



BOTANY

## COMPARATIVE STUDY OF AEROMYCOFLORA IN RELATION TO SOIL MYCOFLORA OF DARJEELING TEA GARDEN, INDIA

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### Abstract

Darjeeling is internationally famous for its tea industry. The aim of the present investigation was to comparative study of aeromycoflora in relation to soil mycoflora at tea garden Darjeeling. Mycoflora of soil and air from tea garden of Darjeeling was studied during summer, 2009. The fungal species from soil samples were isolated by serial dilution method. During the present investigation gravity Petri plates methods was used for aeromycological survey. Fungal spores recorded were representatives of the three major groups i.e. Zygomycotina, Anamorphic fungi and Mycelia sterilia. A total of 12 fungi were isolated from soil. *Aspergillus fumigatus* (18%), showed maximum percentage contribution followed by *A. niger* and *Rhizopus* sp. (14%). The maximum fungal species belonged to Anamorphic fungi. In air total 87 fungal spores represented 16 fungal types were observed during the present investigation period. Out of 16 fungal species 2 from Zygomycotina, 13 from Anamorphic fungi and 1 from Mycelia sterilia (white) were observed. *Aspergillus fumigatus* showed the maximum percentage contribution of aero-mycoflora as well as soil mycoflora. Some common aeroallergens including *Aspergillus*, *Penicillium* were found to dominate to mold spectrum. Over the last few years a significant progress has been observed in the study of airborne fungi, because of the medical and phytopathological consequences associated with fungal spores.

**Keywords:** Darjeeling, *Aspergillus fumigatus*, Soil mycoflora, Aero mycoflora

### Introduction

Soil is the complex ecosystem delimited by physio-chemical parameters that hold enormous number of diverse living organism (Olsoan et al., 2000). Several micro fungi are present in the soil which play significant role in the improvement of soil. The quality and quantity of organic materials present in the soil have a direct effect on the fungal population and type of nutrients available, available moisture, degree of aeration, pH, temperature etc. Air consists of a mixture of permanent gases and water in different proportions, solid particles, pollen- grains and fungal spores. Aerobiology is a scientific discipline which deals with the studies of organisms or part of the organisms present in the air. The term "aerobiology" came in the use during 1930's as collective and other micro-organisms. Aerobiological investigations have been carried out with special reference to diseases on crops, vegetable and fruits etc. The aim of the present investigation was to comparative study of aeromycoflora in relation to soil mycoflora at tea garden Darjeeling.

### Materials and Methods

Soil sample was collected from Dargeeling, in a small plastic bottle, while Potato Dextrose Agar (Potato 20%, Dextrose 2% and Agar 1.5%) was used to isolate fungi from the soil. The fungal species were isolated by serial dilution method, for this purpose 1g of soil

sample was suspended in 10ml double distilled water and serially diluted upto  $10^{-5}$ . One microbial suspension of each concentration was added to Petri dishes containing 15ml Potato dextrose agar medium. During the present investigation gravity Petri plates methods was used for aeromycological survey (Sharma, 2001). Ten sterilized Petri plates containing PDA medium will expose for 5-10 minutes at different places of tea garden (Happy valley) at one meter height above the ground level. Then the Petri plates, brought into the laboratory and incubated at  $26 \pm 1^\circ\text{C}$  for seven days. After few days colonies were observed. The fungi were identified by available literature and frequency distribution of fungal species was calculated.

### Results and Discussions

The results of soil and aeromycofloral survey showed that the tea garden atmosphere was never free of fungal spores. A total of 12 types from soil and 16 types from air, fungal flora were identified. Fungal species recorded were representatives of the three major groups i.e. Zygomycotina, Anamorphic fungi and Mycelia sterilia. During the investigation period 16 fungal species (87 fungal colonies) of 12 genera were recorded in the air and 12 fungal species (50 colonies) of 9 genera were recorded from soil of tea garden of Darjeeling (Table 1,2). Out of 16 fungal species 02

