Environmental Monitoring of Other Bioparticles in the Airspora Over Groundnut Fields

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ABSTRACT: : *In the present study aerobiological investigation over ground nut (Arachys hypogea L. Var. SB 11) fields was carried out during two summer seasons using continuous volumetric Tilak Air Sampler at Walunj (Ahmednagar, Maharashtra) to study qualitative and quantitative estimation of 'Other aerobilogical components'. Hyphal fragments (contributed highest (39.84%) to the total airspora followed by unidentified bioparticles (18.02%), indesct parts (16.49%), plant parts (15.48%) and pollen grains (10.15%) during the first summer season and hyphal fragments (33.90%), pollen grains (27.46%), plant parts (13.51%), unidentified bioparticles (13.30%) and insect parts (11.80%) during second summer season respectively. These aerobiocomponents have been recognized as aeroallergens.*

Key Words: *Aerobiocomponents, Tilak air sampler, percentage contribution, summer season, groundnut field.*

I. INTRODUCTION

Groundnut (*Arachis hypogaea* L.), commonly called peanut (Family Fabaceae) is an annual herb growing up to 30 to 50 cm. It is important oilseed crop in tropical and subtropical regions of the world. In Maharashtra, the crop is grown in kharif and summer seasons. About 75 million hector of land is under groundnut cultivation and the production is about six million tonnes. Groundnut have many uses, they can be eaten raw, roasted or with various racepies. Groundnut oil is often used in cooking. It is more healthy, contain high protein and high energy. However the crop is subjected to various fungal diseases. Aerobiology deals with the study of microorganisms which are present in the atmosphere. According to modern concept, it includes dispersion of insect population, bacteria, fungal spores, pollen grains, molds, viruses, bacteria and all forms of life, both plants and animals that are borne and transported partially or wholly by the atmosphere (Jacobs, 1951). All these component of biological origin occur in the air and constitute the 'airspora'. The studies of airborne biocomponents except fungal spores are known as 'Other biocomponents'. In many earlier aerobiological surveys the emphasis was given to the fungal spores and pollen grains due to their importance in various aspects (Mali et al., 2012; Tilak, 1984; Arsule and Pande, 2011; Aher et al., 2002; Mali and Gaikawad, 2011; Aher, 2017; Krishnamurthi and Vitthal, 1983; Thakur and Jite, 2015; Kadam et al., 2008).The 'Other aerobiocomponents' play an important role as aeroallergens similar to fungal spores and pollengrains. Therefore it is important to study the aerobiocomponents which shows allergic effects in extramural environment.

Aerobiocomponents can affect the activities of people and can cause diseases of plants, animals and even human beings also (Tilak, 1982; Ray et al., 1992; Zutkiewicz, 1997). It has been reported that airborne fungi are among the most common organism correlated with air pollution that have adverse effect on human health. It has been known beyond doubt that the airborne fungal spores play an important role in the etiology of respiratory allergic disorders (Shivpuri and Agarwal, 1969).

The present study was conducted with a view to access qualitative and quantitative dominance of 'Other aerobiocomponents' and their relation with environmental parameters.

II. MATERIALS AND METHODS

The present aerobiological investigations were carried out over ground nut fields at Walunj, Ahmednagar, India with a view to study qualitative and quantitative assessment of airspora with the help of Tilak continuous air sampler (Tilak and Kulkarni, 1970). The sampler continuously runs with 320V current and the drum present inside the sampler completes one rotation in eight days. The sampler was operated over the groundnut fields for two consecutive summer seasons i.e. first season from 12th May 1990 to 31st August 1990 and second season from 5th My 1991 to 20th August 1991. Regular visits to the field were

arranged.

The culture plates were also exposed periodically for the study. In order to understand the exact morphology of the fungal spores, the petriplates of PDA media were exposed at every eight days interval for 15 minutes, at the sampling site. Thus the reference slides were prepared for comparative study of the fungal spores.

The meteorological data was maintained throughout the period of investigation. Scanning and detailed calculations were obtained by using same method described earlier (Tilak and Srinivasulu, 1967). Identification of fungal spores was accomplished with the help of visual identification and literature after Ellis (1971), Barnet and Hunter (1972), Tilak (1989) and Nair *et al.* (1986).

