

Aeromycological profile of the public parks of Bhilai Township, Chhattisgarh, India

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Abstract

A systematic aeromycological survey of four public parks of Bhilai Township in terms of sporal diversity and number was carried out during July 2009 to June 2010. A total of 22 genera of fungi having 37 species were recorded during the study period. Aeromycospore diversity was maximum in the month of November (152) followed by October (148). Overall highest prevalence of fungal types was represented by *Aspergillus* (06 spp.) followed by *Alternaria* and *Curvularia* (04 spp. each) respectively. *Aspergillus niger* was found as most frequent (91.66%) fungal species followed by *Alternaria alternata* (83.33 %). The highest percentage contribution (9.34%) was observed for *Alternaria alternata*. Aeromycological data may be useful in terms of community health management and environment point of view.

Keywords: Aeromycology, public parks, *Alternaria*, *Aspergillus*, *Curvularia*, health

Introduction

The microflora of any habitat varies with host type, environmental condition and relations among them. Thus, the diversity of microflora differs from time to time and place to place. Accordingly, their impact may also vary resulting disease development in surrounding plants, deterioration of materials, fungal disorders and allergic responses to inhabitants in the form of skin sensitivity and hypersensitivity in sensitive individuals (Ganguly, 1992; Raha & Bhattacharya, 1992; Singh *et al.*, 1992; Singh & Dorycanta, 1992; Tilak, 1998; Begum & Ahmed, 2006; Verma & Khare, 2009). Their continuous occurrence and recurrence at any site also provide required data to build up prediction models for forecasting epidemics (Rao, 1993).

Bhilai is an industrial township of Chhattisgarh, situated near Durg and known as steel city. As per the township norms there are public parks at regular intervals in between the residential sectors. The parks mostly consist of mixed tree plantations, grass lawns and places for recreation and playing. The area mainly receive tropical climate with very hot summer, moderate rainfall and short winters. The present investigation was undertaken to isolate and identify the most frequently distributed aeromycoflora over such areas of Bhilai Township.

Materials and methods

Observations were recorded at four public parks i.e. Steel club park, sector -8; Jubli park, sector-6; Jawahar Udyan, sector - 5 and Ambedkar park, sector -1. The parks consists mainly of mixed tree plantation in the surroundings with the members of family *Caesalpinaceae*: *Cassia fistula*, *Bauhinia variegata*, *Caesalpinia pulcherima* and *Delburgia sissu* etc. Sterilized petri plates of 9 cm diameter containing rose bengal streptomycin potato dextrose agar and sabouraud agar medium were exposed for 10 min with replicates of 5 petri plates per site fortnightly during July 2009 - June 2010. The plates were kept at 12 inches above the

ground in between 7-8 am for trapping of fungal flora on the basis of gravitational fall. The exposed plates were incubated in an inverted position at $28 \pm 1^\circ\text{C}$ for 5- 10 d for the growth of CFUs. Fungal colonies were identified on the basis of visual and microscopic structures as per the manual of soil fungi (Gilman, 1959), dematiaceous hyphomycetes (Ellis, 1971) and illustrated genera of Imperfect fungi (Barnett *et al.*, 1972). Percentage frequency and percentage contribution of individual species were calculated as per standard formula:

$$\% \text{ Frequency} = \frac{\text{No. of observations in which colony appear}}{\text{Total no of observations recorded}} \times 100$$

$$\% \text{ Contribution} = \frac{\text{Total number of colonies of all species}}{\text{Total number of colonies of one species}} \times 100$$

