (28.50%) as there was no single spore free day, during both the seasons. Maximum spore load has been encountered during October 2011 as Compare to other months. According to seasonal variation 36.95% spore load was recovered in south west monsoon that is (July to August 2011)and 74.04% spore load was observed in retreating monsoon (September to November 2011).

Table 1-seasonwise duration of groundnut crop and sampling

Sr. No	Season	Variety	Date of Sampling	Sowing Date	Harvesting Date	Date Sampling Stopped	Days	Place
1	Kharif	S.B.11	11 July 2011	18 July2011	10 Nov 2011	18 Nov 2011	128	Kaloli
2	Summer	S.B.11	1 Jan 2012	8Jan 2012	20 May 2012	28 May 2012	118	Meahtewadi

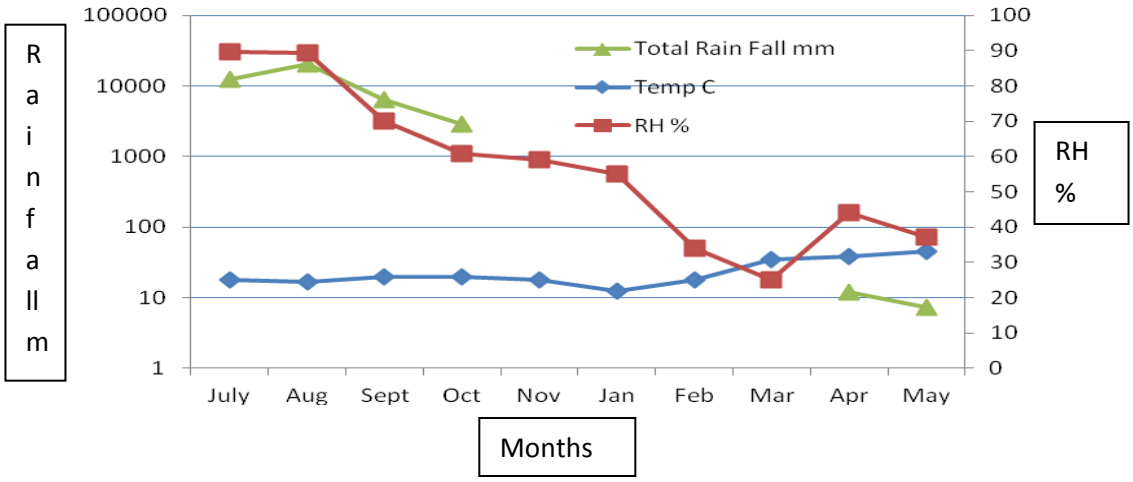

Fig. 1: Meteorological Data

Table 2 : Monthly concentration of airborne pathogenic spores over ground nut crop field during 1st and 2nd season in relation to meteorological parameters

Spore	Parameters										
	Ave.	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Jan**	**Feb**	**Mar**	**Apr**	**May**
	Temp^0 c	25.14	24.6	26	26	25.13	22	25	30.8	31.8	33.12
	RH %	89.54%	89.48%	70%	60,8%	59.13%	55%	34%	25%	44.11%	37.2%
	Total rainfall	12218 mm	20412 mm	6350 mm	2872 mm	-	-	-	-	12 mm	7.2 mm
Cercospora	-	630	2282	4676	21882	616	98	280	336	182	616
Alternaria	-	784	896	1288	8218	1764	1652	3150	1120	252	560
Puccinia	-	2128	2072	2268	4872	1610	2324	2756	518	210	-

During summer season 57.20% spores have been encountered in cold season (Jan and Feb) and rest 42.79% in hot months of summer (Mar to May) 2012).(Graph 1).

Some spores have been found to occur constantly during both the seasons include *Cladosporium, Alternaria, Aspergillus, Nigrospora, Periconia, Curvularia*. Among all the spore types, Cladosporium, (12.13%and 24.04%), followed by *Aspergillus* (8.52%and 10.86%). (table 3), *Nigrospora, Alternaria* found abundant while *Drechslera* was dominant in summer season. Our finding correlates with A Janaki Bai and Subba Reddi (1981) there is high incidence of airspora in this region because of congenial environmental conditions like rainfall, Temperature, relative humidity and abundance of substratum from thick forest litter around. Observation of *Pringsheimia* revealed interesting findings during kharif season its percentage contribution has been 7.75% (34692) only, while during summer crop season it is 0.18% (336) only. This indicates that it belongs to wet airspora group hence found in prominently more percentage during kharif season having congenial conditions for *Pringsheimia* (average temp.25.20c, average RH-74%,Total rain fall 4441mm).During summer season due to unfavourable condition (31 mm rainfall, 33.10c and RH 44%).(Table.2).

