Study of Fungal Diversity with Special Reference to Winter Season

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Abstract- Aerobiological studies are very important as they provide with qualitative and quantitative information about airborne fungi in a given region .Fungi are diverse group of organisms and are found in large number and amount in the indoor and outdoor environment. The study deals with the survey of the fungal diversity at the Railway station of Bilaspur (C.G.). The present study has been done for analysing the aeromycoflora of winter season, from November 2015 to February 2016. The culture plate method has been adopted for trapping the mycoflora. After sampling slides were mounted with glycerine and observed under microscope. In this study 44 fungal species and 31 fungal genera were obtained in which *Aspergillus, Penicillium, Rhizopus, Cladosporium, Alternaria* and *Fusarium* was most dominant. Environmental factors plays important role for the dispersal of the fungal spores. The main aim of the aerobiological survey is the biotic particles present in the atmosphere especially fungal spores.

Index Terms- Fungal spores, diversity, aeromycoflora, environmental factor, Bilaspur

I. INTRODUCTION

Survey of the aeromycoflora has assumed significance with the increasing environmental pollution. Recent scientific reports have established the fact that environment is full of different dangerous fungal propagules comprising Phytopathogens, allergies and saprophytes (Bajaj and Mishra 1978, Chaubal and Kotnis 1985, and Mishra and Bhandari 2006). It would not be incorrect to say that level of airborne fungi indicates the level of atmospheric biopollution .The presence of fungal spores and mycotoxins in the air can cause health hazards in all segments of population (Kakde et.al.2001). Everywhere in nature presence of airborne fungal spores could be proved. Some of the world wide spread genera of airborne fungal spores are *Alternaria, Cladosporium and Aspergillus.* Aerobiology is the branch of biology which studies organism or part of organisms that survives in the air. Aerobiological investigations have been carried out with special references to diseases on crops, vegetables and fruits etc. and there is a wide discussion on aerobiology and cereal crops (Tilak 1984). These are the organisms most responsible for deterioration of organic materials. This study has been aimed to observe impacts, dispersions and the role in bio-deterioration of fungal spores and also to observe how they affect the environment of Bilaspur Railway Station in C.G. in India.

II. MATERIAL AND METHODS

Samplings of aeromycoflora were done with the help of gravity petri plate's method during Nov.2015 to Feb. 2016. The sampling was done fortnightly by exposing five petri plates containing PDA media. The petri plates were exposed 5 to 10 minutes in different platforms of Bilaspur railway station (C.G.). The methods used for determination of total number of colonies that have been recorded in the entire sampling process were the petri dish culture plate method. Every month the sites were sampled with PDA (potato dextrose agar) media to trap fungal colonises. These petri dishes were opened in the study site to allow fungal colonies. In the culture plates streptomycin was dissolved to prevent contamination of bacterial colonies. After petri dishes were exposed they were incubated at $28 \pm C^0$ for 4 to 5 day and these plates were regularly examined. Fungal colonies developed in few days which were observed for their numbers and distribution, all these were recorded for the identification of fungal species help of the available literature was taken which was later conformed by authentic authority. At the end of the incubation period of aeromycoflora, for ecological studies, percentage frequency and percentage contribution of individual species during the survey period was calculated using the standard formula (Tiwari, 1999)

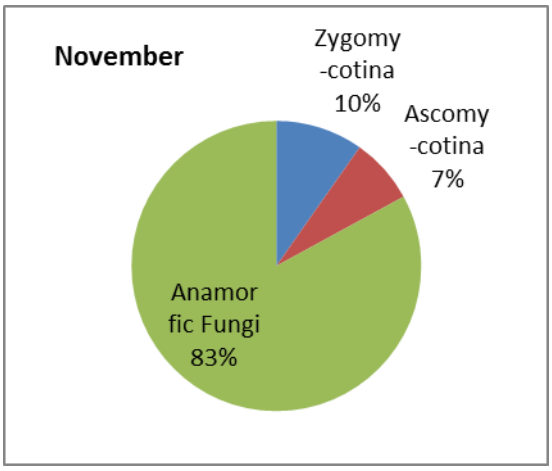
$$\text{Percentage frequency} = \frac{\text{Number of observation in which a species appeared}}{\text{Total number of observation}} \times 100$$

