WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 9, Issue 7, 1752-1758. Research Article ISSN 2277– 7105

AIRBORNE MYCODIVERSITY IN THE INDOOR ENVIRONMENT OF LIBRARY

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Article Received on
11 May 2020,

Revised on 31 May 2020,
Accepted on 21 June 2020,

DOI: 10.20959/wjpr20207-17835

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ABSTRACT

Aeromycoflora only refers to the airborne fungal contributors of the environment. Air sampling investigation was carried out by using PDA, Petri plate exposure method, aeromycoflora inside the library of the Indraraj College, Sillod, India, which was investigated from May 2018 to April 2019. Altogether sixteen types of fungal colonies were identified of which 87.05% of the genera belonged to Deuteromycotina and 12.05% to Zygomycotina. Out of which the sixteen genera identified 10 are reported to cause damage and decoloration of books and paper materials. These are *Mucor*, *Rhizopus*, *Aspergillus*, *Cladosporium*, *Curvularia Alternaria*, *Penicillium Fusarium*, and *Epicoccum.* The concentration of fungal colonies was maximum in October 146 followed by September 136 and minimum on April 52. The present investigation was undertaken to identify and find out the composition and percentage contribution of various airborne fungi inside the college library and their relevance to bio deterioration.

KEYWORDS: Aeromycroflora, Petriplate, Colony, Library, & Book deterioration.

INTRODUCTION

Several airborne microbes in the indoor atmosphere are responsible for the biodeterioration of library materials; very little attention has been paid to aeromycoflora of the indoor environment. The fungi associated with old books and paper materials in the library and their role in bringing about deterioration. The bio-deterioration not only include mildewing of the substrate, which is the real manifestation of the interaction of organism and material study of aeromycoflora of the library is especially important as the old books with bindery glues and wooden partition support the growth of fungi in the favorable condition, but they also

proliferate and damage the books by decolorization, Kowalik et at (1962), and Tilak et at (1989).

The present aero mycological investigation was undertaken to study the aeromycoflora of indoor environment of the Library. The library is the main information and knowledge resource center of any learning institute. Bio deterioration occurs in library materials mainly constitute cellulose from green plants which produce fibers suitable for papermaking (P.G. kalaskar and Zodpe S.N 2016), along with glue, gum in bonded books, sometimes leather can be used as a binding material. These paper materials in the form of books, newspapers, and journals are used by students, teachers, and other stakeholders. Library staff members spent maximum time in the library or handling of books.

The main task in front of librarians is to maintain these resources in meticulous and protective forms for years long. Most of the books and other library materials get deteriorated due to wrong handling, humid atmosphere and carelessness and attached of the fungal pathogen (BPR Vitthal 1995).

Recently it was believed that the ideal temperature and humidity conditions could only be maintained by artificial climate control. However, natural ventilation can allow good air circulation, which in turn permits more effective moisture exchange between objects and the air (Scott G 2001) often natural ventilation is the best choice, especially in libraries where maintenance of an air conditioning system would be difficult and it would function intermittently.

The studies of Aeromycoflora inside the library (J. S. Ambhore and V.P. Mali 2007) reveals that besides damaging the books may also cause allergic diseases to library users and especially the library staff, spent most of their time in the library. (Bhagat G.S. and Ambhore J. S. 2015, Mali V.P, Ambhore J. S and B. N. Pande 2011 and Ambhore J. S 2003) during their investigation recorded these Fungal spores and found allergic during agricultural practices.

The high moisture content and moderate temperature in the indoor environment of the library are conducive for the growth of microbes and accelerate the deterioration process that affects the physical and chemical properties of library collection (Dalal 2011). The Library material provides a favorable platform for the growth and sporulation of fungi and handling of moldy

books and papers causes inhalation of spores may cause respiratory and cardiac problems, with allergic reactions in library staff and visitors.

The present research attempt was made to determine the aeromycoflora of the indoor environment of the Library. The study of aeromycoflora of this library was performed between May 2018 to April 2019. The purpose of this study was to determine aeromycoflora and their identification, concentration, and diversity in the indoor environment of the working library.

