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Studies on effect of roadside particulate matter on phyllopane mycoflora of *Polyalthia longifolia*

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Abstract- Microorganisms present on surface of leaves constitute phylloplane microflora, They interact with leaves and with each other. They also play a major role in litter decomposition and help in recycling of mineral cycling in ecosystem. Present paper is aimed to study the effect of roadside particulate matter on phylloplane microflora of *Polyalthia longifolia.* A total of the 11 fungal species were isolated from the leaf surface of *Polyalthia longifolia* from all the study areas during the study period. Of these 10 species were recorded from polluted sites and 8 species from unpolluted site. . *Curvularia sps.* was obtained only from the unpolluted site Relative abundance of the phylloplane fungi was significantly reduced in polluted site as compared to the unpolluted site. This indicated the detrimental effect of the pollutants on the leaf surface microbial community.

Keywords- phylloplane microflora, *Alnus nepalensis*

INTRODUCTION

Leaves of plants provide a good habitat for microorganisms. The microbes harboring on the surface of leaves are known as phylloplane microflora. The predominant phylloplane microorganisms include bacteria, yeasts, actinomycetes, and filamentous fungi The interaction between the microorganisms and the leaf surface is of great importance to both the partners. The microbe and their spores get nutrition from the chemicals diffusing from the leaf and they also get suitable habitat for survival. Phylloplane microorganisms are also capable of influencing the growth of their host plants in various ways. There is evidence that they are able to fix atmospheric nitrogen and involved in nitrogen economy of nature (Last & Deighton,). Under normal conditions, microbial population in this habitat are held in a dynamic balance by interactions between microorganisms themselves as well as between them and the leaf. Many air pollutants including sulfur dioxide, acidic precipitation, hydrogen fluoride, heavy metals and particulates in the form of dust can influence microbial growth and development, Chemical sprays on the leaf surface is reported to reduce diversity of bacteria, filamentous fungal and yeasts communities of mango phylloplane (De jager *et al.,* 2001). The effect of dust pollution on crops, grasslands, trees and woodlands, arctic bryophytes and lichen communities has been studied by various workers from time to time. But little work has been done to show the effect of roadside dust/ particulate pollution on the phylloplane microorganisms. This piece of work is aimed to study the influence of roadside dust pollution on the microbial population of phylloplane. Present study was undertaken with the aim to compare between the polluted and non polluted sites with reference to dust deposition and its effects on fungal community of the phylloplane of roadside trees growing at Indore city. Rai and Singh (1989) studied the effect of the leaf extracts of wheat treated with pollutants on growth behavior of some phylloplane fungi. Also the influence of air pollution on the phyllosphere microflora composition of *Tillandsia* leaves (Bromiliaceae) have been studied by Brighigna *et. al.* (1999). Joshi (2008) carried out the study on the Influence of roadside pollution on the phylloplane microbial community of *Alnus nepalensis* (Betulaceae).

METHODS

Present studies were carried ouy at Indore. Indore is a commercial and educational center of central India. This city experiences a lot of vehicular movements along its roads.

Selection of sites

Survey of various sites which are more prone to vehicular and dust pollution was made . Out of these, two sites , one along the Mahatma Gandhi Road (Regal Square) and other along the Agar Bombay Road (Navlakha circle) have been selected for the study and a control site (Residency park) has been selected.

Sample collection

Polyalthia longifolia is a common roadside tree. It is planted for it's lush green , beautiful foliage. Leaves are simple, glaucous with wavy margins arranged in alternate manner forming a dense canopy.

Leaf samples were collected at a regular interval of one month.

Measurement of amount of dust

The collected leaves were weighed before and after washing with 10 ml. distilled water. The weight of the dust was calculated by weighing machine of MH Series model.

Isolation and Identification of Fungi

For the isolation of fungi from the leaf surface dilution plate method was followed (Dickinson 1981). 0.5 ml. of the microbial suspension was transferred from each of the prepared dilution series to the separate Petri plates containing Potato Dextrose Agar medium. Number of colonies, their appearance and abundance were recorded. Fungal forms from each colony were identified by making a temporary slide. By observing the mycelium and the spores, the fungi was identified with the help of available A total of the 11 fungal species were isolated from the leaf surface of *Polyalthia longifolia* from all the study areas during the study period. Of these 10 species were recorded from polluted sites and 8 species from unpolluted site. The relative abundance (%) of fungi was calculated by using the following formula:-

$$\text{Relative Abundance (\%)} = \frac{\text{Total no. of colony of a species}}{\text{Total no. of species}} \times 100$$

RESULTS

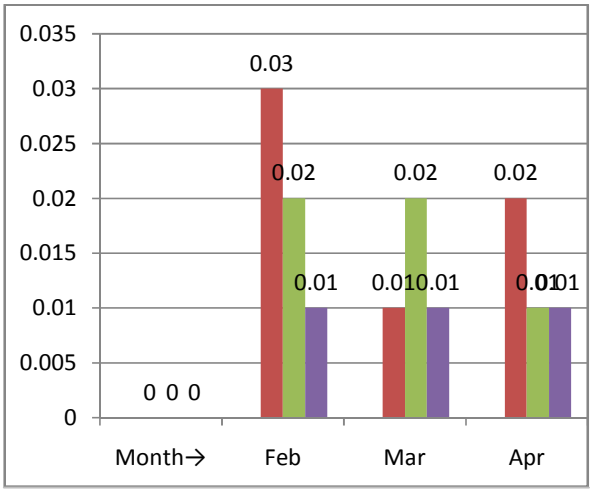
During the study months , there was a remarkable variation in temperature, relative humidity and wind velocity. The temperature ranges from the minimum average value of 1ºC to maximum average value of 32 ºC. Relative humidity varied between 10% to 80%. The wind velocity ranges from 5 Km/hr to 30 Km/hr.

