Jour Pl Sci Res **39 (2)** 167–171 2023

Evaluation of Aeromycoflora of Satish Pradhan Dnyanasadhana College Library, Thane, Maharashtra, India

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Fungi with wide range of diverse group are the primary component of environment. Environmental conditions like humidity, temperature, light, moisture are some major factors for their sustainable growth and diversity. The cellulite activity causes the maximum deterioration to library books, covers, materials, binding of papers. Fungal spores also known for many allergic diseases like respiratory syndromes, allergy to the library workers, members and readers. As library is the basic source of most of the cellulosic fungi, as it provides ambient temperature and moisture for their proliferation. The study investigated at the two different intervals of weeks in a month. In this study it revealed that resulted the most abundant species were: *Aspergillus* spp. (32.3%), spp. (13.8%), *Alternaria* spp. (23%), *Cladosporium* sp. (4.6%), *Trichoderma* species (7%), *Chaetomium* (1.2%) etc.

Keywords: Library, Aeromycoflora, Fungi, Humidity, *Cladosporium, Trichoderma.*

INTRODUCTION

Environment is mixture of various gases, dust particles different transient microorganisms. It may contain certain, pollen grains, fungal spores, virus and bacteria etc. atmosphere is main source by which these micro-organisms get fertile substratum for their multiplication. Many times, these substratum by which they get fertile are dead or either living materials. These microorganisms we called them as bio-aerosols range from 0.5 to 30 µm in diameter. These bio-aerosols are responsible for various allergic as well as many respiratory infections in humans and in some animals.

Libraries are the most important source of knowledge and wisdom with well-organized collection of books, research projects, thesis, newspapers, records, etc. which are made easily available to readers for borrowing or for referencing (Kayarkar and Bhajbhuje, 2014). Books, information resources in library are the most valuable source of nations as they carry forward many heritable cultural aspects and religious knowledge (Kalbende et al., 2012). These important aspects of knowledge and wisdom should be preserved well and maintained in good condition. Libraries serve as an eminent source of mostly cellulosic and non-cellulosic materials (Verma et al., 2013; Kakde, 2015). Papers which are made from green plants are polymers of cellulose. These cellulosic and non-cellulosic material is responsible factor for indoor pollution in library as they are the major fertile substratum for many micro-organisms. These can also affect on the health of the readers, visitors and library workers (Prester, 2011; Lanjewar and Sharma, 2014).

The biodegradation of books and valuable information sources in library fascinated the awareness in recent era. This kind of studies on biodegradations of libraries and museums has been investigated by many scientists (St. George et al., 1954, Greathouse et al., 1954, Kowalik 1984). They concluded that many fungi, bacteria were responsible for degradation of libraries and museums Mostly the humid atmosphere in indoors of libraries are favorable for micro-organism to survive. Many fungi, moulds can easily

DOI:- https://doi.org/10.32381/JPSR.2023.39.02.17

grow on getting suitable environmental conditions and damage the most useful resources in libraries. In this study we focused to investigate these cellulose degrading fungi, common fungi, which damages the books and records.

Our study will be helpful with regards to public health, as it will focus on identification and fungal species present in indoor and outdoor atmosphere of library. It can reveal whether the indoor library atmosphere is protected from pathogens or not to avoid further allergic diseases.

MATERIALS AND METHODS

The study of aeromycoflora was carried out in the college library a various location such as, book sections, journal section, newspaper section, book racks. The aeromycoflora sampling has be carried out with two different media i.e., Sabouraud's agar and PDA. For sampling analysis settle gravity culture plate method was applied. The Petri plates containing 9 mm above mentioned media were exposed for 15 minutes at various locations in the libraries. Sampling was conducted twice in the month with fifteen days intervals. Many researchers also used the same method for the isolation and identification of air borne fungal culture sampling (Jadhav and Tiwari, 1994; Sahu, 1996; Tiwari, 1999; Verma and Khare, 2009 and Sharma, 2012).

