

RESEARCH ARTICLE

AEROBIOLOGICAL ASSESSMENT OF THE INTRAMURAL ENVIRONMENT OF MAHARSHI DAYANAND COLLEGE LIBRARY

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ABSTRACT

Aerobiology deals with the study of the movement and dispersal of living as well as non-living material through the atmosphere. Indoor or intramural environment as of library provides congenial conditions such as low temperature and high humidity as compared to outside environment. The location of Maharshi Dayanand college library is such that it is subjected to heavy air pollution with varied species and quantity of microorganisms. The present study from Nov 2010 to Oct 2011 aimed at qualitative & quantitative analysis of intramural environment of the library. In the intramural environment of library total 19446. Pollen and fungal spore types were recorded of which 966 (4.97%) were pollen grains and 18480 (95.03%) were fungal spores. The percentage of pollen grains recorded in the intramural environment of library is very low. Total 5 species of *Aspergillus* were recorded: i. e, *Aspergillus flavus*, *Aspergillus fumigatus*, *A. nidulans*, *A. niger* and *Aspergillus oryzae*. Throughout the period of study, *Aspergillus* sp. spores were recorded with highest percentage (27.71%) Among the fungal spores, *Cladosporium* spores were recorded the second largest in percentage (26.70%) Among the pollen grains, Grasses recorded the highest percentage of (1.44 %) with a total of 280 pollen grains throughout the year in the intramural environment of the library. The peak season for Grass pollens was from Dec 2010 to June 2011 with maximum in October 2011. Large no of Dust mites were also recorded from carpets, book covers and dust. Miscellaneous type like hyphal filaments, Algal filaments and plant cell fragments were also recorded throughout the year. Meteorological parameters were recorded and fungal growth was correlated with variation in temperature and %age humidity. The fungal growth was maximum during the months of Aug to Oct which showed high humidity in the atmosphere. The concentration of pollen grains was also correlated with wind speed.

Keywords : Airborne bioparticles, Intramural Environment, Library, Allergy

INTRODUCTION

Aerobiology deals with the study of the movement and dispersal of living as well as non-living material through the atmosphere. Indoor environment as of library provides congenial conditions such as low temperature and high humidity as compared to outside environment. The library particularly provides a rich stock of substrate for the microorganisms to

thrive on. The bindery glue, cloth covering in addition to paper support fungal growth. Fungal spores are amongst the most common airborne particles present in air. The library is also subjected to the growth of the fungi which can result in a variety of adverse health effects, which includes infectious diseases like skin irritation, reddening of eyes, respiratory allergies etc. Fungal spores count directly influence the manifestation of allergic symptoms in sensitive individuals.

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MATERIAL AND METHODS

A) Selection of Site:

Initially a detailed survey of Library atmosphere was undertaken to select the site, keeping in mind the



objectives of the study. This resulted in the selection of site as MaharshiDayanand College Library.

B) Floristic surveys:

Regular periodic visits were made to the Library, vicinities and surrounding area to study and record the flowering period of the Angiosperm species and collection of fungi samples for culturing. The polliniferous material of these species were brought to the laboratory for preparing reference slides of confirmed pollen types, so as to correctly identify the trapped air-borne pollen types. The reference slides were prepared by using the same type of glycerin jelly as in gravity slide sampling. This made the comparison and identification of trapped pollen grains easier.

C) Gravity slide sampling:

Glycerine jelly coated micro slides were exposed, by using locally fabricated Durham's spore sampler due to its economy and simplicity, inspite of its limitations. The exposure were done at a height of 2 metres, daily for a duration of 7 consecutive days a month inside the library and surrounding area for two years. The Glycerine jelly had the following constituents:

Glycerine	-150gm
Gelatin	-50gm
Distilled Water	-150ml
Phenol Crystals	-5gm
and a small trace of saffranin	

D) Petri plate Culture Method:

Petri plates containing Rose Bengal Streptomycin (RBS) Agar medium were exposed once a month for 10 minutes at a height of 2 meters from ground level at the Indoor and outdoor environment of library. Three exposures/trappings were done in a day at 8.00hrs, 12.00hrs and 16.00hrs, once a month for one year.

The RBS Agar medium consisting of the following ingredients was prepared as follows:

Rose Bengal Dye	-00.05gm
Bacto-Peptone	-02.00gm
Bacto-Agar	-20.00gm
Glucose	-10.00gm
Magnesium Sulphate	-00.50gm
Potassium Dihydrogen Phosphate	-00.50gm
Distilled water	-1000ml

E) Volumetric sampling using Tilak Air sampler:

The standard Tilak Air sampler (Tilak and Kulkarni, 1970) was employed for continuous volumetric sampling of air for 8 days a month for one year, i.e. from 1st November 2010 to 31st October 2011, at the intramural environment of MaharshiDayanand College library.

