

# 1. Aero Palynological Survey of Pollen and Fungal Spore in Campus Area

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## Abstract

Aerobiology is the study of dispersion of air microorganism, pollens, seeds, especially fungal spores which can create the infections in plant and human beings or in another word's aerobiology means study of airborne bio-particles. The airospora of a region is influenced by topography & meteorological parameters of the concerned area. Aerobiology is a scientific discipline that, deals with the transport of organism and biologically significant materials through the atmosphere. Pollen grains trapped during investigation reported to be allergenic. The pollen grains are important cause of allergic disorders and they vary from place to place. Thus the pollen grains recorded during the observations may be allergenic. However, the amount of pollen grains suspended in environment may play an important role for causing the allergenic reaction. The weather conditions such as temperature, humidity, wind velocity etc. may affect the release and dispersal of pollen grains. This leads to the seasonal variation in different types of pollen grains. Their concentrations also vary month to month.

**Keywords:** Pollen grain, Gravity methods, Gravity slide

## Introduction

Aerobiology is the study of airborne bioparticles present, in the atmosphere. The term aerobiology was coined in (1930) by F. C. Meier, who was the plant pathologist working in the department of agriculture USA. Agashe S.N. (2006). Aerobiology is the study of dispersion of air microorganism, pollens, seeds, especially fungal spores which can create the infections in plant and human beings or in another word's aerobiology means study of airborne bio-particles (Sing and Mathur, 2012). Airospora, i.e. microbial population of the atmosphere which is composed of fungal spores, algal filaments, pollen grains and insect scales etc. It is an interdisciplinary science wherein attention is given to the source of an organism or material, take off, dispersion, deposition and impact on plants, animals & human systems (Ahire, 1990). The airospora of a region is influenced by topography & meteorological parameters of the concerned

area. Aerobiology is a scientific discipline that, deals with the transport of organism and biologically significant materials through the atmosphere (Isard and Gage, 2000). The availability and concentration of airspora may differ according to the availability of substrate (Helfman et al., 2012). The wind velocity and direction also had importance in dispersion of spores. Different types of spores can easily get dispersed in nearby areas by wind. The spores float on wind and easily travel over long distance. The dispersion of pollutants as well as aerobiological agents is studied in environmental science which becomes a new emerging interdisciplinary branch of science (Subha Reddy and Janakibai, 1977). The study incorporates external ambient air quality which protects the atmospheric particles and its interaction with abiotic factors and meteorological parameters (Butlin, 1990). Guava is an important, irrigated horticultural crop of Nashik district and is rich source of vitamin C & mineral elements. This is hardy crop, can be cultivated successfully even in neglected soil and it is attacked by large no. of pathogens mainly fungi (Gupta et al.,(2010),P.P. Shinde & P.P. Ahire (1990).

Particles in the air are called Aerosols. Bioaerosols which constitute the aerospora are algae, fungi, bacteria, viruses, pollen, etc. Biotic environmental pollutants comprised are chiefly of pollen and fungal spores<sup>3</sup>. The branch of science dealing with airborne fungi is called Aeromycology. A difference in the pollens kit (sticky substance) of fresh pollen is mainly decisive for the mode of pollen transfer either by wind or insect. Entomophilous plants produce large quantities of homogenous pollen kit which is deposited on the outer layer of the exine such that it would stick to the body of insect. The aerobiological processes comprises five main steps- source, liberation, passive transport, deposition and impact on vegetation, water bodies and various substrates. These different steps are integrated with each other and are affected by environmental factors. The aerobiological observations are focused on pollen and fungal concentrations in the air. The results of this analysis are of great help for some scientific disciplines such as phenology, climatology, ecology, agriculture, forensic and allergology<sup>4</sup> The introduction of new trees in forests or urban areas, parks, etc. needs attention in order to avoid addition of allergens or plants pathogens. The airborne pollen spectrum also gives an idea about the vegetation of a place. Fungi are the major source of contaminants in air; it either infects plants or other organisms. About 100,000 species of fungal spores are known today, with about 80 related with pathologies, where as allergic proteins have been identified in 23 fungal genera. Dead spores also contain allergens. They cause allergies associated with cardiac disease,

dermatitis and respiratory disorder. Certain fungi cause damage to the crops. Continuous monitoring and improved forecasting systems would be helpful in minimizing harmful effects. Airborne contact dermatitis pattern is the most common clinical presentation of Parthenium contact sensitivity.