III. RESULTS AND DISCUSSION

In aerobiological investigations over groundnut crop (*Arachys hypogea* L. Var. SB 11) during two summer seasons along with common fungal airspora, other aerobioparticles are studied. The study area exhibit wet and dry atmosphere. The group, being heterogenous in composition, comprised of hyphal fragments, pollen grains, insect parts, plant parts and unidentified bioparticles showing varying percentage contribution to the total airspora. The total contribution of 'Other bioparticles' (6524/m^3 during second summer crop season was found to be more than during first summer crop season (5516/m^3).

Table 1. Total concentration and percentage contribution of each spore type to the total airspora over groundnut fields for two consecutive summer seasons

Sr. No.	Other types of aerobio components	Total concentration per cubic metre		% concentration	
		Season I	Season II	Season I	Season II
1	Hyphal fragments	2198	2212	39.84	33.90
2	Insect parts	910	770	16.49	11.80
3	Plant parts	854	882	15.48	13.51
4	Pollen grains	560	1792	10.15	27.46
5	Unidentified bioparticles	994	868	18.02	13.30
	Total	5516	6524	99.98	99.97

Hyphal fragments occurred in the air over ground nut fields throughout the period of investigation in both the summer crop seasons and contributed 39.84% and 33.90% to the total air spora (Table 1). Trapped hyphal fragments showed much variabilities in their length, width and colour. They may be either the mycelial pieces of intercalary or apical type. Sometimes entire conidiophores along with conidia have been trapped. Viability of hyphal fragments, like viable spores was determined by Pady and Kramer (1960), Harvey (1970) Sinha *et al*., (1976) using colour structure of septum and hyphal wall as criteria for identification, tried to identify hyphal fragments. Their concentration was found to increase with high wind velocities, dry and hot climate. The harvesting operations in the field also have helped in increasing the hyphal fragment load in the air. Tilak (1982) reported the hyphal fragments having ability as propogules due to their viability. Ectophytic fungal types, either as saprobic or parasitic, present in and around the trapping site might have served as main source for the airborne hyphal fragments.

While making aerial survey for the exploration of microbial population, due importance was given to the insect parts, insect scales, insect bodies etc. Insect parts contributed 16.49% and 11.80% to the total air spora in the first and second summer seasons respectively. They occurred in all months in both the summer seasons. (Table 2). Their prevalence was high (588 and 308/m^3 of air) in the month of July of first and second summer seasons. High frequency of occurrence of insect scales was well associated with weather parameters such as moderately high temperature ranging from 24 to 29^{0}C temperature and wind velocity ranging between 4 to 12 km/hr. Their incidence was high during flowering of the crop. The insect parts may appear in the airspora after the death and decay of insect on the ground and shedding of scales or wings while flying.

The role of insects and insect parts in allergy was studied long back by Sultzberger and Weinberg (1930), Fienberg (1956). Tilak and Bhalke (1979) observed the seasonal variations and concentrations of insect parts from Aurangabad. Tilak (1982) observed the abundance of insect parts and correlated them with weather conditions.

The fungal spore types which could not be identified due to their inadequate distinct external morphological features. They were broken and opaque in nature, therefore, have been kept under 'unidentified bioparticles'. As a matter of fact, most of them were one celled broken and few were many celled and

opaque in appearance. They contributed 18.02% high in first summer season as compared to second summer season. The abundance of these spores was mainly confined to hot and dry days.

During the period of present investigation, various pollen grains of dicotyledonous and monocotyledonous plants, grasses, ephemerals were encountered. They contributed 10.15 and 27.46% to the total airspora during first and second summer seasons respectively. The composition and seasonal variation in the pollen contents of air showed its relation with the varied flowering period of investigation. High incidence of pollen grains in air was observed during forenoon hours. Nevertheless, exact relationship between air borne pollen grains and weather parameters is still in dispute. Hamilton (1959) and Lacey (1962) reported that locality and vegetation had an influence on the concentration of pollen incidence in the air. The role of pollen in allergy is well known and now gaining much importance. Pund (2007) studied the clinical data of 232 patients of Amravati city showing 33 types of pollen grains were allergenic out of which 6.47% of patients were noted with allergic symptoms by pollen grains. Similar results were also noted at Nagpur region by Arbat and Patil (1985).

