

Study of Air-Spora over the Groundnut Fields in Nashik District of Maharashtra, India

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Abstract

Original Research Article

Air contains number of different particles suspended in it. Fungal spores, pollen grains, viruses, bacteria, dust particles, insect parts etc. The Present aerobiological investigation was carried out at Nashik District by using a device Tilak Air sampler. Continuous air monitoring operation was done for 97 days during the months of June, July, August and September of Kharif Season during the year 2013. Airborne catches trapped over the groundnut (*Arachis hypogea* L.) field includes 45 fungal spores, hyphal fragments, insect parts, pollen grains etc. the article defines the definite correlation between the air borne microorganisms, meteorological parameters, growth stages of the crop plants and their impact in bringing about the disease incidence to the ground nut crop plants. A volumetric Tilak Air Sampler was used to trap airborne biological components, which incidentally provided continuous quantitative and qualitative data. Present investigation also mainly aimed to study the population of fungal morphotypes prevailing in the ambient air over the groundnut fields in one Kharif Crop season.

Keywords: Tilak air sampler, Groundnut crop, Air-spora, Kharif season.

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INTRODUCTION

Aerobiology is a scientific and multidisciplinary approach focused on the transport of organisms and biologically significant materials. Aerobiology thus does not simply mean the study of microorganisms in the atmosphere. Groundnut (*Arachis hypogea* L.) is an important food and oil seed crop in tropical and subtropical regions. It is native to South America, where, the genus *Arachis* is distributed over a wide range of environment from South of the Amazon to 34° s altitude and from the eastern coast to the eastern slopes of the Andes [1] Groundnut crop as the world's fourth most important source of edible oil and important source of vegetable protein. Oil seeds account of groundnut is for one ninth (1/9) of the total agricultural production in India. Groundnut oil is used for cooking, used for production of vanaspati ghee, making shaving cream, used as lubricant. It can be eaten raw, roasted or used in different recipes. After harvesting *Arachis hypogaea* L. plants are used as fodder to cattle. Oil cake is a by-product formed after extraction of oil from seed is rich in protein and used as cattle feed and fertilizer for many crops. Groundnut crop is susceptible to a many kind of soil borne, seed borne and air borne diseases caused by fungi, viruses, bacteria and nematodes results into low yield of kernel & poor quality of fruits. Some of the important and

major fungal diseases of groundnut crop are early Root rot (*Macrophomina phaseolina*), Viral disease are Rosette (Groundnut rosette assistor virus), leaf spot (*Cercospora arachidicola*), Rust disease (*Puccinia arachidis*), Collar rot or seedling blight (*Aspergillus niger*), Groundnut bud necrosis disease (Groundnut bud necrosis virus), late leaf spot (*Cercospora personata*) however during present investigation more trace has been given to the fungal components of airspora. Deshpande *et al.*, [2] study the airspora of groundnut crop field. Sreeramulu & Seshavataram 1962 [3], Sreeramulu and Ramalingam [4, 5]; Sreeramulu and Vittal [6, 7]; Tilak *et al.*, [8] and onwards etc. were involved in the aerobiology and studied the aerospora over groundnut crop, Paddy crop, sunflower crop, cotton crop in different regions of India.

They have categorized in to five respective groups. Out of 45 air borne components, 5 belonged to Zygomycotina, 10 to Ascomycetes, 2 to Basidiomycetes, 21 to Deuteromycetes, and 3 included to other types. The percentage contribution of each spore type to the total airspora was calculated. The group Deuteromycetes was dominant with higherspore concentration 54.327 /m³ of air and with 16.85contribution, followed by Ascomycetes with spore concentration 84,140/m³ of air and 33.16%

contribution, then Basidiomycetes with spore concentration 23,968/m³ of air and 9.45% contribution, then other types with 21,504/m³ with 8.48% contribution, then Phycomycetes with 13,986/m³ of air with 5.51% contribution. Influence of weather factors such as humidity, rainfall, and temperature on the incidence of disease and percentage contribution of airborne components was also studied & recorded. The information provided by this research study is useful for forecasting of the air borne diseases affecting the groundnut crop and to provide the effective control measures.

