

Biodiversity of *Aeromycoflora* in indoor environment of Nagbhid (M. S.) India

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Abstract: The different component of air may have important effect on the health of man and animals, both individually and through their interactions. The present investigation was carried out to monitor the occurrence of indoor aeromycoflora at two different sites of Nagbhid during June 2013 to May 2014. Air sample was collected at each site twice in a month by exposing petriplates containing Potato Dextrose Agar (PDA). Total 498 colonies were recorded. The fungal colonies were assessed on the basis of micro and macro morphological characteristics. Winter season favors the occurrence of more fungal colonies. In this investigation, the predominant fungi observed were *Aspergillus niger* (18.29%), *A. flavus* (11.04%), *A. fumigatus* (7.23%), *Curvularia lunata* (6.83%), *Cladosporium* spp. (6.43%). The rainfall (mm), temperature (°C) and relative humidity (%) was noted and occurrence of fungi was correlated with these meteorological factors.

Keywords: Air, PDA, fungi, Meteorological factor.

I. INTRODUCTION

Fungal spores are one of the dominant components in the air and on account of their dimensions (several micrometers), they are classed as a bioaerosols [1]. The study of aeromycoflora of particular region provides the clear view about interaction of fungal spores in the form of disease on plants as well as occurrence of allergy in human being. If the specific fungal allergen is identified, the most effective therapy is specific hyposensitization, as complete avoidance is impossible [2]. So, it is of great clinical value to know the identity of the dominant airborne fungi in a particular area, as the fungal population varies from one place to another. The investigation on common airborne fungi and their distribution in a particular region can be helpful in identifying association between fungal sensitization and clinical diagnosis and clinical prevention of the seasonal allergic diseases [3]. Fungal organisms in indoor environment caused spoilage of stored grains and food stuff [4], fabrics, leather and other similar articles [5] and bio- deterioration of books and other material [6]. Fungi have some important structure that may help them to survive even in the unfavorable conditions.

Keeping this in mind a systematic intramural investigation was carried out in Nagbhid for a period of one year from June 2013 to May 2014.

II. MATERIAL AND METHODS

Study site: Aeromycological survey was carried out at Nagbhid, Dist Chandrapur, from June 2013 to May 2014. Two sites were selected for present study viz. Site I - Primary Health care centre (PHC) and site II – Science wing of RMG College Nagbhid, Dist. Chandrapur, India.

Media used: Potato Dextrose Agar (PDA) medium is used for the present study. This media probably provides the nutritional need of the fungi.

Collection of sample: Petriplates were exposed for 5 minutes twice in a month at each site. They were incubated at room temperature for the growth of fungal colonies. After exposing, the Petri plates containing the samples were incubated for 3 to 5 days at room temperature (25 to 28°C).

Identification: The fungal colonies were identified by colony morphology and characteristics of sporulation. The fungi were identified up to genus level and in some cases up to species level. The identification of the colonies was done with the help of standard literatures [7-11].

Percentage contributions of individual species were calculated as per the standard formula:

$$\% \text{ Contribution} = \frac{\text{Total no. of colonies of one species}}{\text{Total no. of colonies of all species}} \times 100$$

III. RESULTS AND DISCUSSION

Total 498 colonies of fungi were analyzed during June 2013 to May 2014. Twenty fungi were identified. In addition to this the fungi without sporulation was placed in sterile type and the fungi unable to identify in unidentified group. Maximum numbers of colonies were identified during winter seasons (219) followed by rainy (199) and summer season (80) (Table 1). Variation in concentration of fungal spores was found in different seasons (figure 1). Occurrence of more number of colonies during the winter indicated that fungi were very specific to temperature and humidity (Table 2). The dominant fungi observed was *Aspergillus niger* (18.29%), *A. flavus* (11.04%), *A. fumigatus* (7.23%), *Curvularia lunata* (6.83 %), *Cladosporium* spp. (6.43%). Site I (PHC) was more unhygienic as compare to the site II (Science wing of RMG College). Near PHC, most of the garbage of the city is dumped this makes the air unhygienic. This probably the reason of occurrence of more number of colonies in site I.

Incidence of fungal species was dependant on seasonal variations. During rainy season, number of fungal colonies isolated was found to be increased. During summer days number of fungi and their incidence was less. There was a close relation found between number of fungi isolated with relative humidity and temperature. Increased in humidity increased the occurrence of fungal colonies.

