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A COMPARATIVE STUDY OF AEROMYCOSPORA IN DIFFERENT LOCALITIES OF GORAKHPUR ,U.P.

KUMARI SUNITA[a1], DEEPAK KUMAR GOND[b], C.O. SAMUEL[c] AND P. ABBASI[d]

Department of Botany, St. Andrew's College, Gorakhpur, U..P. India
[a]E-mail: ksunita78@gmail.com
[b]E-mail: botanydeepakgond@gmail.com
[c]E-mail: cosamuel45@gmail.com
[d]E-mail: praveenabbasi@yahoo.com

ABSTRACT

An aeromycological study was conducted from at three different localities of Gorakhpur district to identify and quantify fungi. The diversity of the aeromycoflora present in the air of very less populated (College Campus) to comparatively higher populated (Railway platform) and then to highly populated (Gorakhnath mela) regions was studied from 20th to 30th of January 2010, using agar plate method. The investigation showed variation in number as well as in composition of fungal species in these areas .The study showed that spores of *Alternaria, Aspergillus, Cladosporium, Curvularia, Helminthosporium, Mucor, Penicillium* and *Rhizopus* were the major components in the air of Gorakhpur.The number of fungi collected showed gradual decrease from the region of mela to platform and then to college campus. *Scytalidium lignicola* a fungus, antagonistic to many fungi, was conspicuous for its presence at college campus region. *A. flavus*, the aflatoxin (carcinogenic toxin) producing fungus was also recorded from both mela and platform regions.

KEY WORDS: Allergens, aflatoxin, antagonism, carcinogene, mycoflora

Air does not act as a natural environment for the growth and multiplication of air mycoflora, but it acts as a very good medium for their dispersal from one place to another. Several factors, e.g. humidity, temperature, sunlight and suspension of organic and inorganic material affect the distribution of microbes in the air. This is the reason that the composition of air microflora is always transient. In addition, many physical, chemical and biological factors bring about changes in the composition of aeromycoflora of an area. Human activities going on in and around the area also determine the number and nature of spores to be found after sampling .

Airborne fungi are considered to act as indicator of the level of atmospheric bio-pollution. The presence of fungal spores, volatiles and mycotoxins in the air can cause health hazards in all segments of the population (Kakde et al., 2001). Airborne fungal spores are ubiquitous in nature. Much of our knowledge on the behaviors of airborne spores comes from various studies on the epidemiology of plants, animals and human diseases, especially infections of the respiratory tract and allergy. More than 80 genera of fungi have been associated with respiratory tract allergy (Horner et al., 1995). Most of the allergenic fungi are classified under Ascomycetes and Deuteromycetes with a few in Basidiomycetes (Kurup et al., 2000). Some genera of airborne fungal spores such as *Alternaria, Aspergillus,* and *Cladosporium* are found throughout the world.

Airborne fungi occur as single units, spores and occasionally as hyphal fragments, conidiophores, associated with inorganic particles or as “bioaerosol” (Comtois, 1990). Number and type of fungi vary with time of day, weather and seasonal fluctuations, condition of the surrounding areas, climatic conditions and the presence of a local source of spores (Pepeljnjak and Segvic Klaric, 2003). The presence of plants, known to produce essential oils and aerosol, which showed sporistatic, fungistatic and fungicidal activities possibly, reduce aerospora viability. Increase of CO_2 concentration stimulates fungal sporulation suggesting that levels of the aeromycospora correlate with air pollution. In addition, increase of SO_2 can reduce airborne fungi concentration (Asan et al, 2002).

Concentration of airborne fungi has been studied in the extramural and indoor environments in India and abroad (Vittal and Krishnamurti, 1988). It is noteworthy that information on their occurrence in crowded places is not much available. The places which are inhabited by a large number of human beings and where vegetables, fruits, cosmetics and grocery items are accumulated contain enormous numbers of fungi. Spoilage of stored vegetables and food materials play an important role in determining the

[1]**Corresponding author**

number and nature of fungi present in the air. The relationship between occurrence of fungi and the place buzzing with human activities has already been established by Sullia and Khan (1980.)

