



### STUDIES IN PATHOGENIC AIRSPORA AND EPIDEMIOLOGY OF GROUNDNUT CROP AT SOLAPUR DURING THE SUMMER SEASONS



**N. S. Mali**

Department of Botany, Shankarrao Mohite Mahavidyalaya, Akuj Dist.Solapur (M.S.)

#### ABSTRACT:

*Aarchis hypogaea*. Linn. is an important oil seed crop of Maharashtra. It is cultivated in both summer and kharif season in Solapur District. The bunchy variety SB-11 of groundnut was selected for aerobiological studies and the site selected for the study was a village Dadpur of Solapur District. For the occurrence of Pathogenic fungal spores and the incidence of disease, the aerial survey was carried out over the groundnut fields during summer seasons of the year 1991 and 1992 with the help of Volumetric Tilak Air Sampler. The meteorological data for the concerned period was obtained from Mahatma Phule Agriculture College, Solapur. The total number of biocomponents trapped by the sampler was 76 out of which 45 were pathogenic fungal spores. Other types included 31 types like saprophytic fungal spores, hyphal fragments, Pollen grains, nematode cysts and insect parts. In all, 45 different types of plant pathogenic fungal spores were trapped of which 3 types belonged to the class Phycomycetes, 11 to Ascomycetes, 2 to Basidiomycetes and 29 to Deuteromycetes. The spores like

*Cladosporium. sp*, *Alternaria. sp*, *Helminthosporium.sp*, *Aspergillus. sp*, *Nigrospora. sp*, *Drechslera. sp*, *Geotrichum. sp*, *Fusarium. sp*, *Curvularia. sp*, were the dominant types recorded from the air during two summer seasons. The epidemiological study was carried out during the period of investigation in which, the pathogenic spores like *Alternaria. sp*, *Puccinia. sp*, *Cercospora. sp*, *Aspergillus. sp*, *Fusarium.sp*, produced the diseases in crop.

**KEY WORDS:** Aerobiology, SB-11.Meteorology, Dadpur.

### INTRODUCTION:

Groundnut (*Arachis hypogaea*. L-family Fabaceae) is one of the important oil seed crops of Maharashtra and is grown in both summer and kharif seasons. The crop is generally infected by *Puccinia arachidis* sp. which is responsible for pod yield losses to the tune of 50% one or more itself or combined with other Pathogens. The fungal spores like *Cercospora personata* Ell and Ev, *Cercospora arachidicola* Hori, *Alternaria arachidis* Kulkarni, *Aspergillus niger* Van Tiegh, *Fusarium solani* (Mart) Sacc, (Maillaiah.1982) infected the crop and decreased the yield. All these spores are thought to be the only source of inoculums and development of the fungal diseases.

The out break of the diseases is mainly governed by the environmental factors. Any kind of aerobiological work was not carried out by anybody from this region. Hence it was felt necessary to carry out the present research work.

### MATERIALS AND METHODS

Aerobiological study was undertaken during the summer seasons of the year 1991-92 over the groundnut fields with the help of Tilak Air Sampler (Tilak.S.T.1988). The sampling site (Dadpur village) selected was west to and 14 kms away from Solapur city. Groundnut variety (early) SB-11(bunchy) was sown (40kg/acre) in the field during summer seasons of the year 1991 and 1992. Volumetric Tilak Air Sampler was installed on a table in the middle of groundnut field at the height 2.5 ft above the crop pointing the orifice towards the east. The fungal spores were trapped on the cello tape which was fixed on the rotating disc inside the Tilak air sampler. Air sampling was carried out about 123-125 days during each summer season. Sampling was started one week before the sowing and continued up to one week after harvesting the crop. The crop was harvested after about 110 days in each season. During the sampling period, the cello tape was removed once a week from the sampler and cut in to 8 equal parts, each part representing 24 hours spore trap. Each part was further divided in to two equal parts i.e. one part representing day spora and other night spora. Each part was further divided into 12 equal divisions; each division representing one hours spore trap. During the period of investigation, the Permanent slides were prepared after every 8 days using glycerin jelly. Each slide was scanned for the pathogenic spores and other types.(saprophytic fungal spores,hyphal fragments,pollengrains, nematode cysts, insect parts) (Meshram.1990,Sankaye,1990).

Identification of fungal spores was done on the basis of spore morphology and reference slides prepared from the known fungi.(Subramanian,1971;Barnett and Hunter;1972,Ainsworth.et.al.1973). The crop was also examined throughout the growing seasons at different growth stages for the disease incidence and associated pathogenic fungi.(Mukerji.et.al.1986). Prior to the research work, meteorological data for the concerned period was obtained from Mahatma Phule Agriculture College, Ravivar peth, Solapur (Mulegaon farm).

