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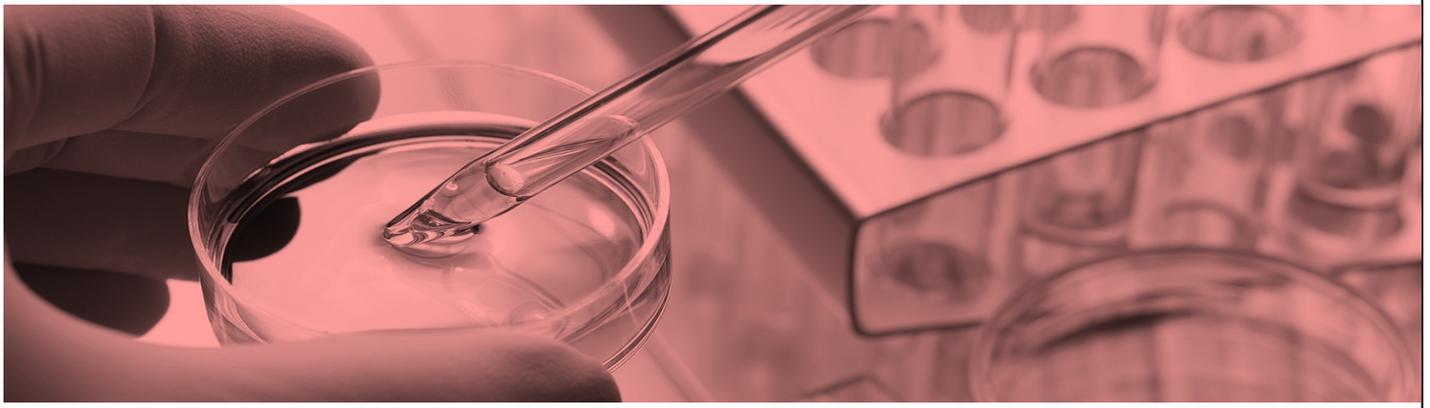
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Fungal Aerospora of urban roads of Bangalore, Karnataka, India

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ABSTRACT

Fungi are omnipresent i.e. both indoor and outdoor environments throughout the world. The fungal spores remain in the air for a longer time as suspended matter. So the present study aims at the fungal spore's distribution in the outdoor environment of urban roads of Bengaluru, India. In the present study four different urban roads like Dasarahalli, Jalahalli road, Lalbagh road, and Richmond road were selected to isolate different spore-producing fungi. Culture plates were exposed to the air of urban roads of Karnataka, India. A total of 230 fungal colonies were isolated from four urban roads atmosphere. The spores of *Aspergillus flavus* and *Fusarium moniliformae* were frequently isolated forms, whereas the least isolated spores are *Nigrospora* and *Trichoderma*. The study provides the preliminary data of the different fungal populations of urban roads of Bengaluru and brings awareness to the people about airborne fungal spores and also various Respiratory problems, Asthma, bronchitis, and allergic disorders caused by this fungus in traffic police and common peoples.

KEYWORDS: Aerospora, *Aspergillus*, *Fusarium*, *Alternaria*, Urban Roads, Bengaluru

CITATION OF THE ARTICLE



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I. INTRODUCTION

Many numbers of an airborne organism and its spores/particles passively float in the atmosphere. Airborne fungi act as a key factor and also an indicator of the level of air pollution throughout the world. Airborne microbial load in the atmosphere varies with time of day, year, and location (Lighthart 2000). Many aeromycological studies were carried to identify different types of allergies and respiratory problems in humans and diseases of vegetables in India. (Tilak and Kulkarni 80; Tiwari 1999). The outdoor air quality was related to natural disasters, air pollution due to human activity, climatic factors, precipitation, and balance in the atmosphere (Sautour et al., 2009, Cordeiro et al., 2010). Fungal spores or fragments of hyphae in ambient air are inhaled by human beings in that particular environment (Pepeljnjak and Segvic Klaric 2003). Nearly 10% of people reported having fungal allergies throughout worldwide (Burge 2001). Many numbers of studies have shown that exposure to fungal spores or fragments of hyphae present in the air may be associated with health problems related to acute toxic effects, allergies, and asthma (Bush and Portnoy 2001). Aeromycologists believe that more than 80 genera of fungi reported are associated with symptoms of respiratory problems (Horner et al., 1995). More than 100 species of fungi are reported to be involved in serious human and animal infections, whereas any number of species cause serious diseases in plants (Cvetnic and Pepeljnjak 1997). These fungal spores present in the atmosphere of urban roads with heavy traffic in peak hours may be causative agents of respiratory diseases in humans (Pepeljnjak and Segvic Klaric 2003). So the present study aims at the air quality of urban roads of Bengaluru and its effect on the human population of Bengaluru, Karnataka, India.

II. MATERIALS AND METHODS

Study area

The natural outdoor environment sites selected for the present study were the National highways like Tumkur road of Dasarahalli, Jalahalli road, urban roads of Lalbagh road, Richmond road in Bengaluru, Karnataka, India. Tumkur road Dasarahalli was a former City Municipal Council. But, now it is officially merged in urban Bangalore under the Bruhat Bangalore Mahanagara Palike program. Dasarahalli area was located on National Highway 4 of urban Bangalore. Jalahalli area was having township in the northern part of Bangalore. It is mainly divided into the Jalahalli East area and the Jalahalli west area. This place is also connected to the NH4 at Jalahalli Cross junction and the Jalahalli East area of Gangamma Circle. Richmond Road was the major road in the

urban area of Bangalore which connects Trinity Church Road and Richmond Circle. It provides connectivity to nearby locality areas like Victoria Layout, Ashok Nagar, and Richmond Town. The microflora studies of these particular places have never been reported. So, information about the airborne sample in specific places is largely lacking.

