

# Distribution of *aeromycoflora* in the indoor and outdoor environment of Barpeta town of Assam, India

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## Distribution of aeromycoflora in the indoor and outdoor environment of Barpeta town of Assam, India

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The distribution of aeromycoflora in the indoor and outdoor environment is closely related with the climatic conditions like, temperature, rainfall, relative humidity as well as the nature of the mycoflora and location. The aeromycological survey was conducted in the indoor and outdoor environment of Barpeta town of Assam. The field experiments were carried out to study the occurrence of indoor and outdoor aeromycoflora for three months Jun-Aug, 2018. The experimental results showed that a total of 525 outdoor air spores (including pollen grains) and 242 indoor air spores were found in three months. Highest number of air spores were recorded in the month of Jun (190/88) and followed by July (178/82) and August (157/72) in both outdoor indoor environment respectively. The most dominant outdoor air spores were the species of the genus *Aspergillus* (56) *Rhizopus* (51) *Mucor* (45), *Fusarium* (43), whereas, in case of indoor spore is *Rhizopus* (38), and followed by *Aspergillus* (32), *Mucor* (31), and other species were found less frequently. The air quality of both indoor and outdoor environment is very important issue, because it is related to the fungal contamination of our foodstuff and various skin and respiratory problems.

**Key words:** Aeromycoflora, contamination, cosmopolitan incidence, environment, pathogenic

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### INTRODUCTION

Airborne microflora are found in large numbers in indoor and outdoor environments and are widely distributed in nature on the earth surface. Aeromycoflora constitute a significant fraction of bioaerosol and they are often much more numerous than other airborne microorganisms. The aeromycoflora are known to have profound influence on the incidence of several pathogenic bacteria and fungi those are dispersed with the help of certain natural agencies such as air, soil, water and seed. The aeromycoflora are always present in the air especially on the earth surfaces which are mainly attached to the leaf surfaces of plants, dust particles, on dead and decaying organic matters and also on the living organisms. Most of the aero spores in the atmosphere have come from the soil, and hence, the fungal spores are generally more abundant in the air near the earth surface than at high altitude. Airborne fungi are the most common microorganisms which have adverse effect on human health causing various

diseases like asthma, dermatitis, rhinitis and a wide range of cardio-respiratory diseases besides they are considered as a source of plant and animal pathogens (Tawfik and Munirah, 2012). Airborne fungal spores are also important agents of several plant diseases and many common saprophytic fungi cause spoilage of foods, vegetables, fruits, leather, timber and other household products. There are several air mycoflora that produce mycotoxins and can cause health hazards in all segments of the population. It has been reported that the higher concentration of airborne fungal spores along with the dust particles are considered to act as indicator of the level of atmospheric bio-pollution. The fungal propagules in the ambient air are regularly and continuously inhaled by human beings regularly that may cause respiratory diseases in humans as well due to their higher concentration in the air creates environmental pollution (Ahire and Sangale, 2012). The occurrence of the air mycoflora, determined by the environmental factors like, atmospheric temperature, humidity and precipitation in the form of rain, fog and dew along with presence of dust, human activities etc, disease incidence and the

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severity. The airborne fungal spores show great variation in composition and concentration and vary from place to place and seasons (Kotwal *et al.* 2010). However, the environment may possess both beneficial as well as harmful fungal flora and by studying these organisms people can use the beneficial fungi for productions and can take precautions against harmful ones. Therefore, the aim of this study was to determine the aeromycoflora, their identification, concentration and diversity in the indoor and outdoor air of Barpeta town area.

Therefore, the present extramural and intramural investigation was undertaken to study the outdoor and indoor aeromycoflora of residential area in Barpeta town, which will render valuable information regarding the presence of aeromycoflora in the area. Literacy rate in rural areas of Barpeta district is 61.47 % as per census data 2011. As per the estimate made in the Assam Human Development Report (2003), 11.06 percent of people in the district are not expected to survive to age 40. Cancer is one of the most prevalent diseases of the district. As per the records of B. Barooah Cancer Institute, Guwahati, where majority of the cancer cases in the state are treated, 8.4 percent of the patients belonged to Barpeta district during 2005-2006. The Infant Mortality Rate for the district is as high as 101 per 1000 live births.