F) Calculations to obtain conversion factor:

Calculated conversion factor for Tilak Air sampler is = 14

The volume of air sampled per minute = 5litre/min

The number of spores, thus scanned, multiplied by conversion factor would give the number of pollen/fungal spores in m³ of air.

For example, 10 spores X 14=140 spores in m³ of air.

Thus the data provided in the tables are after using the conversion factor=14.

RESULTS:

In the intramural environment of library total 19446. Total 20 pollen and 17 fungal spore types were recorded during this study. Pollen and fungal spore types were recorded of which 966 (4.97%) were pollen grains and 18480 (95.03%) were fungal spores. The percentage of pollen grains recorded in the intramural environment of library is very low. Fungal spores were recorded highest during the month of September. Total 5 species of *Aspergillus* were recorded i: e, *Aspergillusflavus*, *Aspergillusfumigatus*, *A.nidulans*, *A.niger* and *Aspergillusoryzae*. Throughout the period of study, *Aspergillus sp.* spores were recorded with highest percentage (27.71%) Among the fungal spores, *Cladosporium spores* were recorded the second largest in percentage (26.70%) Among the pollen grains, Grasses recorded the highest percentage of (1.44 %) with a total of 280 pollen grains throughout the year in the intramural environment of the library. The peak season for Grass pollens was from Dec 2010 to June 2011 with maximum in October 2011. Large no of Dust mites were also recorded from carpets, book covers and dust. Miscellaneous type like hyphal filaments, Algal filaments and plant cell fragments were also recorded throughout the year. Meteorological parameters were recorded and fungal growth was correlated with variation in temperature and %age humidity. The fungal growth was maximum



during the months of Aug to Oct which showed high pollen grains was also correlated with wind speed. humidity in the atmosphere. The concentration of

Table 1: Monthly average concentration of air-borne pollen grains and other types trapped by using Tilak Air sampler and their % age Contribution-Indoor Environment

Sr. No.	Pollen type	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Total	%age
1	<i>Acacia auriculiformis</i>						14						28	42	0.216
2	<i>Amaranthus/ Chenopodium type</i>	28	14	14	-	-	-	14	28	28	28	14	14	182	0.936
3	<i>Bougainvillea spectabilis</i>	14	14	-	-	-	-	14	14	-	14	14	-	84	0.432
4	<i>Carica papaya</i>														
5	<i>Cassia siamea</i>												28	28	0.144
6	<i>Clerodendroninerve</i>					14								14	0.72
7	<i>Cocosnucifera</i>														
8	<i>Cyperusrotundus</i>														
9	<i>Delonixregia</i>														
10	Grasses	28	28	28	14	14	28	28	14		14	28	56	280	1.44
11	<i>Hibiscus rosasinensis</i>	14	-	-	-	-	-	-	-	14	14	28	-	70	0.36
12	<i>Lagerstroemia speciosa</i>														
13	<i>Lantana camara</i>														
14	<i>Moringaoleifera</i>														
15	<i>Neriumindicum</i>														
16	<i>Peltophorumpterocarpum</i>														
17	<i>Ricinuscommunis</i>														
18	<i>Samaneasaman</i>														
19	<i>Syzygiumcumini</i>														
20	<i>Tridexprocumbens</i>														
21	Unidentified Pollen	14	14	28	14	42	14	28	28	14	42	14	14	266	1.367
		98	70	70	28	70	56	84	84	56	112	98	140	966	4.97

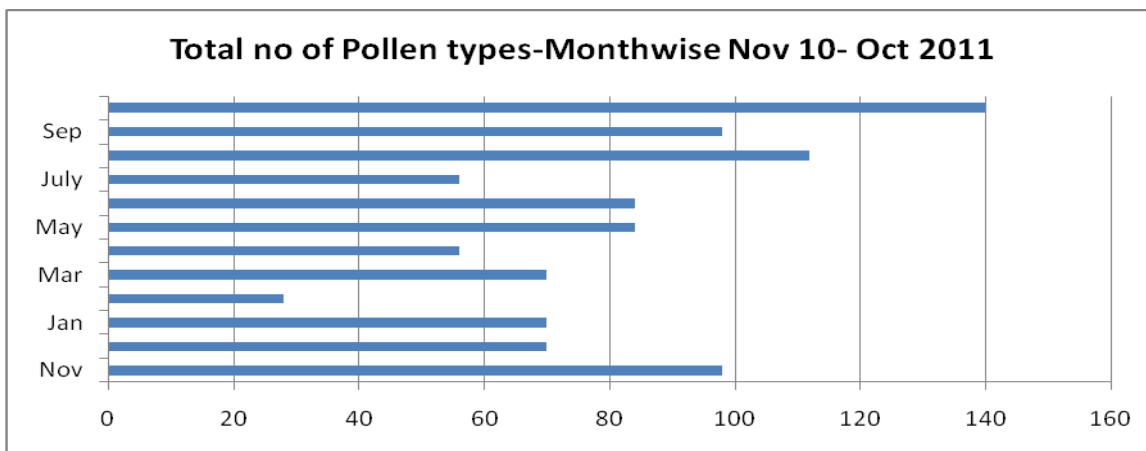


Fig. 1 : Total number of pollen types Monthwise (Nov 10 to Oct- 2011)



Table-2: Monthly average concentration of air-borne fungal spores and other types trapped by using Tilak Air sampler and their % age Contribution-Indoor Environment.