The aeroallergens responsible for sensitization and production of specific antibodies may vary from place to place, and from region, and fluctuate with geographic and climatic conditions such as temperature, humidity and rain. It was demonstrated that exposure to pollen of certain plants caused hay fever and seasonal asthma in some individuals. The study of airborne pollen has gained significant importance in recent years because of its application and treatment of patient suffering from allergy. Although the atmosphere consists of an array of pollen and fungal spores; only a few of them are responsible for allergic manifestation. A detailed pollen calendar of a region is a prerequisite for immunological treatment of pollen allergies. (Agashe, S. N., (2006).

### **Review of literature**

Aerobiological research in India has relatively short history. The beginning of the research is being traceable to the first systematic investigations by Cunningham (1873) in Calcutta. After a fairly long gap research work was initiated by Mehta (1940) at Agra. Kasliwal (1955) at Jaipur and Kalra (1958) at Pune had made aerobiological investigations with particular reference to allergy. Subsequently Sreeramulu (1962) conducted exhaustive investigations on varied aspect of aerobiology at Waltair.

A new decade of aerobiological research in India started with the studies made by Lakhanpal (1958) in Lucknow and Nair (1960) at Almorah. Shivpuri (1982) had made an elaborate investigation on the airborne mycoflora and its relation to allergy in Delhi. Tiwari and Godheja (1985) reported the comparative account of airspora and phylloplane mycoflora of Brinjal at Raipur. Jadhav (1996) studied the aeromycoflora over rice field at Balodabazar. Tiwari (1999) reported aerobiological studies of Raipur with special reference to fungal spores. Ahire et. al. (2007) reported aeromycoflora of a play ground in Pimpri Chinchwad area at Pune. Mohture et. al. (2007) conducted aeromycological studies in relation to fungal allergy in semi urban area, Nagpur (M.S.). Puttaiah and Naveen (2007) studied aeromycoflora of Bhadravathi Town, Karnataka, India. Tiwari et. al. (2007b) reported aeromycoflora of Motibag and Nehru park at Raipur. Kunjam (2007) studied the aeromycoflora of (panabaras) Rajnandgaon district; Lall

(2008) studied the aeromycoflora of Ambedkar Hospital, Raipur; Kotwal et. al. (2010); Kulkarni (2011); Lall (2011) investigated the aeromycoflora of different places. Debasmita et. al (2011); Nafis and Sharma (2012) have studied the aeromycoflora of Metro-railway station, Delhi. Ahire et. al. (2012) have studied aeromycoflora of 5 vegetable and fruit market Pune. Lanjewar et. al. (2013) have studied aeromycoflora present in the indoor environment of FCI godown Tilda, Raipur.

### **Material and methods**

For the aerobiological study sampling methods were followed by Gravity slide method.

#### **Gravity slide method**

During gravity slide method the slides were coated with Vaseline and were exposed for 2-3 days on the terrace. The exposed slides were then mounted with glycerine jelly and observed under trinocular fluorescence microscope. Glycerine coated slides were also exposed to atmosphere for 3 days. After that scanning was done using the microscope.

#### **Data Collection**

The aerobiological study was conducted at three different locations in College campus by using Gravity slide Methods.

The Data were collected from November 2022 at site. (Department of Botany) Wing A, site From November 2022.

#### **Identification**

For morphological details pollen grains were observed under Trinocular Fluorescence Microscope (Carl Zeiss) attached with camera. Pollen grains were identified with the help of specimen slides and available literature. Fungal spores were identified with the help of identification keys.