Air samples were taken from both indoor as well as outdoor environment of library. Outdoor environment was considered as control. After the exposure to air the Petri dishes were brought to the laboratory in the presterilized polythene bags and incubated at 25ºC for 5-7 days. Various colonies grown on medium were counted and identified. The identification of colonies was done on the basis of their size, color, shape and other morphological characters (Raper and Fenell 1965, Smith 1969, Ainsworth et al., 1972, Gilman 1957, Ingold, 1971, Ellis 1971).

RESULT AND DISCUSSION

In the present study it was observed that the occurrence percentage was highest in *Aspergillus flavus, Alternaria alternats, Cladosporium cladosporioides, Penicillium chrysogenum, Chaetomium globosum Fusarium oxysporum, Mucor recemosas* and *Rhizopous stolonifer, Torula caligans, Trichoderma viride* for summer season. It was recorded that the infection causing fungus species were *Aspergillus niger, Chaetomium globosum, Fusarium oxysporum, Mucor recemosas* and *Rhizopous stolonifer, Torula caligans, Trichoderma viride. Chaetomium globosum, Fusarium oxysporum, Torula caligans, Trichoderma viride* were found to be degradating fungi which damages the paper and are reported as a cellulose degrading fungi species.

These findings have been approved with the findings of (Kayarkar and Bhajbhuje, 2014; Verma et al., 2013, Lanjewar and Sharma, 2014 and Larsen, 1981) also reported the as higher fungal colony count of indoor airborne mycoflora by culture settle plate exposure method. This technique was used for identification of airborne fungal species (Wessel, 1970; Blyskal, 2009; Kayarkar and Bhajbhuje, 2014).

Deuteromycota members are responsible for in biodegradation of cellulosic and non-cellulosic material and release huge number of conidia in the indoor atmosphere. These conidia have inference to asthmatic and allergy in many cases. Ascomycota species conidial spores have shown asthmatic and allergy reactions in persons. It was observed that at the time of reproductive and mycelial growth, Alternaria solani secretes some mycotoxins known as Stemphyyltoxin III, Dibenzopyron, Alternariol monomethyl ether, Tetranic acid, Altertoxin-I and II, Altersolarol-A, Alternaric acid, Tenuazonic acid, Altertoxins, (Holensein and Stoessi, 2008). A number of readers, researchers, visitors and staff of library exposed to conidial spores found to develop hay fever, woodworker's lung, and develops some kind of allergies (Wikipedia, 2017).

In our investigation, *Aspergillus niger* was recorded as a dominant fungal species. It was recorded that *Aspergillus niger* produces ochratoxin-A which degrade polysaccharide (Anderson et al., 2012; Dongre and Bhajbhuje, 2015; Wikipedia, 2017).

The study found that fungal species such as *Penicillium, Cladosporium, Chaetomium, Aspergillus, Trichoderma, Torulla* etc. were dominant in all the sectors of indoor library. Some of the other fungal species such as *Alternaria* spp., *Curvularia*, etc. were

the other widespread fungi allied on paper materials, documents, journals and books as reported by many other research fellows. Identification of *Penicillium, Cladosporium, Aspergillus*, and *Alternaria* spp. was the most ordinary fungal species investigated in this study were in conformity with the fungi by Katre, 2016; Shamsian et al., (2006) and Vittal et al., (1985) in libraries studies.

CONCLUSION

It was noticed that some of indoor aeromycoflora was responsible for the biodegradation of books and other documents, record materials in library. In current investigation it was noticed that *Aspergillus, Torula caligans* demonstrated higher frequencies in library. Fungal spores release in atmosphere, their deposition, growth and metabolism study can more effective in identification of many health hazards in human beings as well.

Preservation of library material with well ventilated, significant light and dry area could be a best remedy. Cleaning of tables, chairs, dust free book shelves should be followed on regular basis to maintain all valuable sources in library. Fumigation with effective fungicide in library can serve a good way to maintain libraries.

