

Study of Extramural Aeromycoflora of Banjari Temple

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Abstract

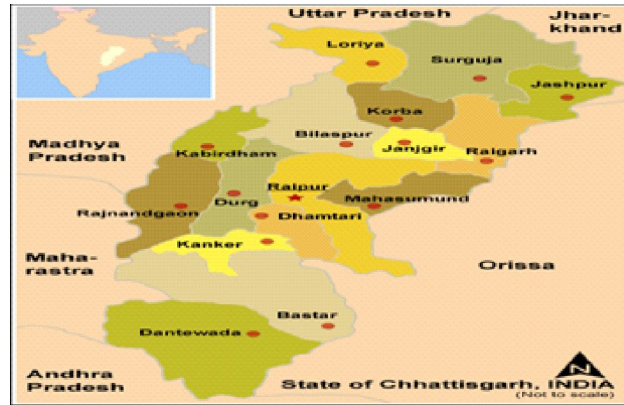
The number of air borne fungi depends on the environmental conditions such as- sources, light intensity, time of day, humidity, geographical location and season. A survey of extramural or outdoor aeromycoflora of Banjari Temple, Pt. Ravishankar Shukla University campus, Raipur (Chhattisgarh) India, was carried out during rainy season from July 2015 to October 2015. For this study gravity petri plate method was used for the isolation of aeromycoflora at monthly intervals. The aim of present study was to evaluate the aeromycoflora of outdoor environment of Banjari Temple, Pt. Ravishankar Shukla University campus, Raipur (Chhattisgarh) India. During investigation period total 138 fungal colonies were isolated representing 16 fungal types and 10 genera. *Cladosporium cladosporioides* dominated the aeromycoflora followed by *Aspergillus niger*, *Aspergillus flavus*, *Mycelia sterilia* (White), *Trichoderma* sp.

Aerobiology is a scientific approach under which study of air borne microorganisms or bioparticles like; bacteria, fungi, pollen grains, insect population, viruses etc. is done along with their origin, distribution and effects on organisms.

The presence of fungal spores and their mycotoxins in the air can cause several diseases in human beings and can also affect plants and animals. Aerobiological scientists have found that some fungal species such as *Aspergillus candidus*, *Aspergillus niger*, *Aspergillus versicolor*, *Cladosporium cladosporioides*, *Cladosporium herbarum*,

Penicillium brevicompactum and *Penicillium chrysogenum* may cause disease like headache, eye & sinus irritation, sore throat, tiredness, general weakness, wooziness, severe asthma and allergic reactions in human^{19, 3 and 7}.

The aim of this study was to evaluate the aeromycoflora, their identification, concentration and diversity in extramural or outdoor environment of Banjari Temple, Pt. Ravishankar Shukla University campus, Raipur (Chhattisgarh) India. Banjari Temple situated in Pt. Ravishankar Shukla University and is connected to the play ground of University.



(A). India and Chhattisgarh map showing location of Raipur



(B). Satellite map showing location of the Banjari Temple in Raipur



(C). Banjari Temple

Figure 1: Sampling site of Aeromycoflora

Air sampling was done by using gravity Petri plate method for the isolation of aeromycoflora^{9,24,17 and 2}. Five sterilized Petri plates containing PDA media were exposed for 5 to 10 minutes in the sampling site at monthly intervals^{21, 8, 11 and 22}. 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^{5, 1 and 23}.

Ecological Studies:

The percentage frequency and percentage contribution of aeromycoflora was calculated by the following formula^{20 and 6}.

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

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

In rainy season, 138 airborne fungal colonies were reported, out of which 16 fungal species belonged to 10 genera. The maximum number of fungal colonies observed was of *Cladosporium cladosporioides* (32 colonies) followed by *Aspergillus niger* (21 colonies), *Aspergillus flavus* & *Trichoderma* sp. (12 colonies), *Mycelia sterilia* (White) & Unidentified sp.-III (09 colonies).