MATERIAL AND METHODS

The present investigation was undertaken to study aeromycoflora in the library. Air sampling was carried out by exposing culture plates inside the indoor environment of working library. Samples were collected by exposing Petri plates containing potato-dextrose-agar (P.D.A) medium supplemented with rose Bengal (0.2g/l), exposed for 5 minutes. After exposing Petri plates brought to the laboratory in sterilized polythene bags and incubated at 28.50c for a period of seven days. The colonies appearing on PDA containing petri plates, colonies were counted and recorded as a percentage for the individual colony. The fungal colonies were identified based on cultural and morphological characters of fungal spore (Ambhore J.S, 2003). The petri plates were examined periodically for changes in the growth of fungal colonies. Infected old book parts were also collected from the library to know the incidence of spores responsible for book deterioration:

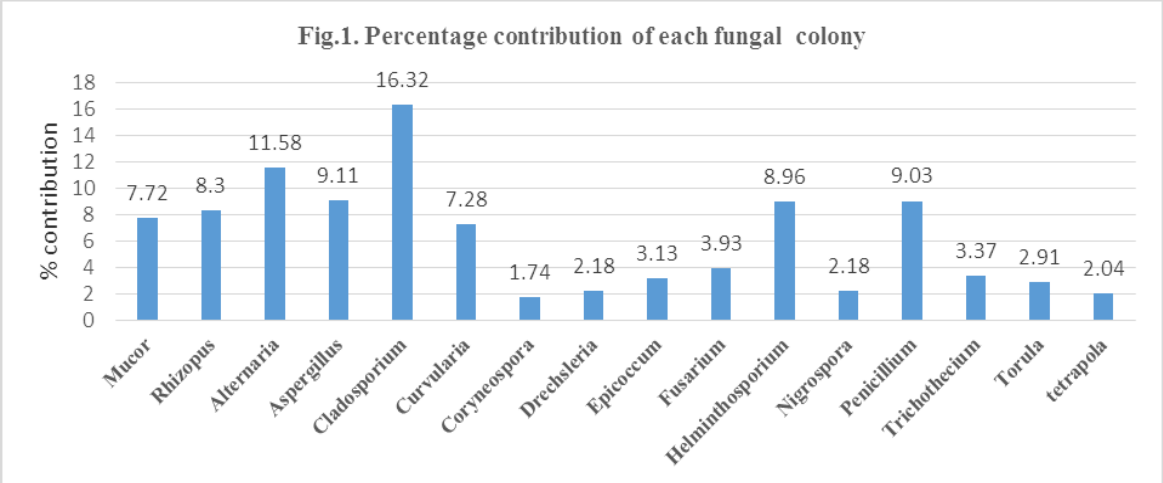
RESULT AND DISCUSSION

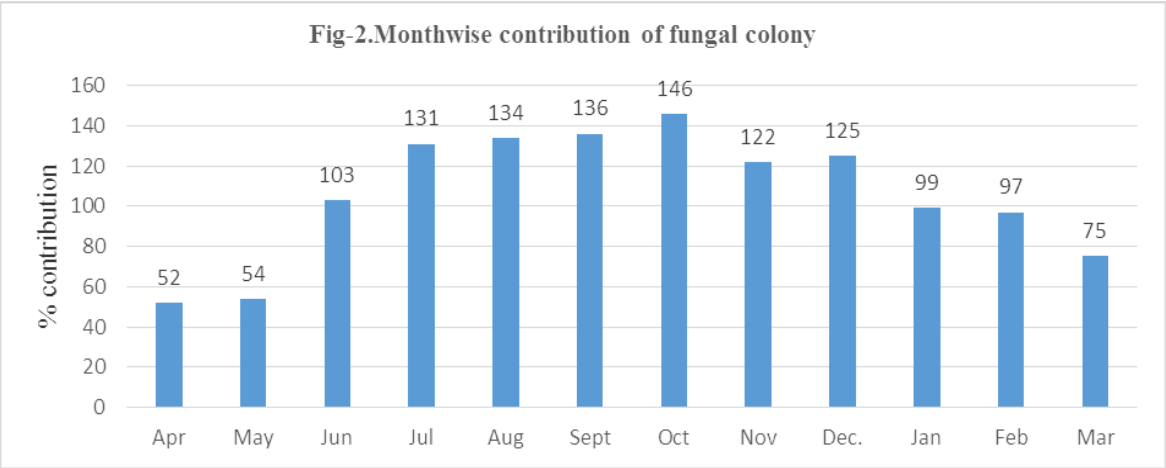
During the period of investigation, 1372 fungal colonies belonging to 16 fungal genera were identified form the indoor environment of the library. Fungal colonies belonging to Deuteromycotina were 87.05%. Zygomycotina was 12.05%. The most dominant fungus was *Cladosporium* (16.32%), *Alternaria* genus was next to decreasing order showing their distribution percentage 11.58%, followed by *Penicillium* (09.03%), *Aspergillus* (09.11%), *Helminthosporium* 08.96%) *Rhizopus* (08.30%) *Mucor (*07.72%) *Curvularia* 07.28% *Fusarium* (03.93%), *Trichothecium* 03.73%, *Epicocum* (03.13) *Torula* (02.91%), *Tetrapola* (02.04%).