It has also been reported that the amount of dust deposition on phylloplane, during the month of February'12 was higher in comparison to the amount of dust deposition on phylloplane during the month of March'12 and April'12. It has also been reported that the amount of dust deposition on the phylloplane of polluted sites was greater in comparison to the phylloplane of control site and out of the two polluted sites, the dust deposition on phylloplane was more at the Navlakha site (P1 site).

Table-1 Average Weight of dust on the leaves of *Polyalthia longifolia* during the study period

Month→	Feb	Mar	Apr
Sites ↓			
P1	0.03	0.01	0.02
P2	0.02	0.02	0.01
C	0.01	0.01	0.01

Fig. 1 Average Weight of dust on the leaves of *Polyalthia longifolia* during the study period



Microfungal community

A total of the 11 fungal species were isolated from the leaf surface of *Polyalthia longifolia* from all the study areas during the study period. Of these 10 species were recorded from polluted sites and 8 species from unpolluted site.Almost similar variety of the fungal species were obtained from the polluted and reference site, but there was difference between their frequency. The number of colonies obtained was maximum at the reference site.*Cladosporium sps., Alternaria sps., Curvularia sps., Rhizopus sps., Trichoderma sps., Aspergillus niger., Aspergillus flavus., Aspergillus fumigates., Penicillium sps*., and some unidentified white sterile mycelium and grey sterile mycelium are the fungal species obtained. *Curvularia sps.* was obtained only from the unpolluted site.

Table-2 Relative abundance (%) of fungal species on leaf surface of *Polyalthia longifolia* at polluted and control site

		February			March			April	
Name of Fungal sps.	P1	P2	C	P1	P2	C	P1	P2	C
Cladosporium sps.	50	29.1	36.6	0	0	6.25	0	0	0
Alternaria sps.	30	20.8	26.6	0	0	0	0	0	0
Curvularia sps.	0	0	10	0	0	0	0	0	0

Tricoderma sps.	0	8.33	0	0	0	0	0	0	0
Aspergillus niger	0	41.6	0	63.6	34.6	28.1	47.3	45	37
Aspergillus flavus	0	0	0	22.7	3.84	34.3	26.3	20	33.3
Aspergillus fumigates	0	0	0	0	30.76	9.37	15.7	20	29.6
Rhizopus sps.	15	0	20	9	19.23	12.5	0	0	0
Penicillium sps	0	0	0	4.54	0	0	0	0	0
Helminthosporium sps.	0	0	0	0	0	0	0	0	0
Mycelia sterilia	0	0	0	0	0	0	0	0	0
white sterile mycelium	5	0	3.3	0	11.5	9.37	5.26	10	0
grey sterile mycelium	0	0	0	0	0	0	5.26	5	0

DISCUSSION

Relative abundance of the phylloplane fungi was significantly reduced in polluted site as compared to the unpolluted site. This indicated the detrimental effect of the pollutants on the leaf surface microbial community. This were supported by industrially derived metal pollution studies (Bewley 1980) and chemical sprays on the leaf surface (DeJager et al. 2001). The relative abundance of the *Cladosporium* sps. was reported to be the highest. It is quite natural as Cladosporium is frequently reported to be the major fungal constituent of the atmosphere (Gregory 1973). *Cladosporium* was also reported to be frequently occurring fungi under all the major isolation techniques (Singh & Rai, 1980). Generally the relative abundance was lesser in polluted sites as compare to the control sites. Joshi (2008), observed similar results while studying the influences of roadside pollution on the phylloplane microbial community on Alnus nepalensis. Industrially derived pollutants also exert same type of impact (Bewley, 1980). Curvularia sps. was found to be sensitive to the roadside pollution, as it was altogether absent in polluted site in all the plants. It may be attributed to its sensivity towards the pollutants as it was present at the control site. The relative abundance of *Curvularia sps.* in the month of Feb-Apr was reported to be zero in the study conducted by Joshi (2008) on the influence of roadside pollution on the phylloplane microbial community on Alnus nepalensis. Bewley (1980), stated that the tolerance of fungi is due to their ability to utilize elements as nutrients in the pollutant dust and the beneficial effect of which might over way the effect of pollutant toxicity.

CONCLUSION

On the basis of the present study it may be concluded that road side air pollution affects the mycoflora of phyllosphere both qualitatively and quantitatively. The phylloplane mycoflora is an integrated part of the leaf. When the leaf falls off from the plant, this flora invades it and the process of litter decomposition takes place. Any change in this microflora can alter the process of litter decomposition which in turn will affect the release of bound macro and micro nutrients. This consequently will deprive other life forms from the essential nutrients.

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