Study Area

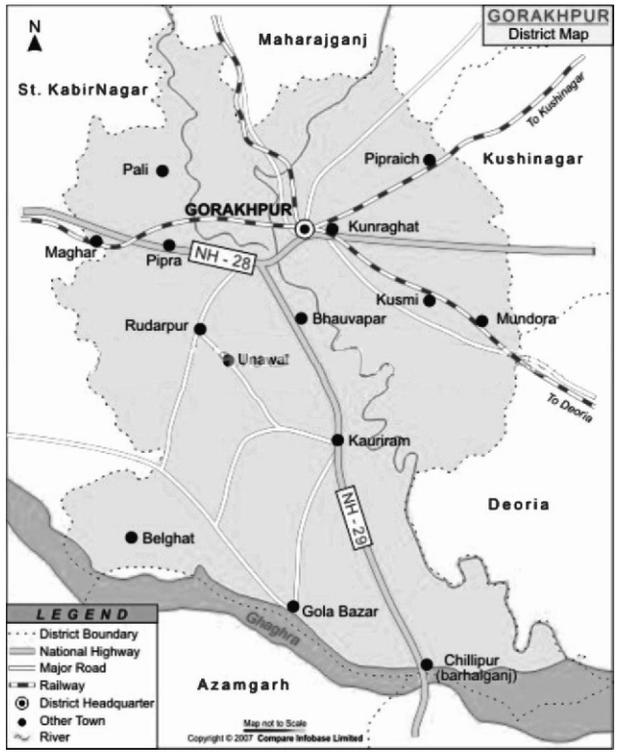
Gorakhpur is the second most important city of eastern Uttar Pradesh. The area is having heavy rainfall and moreover there is very fertile soil, resulting in the development of rich lush green vegetation throughout the year. It also provides ample opportunity to the microbes to grow and interact. The present study was carried out to investigate the fluctuation in aeromycospora of thickly, less and very less populated areas of Gorakhpur. This study would help to evaluate the actual status of aeromycoflora of the city and provide collective information in various localities within the city.

This study was aimed to collect some data on the concentration of mycospores in the air. For this three sites were selected depending upon the degree of population. The first site selected was Gorakhnath temple. It is situated in the north of the city. It is also known as the 'old city' or 'Purana Gorakhpur'. During Maker Sakranti festival (2nd week of January), a fair (mela) is celebrated for about one month. Thousands of people from rural and urban areas visit the place and offer "khichdi" to the deity. On an average about 5 thousand people flock here daily. Vegetation of this area includes *Tectona grandis, Mangifera indica, Cassia tora, Saraca indica, Artocarpus integrifolia, Melia japonica, Nerium indicum, Azadirachta indica, Ficus benghalensis , Ficus rumphii, Dalbergia sissoo, Delonix regia, Polyalthia longifolia* etc. along with herbaceous weeds.

The next site chosen was the railway platform of Gorakhpur station. More over Gorakhpur is the head quarters of North Eastern Railways. Considering the large number of passengers commuting daily, the population is ever changing. The local loop line services are also available. This gives a very crowded environment to the railway platform. Here no trees or other plantations are possible.

Third site selected was the College campus, which has a very large and open area. The college campus is full of trees and ornamental plants besides lush lawns and botanical garden etc.

Map of Gorakhpur District



MATERIALS AND METHODS

An aeromycological study was conducted to identify, quantify and calculate fluctuation of fungi at three different localities of Gorakhpur. For the study three human populations were sampled. First area was every time densely crowded railway platform, then seasonally crowded Gorakhnath temple at mela time and moderately all time crowded college campus. The result showed that variation in number as well as species composition of fungi was very clear among the three study areas .The highest number of fungi was collected from mela area followed by platform and college campus.

For the present investigation local vegetation, population, number of passing vehicles and pollution level were taken into consideration. For isolation of aeromycoflora the gravity settle plate method was used. Malt extract agar was used to trap fungal spores. 10cm sterile Petri plates containing semisolid agar medium was exposed for 5 minutes at various places in the same season.

The cultivable spores settle down on the plate and incubated at 28° ($\pm$ 1° C) for 7 days. Colonies were counted, calculated and identified following various literatures

available. The isolates were maintained on agar slants for further morphological studies. The fungal flora were identified and listed according to their number of occurrences.

OBSERVATION

The present study identified fungal spore belonging to Zygomycotina, Ascomycotina and Deuteromycotina. They are listed below in table.