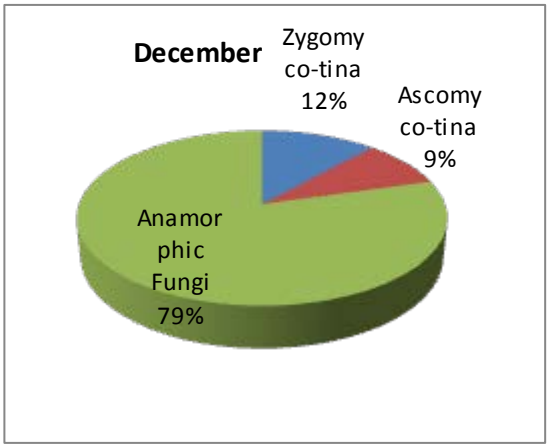
$$\text{Percentage contribution} = \frac{\text{Total number of colonies of a species in all observation taken together}}{\text{Total number of colonies of all species}} \times 100$$

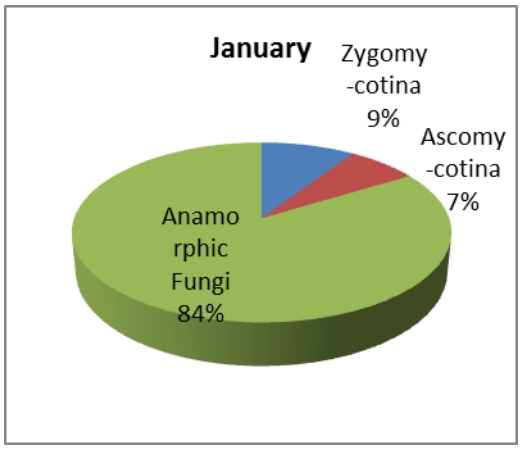
III. RESULT AND DISCUSSION

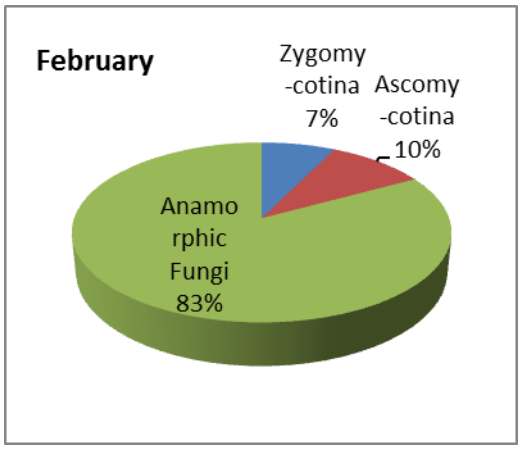
During the present investigation period 31 genera, 44 fungal species and 1764 colonies were found in the different platforms of Bilaspur railway station, Table -1. The number of fungal species increased from October to December. In the present study percentage frequency and percentage contribution of aeromycoflora observed during Nov. 2015 to Feb. 2016. It was also observed that maximum frequency of the aeromycoflora shown by *Aspergillus niger A.luchensis, Alternaria alternata, Penicillium sclerotiorum, Fusarium oxysporium, Torulla Caligans* (100%), *Aspergillus fumigatus, Curvularia lunata,*

