

**Study of Intramural Aeromycoflora of Zoological  
Museum of Govt. Nagarjuna (P.G.) College of  
Science, Raipur (C.G.), India**

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**Abstract**

The paper deals with occurrence of fungal deteriogens in indoor air in Zoological museum of Govt. Nagarjuna (P.G.) College of Science, Raipur (C.G.), India. A total of 14 fungal species belonging to 10 different genera were isolated from indoor environment of museum during winter season from November 2015- February 2016. During this investigation period total 199 fungal colonies were isolated representing 14 fungal types. *Cladosporium cladosporioides* dominated the aeromycoflora followed by *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus* sp., while the most frequent fungal species were *Aspergillus flavus*, *Aspergillus* sp. & *Cladosporium cladosporioides*.

**B**iodeteriogens such as actinomycetes, bacteria and fungi cause severe threat to museum objects. Microorganisms get entry from indoor atmosphere through air currents and settle on various objects. Fungi play important role for deterioration of various objects including museum objects<sup>1,8</sup>.

In India there are very few colleges having Zoological Museum. Zoological Museum deals with a collection of various taxidermy, museum specimens as preserve state. Museum play important role for pioneer students of biological science to understand the basic structure, anatomy and diverse form of living beings.

Govt. Nagarjuna P.G College of Science is situated near to PT. R.S.S., University Raipur, in front of NIT and also connects with G.E. road. The Zoological museum of Govt. N.P.G. College of Science, Raipur, is famous for the collection of various specimens of faunal species such as-herpetology, ornithology, physiology, mammal and oestology sections etc. Students, staff members, visitors and workers come to the zoological museum for the purpose of study; visit and management. These people enter along with outdoor air into zoological museum and air borne mycoflora

get entry through the outdoor environment to indoor environment of museum. These air borne fungi play important role for deterioration of various objects of zoological museum and also cause various disease to human beings. The aim of present study was to evaluate the indoor aeromycoflora of zoological museum, which effect the museum objects and also human health. Therefore, the present research will be beneficial for the study of micro flora present in the museum and their management to save the museum objects and also to prevent human health from pathogenic fungi.



Figure 1. Zoology museum of Science College, Raipur

Air sampling was conducted by using gravity petri plate method for the isolation of aeromycoflora<sup>3,9,10,17,19,25</sup>. Five sterilized petri plates containing PDA media were exposed for 5 to 10 minutes in the sampling site at monthly intervals<sup>6,12,22,23</sup>. The exposed petri plates were brought into lab and incubated at room

temperature for the incubation period. Fungal colonies were counted and identified with the help of morphological characters, microscopic slide and available literature<sup>2,4,12,24</sup>. The percentage frequency and percentage contribution of aeromycoflora was calculated by the following formula<sup>5,13,14,18,21</sup>.

$$\text{Percentage frequency} = \frac{\text{Number of observations in which a species appeared}}{\text{Total number of observations}} \times 100$$

$$\text{Percentage contribution} = \frac{\text{Total number of colonies of individual species in all the plates}}{\text{Total number of colonies in all species}} \times 100$$

Table 1. Airborne fungal spores of indoor environment of Zoological museum, Science College, Raipur

S. no.	Name of fungi	Months				Total colonies	% contribution	% frequency
		Nov	Dec	Jan	Feb			
	Zygomycotina							
1.	<i>Rhizopus</i> sp.	-	-	-	1	01	0.50	25
	Anamorphic fungi							
2.	<i>Aspergillus flavus</i>	8	2	3	1	14	7.03	100
3.	<i>A. fumigatus</i>	-	-	5	-	05	2.51	25
4.	<i>A. niger</i>	18	2	-	9	29	14.57	75
5.	<i>A. sp.</i>	3	4	3	1	11	5.52	100
6.	<i>Cladosporium cladosporioides</i>	27	47	18	9	101	50.75	100
7.	<i>Curvularia lunata</i>	4	2	-	2	08	4.02	75
8.	<i>Fusarium</i> sp.	-	-	4	1	05	2.51	50
9.	<i>Penicillium</i> sp.	1	-	1	-	02	1.00	50
	Mycelia sterilia							
10.	<i>Mycelia sterilia</i> (White)	2	1	2	-	05	2.51	75
11.	<i>Mycelia sterilia</i> (Brown)	-	-	2	-	02	1.00	25
	Unidentified fungi							
12.	Unidentified sp.- I	-	1	3	-	04	2.01	50
13.	Unidentified sp.- II	-	-	6	4	10	5.02	50
14.	Unidentified sp.- III	-	-	-	2	02	1.00	25
	Total	63	59	47	30	199		

Table-2. Class wise percentage contribution of aeromycoflora of Zoological museum