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fungal species (16 fungal colonies) of 02 genera belonging to group Zygomycotina i.e. 01 fungal species of *Mucor hemalis* and 01 fungal species *Rhizopus oryzae* were recorded. 13 fungal species (63 fungal colonies) of 09 genera belonging to group Anamorphic fungi i.e. 01 fungal species of *Alternaria alternata*, 05 fungal species of *Aspergillus* that is *Aspergillus flavus*, *A. fumigatus*, *A. ochraceus*, *A. niger* and *A. tamari*, 01 fungal species of *Bispora* sp., 01 fungal species of *Cladosporium oxysporum*, 01 fungal species of *Curvularia lunata*, 01 fungal species of *Nigrospora oryzae*, 01 fungal species of *Penicillium frequentans*, 01 fungal species of *Periconia* sp. and 01 fungal species of *Trichoderma viride* were recorded. 01 fungal species (08 fungal colonies) of 01 genus belonging to group mycelia sterilia (White) were recorded. During the investigation period group wise percentage contribution was also observed. Percentage contribution of Zygomycotina (18.39%), Anamorphic fungi (72.41%) and Mycelia sterilia (9.19%) were observed. The members of Ascomycotina and Basidiomycotina were totally absent. Throughout the summer season Anamorphic fungal groups were recorded as a dominant fungal group similar results were also recorded by Tiwari et al. (2007) at Raipur. Sharma (2001) also recorded Anamorphic fungi was dominated in atmosphere of *Ocimum sanctum*. Burrell (1904) studied the relation of micro-organisms of soil and human welfare. The isolated fungal species were

found to be adapted to low temperature. Das and Bhattacharya (2007) studied airborne culturable fungal flora of an agricultural farm in West Bengal and observed that *Cladosporium*, *Aspergillus* and *Curvularia* were predominant fungal species they also found lower concentration in summer.

Fig.1 and 2 Contribution of different class of fungi

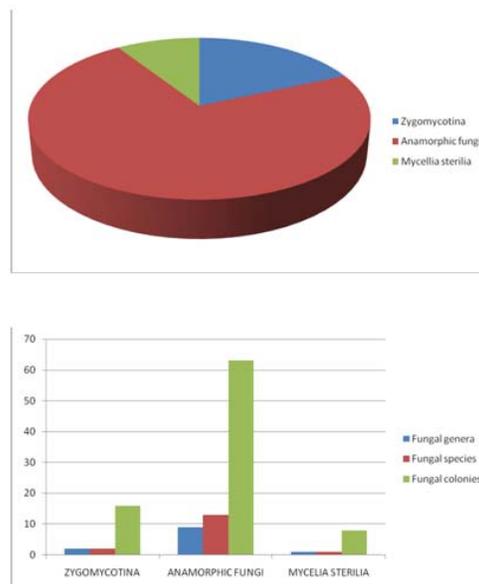


Table 1 Percentage contribution of different fungal species from soil of tea garden

S. N.	Name of fungi	Percentage contribution
1.	<i>Alternaria alternata</i>	4
2.	<i>Aspergillus fumigatus</i>	18
3.	<i>A.nidulans</i>	6
4.	<i>A.niger</i>	14
5.	<i>A.temmari</i>	4
6.	<i>Bispora</i> sp.	2
7.	<i>Cladosporium oxysporum</i>	6
8.	<i>Curvularia lunata</i>	6
9.	<i>Mucor hemalis</i>	8
10.	<i>Mycelia sterilia (white)</i>	8
11.	<i>Penicillium frequentans</i>	10
12.	<i>Rhizopus oryzae</i>	14

Table 2 Observations of different fungal species from air of tea garden

Sr. no	Fungal Species obtained	Percentage contribution
1	<i>Alternaria alternata</i>	2.29
2	<i>Aspergillus flavus</i>	12.64
3	<i>A. fumigatus</i>	14.94
4	<i>A. japonicus</i>	2.29
5	<i>A. niger</i>	9.19
6	<i>A. ochraceus</i>	2.29
7	<i>Bispora</i> sp.	1.14
8	<i>Cladosporium oxysporum</i>	1.14
9	<i>Curvularia lunata</i>	3.44
10	<i>Mucor hemalis</i>	10.34
11	<i>Mycelia sterilia (white)</i>	9.19
12	<i>Nigrospora oryzae</i>	2.29
13	<i>Penicillium frequentans</i>	9.19
14	<i>Periconia</i> sp.	5.74
15	<i>Rhizopus oryzae</i>	8.04
16	<i>Trichoderma viride</i>	5.74

## Conclusion

A total of 16 fungal genera were observed in the atmosphere of tea garden. Some common aeroallergens including *Aspergillus*, *Penicillium*, were found to dominate the mold spectrum. This is a preliminary study based on data from only the summer season in a cold region, being open to confirmation and refinement with more data from future studies.

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