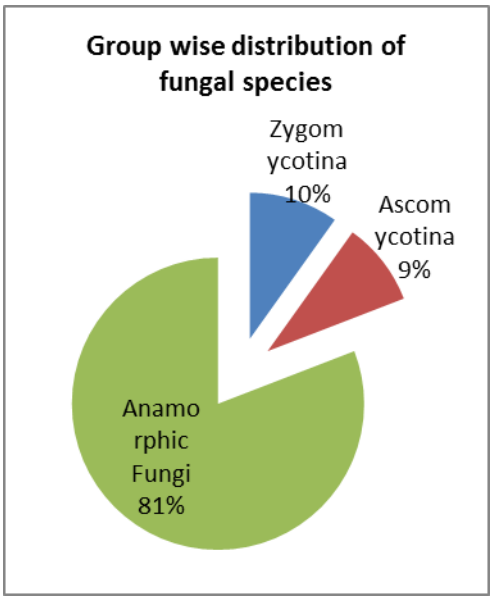
Penicillium fusarium (95%), and *Aspergillus flavus* (90%),while minimum frequency shown by *Gilmaniella humicola* (20%), *Trichothecium roseum* (25%), *Botryodiplodia theodromae* (30%), *Geotricum candidum* (35%), *Mucor micheli,Trichurus spiralis* (40%,) *Pithomyces chartarum* (45%), (**Table-1**). This result is in agreement with Jadhav and Tiwari (1994),Tiwari P. (1999), Singh A.k.et.al. (2004). Out of total aeromycoflora were recorded i.e. Zygomycotina (2.55%), Ascomycotina (2.09%), Anamorphic fungi (95.35%) and *Mycelia sterilia* (9.98). this study is in agreement with Tiwari et.al. (2006), Thirumala S. et.al. (2013) Patle K.D. (2014),. It is also observed that maximum percentage contribution were recorded that *Aspergillus luchensis* (14.23%), *A. niger* (7.48%), *Fusarium oxysporum* (6.01%), *Mycelia sterilia white* (5.49%), *Penicillium citrinum* (4.59%), *Cladosporium clavatum* (4.31%), *Torula caligans* (4.03%), *Curvularia lunata* (3.85%), *Alternaria alternate* (3.79%), while minimum percentage contribution shown by *Gilmaniella humicola* (0.23%), *Botryodiplodida theobromae* (0.34%), *Geotricum candidum* (0.39%), *Pithomyces chartarum* (0.45%), *Mucor micheli* (0.05%), Dictyosporium (0.51%), *Tricothecium roseum* (0.51%), *Rhizopus nigricans* (0.625) *Staychybotris elegans* (0.63%), *Trichurus spiralis* (0.685). **Table-1** similar results were observed by Sabariego S. et.al. (2007), Ghosh D. et.al. (2011), Sharma K. (2012). The members of anamorphic fungi being were the most dominated fungal group throughout the study period. Some of the species of *Aspergillus, Penicillium, Cladosporium,and Curvularia,* are known as allergic and toxic in nature. During the investigation it was also observed that the atmosphere of the railway station platforms were never free from fungal spores.