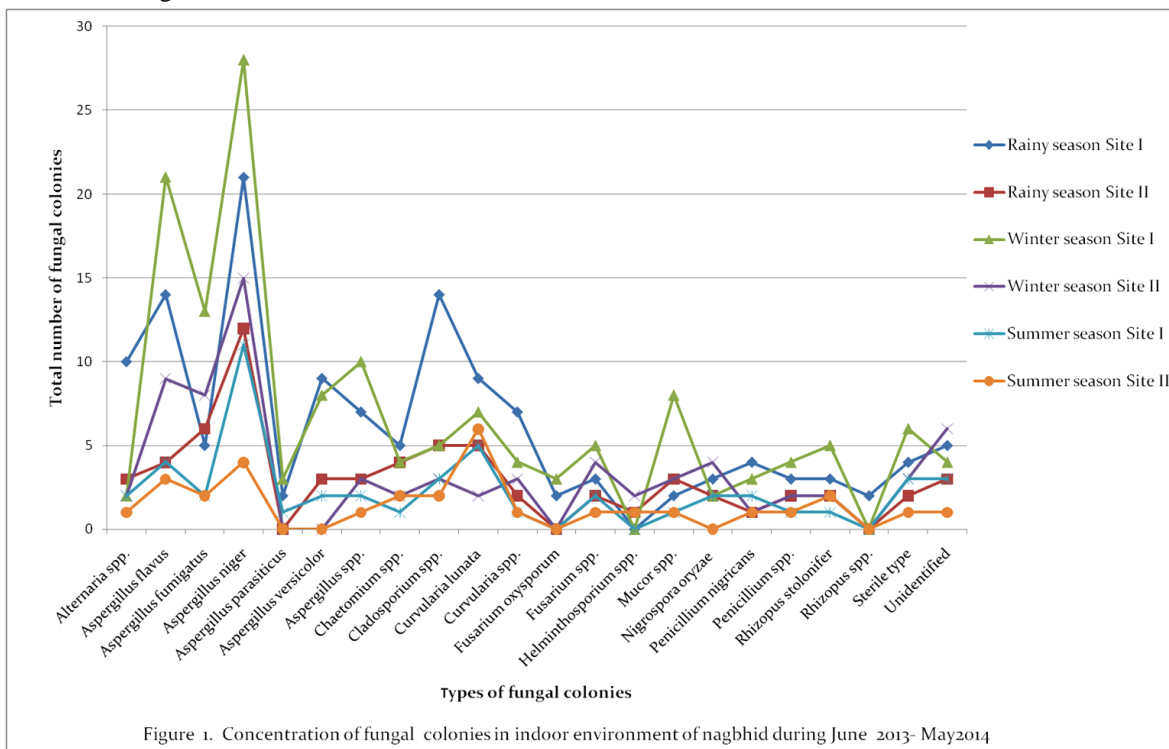


Figure 1. Concentration of fungal colonies in indoor environment of nagbhid during June 2013- May2014

Five species of *Aspergillus* viz. *Aspergillus niger*, *A. flavus*, *A. fumigatus*, *A. parasiticus* and *A. versicolor* were identified while some species of *Aspergillus* was unidentified and placed in separate group. *Aspergillus* colonies were dominant during July to December. Genus *Aspergillus* (including all species) was found to be dominant during the study. *Aspergillus* is dominant component of atmosphere [12-14]

During this aeromycological study fungi showed monthly and seasonal variations in their concentration. Present study showed that winter season and rainy season favored the occurrence of fungi. During winter seasons the concentration of fungi was comparatively more as compared to rainy and summer seasons. During winter seasons especially in the month of November some rainy day was recorded with sudden increase in the humidity which might be the reason of increase in the concentration of fungi in the nearby area. Healthy fungal spores with optimum temperature and high relative humidity favor the indoor fungal growth [15]. People of the area are constantly being exposed to these spores of which a good number are known for their hypersensitive reactions leading to respiratory problems. Fungi from human environment or growing in human body may cause allergic reactions. They are associated with number of allergic diseases in humans including allergic rhinitis, conjunctivitis, bronchial asthma and allergic broncho pulmonary mycoses resulting from exposure to spores [16]. The biological phenomenon of fungal organism concern to their ease of dispersion makes fungi one of the chief agents of contamination of variety of substrates including cellulose materials in the laboratories [17]. The release fungal spores probably depend upon the environmental condition and wind velocity. The spores liberation of *Aspergilli* and *Penicilli* were favored by high air humidity and while those of *Alternaria*, *Cladosporium* and *Helminthosporium*, were liberated mechanically by the action of wind [18].