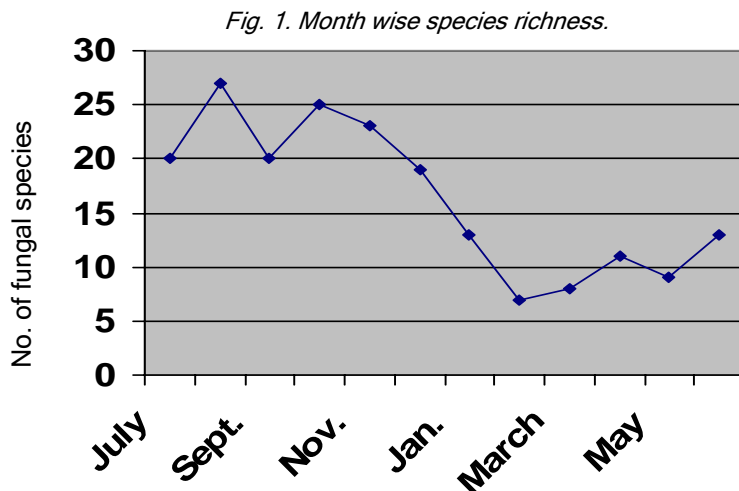
Results and discussion

Altogether 37 fungal species belonging to 22 genera were isolated from study sites during different sampling periods (Table 1). The total fungal species increased from July to Dec both qualitatively and quantitatively. But overall the spore count exhibited seasonal fluctuations. It was higher in between Oct, Nov and Dec and exhibit decreasing trend till June. Maximum fungi were isolated in the month of Oct and Nov in terms of number of CFUs (148 & 152) respectively and least in the months of Feb and Mar (19 & 18). Verma and Chile (1992) also reported greater variety and large number of aeromycoflora during May to Oct and least in Jan. This is generally attributed to favorable conditions for growth during the periods. Singh and Siddiqui (2009) have done similar work in polluted and unpolluted air zones and reported that the survival of air borne spores would depend on several factors like wind velocity, distance from source, time in air, relative humidity, gaseous composition of atmosphere, sunshine and species itself. Month-wise trend of species richness is depicted in Fig.1. It was observed that there is a peculiar trend of number of fungal species found in every

Table 1. Distribution, % frequency and % contribution of Aeromycoflora at study sites

Fungal Species	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	# colonies	% F	% Contribution
<i>Alternaria alternata</i>	02	01	11	14	13	10	10	08	04	02	-	-	75	83.33	9.34
<i>A. helianthi</i>	-	03	02	05	06	-	-	-	-	-	-	-	16	33.33	1.99
<i>A. tritici</i>	-	-	-	06	07	04	05	-	-	03	03	02	30	58.33	3.73
<i>A. soleni</i>	05	05	08	11	12	10	05	02	-	-	02	-	60	75.00	7.47
<i>Aspergillus fumigatus</i>	03	07	03	09	12	10	03	-	-	02	-	-	49	66.66	6.10
<i>A. flavus</i>	06	02	-	-	09	03	-	-	02	03	-	02	27	58.33	3.36
<i>A. niger</i>	02	01	05	10	16	11	02	-	03	05	08	05	68	91.66	8.46
<i>A. sulphureus</i>	-	02	03	05	04	03	-	-	02	02	-	-	21	58.33	2.61
<i>A. terreus</i>	-	02	-	-	-	-	02	02	-	-	-	-	06	25.00	0.74
<i>A. versicolor</i>	-	-	-	01	-	-	-	-	-	-	-	-	01	08.33	0.12
<i>Beltrania sp.</i>	02	06	06	03	02	-	-	-	-	-	-	-	19	41.66	2.36
<i>Bipolaris indica</i>	-	03	05	11	04	-	-	-	01	-	-	-	24	41.66	2.99
<i>Candida albicans</i>	-	-	-	-	-	02	-	-	-	-	-	01	03	16.66	0.36
<i>Cercospora althacina</i>	02	-	-	05	05	08	-	-	01	01	01	-	23	58.33	2.86
<i>Cladosporium clavatum</i>	-	03	06	03	11	15	09	-	-	02	02	-	51	66.66	6.35
<i>C. epiphyllum</i>	02	05	05	10	03	-	-	-	-	01	-	-	26	50.00	3.23
<i>C. herbarum</i>	-	-	-	-	-	02	-	-	-	-	-	-	02	08.33	0.24
<i>Cunninghemella sp.</i>	04	07	-	-	-	-	-	-	04	03	-	-	18	33.33	2.24
<i>Curvularia catenulate</i>	02	04	06	06	-	-	02	02	-	-	-	-	22	50.00	2.74
<i>C. geniculata</i>	-	04	04	09	10	02	-	-	-	-	03	04	36	58.33	4.48
<i>C. lunata</i>	01	02	-	04	07	02	03	-	-	-	-	-	19	50.00	2.36
<i>C. tetramera</i>	-	-	-	-	02	-	-	-	-	-	-	-	02	08.33	0.24
<i>Dictyosporium sp.</i>	01	-	-	03	-	-	-	-	-	-	-	01	05	25.00	0.62
<i>Drechslera sp.</i>	02	03	09	11	09	03	-	-	-	-	-	01	38	58.33	4.70
<i>Epicozum sp.</i>	-	-	-	-	03	02	-	-	-	-	-	01	06	25.00	0.76
<i>Fusarium oxysporum</i>	03	02	-	-	-	-	02	02	-	-	-	-	09	33.33	1.12
<i>Geotricum candidum</i>	02	04	-	-	-	-	-	-	-	-	01	01	08	33.33	0.99
<i>Gliocladium sp.</i>	02	03	-	02	04	05	-	-	-	-	-	-	16	41.66	1.99
<i>Mucor sp.</i>	06	07	03	04	-	-	02	02	-	-	-	-	24	50.00	2.99
<i>Penicillium citrinum</i>	-	02	06	04	09	10	01	-	-	-	-	-	32	50.00	4.95
<i>P. fuscum</i>	-	02	01	01	-	-	-	-	-	-	-	-	04	25.00	0.49
<i>Penicillium sp.</i>	01	-	-	-	-	-	-	-	-	-	-	01	02	16.66	0.25
<i>Rhizopus nigricans</i>	04	04	07	02	01	02	04	-	-	02	02	01	29	83.33	3.61
<i>Trichoderma viride</i>	-	02	02	06	-	-	-	-	-	-	01	01	12	41.66	1.41
<i>Unidentified sp. I</i>	01	01	01	-	-	-	-	-	-	-	-	-	03	25.00	0.36
<i>Unidentified sp. II</i>	-	-	-	-	01	01	-	-	-	-	-	-	02	16.66	0.25
<i>Mycelia sterilia</i>	-	02	05	03	02	-	-	01	01	-	-	01	15	58.33	1.86
Total	53	89	98	148	152	105	50	19	18	26	23	22	803		