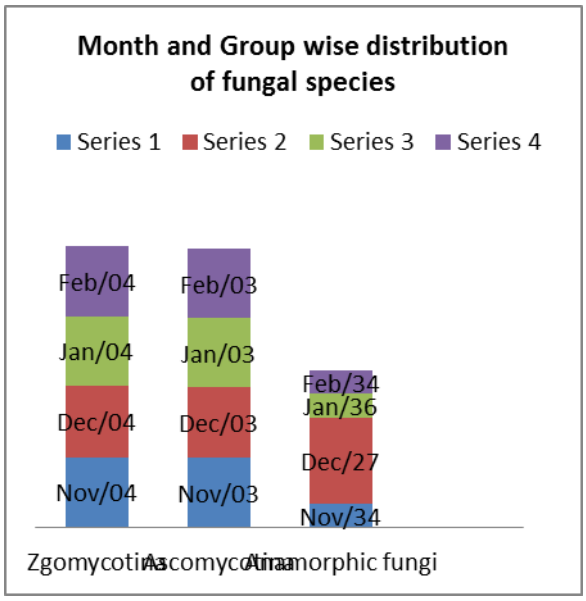


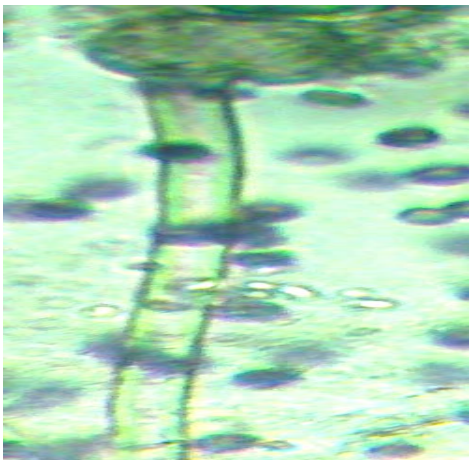




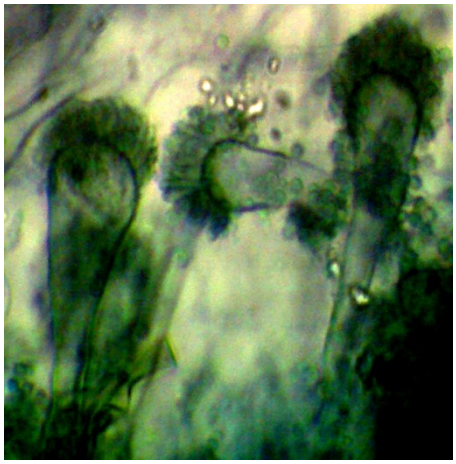




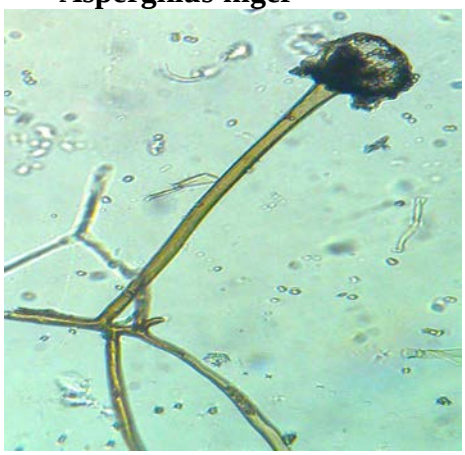




Aspergillus niger



Aspergillus fumigatus



Rhizopus nigricans

Aspergillus luchensis

Fusarium oxisporium

Alternaria alternata

IV. CONCLUSION

Bilaspur railway station is one of the busiest stations in India. It is witness to number of trains, both Goods and passengers, passing every day and night. The main object of this study is to provide a healthy atmosphere by detecting the harmful fungi which cause health hazards to the public, travels by trains or the people who come to railway station for various purposes including coolies and kiosk owners.

Samples of fungi from different platforms of Bilaspur railway station were taken. The air of railway station contains several micro-organisms which are cause of several diseases and allergy. Different people animal and air current from outside some times become source of micro-organisms, which they carry some times as a sufferer or carrier of microbes thus the atmosphere is contaminated. This makes the survey of the aeromycoflora of Bilaspur railway station necessary. Our object is to detect the harmful aeromycoflora, so that measures to prevent their hazard on human beings could be taken and provide the people a healthy and safe atmosphere.

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Table-1 Showing fungal distribution of aeromycoflora from different platforms of Railway Station Bilaspur (C.G.)