#### **Result and Discussion**

The data was collected from Wing C sites from the R.L.T. College campus during November 2022. Microscopic observation of Pollen grains.

#### **Pollen**

During the study period from November 2022 different pollens types were observed. These pollen types belong to families, Butea monosperma, Magnifera indica these all were found in Wing A.

### Gravity Method

The Pollen Grains of Azadirachta indica and Caesalpinia pulcherrima, Ricinus communis were trapped. Among them the pollen grains of Caesalpinia pulcherrima (0.01) of family Fabaceae (Fig. A), and Azadirachta indica (0.01) of family meliaceae was in fewer amount (Fig. B). A total no, Ricinus communis (0.01) of family euphorbiaceae (Fig. C) of pollen types were recorded during November 2022 by the Wing-A Sites by Gravity methods.

An aerobiological study was carried out from November. From the analysis it was known that the aerospora represents different pollen types and fungal spores. The number of pollen grains and fungal spores were observed during the gravity slide method.

Pollen grains trapped during investigation reported to be allergenic. The pollen grain are important cause of allergic disorders and they vary from place to place. Thus the pollen grains recorded during the observations may be allergenic. However, the amount of pollen grains suspended in environment may play an important role for causing the allergenic reaction. The weather conditions such as temperature, humidity, wind velocity etc. may affect the release and dispersal of pollen grains. This leads to the seasonal variation in different types of pollen grains. Their concentrations also vary month to month.

Fig.- Different airborne pollen types observed during November-February 2023 by Gravity method.

**Plate I**




| Sr No | Plant Name              | Figure   |
|-------|-------------------------|--|
| 1     | Caesalpinia pulcherrima |  A |
| 2     | Azadirachta indica      |  B |
| 3     | Ricinus Communis        |  C |

Table 1

| Sr.No. | Pollen Grains            | Pollen Percentage | Month | Family        |
|--------|--------------------------|-------------------|-------|---------------|
| 1.     | Caelsalpinia pulcherrima | 0.02              | Nov   | Fabaceae      |
| 2.     | Azardirachta Indica      | 0.01              | Nov   | Meliaceae     |
| 3.     | Ricinus consnunis        | 0.01              | Nov   | Euphorbiaceae |

### Percentage of airborne pollen during November 2022 by Gravity method

#### Conclusion

The Aerobiological investigation gives an idea of the airborne pollen types present at all site of R.L.T College campus Akola. Pollen types Azardirachta indica and Butea monosperma etc. from site. It can be Concluded from this study that the atmospheric condition such as temperature, wind velocity, humidity and ecological conditions such as vegetation also have effect on the distribution, and presence of palynomorph in atmosphere. The present study reveals that there were large numbers of pollen grains found. They were found in the scattered form. The knowledge about plant's flowering seasons, pollen and spore dynamics and its relation to meterlogical parameters.

#### References

- Agashe, S.N., (2006): Palynology and its applications, Oxford and IBH publishing Co. Pvt. Ltd., Panchshila Park, New Delhi 110017
- Ahire, P. P. (1990): Airspora at Nashik, Ph.D. Thesis. Dr. Babasaheb Ambedkar Marathwada University, Aurangabad
- Ahire, Y. R., Cholke, P. B. and Mahajan, M .C. , (2007): Aeromycoflora of play ground in Pimpri Chinchwad Area. Abstract. 14th National. Conference Aerobiology. Pt. Ravishankar Shukla University. Raipur.E-19, p. 42.
- Beggs P.J., (2004). Impacts of climate changes on aerollergens past and future. Clin. Exp. Allergy. 34:1507-1573
- Cunningham, D. D., 1873. Mircoscopic examination of air. Govt. printers, Calcutta.58.
- Debasmita G, Priyanka D, Ashok K and Naimuddin., (2011): Identification and Distribution of Aeromycoflora in the environment of Shyambazar Metro Railway Station, Kolkata, India. African Journals of Microbiology Research. 5 (31), 5569-5574.
- Erdtman, G. (1992): Erdtman's Handbook of Palynology, Second Edition, Munksgaard.