Table : List of Recorded Fungal Flora

S.N.	Fungus	Mela Area	Railway Platform	College Campus
1	*Acremonium sp.*	-	+	-
2.	*Alternaria alternata*	+	+	-
3.	*A.padwickii*	+	-	-
4.	*A.glauca*	+	-	-
5.	*A.longissima*	+	+	-
6.	*A.tenuissima*	+	+	-
7.	*A.solani*	+	-	-
8.	*Aspergillus candidus*	+	-	-
9.	*Aspergillus carvinus*	-	+	-
10.	*A.clavatum*	+	-	-
11.	*A.carneus*	+	-	-
12.	*A.flavus*	+	+	+
13.	*A.flavipes*	+	+	-
14.	*A.fumigatus*	+	+	+
15.	*A.glaucus*	+	+	-
16.	*A.japonicus*	+	+	-
17.	*A.heteromorphus*	+	+	-
18.	*A.niger*	+	+	-
19.	*A.nidulans*	-	+	+
20.	*A.ochraceus*	+	+	-
21.	*A.oryzae*	+	-	+
22.	*A.parasiticus*	+	-	+
23.	*A.sydowii*	+	-	-
24.	*A.terreus*	+	+	-
25.	*A.versicolor*	+	-	-
26.	*Aspergillus sp.*	+	-	-
27.	*Cladosporium epiphyllum*	+	+	-
28.	*C.herbarum*	+	-	+
29.	*C.lignicolum*	+	+	-
30.	*C.tenuissimum*	+	+	-
31.	*Colletotrichum falcatum*	+	-	-
32.	*Curvularia lunata*	+	+	+
33.	*C.clavata*	+	-	-
34	*Fusarium oxysporum*	+	+	+
35	*F. semitectum*	-	+	-
36.	*Helminthosporium sativum*	-	+	-
37.	*H.nodulosum*	+	+	-
38.	*Mucor racemosus*	+	+	-
39.	*M. varians*	+	-	-
40.	*Nigrospora sp.*	+	+	+
41.	*Penicillium chrysogenum*		+	
42.	*P.citrinum*	+	+	-
43.	*P.camemberti*	+	-	-
44.	*P.nigr icans*	+	+	-
45.	*P.oxalicum*	-	-	+
46.	*Rhizophora sp.*	-	+	-
47.	*Rhizopus nigricans*	+	-	-
48.	*R. stolonifer*	+	+	+
49.	*Scytalidium lignicola*	+	-	-
50	*Torula sp.*	-	+	-

DISCUSSION

The three localities selected for study, are situated at three corners, making a triangle. College and railway platform are 2 - 2.5 kms away whereas Gorakhnath temple is nearly 4-5 kms away from both the places. Survey clearly showed that there exists enough diversity in the fungal flora. The species of *Aspergillus, Penicillium, Acremonium, Alternaria, Curvularia, Mucor, Rhizopus, Helminthosporium,* and *Cladosporium* were the most dominant type at all the sites.

The present study recorded altogether 50 fungi from all the three places. *Aspergillus* and *Penicillium* contributed the maximum i.e. about more than 45 % of the total aeromycoflora; while the remaining genera contributed only about 55 % *Cladosporium* is the fungal genus most correlated with meteorological parameters. This may be attributed to the size and nature of conidia. *Cladosporium* produces dry conidia in chains easily carried through the air. Therefore dispersion of *Cladosporium* spores is more influenced by meteorological parameters than *Alternaria* spores (Awad, 2005).

If the species of *Aspergillus* of all the places are compared there is also a marked set pattern of species occurrence *A. candidus*, *A. clavatum*, *A. sydowii*, and *A. versicolor* are recorded only from mela site whereas *A. oryzae* was recorded from the college campus only. *A. flavus* was recorded from both mela and platform areas. The presence of *A. flavus* in almost all localities is serious, as it produces aflatoxin, a potent carcinogen.

The higher count of most of the fungal spores in the mela region is possibly because of decaying and rotting vegetables and other food materials. Garbage heaps also provide safe breeding ground for various fungi. Consequently these fungal spores are translocated to the air. Number of *Cladosporium i*s low due to low temperature and high relative humidity. It is also significant that presence of *Scytalidium was* recorded from mela area only. Main sources of fungal spores are the market and surrounding area where the food material and vegetable matters and other garbage are thrown by the visitors along side the mela. The vegetative population around and the leaf litters accumulated beneath could functions as host for the plant pathogenic and saprobic fungi. Impact of airborne fungal spores including their release, dissemination, deposition and effect is of great significance to identify the health hazards and physiological disorders in living beings. The allergenic nature of *Cladosporium, Aspergillus, Penicillium, Alternaria, Curvularia*, has already been established . Effective disposal of solid waste may improve the air quantity of the mela. The air current plays an important role in sweeping the aeromicroflora and making the air more pure. The spores of Deuteromycetes were the largest contributors of the total airborne fungal spores. The distinction between dry-air spores and wet- air spores is well known. During January the air is dry. Dry-air spores include *Cladosporium, Alternaria, Drechslera* and *Curvularia* (Katial et al., 1997). Monitoring of airborne fungi can be helpful in prevention of fungal allergic diseases.

Regarding the less number of aeromycoflora isolated from the air at railway platform and College campus, may be attributed to the fast air current all the time and absence of decaying food and vegetables and other organic matters.

CONCLUSION

Study of this aspect is highly interdisciplinary in nature and has tremendous scope to find the significant application in human health. Exposures to outdoor and indoor airborne inhalant mold allergens develop respiratory symptoms and airway diseases and allergies. Thus clean environment is of prime importance to reduce the fungal spore load in the air. The predominance of fungal spore types, the dominance of Deuteromycotina followed by other fungal groups, concentration of individual fungal spore types, dominant fungal spore types, allergic and pathogenic spore types show close correlation in occurrence and concentration in the aerospora.

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