Table 1: Month wise number of colonies and % contribution to the total colonies of each member.

Sr.no	Fungal Colonies	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec.	Jan	Feb	Mar	Total	%
1	*Mucor*	1	4	9	14	16	12	10	12	8	6	9	5	106	07.72
2	*Rhizopus*	4	3	4	16	13	13	14	12	10	8	7	10	114	08.30
3	*Alternaria*	12	16	17	10	6	13	14	16	14	15	14	12	159	11.58
4	*Aspergillus*	6	6	12	14	14	16	12	12	15	6	7	5	125	09.11
5	*Cladosporium*	12	1	12	14	112	12	22	10	9	1	9	10	224	16.32
6	*Curvularia*	2	3	5	10	12	9	12	12	10	9	6	10	100	07.28
7	*Coryneospora*	-	-	-	1		4	5	2	2	4	5	1	24	01.74
8	*Drechsleria*	1	-	2	3	5	4	4	5	4	2	-	-	30	02.18
9	*Epicoccum*	-	-	1	3	4	7	8	6	6	5	1	2	43	03.13
10	*Fusarium*	2	2	4	5	5	7	9	2	8	9	1	-	54	03.93
11	*Helminthosporium*	6	8	12	15	12	14	9	10	12	9	10	6	123	08.96
12	*Nigrospora*	2	-	1	2	1	3	4	6	3	2	6	2	30	02.18
13	*Penicillium*	2	4	12	12	16	14	16	9	12	10	9	8	124	09.03
14	*Trichothecium*	-	2	5	2	6	3		5	6	9	8	2	46	03.37
15	*Torula*	2	4	5	7	8	4	2	1	1	1	3	2	40	02.91
16	*Tetrapola*	-	1	2	3	4	1	5	2	5	3	2		28	02.04
Total		52	54	103	131	134	136	146	122	125	99	97	75	1372	99.87

Of these, *Cladosporium* was represented by maximum distribution percentage (16.32%) in the indoor atmosphere of the library. *Cladosporium* is a cosmopolitan genus which is abundantly in air collected in many areas of the country and other countries (Karyakar and Bhujbhuje-2014). A high concentration of *Cladosporium* in the indoor atmosphere is known to cause allergic diseases in the number of peoples (Gondve et. E.l. (2010).





The 146 colonies were observed in the October, 136, in September and minimum of 52 and 54 colonies were observed in the month of April and May. Monthly variation in the total number of fungal colonies was trapped and dominant types are illustrated in the graph.

A total number of 16 fungal colonies were identified of which 10 types are reported to by paper detereriogens (Verma and khare, (1987), Paradkar and Munshi (1980), J.S. Ambhore and V.P. Mali-(2007), viz, *Aspergillus, Cladosporium Curoularia, Alternaria, Penicillum, Fusarium, Rhizopus, Epicoccum,* and *Trichothecim.*

All there were very much common in the ambient air in the working library. Eventually, most of them were found in association with the demanded wooden material of the library. The predominance of *Aspergillus* and *Cladosporium* in the library is also reported by Kalbende and Dalal (2012), Ambhore and Mali (2007), Bhagat and Ambhore (2015), Gosavi and Gaikwad (2018), Bhonde and Kalkar (2017) Agase and Anuradha (1988), Saoji and Giri (1997), Sing et al (1990) and Sahney and Purwar (2000) reported the dominance of *Cladosporium* followed by *Aspergillus i*n library environment is also reported by Vittal and Glory (1985), Chaturvedi et. al (1987) and Tilak and Pillai (1988) reported highest contribution of *Cladosporium* followed by *Penicillium* in library Paradkar and Munshi (1998) also reported the highest percentage of *Cladosporium* in the airspora of the library.

Aeromycoflora inside a library, besides damaging the books, may also cause allergic diseases to library users especially the workers of the library who spend most of their time in the indoor environment of the library. The use of antiseptic materials and vacuum cleaner should be used once a week. This will help to reduce the concentration of aerospora as well as dust and other microorganisms.

CONCLUSION

From the investigation, it was concluded that aeromycoflora of the indoor environment of the library, were isolated, out of which some are responsible to the book deterioration, stored in the library and also cause some health problems viz respiratory disorders, allergic diseases, and asthma, to the readers and visitors. The indoor concentration of aeromycoflora, maybe because of favorable conditions (viz stored books, old newspapers) for the growth of fungi. The use of antiseptic materials and vacuum cleaner should be used. This will help to reduce the concentration of aerospora as well as dust.

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