Airspora concentration and percentage contribution of dominant pathogenic spores type, month wise and group wise seasonal spore concentration, epidemiological study of groundnut crop

was carried out during summer seasons. Prior to the epidemiological studies, Infectivity index (I.I.) was calculated (Sharma, P.D. 2001) using the following formula. For the calculation of Infectivity Index (II), 200 diseased plant parts were taken.

$$II = \frac{\text{Sum of all disease ratings}}{\text{Total number of ratings} \times \text{Maximum disease grade}} \times 100$$

## RESULTS AND DISCUSSIONS

During the summer seasons, 45 different types of pathogenic spores were encountered, along with other types. Some dominant spore types in both summer seasons were recorded as *Aspergillus.sp*, *Puccinia.sp*, *Alternaria.sp*, *Cladosporium .sp*, *Cercospora.sp*, *Corynespora.sp*, *Curvularia.sp*, *Drechslera.sp*, *Fusarium.sp*, *Geotrichum.sp*, *Haplosporella.sp*, *Helminthosporium.sp*, *Nigrospora.sp*, *Periconia.sp*. During the summer seasons, maximum spore concentration and percentage contribution was recorded of *Cladosporium sp* i.e 113582(S1) and 101276(S2)/m<sup>3</sup> of air and percentage contribution 31.43(S1) and 27.38(S2) followed by *Alternaria sp* as 34020(S1) and 33054(S2)/m<sup>3</sup> of air and percentage contribution 9.42(S1) and 8.94(S2), *Helminthosporium sp* as 26530(S1) and 31136(S2)/m<sup>3</sup> of air and percentage contribution 7.34(S1) and 8.42(S2), *Aspergillus* as 20502(S1) and 15806(S2)/m<sup>3</sup> of air and percentage contribution 5.69(S1) and 4.27(S2) and remaining followed by *Nigrospora*, *Corynespora*, *Curvularia* etc. (Table-I). The total spore concentration in Summer first (S1) was 249388/m<sup>3</sup> of air and in second summer (S2) was 246708/m<sup>3</sup> of air. The total percentage contribution of pathogenic spores recorded in summer first (S1) was 69.04 where as it was 66.70 in summer second (S2). The mean percentage contribution of pathogenic spores in both the seasons was 67.87 (Table-I). *Cladosporium.sp*, spores were dominant in both summer seasons (29.40%). The spore concentration of *Cladosporium.sp* was recorded as 113582 and 101276/m<sup>3</sup> of the air. The mean percentage contribution of pathogenic airspora was recorded as 69.04% and 66.70% respectively during summer 1991 and 1992 season with the mean of both the season as 67.87% (Table-I) (Singh, et.al 1989). The spores like *Rhizopus* were not recorded during summer first where as the spores of; *Pestalotia*, *Deightonella*, and *Stigmia* were not recorded from the air during summer 1992 season. (Bansal, et.al. 1989) The low temp. high R.H. and scanty rains have positive effect on sporulation and discharge of spores. (Mishra, et.al 1971)

Table I

**Total Airspora Concentration and Percentage Contribution of some dominant Pathogenic spore types during first summer (S1) and second summer (S2) season over the groundnut fields.**

S1:27-01-1991 to 30-05-1991

S2:28-01-1992 to 30-05-1992

Spore types	Total concentration of spores/m <sup>3</sup> of air		Percentage contribution to the total airspora		Mean percentage contribution
	S1	S2	S1	S2	
<i>Aspergillus.sp</i>	20502	15806	05.69	04.27	04.98
<i>Puccinia.sp</i>	3206	2632	00.89	00.71	00.80
<i>Alternaria.sp</i>	34020	33054	09.42	08.94	09.18
<i>Corynespora.sp</i>	7896	13118	02.18	03.55	02.86
<i>Cercospora .sp</i>	3206	3556	00.89	00.96	00.92
<i>Cladosporium.sp</i>	113582	101276	31.43	27.38	29.40
<i>Drechslera.sp</i>	6552	10066	01.82	02.72	02.27
<i>Fusarium.sp</i>	11606	7658	03.21	02.07	02.64
<i>Helminthosporium.sp</i>	26530	31136	07.34	08.42	07.88
<i>Curvularia .sp</i>	7378	13244	02.04	03.58	02.81
<i>Nigrospora .sp</i>	14910	15162	04.13	04.10	04.11
Total spores and % contribution	249388	246708	69.04	66.70	67.87