S. No.	Name of Class	Percentage Contribution
1.	Anamorphic fungi	87.93
2.	Mycelia sterilia	3.51
3.	Zygomycotina	0.5
4.	Unidentified fungi	8.04

During this investigation 14 species of fungi belonging to 10 genera were isolated from indoor environment of Zoological museum of Govt. Nagarjuna P.G College of Science, Raipur (C.G.), India. The maximum percentage contribution was showed by *Cladosporium cladosporioides* (50.75%) followed by *Aspergillus niger* (14.57%), *Aspergillus flavus* (7.03%), *Aspergillus* sp. (5.52%), Unidentified sp.-II (5.02%), *Curvularia lunata* (4.02%), *Aspergillus fumigatus*,

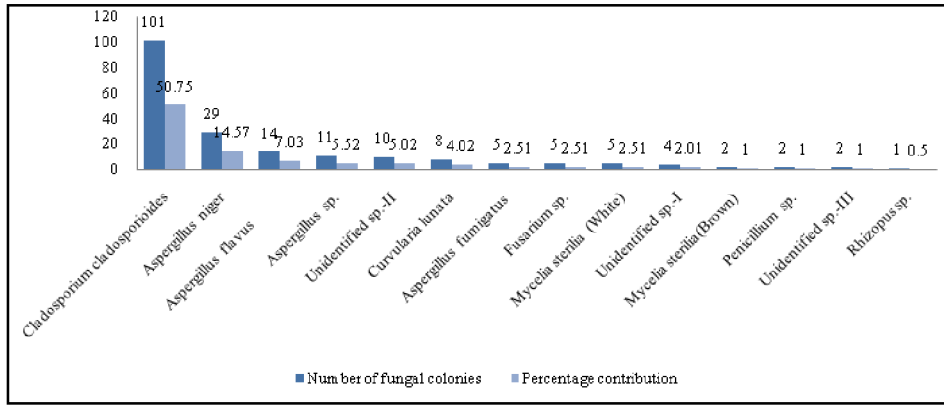


Chart 1. Percentage contribution of Fungal species

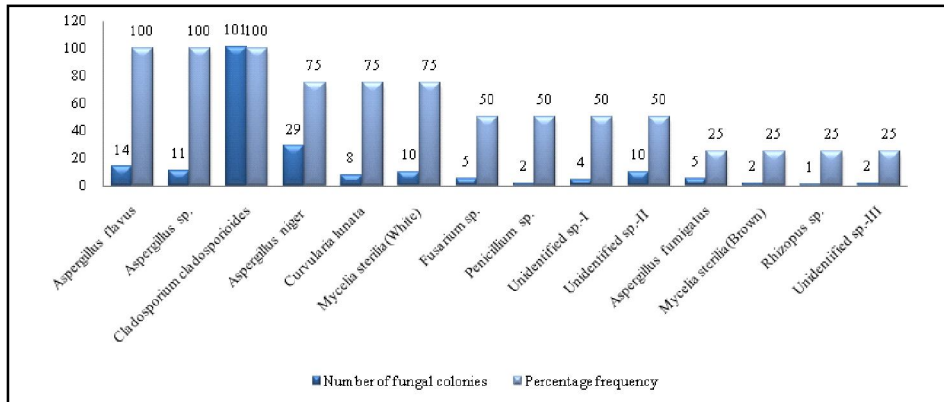


Chart 2. Percentage frequency of Fungal species

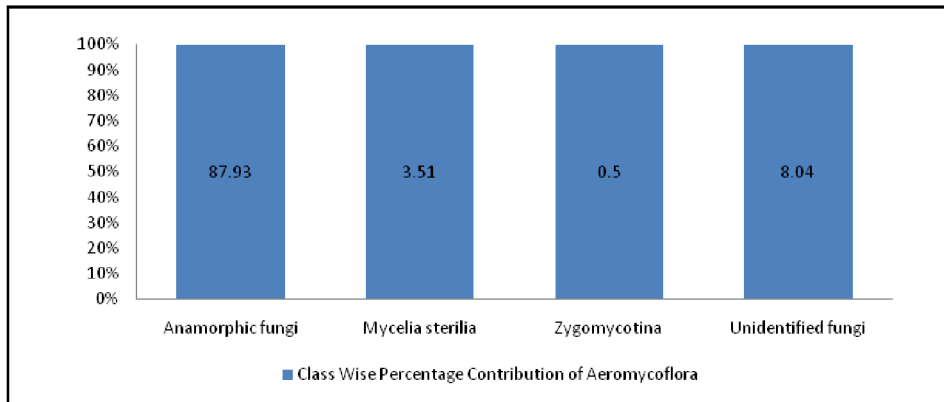
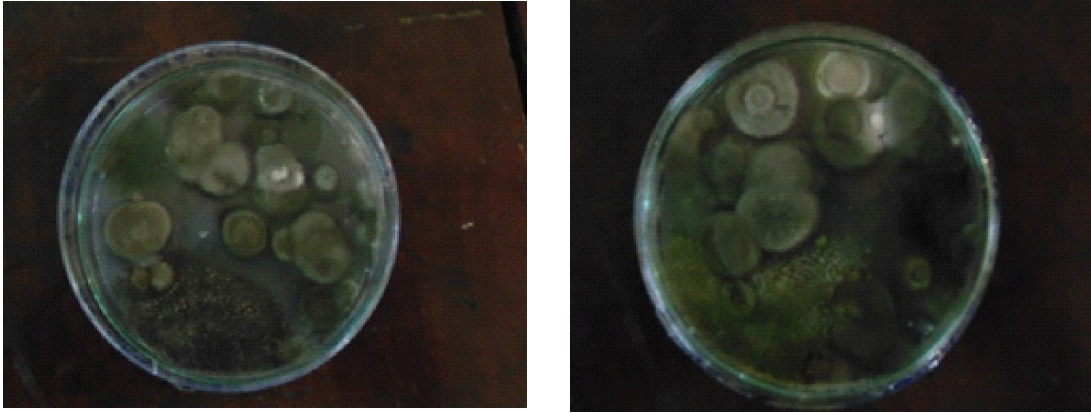


