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Aeromycological Investigations of Intramural Environment of Hospital and Library in Nagpur City (M.S.) India

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ABSTRACT

An intramural aeromycoflora of two different sites viz. Hospital (Bhoyar Hospital) and Library (RTMNU, University Library) at Nagpur city was carried out for two consecutive years September 2007 to August 2008 by sampling air with the help of rotorod air sampler, to study the incidence of fungal spores.

Total airspora concentration 48065 spore /m^3, were observed at both the sites. Although the composition of aeromycoflora of both environments were more/less similar. 59 types of fungal spores were identified from the total catch of indoor environments from hospital 26485 spores /m^3 and 21580 spore /m^3 from Library by using rotorod sampler. The different fungal spores in both the sites are in the order of dominance are *Aspergilli* (11.44%, 12.27%), *Cladosporium* (8.53%, 10.98%) *Curvularia* (8.08%, 8.89%), *Alternaria* (5.87%, 6.32%), *Nigrospora* (2.68%, 5.25%), *Smuts* (2.05%, 1.69%) *Helminthosporium* (4.00%, 4.0%) and Other types (28.84%, 20.18%) in including pollen grains and unidentified spores respectively. Among the fungal groups, *Deuteromycotina* in Hospital and in Library contributed most at both the sites viz. Hospital (54.20%) & Library (62.92%) followed by *Ascomycotina* (8.53%, 11.49%), *Basidiomycotina* (7.30%, 4.54%) & *Zygomycotina* (1.11% ,0.85%) respectively.

The occurrence of different spore types was co-related with the meteorological parameters. Airborne fungal spores are known to cause allergy in human beings. Hence efforts were also taken to survey of allergy patients in the study area.

Key words – Aspergilli, Intramural aeromycoflora, allergy, meteorological parameters. (Note: Aspergilli was a group having the spores of similar appearance i.e. small and rounded e.g. *Aspergillus, Penicillium, Rhizopus Mucor Tricoderma* etc.)

I. INTRODUCTION

Air is a complex mixture of various gases, various living and non-living particles, water vapours, pollen grains and fungal spores. Without air no one can survive but air is very important medium through which diseases spread. The spores and pollen grains release from their source and become suspended in air. Fungal spores numerically dominant than the other components of air. Meteorological factors like temperature, humidity, and rainfall plays an important role in occurrence of airspora.

Intramural environment of hospital is responsible for transmitting pathogenic micro-organisms and hence responsible for spread the discases. *Aspergillus* sp. are major cause of hospital infections. The microbes have been also reported in the beddings of patients. *A.*

fumigatus in air have been reported from the hospitals. Many airborne fungi are responsible for spoil library materials. Increasing humidity is favorable for the growth of moulds and mildews which cause loosening of paste and glue, weakening of fibers of paper and leather.

Plumbe (1964) stated that fungal spores are always present in the atmosphere of library. Parker & Munshi (1973) also reported the highest percentage of *Cladosporium* in the airspora of library. Investigation in India & biodeterioration of paper by the activity of the micro-organisms were known by the work of Kathapalia (1960) and Mukharjee (1973). Dominance of *Aspergillus* spp. in Library environment is also reported by Vittal & Glory (1984, 1985), Burge *et al* (1985), Chaturvedi *et. al* (1992) while Verma & Khare (1987), Tripathi (1987), Tilak & Pillai (1988) reported highest contribution of *Cladosporium* followed by *Penicillium* in library. Spore type recorded more or less similar in both the environments. The largest spore concentration of *Aspergillus* followed by *Cladosporium* were found in both environments.

II. METHODS AND MATERIAL

Sampling Sites:

The present study was carried out at two different sites Bhoyar Hospital and University Library, Nagpur for the period of 1year September 2007 to August 2008 at Nagpur City. Nagpur is situated in the central part of India in Maharashtra State. It is located between 21* 45^{O} N to 20* 30^{O}N & 78*15^{O}E to 79*45^{O} E.

Sampling Method:

The present qualitative and quantitative study was carried out to determine the fungal spores count types and their seasonal variation during the period of investigation. Investigation carried out by rotorod air sampler This air sampling device was developed by Perkins (1957) modified by Harrington (1959). It is a portable air sampler hence was used for the present work. It is a battery operated with a constant rotating speed of 2300 r.p.m. it was placed constant height of 1 meter above the ground level for 30 minutes twice a month at fortnightly intervals. Studies carried out in OPD and general ward and in Library investigation was done in reading room and book self room. The exposed tape strips were mounted on slides by using glycerine jelly. Slide preparation and scanning was carried out by the method after Tilak and Shrinivasulu (1967). Spores counts on strip was expressed as number of spore/m^3. The calculated conversion factor for the sample was 5. Identification of fungal spores was done by comparison with reference slides and by consulting the literature after Burnett and Hunter (1972).