o	Name of the fungal species	Nov-2015						Dec-2015						JAN-2016						FEB-2016						Grand total	% Frequency	%Contribution
		I	II	III	IV	V	Total	I	II	III	IV	V	Total	I	II	III	IV	V	Total	I	II	III	IV	V	Total			
	Zygomycotina																											
	Rizopus stolonifer	3	1	2	1	1	8	1	-	1	-	-	2	-	-	1	1	-	2	-	-	-	-	1	1	13	50	0.73
	Rizopus nigrican	2	1	2	1	-	6	1	-	-	1	-	2	-	1	-	-	1	2	-	1	-	-	-	1	11	50	0.62
	Mucer micheli	-	2	1	-	-	03	-	02	-	01	01	04	01	-	-	-	-	01	01	-	-	-	-	01	09	40	0.05
	Mucer racemous	1	2	1	-	-	04	01	02	02	-	01	06	01	1	-	-	-	02	-	-	-	-	-	-	12	45	0.68
	Total	6	6	6	02	1	21	03	04	03	02	02	14	02	2	1	1	01	07	01	1	-	-	1	03	45	-	-
	Ascomycotina																											
	Chaetomium globosum	1	1	-	2	-	4	-	-	1	-	1	2	2	-	1	-	1	4	2	1	-	2	2	7	17	60	0.96
	Ascotricha chartarum	1	-	-	-	-	1	-	2	1	-	-	3	-	1	-	2	-	3	-	-	1	-	-	1	08	30	0.45
	Myrothecium vrrrucaria	-	1	-	-	-	1	1	1	-	2	-	4	1	-	1	-	1	3	1	-	1	-	2	4	12	50	0.68
	Total	2	2	-	2	-	6	1	3	2	2	1	9	3	1	2	2	2	10	3	1	2	2	4	12	37	-	-
	Anamorhic Fungi																											
	Alternaria alternata	9	2	3	3	2	19	3	1	2	3	3	12	4	2	2	3	3	14	8	2	4	3	3	21	67	100	3.79
	Alternaria solaneni	4	1	1	-	1	7	-	1	2	2	-	5	-	-	1	1	-	2	2	1	1	-	-	4	18	65	1.02
	Alternaria tenuissima	2	3	-	2	1	8	-	1	-	2	-	3	3	-	2	-	-	5	1	1	2	-	-	4	20	55	1.13
	Aspergillus	8	4	5	3	5	25	6	3	1	3	2	15	4	2	3	1	-	10	3	2	1	2	1	9	59	95	3.3

	fumigatus																												5
	Aspergillus terrus	3	1	2	2	1	9	4	-	5	1	1	11	1	3	2	1	-	7	4	1	2	-	1	8	35	85	1.98
	Aspergillus nigar	6	5	4	2	4	21	10	9	11	4	6	40	8	10	2	6	4	30	12	9	7	5	8	41	132	100	7.48
	Aspergillus flavus	4	3	2	1	4	14	4	3	2	1	3	13	1	1	2	-	2	6	1	-	1	2	1	5	38	90	2.15
	Aspergillus luchensis	20	15	25	12	8	80	13	10	10	11	16	60	20	6	7	7	30	70	8	11	7	9	6	41	251	100	14.23
	Aspergillus oryzae	-	-	1	1	-	2	1	2	-	-	1	4	2	1	1	2	1	7	3	2	2	3	2	12	25	75	1.42
	Halmentho sporium	2	-	3	-	1	6	-	1	-	2	-	3	-	1	1	2	-	4	1	2	4	1	1	9	22	70	1.25
	Cladosporium clavatum	8	6	7	5	6	32	9	5	4	3	1	22	3	2	3	1	1	10	6	-	3	1	2	12	76	65	4.31
	Cladosporium herbarum	6	1	3	-	2	12	3	2	2	1	1	9	4	2	1	1	1	9	2	1	1	3	-	7	37	90	2.09
	Curvularia lunata	5	3	2	7	4	21	6	3	1	2	1	13	4	6	4	2	8	24	5	1	-	3	1	10	68	95	3.85
	Curvularia tetramear	1	3	2	-	-	6	2	-	2	4	-	8	3	1	1	2	2	9	1	-	2	1	-	4	27	70	1.53
	Dictyosporrium	-	1	-	1	-	2	-	1	-	1	1	3	-	1	-	1	-	2	-	-	1	1	-	2	9	50	0.51
	Drechslera specifera	1	2	2	1	1	7	2	-	1	2	-	5	-	1	-	-	1	2	-	1	-	1	-	2	16	60	0.91
	Fusarium oxysporium	20	9	11	6	4	50	9	2	4	12	8	35	3	2	2	4	1	12	3	1	2	2	1	9	106	100	6.01
	Geotricum candidum	1	-	-	1	-	2	-	1	1	1	-	3	-	1	-	1	-	2	-	-	-	-	-	-	7	35	0.39
	Penicillium citrinum	11	7	5	2	2	27	6	2	3	4	7	22	4	3	5	1	1	14	5	2	3	6	2	18	81	100	4.59
	Penicillium fuseum	2	-	2	4	1	9	5	3	2	1	3	14	2	4	2	3	1	13	3	6	2	4	2	17	52	95	2.94
	Penicillium sclerotiorum	13	2	4	16	4	39	8	6	7	2	4	27	1	3	2	5	2	13	4	2	5	3	4	18	97	100	5.49
	Trichoderma viride	2	1	3	-	-	6	2	1	1	-	1	5	2	1	4	2	3	12	2	1	1	-	2	6	29	80	1.64
	Cunninghmela echinulata	-	-	1	1	-	2	1	-	1	1	-	3	-	2	1	1	-	4	-	-	1	1	-	2	11	50	0.63
	Botryoidiplodia thcobromae	-	1	-	-	-	1	-	-	-	1	-	1	-	-	1	1	-	2	-	1	1	-	-	2	6	30	0.34
	Gilmaniella humicola	-	-	-	-	-	-	-	-	1	1	-	2	-	1	1	-	-	2	-	-	-	-	-	-	4	20	0.23