REFERENCES

1. **Aher S.K.** [3]2017´: Aerobiological studies with special reference to ascospores over groundnut field at Ahmednagar, Maharashtra. Adv. Plant. Sci, 30(1): 93-96.
2. **Aher S.K.,** Thite S.V. and Pande, B.N. (2002): Fungal airspora of groundnut field. Eco. Env. & Cons, 8(3): 283-288.
3. **Arsule C.S.** and Pande B.N. (2011): Fungal airspora over groundnut fields at Newasa (M.S.). Bionano Frontier, 4(2): 312-315.
4. **Barnett H.L.** and Hunter B.B. (1972): Illustrated genera of Imperfect Fungi. 3rd ed. Burgess Publishing company. Minneapolis, Minnesota.
5. **Feinberg A.,** Samual R., Feinberg M. and Carlos B. (1956): Asthama and Rhinities from insect allergy. J. Allergy, 27: 437.
6. **Ellis M.B.** (1971): Dematiaceous Hyphomycetes. Common Wealth Mycological Institute, Kew, Surrey, England.
7. **Harvey R.C.** (1970): Airspora studies at Cardiff-III : Hyphal fragments. Trans. Brit. Mycol. Soc, 54: 479-495.
8. **Jacobs W.C. (**1951): Aerobiology in compendium of meteorology. American Meteorological Society, Boston, 1103-1111.
9. **Kadam R.M.,** Reddy N.J.M., Jadhav B.S. and Nagpurne V.S. (2008): Aerobiological approach to leaf spot and rust disease of groundnut (Arachys hypogea L.). Internat. Jr.Plant Protection, 1(2) : 63-65.
10. **Krishnamoorthi K.** and Vittal P.B.R. (1983): A survey of airborne fungi and pollen in the city Madras (India). Abst. Int. Aerobiol. Newslett, 17**:** 51-54.
11. **Mali N.S.** and Gaikawad Y.B. (2011): Studies in pathogenic airspora and epidemiology of gruondnut crop at Solapur during two kharif seasons. Bioscience Discovery, 2(1): 113-116.
12. **Mali V.P.**, Pathare G.M., Sumia F. and Pande B.N. (2012): Fungal diversity in ambient air over bajara fields. Bionano frontier Special Issue, 154-157.
13. **Nair P. K. K.**, Joshi A.P. and Gangal S.V. (1986): Airborne pollen, spores and other plants materials India - A survey. CSIR Centre for Biochemicals and National Botanical Research Institute, Lucknow.
14. **Pady S.M.** and Kramer C.L. (1960): Kanas aeromycology - X. Basidiomycetes. Trans. Kanas Acad. Sci, 63: 125-134.
15. **Shivpuri D.N.** and Agarwal M.K. (1969): Studies on the allergic fungal spores of the Delhi, India metropolitan area. J. Allergy, 44(4): 204-213.
16. **Sultzberger M.B.** and Weinberg C.B. (1930). Dermatitis due to insect powder. J. Amer. Med. Assoc, 95: 11.
17. **Thakur V.A.** and Jite P.K. (2015): Circadian periodicity studies in the incidence of airborne spores of Leptosphaeria and Didymosphaeria. Internat. Jr. of Curr. Res. and Academic Review, 3(4)**:** 185-189.
18. **Tilak S.T.** (1989): Airborne pollen and fungal spors. Vaijayanti Prakashan, Aurangabad.
19. **Tilak S.T.** (1982): Aerobiology. Vaijayanti Prakashan, Aurangabad.
20. **Tilak S.T.**1(984): Aerobiology and cereal crop diseases. Ed.S.P. Ray Chaudhari. Rev. Trop. Plant Path. 1: 239-354.
21. **Tilak S.T.** and Bhalke, (1979): Incidence of airborne insect parts in the airspora of Aurangabad. Sci. and Environ. 1: 167-169.
22. **Tilak S.T.** and Kulkarni, R.L. (1970): A new airsampler, Experientia, 26: 443-444.
23. **Tilak S.T.** and Srinivasulu, B. (1967): Indian J. Microbio, 7: 167 - 743.