MATERIALS AND METHODS

The present aerobiological investigation involved qualitative and quantitative analysis of air spora over ground field at Nashik Dist. In Maharashtra state. Air monitoring survey was carried out by using Volumetric Tilak Air Sampler [9]. Tilak Air Sampler was installed in the centre of 1.62 hectare area of a groundnut field and placed on the stool with its orifice facing west and at constant height of 2 feet above the ground level. Tilak Air Sampler is an electrically operated device which has a rotatory drum. The drum completes one rotation in eight days. A cellophane tape has one surface sticky, wrapped around the drum while other surface was smeared with petroleum jelly as adhesive so as to stick spores. Continuous air was

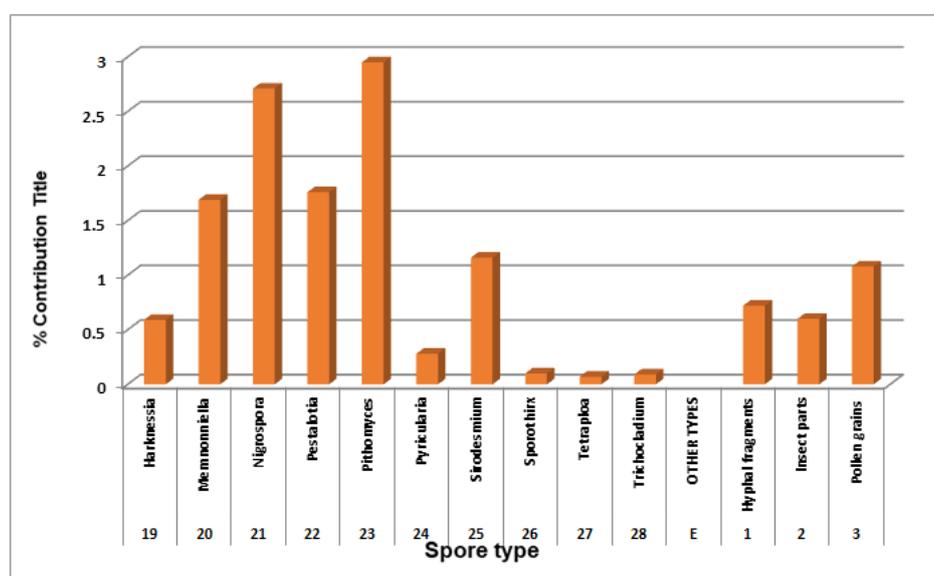
sampled at the rate of five (5) liters per minute for a kharif season of a year after each eight days when drum completed one rotation, previous cellophane tape was removed & replaced by a new cellophane tape. A Cellophane tape was brought to the laboratory & cut into 16 (sixteen) pieces of equal length. Each division provides a qualitative and quantitative data of airborne bio-components of day & night. The slides were prepared and scanned. Air sampling was initiated eight days prior to the sowing of seeds of groundnut in the experimental field and continued eight days even after harvesting the crop. The daily record of meteorological data was regularly maintained with the help of digital thermometer and hygrometer and rain fall record was obtained from.

In the present study, the crop cultivated was Groundnut (*Arachis hypogea* L.) Var.JL24 1.62ha. Land area was devoted for cultivation of ground nut for one consecutive Kharif Seasons i.e. First Kharif season from 23 June 2013 to 20 September 2013 Air sampling was initiated eight days prior to the sowing of seeds of groundnut in the experimental fields and continued for eight days even after its harvesting the same crop. The daily meteorological data of temperature, relative humidity and rainfall was maintained as obtained from Metrological Department, Peth Road, Peth Phata, Nashik.

Table-1: Reveals Total Airspora and Its Percentage Contribution to The Total Airspora of one Kharif Seasons Over Groundnut Field from 23 June 2013 to 20 September 2013

Sr. No	Spore type	First Kharif Season	
		Spore Conc./m ³ of air	% Contribution
A)	ZYGOMYCOTINA		
1	Albugo	1174	0.20
2	Cunninghamella	2813	0.48
3	Mucor	6104	1.04
4	Phytophthora	1537	0.26
5	Rhizopus	11150	1.91
	Total	22778	3.89
B)	ASCOMYCOTINA		
1	Amphisphaerella	2885	0.49
2	Bombardia	2131	0.36
3	Chaetomium	18125	3.11
4	Claviceps	5945	1.02
5	Cucurbitaria	4741	0.81
6	Didymosphaeria	783	0.13
7	Hysterium	27637	4.75
8	Melanospora	16182	2.78
9	Pleospora	9642	1.65
10	Sordaria	10222	1.75
	Total	98293	16.85
C	BASIDIOMYCOTINA		
1	Basidiospores	4886	0.84
2	Smutspores	16936	2.91
	Total	21822	3.75