The spores of Deuteromycetes class were recorded maximum 80080/m<sup>3</sup> of air in the month of February (1992) and 79492/m<sup>3</sup> of air March (1991) and minimum 14364/m<sup>3</sup> of air in the month of January 1991 and 18648/m<sup>3</sup> of air in the month of January 1992. The spores of Ascomycetes class were recorded maximum 16660/m<sup>3</sup> of air in the month of March (1992) and 12572/m<sup>3</sup> of air May (1991) and minimum 5278/m<sup>3</sup> of air in the month of January 1992 and 5656/m<sup>3</sup> of air in the month of March 1991. The spores of Basidiomycetes class were recorded maximum 1862/m<sup>3</sup> of air in the month of April (1992) and 1316/m<sup>3</sup> of air May (1991) and minimum 294/m<sup>3</sup> of air in the month of January 1991 and 196/m<sup>3</sup> of air in the month of January 1992. The spores of Phycomycetes class were recorded maximum 1134/m<sup>3</sup> of air in the month of February (1991) and 700/m<sup>3</sup> of air February (1992) and minimum 98/m<sup>3</sup> of air in the month of January 1991 and 210/m<sup>3</sup> of air in the month of March 1992. The pathogenic spores were recorded maximum 89950/m<sup>3</sup> of air in the month of February (1992) and 786058/m<sup>3</sup> of air March (1991) and minimum 22708/m<sup>3</sup> of air in the month of January 1991 and 24416/m<sup>3</sup> of air in the month of April 1992. The spore group deuteromycetes was dominant in both the summer seasons followed by ascomycetes, other types, basidiomycetes and phycomycetes. (Table-II).

The other types were recorded maximum 9632/m<sup>3</sup> of air in the month of May 1991 and 11578/m<sup>3</sup> of air May (1992) and minimum 2142/m<sup>3</sup> of air in the month of January 1991 and 2940/m<sup>3</sup> of air in the month of January 1992. The maximum spore types were recorded as 97678/m<sup>3</sup> of air in the month of February 1992 and 93968/m<sup>3</sup> of air March 1991 and minimum 24850/m<sup>3</sup> of air in the month of January 1991 and 27356/m<sup>3</sup> of air in the month of January 1992. Maximum percentage contribution of pathogenic spores to the total air spora was recorded as recorded as 92.08% in the month of February 1992 and 91.58% in the month of March 1991 and minimum 88.38% in the month of April 1991 and 86.63% in the month of May 1992. This spore concentration is mostly related to the earlier work. (Sahu, S.K.1988). The fungal spores are not only pathogenic but also occur as biopollutants in the atmosphere with the genera belonging to the spore group deuteromycetes as dominant. (Sinha Anupama et.al.1998) (Table-II).

Table- II

Month wise seasonal Pathogenic spore concentration in number/m<sup>3</sup> of air of each spore group and percentage contribution of spores in first (S1) and second (S2) summer season over the groundnut field.

S1:27-01-1991 to 30-05-1991

S2:28-01-1992 to 30-05-1992

Sr. No.	Spore group/total spores/% contribution.	January		February		March		April		May	
		S1	S2	S1	S2	S1	S2	S1	S2	S1	S2
1	Phycomycetes	<b>98</b>	294	<b>1134</b>	<b>700</b>	532	<b>210</b>	196	350	224	238
2	Ascomycetes	7952	<b>5278</b>	9128	8554	<b>5656</b>	<b>16660</b>	11900	10388	<b>12572</b>	8946
3	Basidiomycetes	<b>294</b>	<b>196</b>	1008	616	378	868	784	<b>1862</b>	<b>1316</b>	1162
4	Deuteromycetes	<b>14364</b>	<b>18648</b>	52220	<b>80080</b>	<b>79492</b>	56406	58268	51968	66570	64708
5	Other types	2142	2940	8302	7728	7910	10892	9352	8610	9632	11578
6	Total pathogenic Spores	<b>22708</b>	<b>24416</b>	63490	<b>89950</b>	<b>86058</b>	74144	71148	64568	80682	75054
7	Percentage contribution of pathogenic spores	91.38	89.25	88.44	<b>92.08</b>	<b>91.58</b>	87.19	<b>88.38</b>	88.23	89.33	<b>86.63</b>
8	<b>Total</b>	<b>24850</b>	<b>27356</b>	71792	<b>97678</b>	<b>93968</b>	85036	80500	73178	90314	86632

So far the distribution of fungal spores based on taxonomic spore group is concerned, deuteromycetes spore group was dominant with the maximum spore trap in the month of March 1991 (79492/m<sup>3</sup> of air) and February 1992 (80080/m<sup>3</sup> of air), followed by ascomycetes as 12572/m<sup>3</sup> of air in May 1991 and 16660/m<sup>3</sup> of air in March 1992, basidiomycetes as 1316/m<sup>3</sup> in May 1991 and 1162/m<sup>3</sup> of air in May 1992, other types as 9632/m<sup>3</sup> of air in May 1991 and 11578/m<sup>3</sup> of air in May 1992 respectively. The highest spore concentration during summer season was recorded in and March 1992 (10892/m<sup>3</sup> of air) during the summer seasons the month of March 1991 (86054/m<sup>3</sup> of air) and February 1992) (Table-II)