S. N	Name of fungi	Rainy season				Winter season				Summer season				Grand total	Overall %
		S-I	S-II	Total	%	S-I	S-II	Total	%	S-I	S-II	Total	%		
1	<i>Alternaria</i> spp.	10	3	13	6.53	2	2	4	1.83	2	1	3	3.75	20	4.02
2	<i>Aspergillus flavus</i>	14	4	18	9.05	21	9	30	13.70	4	3	7	8.75	55	11.04
3	<i>Aspergillus fumigatus</i>	5	6	11	5.53	13	8	21	9.59	2	2	4	5.00	36	7.23
4	<i>Aspergillus niger</i>	21	12	33	16.58	28	15	43	19.63	11	4	15	18.75	91	18.27
5	<i>Aspergillus parasiticus</i>	2	-	2	1.01	3	-	3	1.37	1	-	1	1.25	6	1.20
6	<i>Aspergillus versicolor</i>	12	-	12	6.03	8	-	8	3.65	2	-	2	2.50	22	4.42
7	<i>Aspergillus</i> spp.	7	3	10	5.03	10	3	13	5.94	3	-	3	3.75	26	5.22
8	<i>Chaetomium</i> spp.	5	4	9	4.52	4	2	6	2.74	1	2	3	3.75	18	3.61
9	<i>Cladosporium</i> spp.	14	5	19	9.55	5	3	8	3.65	3	2	5	6.25	32	6.43
10	<i>Curvularia lunata</i>	9	5	14	7.04	7	2	9	4.11	5	6	11	13.75	34	6.83
11	<i>Curvularia</i> spp.	7	2	9	4.52	4	3	7	3.20	1	1	2	2.50	18	3.61
12	<i>Fusarium oxysporum</i>	2	-	2	1.01	3	-	3	1.37	-	-	0	0.00	5	1.00
13	<i>Fusarium</i> spp.	3	2	5	2.51	5	4	9	4.11	2	1	3	3.75	17	3.41
14	<i>Helminthosporium</i> spp.	-	1	1	0.50	-	2	2	0.91	-	1	1	1.25	4	0.80
15	<i>Mucor</i> spp.	2	3	5	2.51	8	3	11	5.02	2	-	2	2.50	18	3.61
16	<i>Nigrospora oryzae</i>	5	-	5	2.51	6	-	6	2.74	2	-	2	2.50	13	2.61
17	<i>Penicillium nigricans</i>	4	1	5	2.51	3	1	4	1.83	3	-	3	3.75	12	2.41
18	<i>Penicillium</i> spp.	5	-	5	2.51	6	-	6	2.74	2	-	2	2.50	13	2.61
19	<i>Rhizopus stolonifer</i>	5	-	5	2.51	7	-	7	3.20	3	-	3	3.75	15	3.01
20	<i>Rhizopus</i> spp.	2	-	2	1.01	-	-	-	-	-	-	-	-	2	0.40
21	Sterile mycelia	4	2	6	3.02	6	3	9	4.11	3	1	4	5.00	19	3.82
22	Unidentified	5	3	8	4.02	4	6	10	4.57	3	1	4	5.00	22	4.42
	Total	143	56	199	100.00	153	66	219	100.00	55	25	80	100.00	498	100.00

	Rainy	Winter	Summer
Taxa_S	22	21	20
Individuals	199	219	80
Dominance	0.07396	0.0878	0.085

Simpson_1-D	0.926	0.9122	0.915
Shannon_H	2.82	2.733	2.732
Evenness_	0.7624	0.7326	0.7681
Margalef	3.967	3.711	4.336

IV. CONCLUSION

Present study showed the seasonal variations of the airborne fungi in the indoor environment of Nagbhid. Aeromycological studies are helpful in providing information about incidence of fungal spores, disease incidence with relation to meteorological parameters. Among the meteorological parameters, temperature and humidity play an important role in the release of such fungal spores in the atmosphere. It is concluded that the present work will be definitely helpful to aero biologist, agriculturalist, pathologist, environmentalist, allergologists and researchers in related fields.

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