The maximum percentage contribution was seen for *Cladosporium cladosporioides* (23.18%) followed by *Aspergillus niger* (15.21%), *Aspergillus flavus* & *Trichoderma* sp. (8.69%), *Mycelia sterilia* (White) & Unidentified sp.-III (6.52%), *Mycelia sterilia* (Brown 5.79%), Unidentified sp.-II (5.07%), *Fusarium* sp. (4.34%), *Curvularia* sp. (3.62%), *Aspergillus* sp.-II (2.89%), *Aspergillus* sp.-I, *Cladosporium* sp.-II & Unidentified sp.-I (2.17%), *Cladosporium* sp.-I & *Rhizopus* sp. (1.44%).

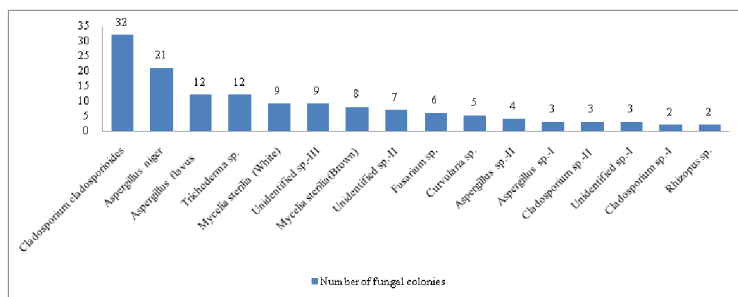
Thus, the most frequent fungal species were *Aspergillus niger* & *Cladosporium cladosporioides* (100%), followed by *Aspergillus flavus* (75%), *Mycelia sterilia* (White & Brown) (75%), *Aspergillus* sp.-I, *Aspergillus* sp.-II, *Cladosporium* sp.- II, *Curvularia* sp., *Fusarium* sp. *Trichoderma* sp., *Rhizopus* sp., Unidentified sp.-II & III were (50%). While, *Cladosporium* sp.-I &

Unidentified sp.-I were (25%).

Maximum number of air borne fungal colonies were recorded in the month of September (58 colonies), while minimum number of air borne fungal colonies were observed in month of August (16 colonies). The highest number of fungal colonies and species observed for class Anamorphic fungi followed by class *Mycelia sterilia*, Zygomycotina and moreover 3 unidentified fungi also reported. These 3 unidentified air borne fungi has been sent for identification from National Centre of Fungal Taxonomy (NCFT), New Delhi.

Cladosporium and *Aspergillus* were most dominant aeromycoflora of extramural or outdoor environment of Banjari Temple, the same type of result has also been reported^{15, 10 and 13}. *Aspergillus* was most dominant fungal species reported by aerobiological researchers 4, 14, 16 and 18.

Aspergillus and *Cladosporium* were most frequent aeromycoflora of outdoor environment of Banjari Temple, the same type of results were also observed^{12 and 25}. In rainy season (from July to October) the environmental relative humidity and temperature is high. The relative humidity, temperature and rainfall play a key role in the proliferation of aeromycoflora.



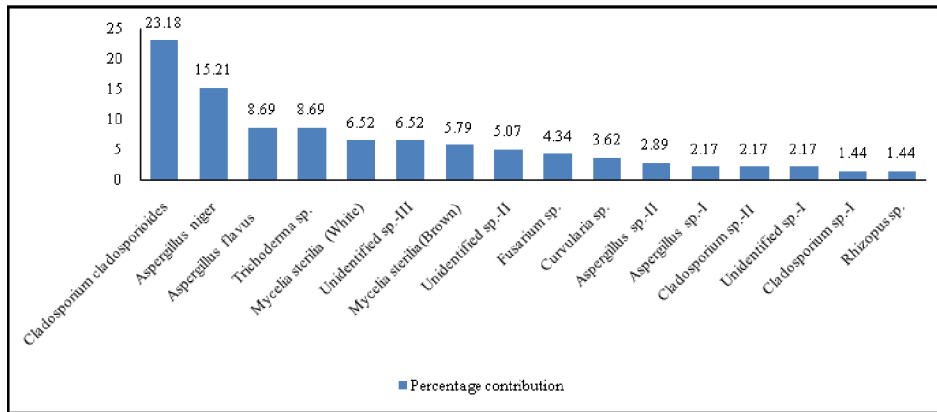
Graph 1. Number of fungal colonies of different species isolated during July 2015- October 2015.