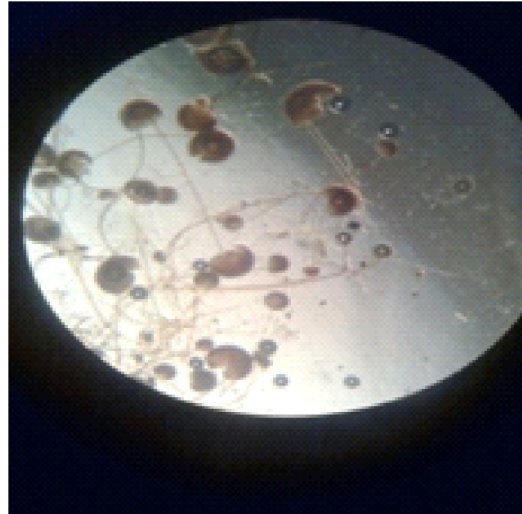
Chart.3 Class wise percentage contribution of aeromycoflora of Zoological museum



**Figure 2.** Fungi growth on culture plate



**Figure 3.** Microscopic slide preparation

*Curvularia lunata**Rhizopus* sp.**Figure 4.** Microscopic Photographs

*Fusarium* sp. & *Mycelia sterilia* (white) (2.51%), Unidentified sp.-I (2.01%), *Penicillium* sp., *Mycelia sterilia* (brown) & Unidentified sp.-III (1%) and *Rhizopus* sp. (0.50%), the same type of results were observed by many researchers<sup>15,17,20,26</sup>.

Thus, the most frequent fungal sp. were observed by *Aspergillus flavus*, *Aspergillus* sp. & *Cladosporium cladosporioides* (100%) followed by *Aspergillus niger*, *Curvularia lunata* & *Mycelia sterilia* (white)(75%), *Fusarium* sp., *Penicillium* sp., Unidentified sp.- I&II (50%), while the least frequent fungal sp. were *Aspergillus fumigatus*, *Mycelia sterilia* (brown), *Rhizopus* sp. & Unidentified sp.- III (25%), the same results were also reported by other aerobiologist scientists<sup>12,16,26</sup>.

The maximum number of fungal colonies (63) was reported in month November,

while the minimum number of fungal colonies (30) was reported in month February. The maximum number of fungi listed under anamorphic fungi and showed maximum percentage contribution 87.93% and followed by Unidentified fungi 8.04%, *Mycelia sterilia* 3.51%, and Zygomycotina 0.5% respectively. The most occurring and contributing fungal spores were *Cladosporium cladosporioides*, *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus* sp. These airborne fungi are responsible for wide range of adverse health effects into human like as- asthma, allergy, chronic bronchitis, opportunistic invasive infections<sup>3,7,12</sup>.

Large numbers of fungal spores were isolated in indoor environment of Zoological museum of Govt. Nagarjuna P.G. College of Science, Raipur during investigation. Winter season was found favorable condition for fungal growth than rainy and summer seasons.

*Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Cladosporium cladosporioides*, *Curvularia lunata*, *Fusarium* sp. and *Penicillium* sp. were listed in the study site. These air borne fungal species are pathogenic nature, which may causes a variety of fungal infections leads many deleterious health issues on human beings and also are responsible for deterioration of various objects of museum like specimens and skeletons of birds, humans, animals. Therefore, control measures and rectification management is very important to save this important asset of Zoological Museum and it is also deeply concerned with human health.

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