Table 3: Reaveals season wise comparative concentration and percentage contribution of each spore group and spore type during two kharif season over groundnut crop fields from 11 July 2011 to Nov 2011 and 1 January 2012 to 18 May 2012

Sr. No.	Name of Spore	Kaloli	%contribution/m3	Meshtewadi	%contribution/m3	Total	%
	Myxomycetes						
1	*Physarum*	1526	0.3409	770	0.431542	2296	0.36676
2	*Stemonitis*	1470	0.3284	168	0.094155	1638	0.26165
			0		0	0	0
	Total	**2996**	**0.6694**	**938**	**0.525696**	**3934**	**0.62841**
	phycomycetes						
1	*Albugo*	3402	0.7601	1918	1.074931	5320	0.84981
2	*Circinella*	966	0.2158	406	0.22754	1372	0.21916
3	*Cunnighemella*	4172	0.9321	630	0.35308	4802	0.76706
4	*Sclerospora*	1708	0.3816	994	0.557081	2702	0.43161
						0	0
	Total	**10248**	**2.2896**	**3948**	**2.212632**	**14196**	**2.26764**
	Ascomycetes						
1	*Ascospores*	1498	0.3347	1302	0.729698	2800	0.44727
2	*Bitrimonospora*	1848	0.4129	1400	0.784621	3248	0.51883
3	*Calospora*	630	0.1408	476	0.266771	1106	0.17667
4	*Cheatomium*	2702	0.6037	364	0.204002	3066	0.48976
5	*Claviceps*	4144	0.9258	56	0.031385	4200	0.6709
6	*Cucurbit aria*	42	0.0094	588	0.329541	630	0.10064
7	*Dydimospheria*	4410	0.9853	1190	0.666928	5600	0.89453
8	*Hypoxylon*	3164	0.7069	574	0.321695	3738	0.5971
9	*Hysterium*	7042	1.5733	826	0.462927	7868	1.25682
10	*Leptosphaeria*	21056	4.7043	1624	0.910161	22680	3.62286
11	*Lophiostoma*	168	0.0375	14	0.007846	182	0.02907
12	*Masarina*	0	0	112	0.06277	112	0.01789
13	*Melanospora*	420	0.0938	56	0.031385	476	0.07604
14	*Metasphaeria*	5712	1.2762	252	0.141232	5964	0.95268
15	*Otthia*	84	0.0188	126	0.070616	210	0.03355
16	*Parodiella*	434	0.097	42	0.023539	476	0.07604
17	*Passaraniella*	336	0.0751	70	0.039231	406	0.06485
18	*Pleospora*	10430	2.3302	2632	1.475088	13062	2.0865
19	*Pringsheimia*	34692	7.7508	336	0.188309	35028	5.59531
20	*Rosellina*	518	0.1157	182	0.102001	700	0.11182
21	*Sordaria*	4186	0.9352	28	0.015692	4214	0.67314
22	*Sporormia*	420	0.0938	84	0.047077	504	0.08051
23	*Teichospora*	476	0.1063	490	0.274617	966	0.15431
24	*Valsaria*	196	0.0438	196	0.109847	392	0.06262
25	*xylaria*	168	0.0375	0	0	168	0.02684
			0		0	0	0
	Total	**104776**	**23.409**	**13020**	**7.296979**	**117796**	**18.8165**