Table 1. Aeromycoflora of extramural environment of Banjari Temple, Pt. Ravishankar Shukla, University campus, Raipur (Chhattisgarh) India

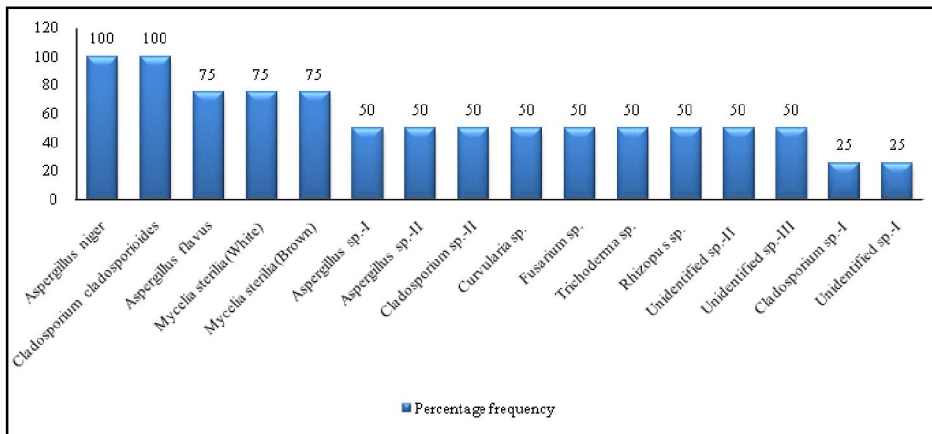
S. n.	Name of fungi	Months				Total colonies	% contribution	% frequency
		July	Aug	Sep	Oct			
	Zygomycotina							
1	<i>Rhizopus</i> sp.	1	-	1	-	02	1.44	50
	Anamorphic fungi							
2	<i>Aspergillus flavus</i>	-	2	8	2	12	8.69	75
3	<i>Aspergillus niger</i>	3	2	13	3	21	15.21	100
4	<i>Aspergillus</i> sp.-I	2	-	1	-	03	2.17	50
5	<i>Aspergillus</i> sp.-II	2	-	-	2	04	2.89	50
6	<i>Cladosporium cladosporioides</i>	1	5	16	10	32	23.18	100
7	<i>Cladosporium</i> sp. -I	-	2	-	-	02	1.44	25
8	<i>Cladosporium</i> sp. -II	-	-	1	2	03	2.17	50
9	<i>Curvularia</i> sp.	2	-	3	-	05	3.62	50
10	<i>Fusarium</i> sp.	-	-	3	3	06	4.34	50
11	<i>Trichoderma</i> sp.	7	5	-	-	12	8.69	50
	Mycelia sterilia							
12	<i>Mycelia sterilia</i> (White)	4	-	3	2	09	6.52	75
13	<i>Mycelia sterilia</i> (Brown)	2	-	1	5	08	5.79	75
	Unidentified fungi							
14	Unidentified sp.- I	-	-	-	3	03	2.17	25
15	Unidentified sp.- II	-	-	4	3	07	5.07	50
16	Unidentified sp.- III	-	-	4	5	09	6.52	50
	Total	24	16	58	40	138		