	Torula caligans	7	2	2	6	1	18	14	2	3	1	1	21	6	2	3	5	3	19	3	2	3	2	3	13	71	100	4.03
	Pithomyces chartarum	1	-	-	1	1	3	-	-	1	1	-	2	-	1	1	-	-	2	-	-	-	1	-	1	8	45	0.45
	Monilla Sps.	1	-	-	1	-	2	2	1	2	1	2	8	1	-	2	1	1	5	-	-	1	1	-	2	17	65	0.96
	Phoma herbarum	4	2	1	1	3	11	2	2	1	1	1	7	3	2	2	1	1	9	2	1	2	1	-	6	33	95	1.87
	Nigrospora Sps	2	1	3	-	-	6	-	2	2	-	-	4	1	-	2	1	1	5	1	-	1	1	-	3	18	60	1.02
	Staychybotris elegans	1	-	2	-	1	4	-	-	1	1	-	2	1	-	1	1	-	3	-	1	1	-	-	2	11	50	0.63
	Trichothecim roseum	1	-	3	-	2	6	-	-	-	-	-	-	1	-	1	-	1	3	-	-	-	-	-	-	9	25	0.51
	Spilodochium berononiae	-	-	-	-	-	-	1	3	2	1	1	8	2	-	2	-	2	6	-	-	1	1	-	2	16	55	0.90
	Pestalotiopsis	2	1	2	1	2	8	2	1	2	1	-	6	-	-	-	-	-	-	-	1	1	2	-	4	18	60	1.02
	Trichurus spiralis	-	-	-	-	-	-	-	1	1	-	-	2	3	-	2	-	1	6	1	-	-	2	1	4	12	40	0.68
	Mycelia sterilia white	13	9	6	8	6	42	11	4	6	5	3	29	7	4	3	2	2	18	4	3	1	2	4	14	103	100	5.84
	Mycelia sterilia black	7	4	1	3	1	16	4	3	2	6	6	21	2	5	4	3	9	23	2	5	3	-	3	13	73	95	4.14
	Total	167	89	108	91	68	523	130	76	86	83	73	448	96	70	74	62	82	384	87	60	67	65	48	327	1682	-	-