Table 3: Continued

Sr. No.	Name of Spore	Kaloli	%contribution/m3	Meshtewadi	%contribution/m3	Total	%
	Basidiomycetes						
1	*Basidiospores colour*	6146	1.3731	4242	2.377403	10388	1.65936
2	*Basidiospores hyaline*	14588	3.2592	2842	1.592781	17430	2.78424
3	*Ganoderma*	2184	0.4879	112	0.06277	2296	0.36676
4	*Rust spore*	12950	2.8932	5628	3.154178	18578	2.96762
5	*Smut spore*	14896	3.328	4606	2.581404	19502	3.11522
6	*Urodospores*	0	0	0	0	0	0
			0		0	0	0
	Total	**50764**	**11.342**	**17430**	**9.768537**	**68194**	**10.8932**
	Deuteromyctes						
1	*Alternaria*	12950	2.8932	6734	3.774029	19684	3.14429
2	*Aspergillus*	38164	8.5265	19390	10.86701	57554	9.19358
3	*Beltrania*	336	0.0751	420	0.235386	756	0.12076
4	*Beltraniella*	224	0.05	126	0.070616	350	0.05591
5	*Bipolaris*	84	0.0188	0	0	84	0.01342
6	*Bispora*	3780	0.8445	2352	1.318164	6132	0.97952
7	*Botriodiplodia*	28	0.0063	70	0.039231	98	0.01565
8	*Ceratosporium*	28	0.0063	0	0	28	0.00447
9	*Cercospora*	30086	6.7217	1512	0.847391	31598	5.04741
10	*Cladosporium*	54334	12.139	42910	24.04865	97244	15.5336
11	*Clasterosporium*	238	0.0532	126	0.070616	364	0.05814
12	*Cordana*	686	0.1533	686	0.384464	1372	0.21916
13	*Coryneospora*	1638	0.366	350	0.196155	1988	0.31756
14	*Curvularia*	7742	1.7297	3598	2.016477	11340	1.81143
15	*Darluka*	448	0.1001	448	0.251079	896	0.14313
16	*Deigtonella*	126	0.0282	182	0.102001	308	0.0492
17	*Diplocladiella*	42	0.0094	0	0	42	0.00671
18	*Diplodia*	350	0.0782	476	0.266771	826	0.13194
19	*Drechslera*	1120	0.2502	1274	0.714005	2394	0.38241
20	*Epicoccum*	7350	1.6421	1652	0.925853	9002	1.43796
21	*Exosporoium*	1218	0.2721	0	0	1218	0.19456
22	*Fusariella*	1442	0.3222	252	0.141232	1694	0.2706
23	*Fusarium*	2436	0.5442	168	0.094155	2604	0.41596
24	*Gilmanigella*	0	0	126	0.070616	126	0.02013
25	*Haplosporella*	462	0.1032	294	0.16477	756	0.12076
26	*Helicomyces*	182	0.0407	294	0.16477	476	0.07604
27	*Helminthosporium*	2674	0.5974	1232	0.690467	3906	0.62394
28	*Heterosporium*	672	0.1501	392	0.219694	1064	0.16996
29	*Hirdunaria*	126	0.0282	28	0.015692	154	0.0246
30	*Lacellina*	3052	0.6819	518	0.29031	3570	0.57027