Table-2. Fungal species and genera of Aeromycoflora of Banjari Temple

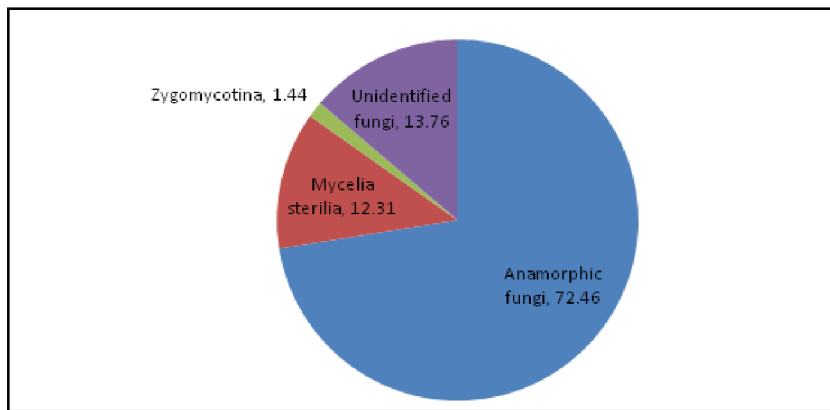
S.N.	Name of Class	Number of fungal colonies	Number of fungal species	Number of genera	Percentage Contribution
1.	Anamorphic fungi	100	10	5	72.46
2.	Mycelia sterilia	17	2	1	12.31
3.	Zygomycotina	02	1	1	1.44
4.	Unidentified fungi	19	3	3	13.76
	Total	138	16	10	



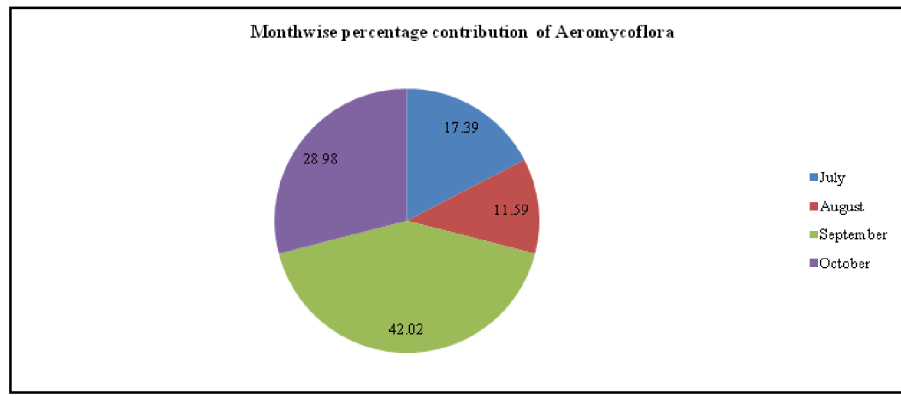
Graph 2. Percentage contribution of fungal species during July 2015- October 2015.



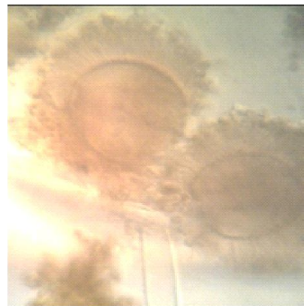
Graph 3. Percentage frequency of fungal species during July 2015- October 2015.



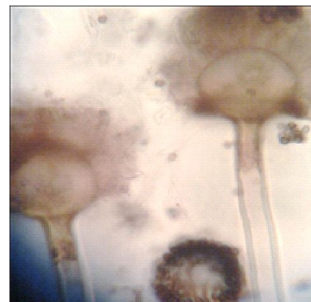
Graph 4. Class wise percentage contribution of aeromycoflora



Graph 5. Month wise percentage contribution of total aeromycoflora



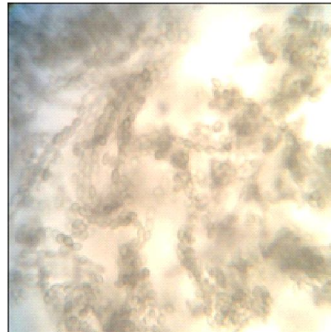
Aspergillus flavus



Aspergillus niger



Curvularia sp.



Trichoderma sp.



Rhizopus sp.

Figure 2. Microscopic Photographs of Aeromycoflora

In the present study the most dominant and most frequent fungal species were *Aspergillus niger* & *Cladosporium cladosporioides*. These fungus species have been found to cause disease like headache, eye & sinus irritation, sore throat, tiredness, general weakness, wooziness, severe asthma and allergic reactions in human. Waste materials should be are properly dumped and burn it. Because waste materials, relative humidity and temperature provides medium for the fungal growth. These fungi are transferred via air in outdoor environment can damage to the monument. The fungal diversity and their numbers in outdoor environment of Banjari Temple can cause many human health hazards and can contaminant atmosphere, therefore control measure and management of outdoor environment should be seriously taken under consideration. It has been confirmed by many aerobiological scientists that these Aeromycoflora affects human, animals and plants life. Hence, our present study may provide significance data to understand of aeromycoflora of extramural environment of Banjari Temple.