Meteorological Data –

The aeromycoflora is co-related with weather parameters and also with the incidence of allergy in the area. Temperature and Humidity was obtained from personal instrument and rainfall data obtained from Dr. Babasaheb Ambedkar Airport Sonegaon, Nagpur (Table no.1and 2)

III. RESULTS AND DISCUSSION

The observation and data obtained during the course of investigation at both site (Hospital & Library) using rotorod air sampler for nonculturable fungal types over a period of one year viz. September 2006 to August 2007. Both the environments i.e. Hospital and Library the major contributors are *Aspergilli* which is followed by *Cladosporium*, *Curvularia*, *Alternaria*, *Nigrospora, Helminthosporium*, *Drechslera*, *Diploidia, Ganoderma*, Smut spores *Uredospores* and *Chaetomium.* A total no of 26485 spore /m^3 of air belonging to 55 fungi were recorded from site I (Hospital). Among these 55 types, 30 belongs to Deuteromycotina, 18 to Ascomycotina, 4 to Basidiomycotina & 3 to Zygomycotina. On the other hand, Maximum no of fungal spores 21580 spores/m^3 belonging to 59 fungal types were observed from site II (Library). In library also Deuteromycotina (34) was

the most dominating group followed by 19 belonging to Ascomycotina, 3 from Basidiomycotina & 3 from Zygomycotina.

Site I – Hospital:

Total 26485 spores/ m^3 airspora types were recorded during the study period. Highest incidence of fungal spores were recorded in the months of June to August. Highest peak was observed in the month of June (2845 spores /m^3).

Chaetomium (235/m^3) was the dominant fungal forms in the group of Ascomycotina while Basidiomycotina showed the abundance. The largest spore conc. of *Aspergilli* (11.44%) followed by *Cladosporium* (8.53%), *Curvularia* (8.08%), *Alternaria* (5.87%), *Helminthosporium* (4.22%), *Nigrospora* (2.68%), *Ganoderma* (2.94%) and *Smut spores* (2.05%). In other types Hyphal Fragments (5.64%) contributes most percentage which is followed by Algal filaments (5.56%), Insect Parts (5.09%), Trichomes (4.02%), Pollen grains (3.53%), Tracheideal elements (3.03%), Unidentified spores and this data was also reported by others (Tilak & Talib, 1980; Tilak & Saibaba 1984; Vittal & Glory 1985; Tripathi 1987; Santra & Chanda, 1981; Singh & Chatterji 1990).

Site II – Library:

The total no of biopollutants recorded during one year of investigation in library were 21580 spore /m^3. The highest incidence of fungal spores was recorded in the months of June, July and August. The highest pick was observed in month of August (1920 spore /m^3).

Chaetomium (1445/m3) is the most dominant among the group Ascomycotina. Basidiomycotina recorded the occurrence of *Ganoderma* (390/m^3), Smut spores (365/m^3) *Uredospores* (225/m^3) as the dominant spores. In Deuteromycotina group the dominant fungal spores Aspergilli 2650 spore /m^3, (12.27%) which is followed by *Cladosporium* 2370/m(10.98%), *Curvularia* (1920/m^3) 8.89%, *Alternaria* (1365/m^3) 6.32%, *Helminthosporium* (785/m^3), 4% , *Diplodia* (230/m^3) 1.06% , *Drechslera* (615/m^3) 2.84% . Among the other types, Insect parts (1540/m^3), 7.13% contributes more which is followed by fungal fragments (755/m^3) 3.49%, Algal filaments (670/m^3) 3.10% , Pollen grains (440/m^3) 2.03%, Trichomes (325/m^3) 1.50%, Tracheideal elements (355/m^3) 1.64% & unidentified spores (270/m^3).

Increase in the humidity is favorable for the growth of moulds and mildews which cause loosen in of paste and glue weakening of fibers and paper and leather. Investigation in India and deterioration of paper by the activity of the microorganisms were known by the works of Kathapalia (1960), & Mukherjee (1973) has implications these spores in allergy. Concentration of Aspergilli spores was high in Hospital ward (3030 spores/m^3, 11.44%) as compared to the Library (2650spores/m^3,12.27%)

Table 1: No. of Biopollutants from September 2006 to August 2007 along with average monthly temperature and relative humidity in Hospital

Sr. No	Months	No. of Bipollutants	Average temp	Relative Humidity
1	Sept 2006	1870/ m^3	21.0	66%
2	Oct 2006	2020/m^3	22.30	64%
3	Nov 2006	1975/m^3	24.8	63%
4	Dec 2006	1925/m^3	24.5	58%
5	Jan 2007	2010/m^3	23.2	59%
6	Feb 2007	1920/m^3	24.0	62%
7	Mar 2007	1930/m^3	27.5	63%
8	Apr 2007	1960/m^3	28.7	60%
9	May 2007	2390/m^3	29.2	47%
10	June 2007	2845/m^3	24.3	61%
11	July 2007	2355/m^3	21.3	63%
12	Aug 2007	2675/m^3	21.0	65%

Table 2: No. of Bipollutants from September 2006 to August 2007 along with average monthly temperature and relative humidity in Library