## MATERIALS AND METHODS

The extramural and intramural investigation was undertaken to study the outdoor air i.e. outside the residential houses and indoor air i.e. inside the residential houses of Barpeta town. The air monitoring was carried out for a period of three months from May – July, 2018. The fungal spores were trapped by using Nutrient agar plate method containing PDA medium with Chloramphenicol (250 µg/L) to prevent bacterial growth. Extramural and intramural air samples were collected daily for the said period in the morning at 7 a.m. and in the evening at 5 p.m. for 20 minutes each at a height of 1-1.5m above the ground level for 15 minutes twice in a week. Three replica plates were taken for the experiment. The Petri plates were recovered with the lids, brought to the laboratory of B.B.K.College and incubated at 27 + 1°C. Fungal growth was examined at 3-5 days intervals. Pure culture was made for each of the isolated fungi

and identified with the help of the literatures. The fungal colonies developed were counted and identified up to the generic level based on colony and reproductive characters and the average numbers were recorded on the Table. Rainfall, temperature and relative humidity in the areas were recorded with the help of maximum, minimum, and wet-dry bulb thermometer respectively.

## RESULTS AND DISCUSSION

The results of aeromycological survey of indoor and outdoor air of Barpeta area revealed that the study areas harbours a cosmopolitan fungal species. The occurrence of indoor and outdoor aeromycoflora of showed significant different in months of the year. The experimental results (Table 1) showed that a total of 525 outdoor air spores (including pollen grains) and 242 indoor air spores were found in three months. Highest number of air spores were recorded (Table 2) in the month of Jun (190/88) and followed by July (178/82 and August (157/72 in both outdoor and indoor environment respectively. The most dominant outdoor air spores were the species of the genus *Aspergillus* (56) *Rhizopus* (51) *Mucor* (45), *Fusarium* (43), whereas, in case of indoor spore is *Rhizopus* (38), and followed by *Aspergillus* (32), *Mucor* (31), and other species were found less frequently. The exposure of these air spores may result in asthma, rhinitis, bronchopulmonary aspergillosis and various allergic problems in human beings (Pande and Goodbole,2009). Species of *Cunninghamella* (4) , *Drechslera*,(8), *Epicoccum* (4) and *Pestalotia* (5) were isolated in less quantity in outdoor environment and were absent in indoor environment. A similar result was obtained by Latha and Ramachandra Mohan (2013) who had studied dominant fungal flora (*Aspergillus*, *Fusarium*, *Alternaria* and *Curvularia*) from outdoor environments of four sites of Jnanabharathi campus of Bangalore. The maximum number of fungal colonies was recovered during the month of Jun in air both the indoor and outdoor environment is probably may due to the optimum temperature range (20-35°C) and high relative humidity (65-92%) along with high rains during this period favoured the fungal growth. During the rainy seasons various fungal species have been found to cause deterioration of foodstuff, fruits, vegetable, wooden furniture, papers, cloths, leather and other utensils. It has

**Table 1:** Occurrence of some important types of extramural and intramural spore types of airspora (2018). (Average of 3 replica plates)

| Spores Isolated             | Outdoor Airspores |     |     |                               | Indoor Airspores |     |     |                               |
|-----------------------------|-------------------|-----|-----|-------------------------------|------------------|-----|-----|-------------------------------|
|                             | Jun               | Jul | Aug | Total no. of spores/m3 of air | Jun              | Jul | Aug | Total no. of spores/m3 of air |
| <i>Alternaria sp.</i>       | 12                | 15  | 11  | 38                            | 7                | 7   | 6   | 20                            |
| <i>Aspergillus sp.</i>      | 20                | 20  | 16  | 56                            | 13               | 10  | 9   | 32                            |
| <i>Chaetomium sp.</i>       | 5                 | 3   | 5   | 13                            | 2                | 2   | 4   | 8                             |
| <i>Cladosporium sp.</i>     | 6                 | 3   | 3   | 12                            | 1                | 3   | 3   | 7                             |
| <i>Colletotrichum sp.</i>   | 10                | 11  | 7   | 28                            | 4                | 7   | 6   | 17                            |
| <i>Curvularia sp.</i>       | 4                 | 4   | 3   | 11                            | 2                | 2   | 1   | 5                             |
| <i>Cunninghamella sp.</i>   | 1                 | 2   | 1   | 4                             | -                | -   | -   | 0                             |
| <i>Drechslera sp.</i>       | 2                 | 2   | 4   | 8                             | -                | -   | -   | 0                             |
| <i>Epicoccum sp.</i>        | 2                 | 1   | 1   | 4                             | -                | -   | -   | 0                             |
| <i>Fusarium sp.</i>         | 15                | 15  | 13  | 43                            | 7                | 6   | 6   | 19                            |
| <i>Helminthosporium sp.</i> | 13                | 11  | 12  | 36                            | 5                | 4   | 2   | 11                            |
| <i>Mucor sp.</i>            | 17                | 14  | 14  | 45                            | 12               | 10  | 9   | 31                            |
| <i>Nigrospora sp.</i>       | 3                 | 3   | 2   | 8                             | 1                | 1   | -   | 2                             |
| <i>Penicillium sp.</i>      | 12                | 11  | 9   | 32                            | 5                | 3   | 5   | 13                            |
| <i>Pestalotia sp.</i>       | 1                 | 2   | 2   | 5                             | -                | -   | -   | 0                             |
| <i>Phoma sp.</i>            | 5                 | 3   | 3   | 11                            | 1                | 2   | -   | 3                             |
| <i>Phytophthora sp.</i>     | 8                 | 10  | 8   | 26                            | 3                | 4   | 4   | 11                            |
| <i>Pythium sp.</i>          | 8                 | 5   | 6   | 19                            | 2                | 1   | 1   | 4                             |
| <i>Rhizopus sp.</i>         | 18                | 18  | 15  | 51                            | 15               | 13  | 10  | 38                            |
| <i>Torula sp.</i>           | 7                 | 5   | 5   | 17                            | 2                | 2   | 1   | 5                             |
| <i>Smut spores</i>          | 7                 | 4   | 4   | 15                            | 2                | 2   | 1   | 5                             |
| <i>Rust spores</i>          | 3                 | 5   | 5   | 13                            | 2                | 1   | 1   | 4                             |
| <i>Pollen spores</i>        | 6                 | 6   | 4   | 16                            | -                | -   | -   | 0                             |
| <i>Unidentified</i>         | 5                 | 5   | 4   | 14                            | 2                | 2   | 3   | 7                             |
| <i>Month wise total</i>     | 190               | 178 | 157 | 525                           | 88               | 82  | 72  | 242                           |