- Jadhav, S. K., (1996): Studies of Aeromycoflora over rice field at Balodabazar, Raipur (M.P). Ph.D Thesis, Pt. Ravishankar Shukla University, Raipur (M.P)
- Kalra, S. L., (1957): Aerobiology of army medical campus. Armed forces Medical. Journals of India. 13, 3-16.
- Kasliwal, R. M., (1955): Correlation of respiratory allergic cases with atmospheric pollen concentration and meteorologic factors. J. of Ass. Phy. India. 6, 180.
- Kasliwal, R.M., (1955): Respiratory allergens in Rajasthan. J. Ass. Phy. India. 3, 184-188.
- Kotwal, S. G, Gosavi, S.V and Deore, K. D., (2010): Aeromycoflora of outdoor and indoor air residential area in Nasik. Asian Journals of Experimental Biology Science. SPL, 24-30.
- Kunjam, S., (2007): Studies of aeromycoflora of Tribal atmosphere at Panabaras region, Rajnandgoan District (C.G). Ph.D. Thesis. Pt. Ravishankar Shukla University, Raipur (C.G).
- Lakhanpal, R. N. and Nair, P. K. K., (1958): Survey of atmospheric pollen at Lucknow. Journals of Science. Indus. Research 17, 80-87.
- Lall, B. M., (2008): Studies of Indoor and Outdoor Aeromycoflora of Dr. Bhim Rao Ambedkar Hospital, Raipur. Ph.D. Thesis. Pt. Ravishankar Shukla University, Raipur. (C.G).
- Lanjrwa, S., Rizwan Ulla, and Sharma, K , (2013): Survey of aeromycoflora present in the Indoor environment of FCI godown Tilda. Journals of Phytology. 4(6), 07-08.
- Mandal J., Chanda S., Gupta S. and Bhattacharaya. (2006): Current Status of Airborne pollen grains in Kolkata with special reference to their allergenic significance. Indian J. Aerbiol; 19(1): 19- 30. 17
- Mehta, K. C., (1940): Further studies on cereal rusts of India. Part I. Scientific. Monograph 14. Imperial Council of Agricultural Research. New Delhi, India. p. 1-368.
- Mohture, V. M. Kalkar, S.A. and Arbat, A.P., (2007): Aerobiological studies in relation to fungal allergy in Semi-Urban area, Nagpur. (M.S.) Abstract of 14th National. Conference of Aerobiology, Pt. Ravishankar Shukla University., Raipur B- 8, 16.
- Nair, P. K. K. (1960): A modification in the method of pollen preparation. Ibid 19c (1): 26 - 27.

- Nair, P.K.K. (1962): Pollen grains of Indian Plants, National Botanic Gardens, Lucknow, India.
- Patel, S. I. (2012): Effect of weather variation on the dissemination of air borne pathogenic fungal spores in the onion storage godowns at Nashik district. Bionanofrontiers, Jan-Jun.,
- Puttaiah, E.T. and Naveen, D., (2007): Aeromycoflora of Bhadravathi Town Karnataka, India. Environment and Ecology, 25(3), 561-563.
- Shivpuri, D. N., (1982): Studies in allergy to fungi in India. Asp. Aller. Appl. Immun. 14, 19-30.
- Sreeramulu, T., (1961): Concentration of fungus spores in the air inside cattle shed. Acta. Allegol. Kbh. 16, 337-346.
- Tiwari, K. L. and Godheja, A., (1985): Airspora and the phylloplane of Brinjal at Raipur – Botanical Research Chhattisgarh. 1, 149-152.
- Tiwari, K. L., Jadhav, S. K., Tiwari, P and Patle. K., (2007): Aeromycoflora of Motibag and Nehru Park. at Raipur. Abst. 14th National. Conference of Aerobiology. Pt. Ravishankar Shukla University. pp. 45.
- Tiwari, P., (1999): Aerobiological studies of Raipur with special reference to fungal spores. Ph.D. Thesis, Pt. Ravishankar Shukla University, Raipur.C.G.