Table 3 : Continued

Sr. No.	Name of Spore	Kaloli	%contribution/m3	Meshtewadi	%contribution/m3	Total	%
31	*Mennoniella*	854	0.1908	0	0	854	0.13642
32	*Nigrospora*	30856	6.8937	8176	4.582189	39032	6.2349
33	*Odium*	322	0.0719	686	0.384464	1008	0.16102
34	*Penicillium*	1330	0.2971	4844	2.71479	6174	0.98622
35	*Periconia*	8162	1.8235	7280	4.080031	15442	2.46668
36	*Pestilotia*	1540	0.3441	686	0.384464	2226	0.35558
37	*Pithomyces*	11256	2.5148	1820	1.020008	13076	2.08874
38	*Pseudotorula*	2338	0.5223	1386	0.776775	3724	0.59487
39	*Pyricularia*	1036	0.2315	0	0	1036	0.16549
40	*Sirodesmium*	112	0.025	294	0.16477	406	0.06485
41	*Spegazzinia*	1050	0.2346	1260	0.706159	2310	0.369
42	*Spermospora*	2114	0.4723	0	0	2114	0.33769
43	*Spicaria*	434	0.097	70	0.039231	504	0.08051
44	*Sporidesmium*	84	0.0188	238	0.133386	322	0.05144
45	*Stemophillium*	56	0.0125	84	0.047077	140	0.02236
46	*Stigmina*	784	0.1752	168	0.094155	952	0.15207
47	*Tetracoccosporium*	630	0.1408	1302	0.729698	1932	0.30861
48	*Tetraploea*	462	0.1032	826	0.462927	1288	0.20574
49	*Torula*	9030	2.0175	3290	1.84386	12320	1.96798
50	*Tricoconis*	280	0.0626	462	0.258925	742	0.11853
51	*Tryblidium*	574	0.1282	532	0.298156	1106	0.17667
			0		0	0	0
	Total	**245322**	**54.809**	**119014**	**66.70067**	**364336**	**58.1984**
	Other type						
1	Fungal hypae	15414	3.4437	4788	2.683405	20202	3.22703
2	Insect parts	4200	0.9384	4676	2.620636	8876	1.41784
3	Pollen grain	1638	0.366	5040	2.824637	6678	1.06673
4	Protozoan cyst	1806	0.4035	1036	0.58062	2842	0.45398
5	Algal filaments	952	0.2127	532	0.298156	1484	0.23705
6	Mites	84	0.0188	28	0.015692	112	0.01789
7	Plant part	6958	1.5545	5012	2.808945	11970	1.91207
8	unidentified	2436	0.5442	2968	1.663397	5404	0.86323
			0		0	0	0
	Total	**33488**	**7.4818**	**24080**	**13.49549**	**57568**	**9.19581**
	Grand total	**447594**	**100**	**178430**	**100**	**626024**	**100**

CONCLUSION:

It may be concluded that kharif airspora and pathogenic airspora has been found to be abundant may be because of favourable meteorological parameters like heavy rainfall, high humidity and moderate temperature while quite less during summer crop season due to hot condition with high temp., less humidity, accompanied by minimum scanty total rainfall. In kharif season, the Tikka disease caused by *Cercospora arachidicola* and rust by *Puccinia arachidis* were prominent whereas the traces of diseases were not encountered during summer season of groundnut field.

Thus meteorological parameters have been found to play detrimental role in incidence of airspora and due to heavy rainfall wet airspora has been found abundantly as compare to dry air spora apart from constant air spora.

REFERENCES:

1) Agarwal M. K. (1969),Studies on the allergenic fungal spores of Dehli, India, Metropolitan area, *J.Allergy*, 44:193-203.
2) Aher S.K, S.V.Thite and B. N. Pande (2002) Fungal airspora of a groundnut field *Eco. Env. & Cons* 8(3) PP 283-288.
3) A Janaki Bai and Subba Reddi (1981) The fungus airspora of Visakhapatnam. *Proc. Indian nat. Acad* B47 No 5 pp .731-747.
4) Arsule C.S. and Pande. B.N. (2011) fungal airspora over the groundnut fields at Newasa. *Bionand Fronier*, vol. 4 (2) July- Dec 2011.
5) Gregory (1952) fungal Spores. *Trans. Brit. Mycol. Soc*., 35: 1 - 18.
6) Kadam R.M. N. J. M. Reedy, B. S. Jadhav and V.S. Nagpur (2008) Aerobiological approach to leaf spot and rust disease of groundnut (Arachis hypogaea L.) *Internat. Jr of Pit. Protection. Vol* 1 No 2.63-65.
7) Kalkar S.A. and G.V. Patil (1997) fungal airspora over the groundnut fields at Nagpur Aerobiology Proceedings of the 5th international conf. Bangalore 1994 (Ed SN Agashe) 249- 254.
8) Mahajan .M.C. & B. N. Pande (2002) Atmospheric Incidence of Rust Spores over groundnut fields *Eco. Env. & Cons* 8 (3) PP 257—259.
9) Mali N.S. and Gaikwad Y. B. (2011) Studies in pathogenic airspora and epidemiology of groundnut crop at Solapur during two Kharif seasons. *Bioscience Discovery* Vol 02, No 1, Jan. 2011.
10) Mallaih K.V. (1989) Aerobiology of Cercospora species pathogenic to crop plants. Recent Res. *Eco. Env. & poll* 3 67-78.
11) Quazi. S.M. (1985) Aerobiological approach to some crop diseases. PhD Thesis .Marathwada University Aurangabad.

Sreemulu T. (1967) Aerobiology in India *J. Science Indus*. Res 26:474-480.

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