The epidemiological study of groundnut diseases was carried out during the summer seasons of the year 1991 and 1992. During the summer seasons (S1&S2) *Alternaria*.sp, spores were recorded in the last week of January, leaf blight disease appeared (I.I.21.6%) after 30 (S1) and 31 (S2) days in the crop when the temp. was 23.7°C and 21.0°C and R.H. was 42.5% and 24%, wind velocity was 4.9 and 4.4 km/h respectively during summer first and second season when the crop was at vegetative growth stage.(Table-III)

*Aspergillus*.sp, spores were recorded in the last week of January (S1 & S2), pod rot disease appeared after 61 (S1) and 62(S2) days in the crop (I.I.27.5%) when the temp was 29.3°C and 19.4°C, R.H. was 56.5% and 35.5%, wind velocity was 5.5 & 6.9 km/h respectively during summer first and second season when the crop was at pod formation and maturation stage. .(Table-III)

*Cercospora*.sp, spores were trapped in the last week of February (S1) and first week of March (S2), after 34 (S1) and 47 (S2) days, the tikka disease appeared in the crop (I.I.29.4%) when the temp. was 30.0°C and 20.6°C, R.H. was 33.5% and 34.5% and wind velocity. was 7.9 & 4.1km/h respectively during summer first and second season when the crop was at vegetative-flowering stage. .(Table-III)

Spores of *Fusarium*.sp, were recorded from the air in the last week of January (S1) and first week of February (S2), the wilt/root rot disease appeared in the crop (I.I.14.0%) after 20(S1) and 41(S2), days



Academic press .London.

- 2) Anil Arora and Jain, V.K., 2003: Fungal Airspora of Bikaner (Rajasthan). *Indian.J.Aerobiol* Vol.16 nos.1&2, PP 1-9.
- 3) Anupama, Sinha, M.K. Singh and Raju Kumar: 1998 aero fungi – an important atmospheric bio pollutant at Jamshedpur *Indian.J.Aerobiol* Vol.11 nos.1&2, PP 19-23
- 4) Bansal, B.K. Navneet and Mehrotra, R.S.:1988 Studies on aeromycoflora and phyllosphere mycoflora of wheat. *Indian J.Mycol.pl.Pathol.*18 (1):19-24
- 5) Barnett, H.L. and Hunter, B.B.: 1972 .Illustrated genera of imperfect fungi. Burgess publishing company. U.S.A.
- 6) Mallaiah K.V.and Rao A.S.; (1982): Aerial dissemination of uredinospores of groundnut rust. *Trans. Brit.Mycol. Soc.*78:21-28
- 7) Mesh ram, B.M.(1990): Studies in Airspora at Udgir. Ph.D. Thesis, Marathwada University, Aurangabad.
- 8) Mishra, R.R. and Kamal, 1971: Aero mycology of Gorakhpur –III and seasonal variation in air fungal spora .*Mycopathologia at mycologia applicata.* 45:301-310
- 9) Mukerji, K.G. and Jayanti Bhasin (1986): Plant diseases of India.TATA MAGROW-HILL DOBL. Company.
- 10) Reddy, R.R.and Reddy P.R. 1996: Aeromycological survey of Vikarabad. *Ind. J. Aerobiol.* 9(1&2) : 9-13
- 11) Sahu, S.K.: 1998: Aerophyllomycoflora of some Solanaceous crop plants. *Ind.J.Arobiol* Vol.11 No.1&2 PP 27-32.
- 12) Sankaye, T.B. (1989): Studies in Airspora over groundnut and sunflower fields at Latur, Ph.D. Thesis,Marathwada University, Aurangabad.
- 13) Sharma, P.D.: 2001: Plant Pathology 1st Edn. Rastogi Publications, Meerut .250002.
- 14) Singh, B.P, and Miss Maninder Grewal.: Survey of Aeromycoflora at Sriganganagar city (Rajasthan): *Journal of Palynology* Vol.25 (1989):25-43.Today and Tomorrow's Printers and Publishers, New Delhi.110005.
- 15) Subramanian, C.V 1971: Hypomycetes, Indian council of Agricultural Research .New Delhi.
- 16) Subramanyam, P.and D.McDonald, (1983): The Groundnut Rust .Bulletin No.13, ICRISAT, Patancheru. (A.P)
- 17) Tilak .S.T.1998: Air monitoring Practical Manual.PP.1-110
- 18) Mali N S and Gaikwad Y B.2011 Studies in pathogenic airspora and epidemiology of groundnut crop at Solapur during the kharif seasons.*Bioscience discovery*, Vol., 02, No.1. Jan.2011.pp 113-116