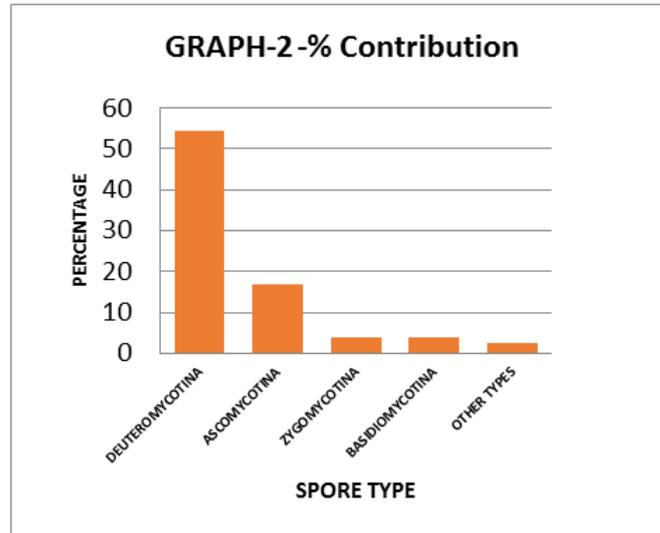
D	DEUTEROMYCOTINA		
1	Alternaria	34452	5.92
2	Aspergillus	6974	1.19
3	Beltrania	17733	3.05
4	Bispora	31436	5.40
5	Ceratophorum	2943	0.50
6	Cercospora	16196	2.78
7	Cladosporium	14140	2.43
8	Curvularia	27734	4.77
9	Clasterosporium	1358	0.23
10	Dictyoarthrinium	42	0.007
11	Dictyosporium	294	0.05
12	Diplodia	17850	3.07
13	Epicoccum	12166	2.09
14	Exosporium	6972	1.19
15	Fusarium	20776	3.57
16	Helminthosporium	27020	4.64
17	Heterosporium	11900	2.04
18	Hirudinaria	-	-
19	Harknessia	3444	0.59
20	Memnonniella	9842	1.69
21	Nigrospora	15778	2.71
22	Pestalotia	10290	1.76
23	Pithomyces	17192	2.95
24	Pyricularia	1652	0.28
25	Sirodesmium	6762	1.16
26	Sporothrix	616	0.10
27	Tetraploa	462	0.07
28	Trichocladium	532	0.09
	Total	316556	54.327
E	OTHER TYPES		
1	Hyphal fragments	3430	0.72
2	Insect parts	2828	0.60
3	Pollen grains	5152	1.08
	Total	11410	2.40
	Grand Total	474956	100



Graph-1

Table-2

Spore Groups	% Contribution
Deuteromycotina	54.327
Ascomycotina	16.85
Zygomycotina	3.89
Basidiomycotina	3.75
Other Types	2.4



Graph-2: Percentage Contribution of total spores' types of each group in Kharif Season during the year 2013

RESULT AND DISCUSSION

The slides were observed and identification of fungal spore carried out with the help of visual identification, comparing with permanent slides and available literature of aerobiology and the result of the analysis given in table. The present aerobiological investigation for Kharif season of the year have revealed total forty-five airborne components of these forty-five (45) is fungal air borne bio components and are classified in to four groups such as Phycomycetes includes three (3) spore types, Ascomycetes contributes twenty two (22) spore types, Basidiomycetes contributed total four (4) spore types and deuteromycetes contributed total twenty one (21) spore types. The remaining five (5) airborne components forms artificial group and are belonged to other type.

It is observed that temp. Humidity growth and age of plant favour the incidence and spread of disease. During the month of July Rhizopus member of group Zygomycotina contributed to the total airspora by contributing 3.53% conc./m³ of air. Concentration of this spore was continuous throughout the investigation maximum percentage of spore observed during the month of July.

Chaetomium member of Ascomycotina contributed 3.00% conc./m³ to the total airspora over the crop field during the month of September.

Smut spores belong to Basidiomycotina are having maximum percentage that is 5.39% conc./m³

during the month of August. Which shows the possibilities of the increase in the percentage of occurrence disease. It is alarming situation for the grower.

Alternaria 6.65% conc./m³ (July), *Bispora* 6.10% conc./m³, Tilak [10], Mullaiah [11] and Aher *et al.*, [12] have clearly brought out the close relationship between the spore load of pathogen in air, meteorological factors growth stages of the crop are related with each other. Climatic factors were favorable for initiation of the disease but the crop variety grown in the field (*Arachis hypogaea* L.) JL-24 was found to be highly resistant for disease incidence during the periods when the crop was growing in the fields and therefore crop was found quite healthy during this investigation period.

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