month. Maximum fungal species were found in the months of Aug (27), Oct (25) and Nov (23) and least in the months of Feb (07) and Mar (08).



Among the various species encountered, *Alternaria alternata* was the principal fungi with a contribution of 9.34% followed by *Aspergillus niger* (8.46%) and *Alternaria soleni* (7.47%) respectively. The overall dominance of *Aspergillus* by 6 species and maximum frequency (91.66%) of *A. niger* was observed. This was followed by *Alternaria* and *Curvularia* with 4 species each and *Cladosporium* and *Penicillium* with 3 species each. *Aspergillus* was found most predominated genus in the air at Raipur (Tiwari & Sahu, 1988; Jadhav, 1996; Sahu, 1998; Tiwari *et al.*, 2006).

Although the aeromycoflora was dominated by saprobe, the plant pathogenic and human allergic fungi was also encountered. The study indicates that the incidence of air borne fungal spores of clinical significance show greater variation in response to the environmental conditions. *Aspergillus* sp. is an opportunistic organism and generally harmless in its normal environment but becomes pathogenic in compromised hosts having lowered resistance. Some of the species of *Aspergillus* are known to cause aspergilloses. *Penicillium*, *Cladosporium* and *Curvularia* are also considered as important allergenic and mycotoxin producing fungi. The prevalence of these fungi in study site explores potential risk of allergy among residing people. Sawane (2010) done a survey of air borne *Penicillium* in different environments of Nagpur and concluded its high percentage in the air as a potential risk factor for allergic disorders to people reside nearby. During the investigation it was also observed that the atmosphere of these parks were never free from fungal spores throughout the month. Verma and Khare (2009) studied the aeromycoflora in the houses of allergic patients and suggested such patients to avoid the contact or direct exposure to aeromycoflora.

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