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Effect of roadside air pollution on Phylloplane fungal diversity of *Polyalthia longifolia* Sonn.

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ABSTRACT

Leaves of plants provide a good habitat for microorganisms. The interaction between the microorganisms and the leaf surface is of great importance to both the partners. Present paper is aimed to study the effect of roadside particulate matter on Phylloplane mycoflora of *P. longifolia*. A total of the 07 fungal species were isolated from the leaf surfaces of *P. longifolia.* Phylloplane fungi were significantly reduced away from the roadside as compared to the exact roadside. This indicated that pollution influence the growth of fungi on Polyalthia leaves collected from exact roadside.

Keywords: microorganisms, *P. longifolia,* fungal species.

INTRODUCTION

It was Last [1] who for the first time introduced the term phyllosphere for leaf surface mycroflora. Thereafter, a new term phylloplane was suggested for leaf surface environment by Last and Deighton (1965). Thus, phylloplane is the leaf surface itself that harbours a variety of microorganisms both pathogens and saprophytes.

Air pollution influence biological systems in different ways at a global level. At regional or local levels these effects are more significantly detectable, especially in urban and industrial areas or when the pollution is associated with roadways [2]. The microbial ecosystems established on plant surfaces are strongly influenced by pollutants [3, 4].

The phylloplane, the surface of plant leaves is a complex terrestrial habitat that is characterized by a variety of microorganisms including bacteria, filamentous fungi, and yeast [5].

Phylloplane fungi are the mycota growing on the surface of leaves [5]. Phylloplane fungi play a major role in litter decomposition and help in recycling of mineral cycling in ecosystem.

Leaves of plants provide a good habitat for micro-organisms. The microbes harbouring on the surface of leaves are known as phylloplane mycoflora. The interaction between the microorganisms and the leaf surface is of great importance to both the partners. The microbes and their spores get nutrition from the chemicals diffusing from the leaf and they also get suitable habitat for survival. Phylloplane micro-organisms 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 N_2 economy of nature. The effect of dust pollution on crops, grasslands, trees and woodlands, 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 particle pollution on the phylloplane microorganisms to compare variation of pollution from roadside to the away from the roadside trees [6].

Fungi are found everywhere such as in water, in soil, in air and in footsteps, in an Antarctica too - in snowy also biodiversity is the variation of life forms in a given ecosystem. Biodiversity is to be studied to avail the knowledge and behavior of living things in a particular environment or in biological systems.

As aerobiology deals in large parts with bio-particles in air, it contributes a lot in enumeration of types of bio-particles present, among all the air borne bio-particles, fungal spores constitute the greatest and most important portion in air (Salvagno and Lars 1981).

Aero-mycology deals with the study of air borne fungi and their spores. Fungi have both positive and negative effects on our lives from the negative point of view they destroy our food leather and other similar articles they are also responsible for causing a large number of diseases in plants like rusts, smuts, blight etc. Leaf surfaces of roadside trees are exposed to various trace metal and gaseous contaminants discharged from the vehicles. The increasing number of vehicles running on petrol and diesel, fuel produces excessive fumes containing tar particles and other metal contaminants due to the incomplete combustion of fuel. Certain other human activities like road construction, sand milling, stone grinding, etc. also add to the atmospheric dust and trace contaminants which get settled on the leaves of roadside trees.

The relationship between air pollution and microorganisms is an important and incompletely appreciated topic. Air pollution has been reported to bring about change in the lichen cover in a tropical habitat over a period of time.

Aims and Objectives

- Therefore, a study to understand the impact of vehicular air pollution on the phylloplane microorganisms of roadside trees (*P. longifolia* Sonn.).
- Phylloplane fungi have been poorly studied as compared to endophytes, saprobes and pathogen fungi.
- This work is aimed to study the effect of roadside particulate matter on phylloplane mycoflora of P. *longifolia* Sonn.

METHODOLOGY

Selection of Site:

Survey of various sites which are more prone to vehicular and dust pollution was made. Out of these, one site, at Belapur Khurd has been selected. The fresh leaves of *P. longifolia* Sonn. were collected.

P. longifolia is a common roadside tree. It is planted for its lush green, beautiful foliage. Leaves are simple, glaucous with wavy margins arranged in alternate manner forming a dense canopy. *Polyalthia* leaves were collected from the exact roadside, 5 ft, 10 ft, 15 ft, 20 ft away from the roadside respectively. Collected leaves were put in sealed polythene bags, stored at 0^{o}c in a refrigerator.

Media Preparation :
For the identification of fungi (CDA) Czapek's Dox Agar medium was used.

Composition of Media:-

Chemical	**Amount gm/l**
Sodium nitrate	2.0
Potassium chloride	0.5
Magnesium glycerophosphate	0.5
Ferrous sulphate	0.01
Potassium sulphate	0.35
Sucrose	30.0
Agar	12.0
pH	6.8 $\pm$ 0.2 at 25^{0}C

Procedure:
Suspend 45.4 gm. in 1 lit of distilled water. Bring to the boil to dissolve completely sterilize by autoclaving at 121^{o}c for 15 minutes. Mix well before pouring.

Description:
CDA is a medium containing sodium nitrate as the sole source of nitrogen, it is one of the most solid media for the general culture of fungi. The medium was made up to 1 lit by addition of distilled water. The pH of the medium was adjusted to 5.6 finally the medium was cotton plugged and autoclaved at 121^{o}C for 15 min.

Isolation and Identification of fungi:
For the isolation of fungi from the leaf surface, leaf impression method was followed. Fungi were identified referring the standard manuals.

Leaf Impression Method:
In this method leaves are gently pressed on the surface of nutrient agar medium in Petri plates. After incubations microorganisms grows which are isolated and identified.