Table 1: Monthly distribution of fungal species percent frequency and percent contribution in library environment

Sr. No.	Fungal Group	Name of Fungus	January' 2022		February' 2022		March' 2022		Grand Total	% Frequency	% Contribution
			First half	Second Half	First half	Second Half	First half	Second Half			
1	Anamorphic fungi	*Alternaria alternata*	12		12	12	11	13	60	83.3	23.7
2	Anamorphic fungi	*Aspergillus Flavus*	10	16	15	18	12	10	81	100.0	32.0
3	Anamorphic fungi	*Botryodiplodia theobromae*	1						1	16.7	0.4
4	Ascomycotina	*Chaetomium globosum*	1						1	16.7	0.4
5	Anamorphic fungi	*Cladosporium cladosporioides*	8		9	8		12	37	66.7	14.6
6	Anamorphic fungi	*Curvularia clavata*	1	2					3	33.3	1.2
7	Anamorphic fungi	*Fusarium chlamydosporum*	5	6		8			19	50.0	7.5
8	Zygomycotina	*Mucor circinelloides*		2	2				4	33.3	1.6
9	Anamorphic fungi	*Penicillium chrysogenum*	8	13	11	12		7	51	83.3	20.2
10	Zygomycotina	*Rhizopus nigricans*	2	2	2				6	50.0	2.4
11	Anamorphic fungi	*Torula caligans*	15		12			5	32	100.0	12.6
12	Anamorphic fungi	*Trichoderma viride*	5		7			6	18	50.0	7.1
Sum			56	41	58	46	12	40	253		100

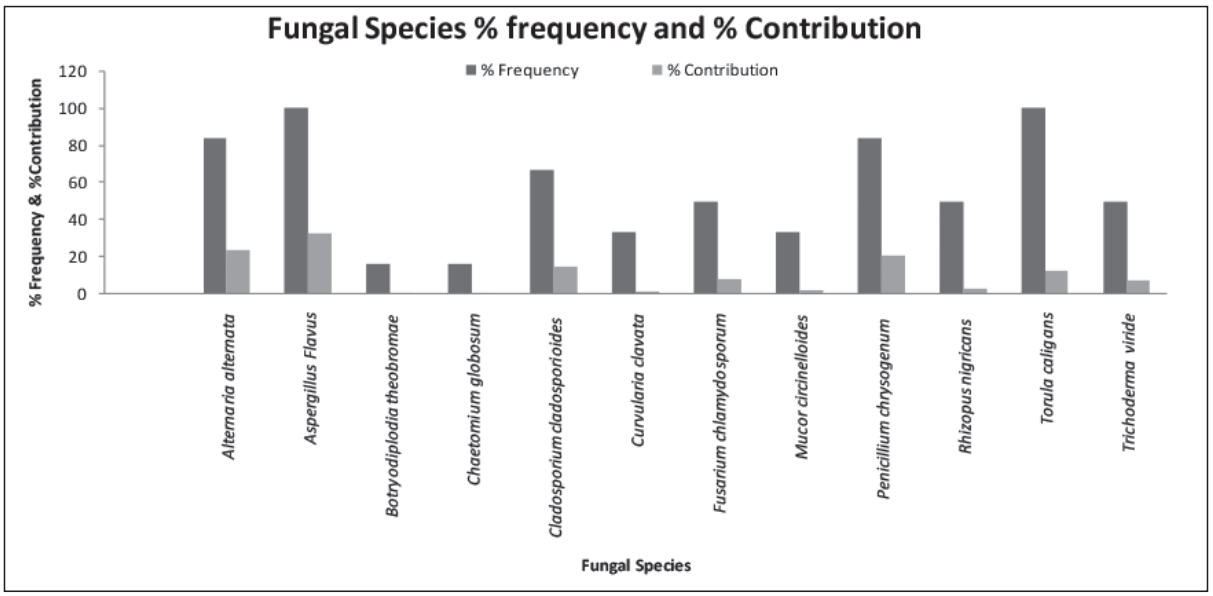

Fig. 1: Fungal species percent frequency and percent contribution in library

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Received: 06.02.2023

Accepted: 20.04.2023