Sr. No	Months	No of Bipollutants	Average temp	Relative Humidity
1	Sept 2006	1830/m³	20.2	64%
2	Oct 2006	1785/m³	22.3	65%
3	Nov 2006	1720/m³	24.7	61%
4	Dec 2006	1700/m³	24.5	61%
5	Jan 2007	1855/m³	26.3	58%
6	Feb 2007	1820/m³	26.5	60%
7	Mar 2007	1680/m³	29.6	59%
8	April 2007	1750/m³	31.3	64%
9	May 2007	1675/m³	28.9	47%
10	June 2007	1870/m³	25.7	61%
11	July 2007	1895/m³	27.2	60%
12	Aug 2007	1920/m3	27.0	65%

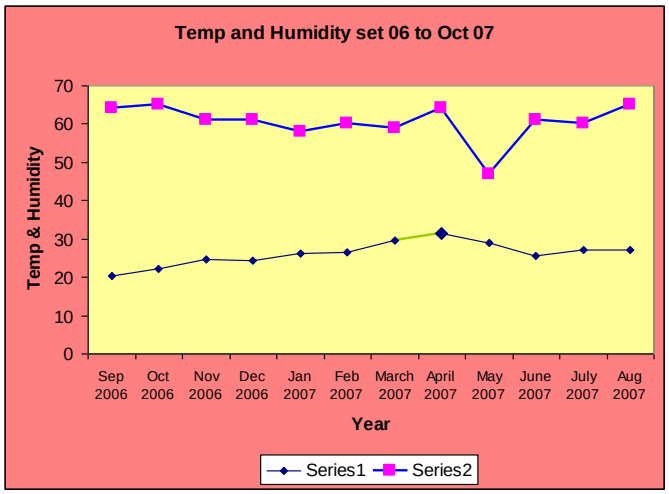
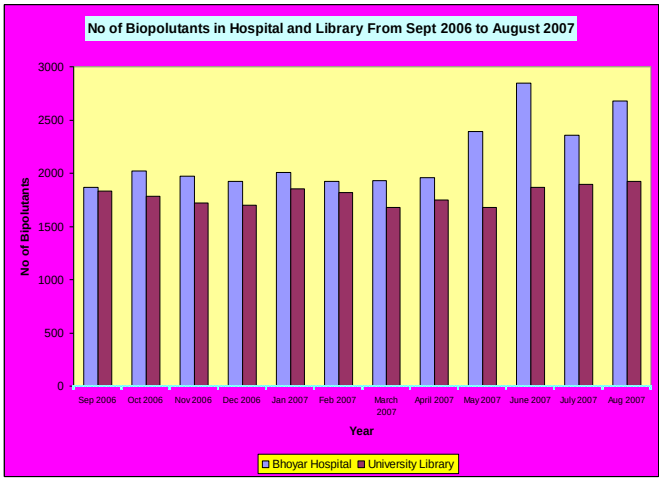


Fig: 1



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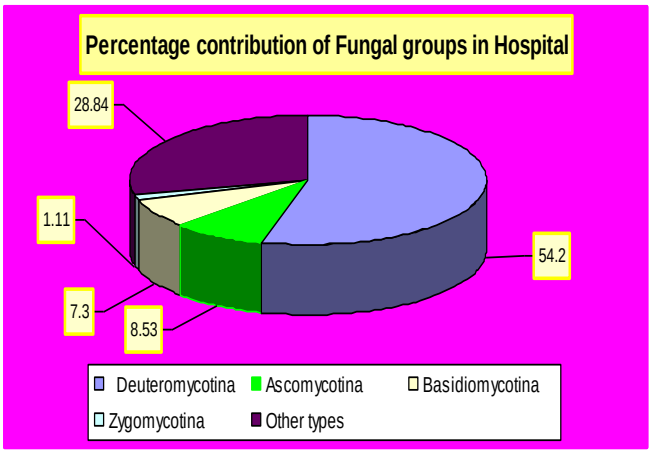

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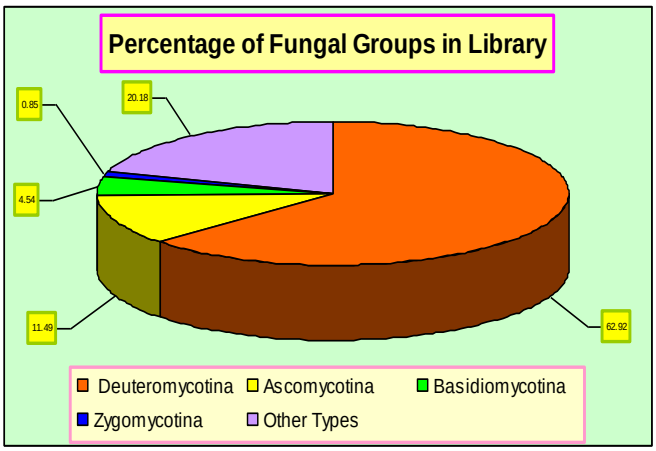

Fig: 4

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