Sr. No.	Fungal spores	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Total	%age
1	<i>Absidia sp.</i>	14	-	-	-	-	-	-	14	42	70	98	14	252	1.295
2	<i>Alternariaal ternata</i>	70	42	70	56	70	154	70	196	294	518	686	126	2352	12.095
3	<i>Aspergillusflavus</i>													0	
4	<i>Aspergillus fumigatus</i>													0	
5	<i>Aspergillusnidulans</i>	224	196	350	336	196	266	196	350	658	1050	1274	294	5390	27.71
6	<i>Aspergillusniger</i>													0	
7	<i>Aspergillusoryzae</i>													0	
8	<i>Basidiospores</i>	-	-	-	-	-	-	-	-	14	28	98	28	168	0.864
9	<i>Chaetomium globosum</i>	70	154	280	70	126	-	-	-	70	56	-	-	826	4.247
10	<i>Cladosporiumsp</i>	308	182	266	98	238	210	196	322	1064	924	1036	350	5194	26.70
11	<i>Cunningha mella sp.</i>	-	14	98	14	-	-	-	-	-	-	-	-	126	0.648
12	<i>Curvularia sp.</i>	28	70	14	-	14	14	14	28	42	56	308	70	658	3.383
13	<i>Dreschlera sp.</i>	14	-	-	-	-	-	-	-	14	14	126	224	392	2.016
14	<i>Fusariumsp</i>	42	-	56	-	-	-	-	-	14	14	42	98	266	1.367
15	<i>Penicillium spp.</i>	-	-	-	-	-	-	-	-	14	28	42	-	84	0.432
16	<i>Rhizopus spp.</i>	-	-	14	56	70	28	56	98	308	378	448	126	1582	8.135
17	<i>Trichoderma sp.</i>	-	-	28	28	42	56	56	28	98	154	168	-	658	3.383
18	Unidentified sp.	28	28	70	56	42	70	14	28	70	42	70	14	532	2.735
		798	686	1246	714	798	798	602	1064	2702	3332	4396	1344	18480	95.03

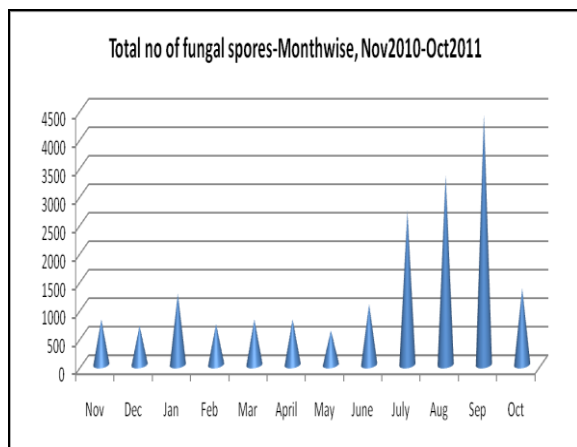


Fig. 2: Total number of fungal spore- month wise Nov. 2010 to Oct. 2011

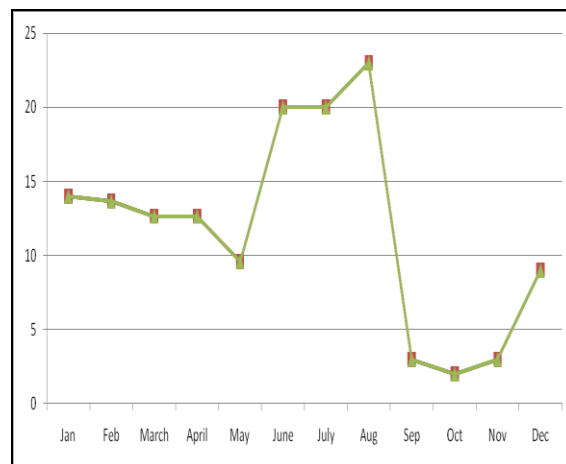


Fig. 3: Petri plate Culture Method: Month wise average total fungal colonies developed on Petri Plates-(Indoor Environment).

CONCLUSION:

Airborne Pollen and fungal spores which are allergenic to inhabitants in the intramural environment especially libraries contributes a great

threat. The present study concludes presence of significant concentration of fungal spores generated from old papers, books and air conditioning vents. Significant amount of pollens were also accounted for.



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Cite this article as: Sohal Satnam Singh, Bhalerao Satish and Deshbhratar Shantaj (2013) Aerobiological assessment of the intramural environment of Maharshi Dayanand College Library. *Int. J. of Life Sciences*, Special Issue A (1): 17- 21.