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References :

1. Bennett, H.L. and B.B. Hunter, (1972): Illustrated genera of Imperfecti fungi, Burgess. Co. Minneapolis, Minnesota, U.S.A., 332.
2. Bhagat, S., A. Singh and A. Bhalerao (2014): *Ind. J. of Appl. Resear.*, 4(3): 192-195.
3. Buttner, M.P., P. Cruz-Perez and L.D. Stetzenbach (2001). *Appl. Environ. Microbiol.*, 67(6): 2564-2570.
4. Choudhary, R. P. and R. L. Singh (1991): Aeropalynological survey, pollen and fungal spores in Kathmandu valley (Central Himalaya). *Abst. 6th Nat. Con. Aero.*, 52- 53.
5. Cooke, W.B. (1963): A laboratory guide to fungi in polluted waters, sewage, and sewage treatment system; their identification and culture. *PHS Publ.*, 999-WP-I., Cincinnati.
6. Dalal, L., M. Bhowal and S. Kalbende (2011): *Arch. Appl. Sci. Res.*, 3(5): 479-485.
7. Denning, D. W., B. R. O'driscoll, C. M. Hogaboam, P. Bowyer and Niven, R.M. (2006). *Eur. Respir. J.*, 27(3): 615-626.
8. Devi, J., S. Medhi and T.C. Sarma (2010): *J. of Life Sci.*, 2 : 547-552.
9. Jadhav, S.K. and K.L. Tiwari (1994): *Ind. Bot. Report.*, 1(1&2): 33-36.
10. Jothish, P.S., T.K. Mohan and T.S. Nayar (2004): *Ind. J. Aero.*, 17(1&2): 53-62.
11. Kalbende, S., L. Dalal and M. Bhowal (2012): *J. Nat. Prod. Plant Resour.*, 2(6): 675-679.
12. Kulkarni, P. (2011): *Ind. J. of Sci. and Technol*, 4(5): 558-560.
13. Kunjam, S. (2007): Studies of aeromycoflora

- of Tribal atmosphere at Panabaras region, Rajnandgaon District (C.G). Ph.D. Thesis, Pt. R.S.U. Raipur (C. G).
14. Pawar, I. S. (1991): Airspora at Nasik, Maharastra. Abst. 6th Nat. Conf. Aero. 119.
 15. Peerally, A. and V. Rao (2003): *Ind. J. Aero.*, 16(1&2): 57.
 16. Saluja, P.K., B.M. Lall and P. Dewangan, (2011): Aeromycological survey of outdoor environment in school premises at Raipur. Abst. Nat. Sem. Ambikapur, 13.
 17. Sharma, K. (2011): *Int. Multidiscipli. Research J.*, 1(9): 34-36.
 18. Shukla, S. and R.V. Shukla (2011): *Microbiol. J.*, 1: 33-39.
 19. Simeray, J., D. Mandin, and J.P. Chaumont, (1995). *Grana*, 34(4): 269-274.
 20. Singh, N.B. (2006): Studies of aeromycoflora in relation to leaf surface mycoflora of *Mentha arvensis* Linn. Ph.D. Thesis, Pt. R.S.U. Raipur (C.G).
 21. Suerdem, T.B. and I. Yildirim (2009): *African J. of Biotechnol.*, 8(18): 4450-4458.
 22. Thirumala, S. and M.P. Nathu (2013): *Int. J. Curr. Microbiol. App. Sci.*, 2(3): 44-48.
 23. Tilak, S.T. (1989): Air borne pollen and fungal spores, Vaijanti Prakashan, Aurangabad, 187.
 24. Tiwari, P. (1999): Aerobiological studies of Raipur with special reference to fungal spores. Ph.D. Thesis, Pt. R.S.U. Raipur (M.P.).
 25. Tiwari, P. (2014): *Ind. J. Sci. Res.*, 4(1): 15-21.