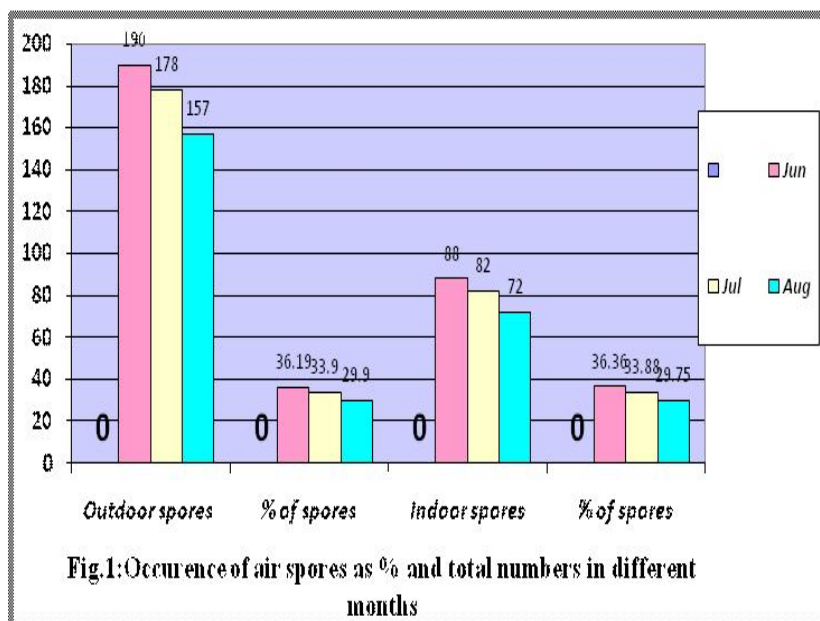
**Table 2:** Month wise total and % of occurrence of outdoor and indoor airspores

| Months | Outdoor air spores |             | Indoor air spores |             |
|--------|--------------------|-------------|-------------------|-------------|
|        | Total              | % of spores | Total             | % of spores |
| Jun    | 190                | 36.19       | 88                | 36.36       |
| Jul    | 178                | 33.90       | 82                | 33.88       |
| Aug    | 157                | 29.90       | 72                | 29.75       |

been reported by earlier that *Aspergillus* is an aero-allergen which is a common fungus in the environment that caused diseases easily in human beings. The experimental results were also revealed that the airspora of indoor and outdoor environment of Barpeta shows a close correlation qualitatively but there is a significant difference quantitatively. Analysis of variance of data of the Table 1 revealed that there is a significant difference of air spore population ( $P < 0.05$ ) in

outdoor and indoor environment. The mean difference is highly significant at the 5% probability level.

The occurrence of aeromycoflora in the air is closely related with climatic conditions like, temperature, rainfall, relative humidity and nature of the mycoflora. The aeromycoflora are responsible for a variety of plant and animal diseases. The air quality of both indoor and outdoor environment is



**Fig. 1 :** Diagrammatic representation of air spores as % and total numbers in different months

very important issue, because, it is related to the fungal contamination of the foodstuff and various skin and respiratory problems. The monitoring of outdoor and indoor aeromycoflora is important and it will help to find out the nature of various types of pathogens and way out the various control measures. It is also important to identify the various types of the non-pathogenic and pathogenic mycoflora that causes health hazards to people.

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