RESULTS AND DISCUSSION

Data depicted in table indicates that the *Alternaria* spps. is common among all the fungi found on both the leaf surfaces (i.e.- upper and lower). *Aspergillus niger* is common on upper epidemis in all the plants. Investigation showed that air pollution influence phyllosphere microflora. Leaves collected from the exact roadside have observed luxuriant growth of fungi on both the surfaces i.e. upper and lower while leaves collected from 5 ft. away from roadside have observed less growth on lower surface in comparing to the upper surface. In case of leaves collected from the 10ft away, lower surface contained slightly more growth of fungi than the upper surface.

Table : Growth of fungi in petriplates with respect to the leaf surfaces.

Sr.No.	Name of fungi	Exact road side		**5ft**		**10ft**		**15ft**		**20ft**	
		L.S	**U.S**	**L.S**	**U.S**	**L.S**	**U.S**	**L.S**	**U.S**	**L.S**	**U.S**
1.	*Aspergillus niger.*	+	+	+	+	-	+	-	+	-	+
2.	*Alternaria* spps.	+	+	-	+	+	+	+	+	+	+
3.	*Colletotrichum* spps.	_	_	_	_	+	+	_	+	_	_
4.	*Fusarium* spps.	+	+	+	+	_	_	_	_	_	_
5.	*Mucor* spps.	+	+	+	+	_	_	_	_	_	_
6.	*Penicillium* spps.	_	-	+	+	+	_	+	+	_	_
7.	*Rhizopus* spps.	_	+	+	+	_	_	_	_	_	_

[(+) = present , (-)= absent]

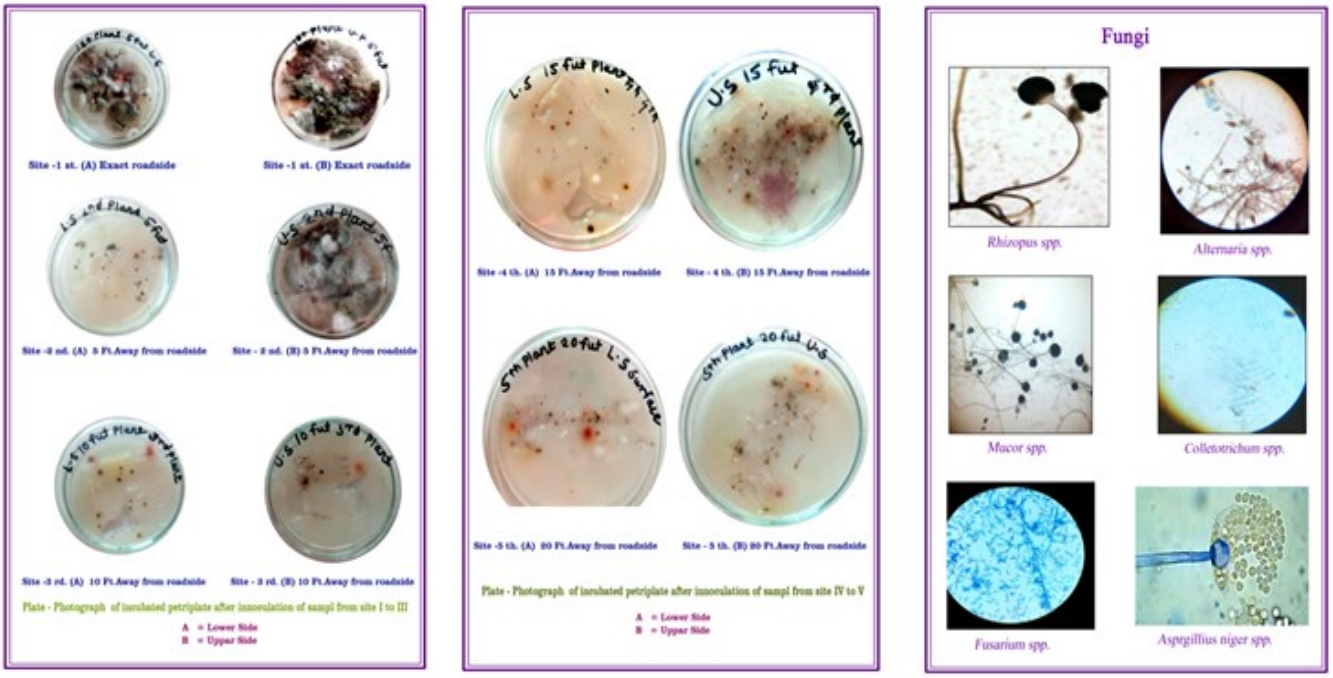

Fig: Microscopic images of fungi observed under compound microscope (45X)

In comparison to the 10 ft. observation, 15 ft. observation of upper surface shows slightly higher colony of microorganisms while lower surface contain very negligible amount of growth while the leaves collected 20 ft. away from the roadside shows sudden increase in microbial growth. As per result observed from exact roadside to 20 ft. away from the roadside, the continuous decrease in phylloplane fungal diversity and the rate of growth and occurrence of phylloplane fungi on both leaf surfaces also decreased. Due to higher pollution abundant amount of increase in fungal diversity on leaves of *P. longifolia* which is occurred on exact roadside. Phylloplane mycoflora colonies occurred on the roadside *Polyalthia* plant shows the abundant amount of increase in fungal colonies. Colonies observed in this are majorily *A niger* and *Alternaria* spp., *Fusarium* spp.

CONCLUSION

From above study we have concluded that, effect of air pollution on Phylloplane fungal diversity. It is observed that, fungal diversity decreases on leaves of *P. longifolia* Sonn. collected from away from roadside.

Conflicts of interest: The authors stated that no conflicts of interest.

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