Isolation of fungi

A sampling of fungal spores was done with the help of the gravity petri dish method. The Petri dishes containing potato dextrose agar medium were taken to the selected site like Tumkur road Dasarahalli area road, Jalahalli road, Lalbagh road, and Richmond road in Bengaluru. The samples were collected at three months intervals of January 2018 to March 2019. Samples were taken in the busy hours of heavy traffic by exposed petri dish in the air for 10 min and brought to the laboratory. The three replicates of the petri dish were incubated for up to 3 to 7 days in a bod incubator. The percentage frequency and percentage contribution of the total fungal flora were assessed (Jadhav and Tiwari 1994).

% frequency = (No of observations in which a species appeared/ total no of observations) X 100

% Contribution =

$$\frac{\text{Total No of colonies of species in all observations taken}}{\text{Total no of colonies in all the species}} \times 100$$

Identification of fungal strains

The colonial features of the fungal colonies were studied as well as the morphological features of the fungi were studied using a compound microscope. The determination of the morphological structures of fungi was carried out after being mounted in lactophenol and cotton blue covered with a coverslip. The fungal types were analyzed for each day. The species were identified based on micro and macro morphology, and reverse and surface coloration of colonies grown on the PDA media. The fungi were identified up to genus level and in some cases up to species level (Cooke 1963). The present study aims at aerospora studies of fungi from urban roads of Bengaluru, Karnataka, and their impact on human health.

III. RESULTS AND DISCUSSION

From the T. dasarahalli area total of 102 fungal isolates were isolated, from the jalahalli area total of 26 fungal colonies were isolated, from Lalbagh road 41 fungal colonies were isolated, and from Richmond circle total of 61 fungal isolates were isolated (Table 1).

The high percentage frequency and %contribution in T. dasarahalli road was shown by *Fusarium moniliforme*. The high percentage frequency and %contribution in Jalahalli road was shown by *Aspergillus fumigatus*. The high percentage frequency and %contribution in Lalbagh road was shown by *Fusarium moniliforme* and *Chaetomium globosum*. and The high percentage frequency and %contribution in Richmond circle road was shown by *Aspergillus flavus* and *Nigrospora* (Fig. a, b,c,d).

Mycotoxins are secondary fungal metabolites, toxic to humans, animals, and plants. Most mycotoxins are produced by three different genera of fungi like *Aspergillus*, *Penicillium*, and *Fusarium* and dematiaceous fungal genera like *Alternaria*, *Helminthosporium*, *Drechslera*, *Phoma*, *Zygosporium* (Ismail and Papenbrock 2015). In the present study, the mycotoxin-producing fungi like *Aspergillus*, *Fusarium*, and *Alternaria* were isolated. Many studies were reporting that aflatoxin production by *Aspergillus* spp. (Bennett and Goldblatt 1973, Hesseltine et al., 1970).

In the present paper different aflatoxin-producing fungi like *Aspergillus niger*, *A. flavus*, and *A. fumigatus* were observed so these fungi may cause health problems. Aflatoxicosis was toxic hepatitis that leads to jaundice and in severe cases finally leads to death. Such incidents of this kind have occurred in Kenya, India, and Malaysia (Shephard, 2004, Lewis et al., 2005). So in the present study also the fungi isolated from urban roads of Bangalore may cause diseases like aflatoxicosis in the urban population of Karnataka.

Table 1: Occurrence of mycoflora in urban roads of Bangalore.

SL. No	Area	Name of the fungus	% of frequency	% of contribution
1	T.Dasarahalli	<i>Aspergillus niger</i>	7	6.8
2	T.Dasarahalli	<i>Aspergillus flavus</i>	21	20.5
3	T.Dasarahalli	<i>Aspergillus fumigatus</i>	15	14.7
4	T.Dasarahalli	<i>Epicoccum</i> sp	5	4.9
5	T.Dasarahalli	<i>Fusarium moniliforme</i>	28	27.4
6	T.Dasarahalli	<i>Fusarium roseum</i>	8	7.8
7	T.Dasarahalli	<i>Cladosporium cladosporoides</i>	18	17.6
8	Jalahalli	<i>Alternaria alternata</i>	7	26.9
9	Jalahalli	<i>Aspergillus niger</i>	4	15.3
10	Jalahalli	<i>Aspergillus flavus</i>	5	19.2
11	Jalahalli	<i>Aspergillus fumigatus</i>	8	30.7
12	Jalahalli	<i>Fusarium moniliforme</i>	2	7.6
13	Lalbagh road	<i>Aspergillus niger</i>	6	14.6
14	Lalbagh road	<i>Aspergillus ochraceus</i>	3	7.3
15	Lalbagh road	<i>Aspergillus awamori</i>	3	7.3
16	Lalbagh road	<i>Fusarium moniliforme</i>	10	24.3
17	Lalbagh road	<i>Chaetomium globosum</i>	10	24.3
18	Lalbagh road	<i>Trichoderma viridi</i>	9	21.9
19	Richmond road	<i>Aspergillus flavus</i>	14	22.9
20	Richmond road	<i>Aspergillus ochraceus</i>	10	16.3
21	Richmond road	<i>Fusarium moniliforme</i>	15	24.5
22	Richmond road	<i>Fusarium roseum</i>	4	6.5
23	Richmond road	<i>Nigrospora</i>	14	22.9
24	Richmond road	<i>Epicoccum</i> sp	4	6.5

Fig. a. shows different fungal isolates from T.Dasarahalli road

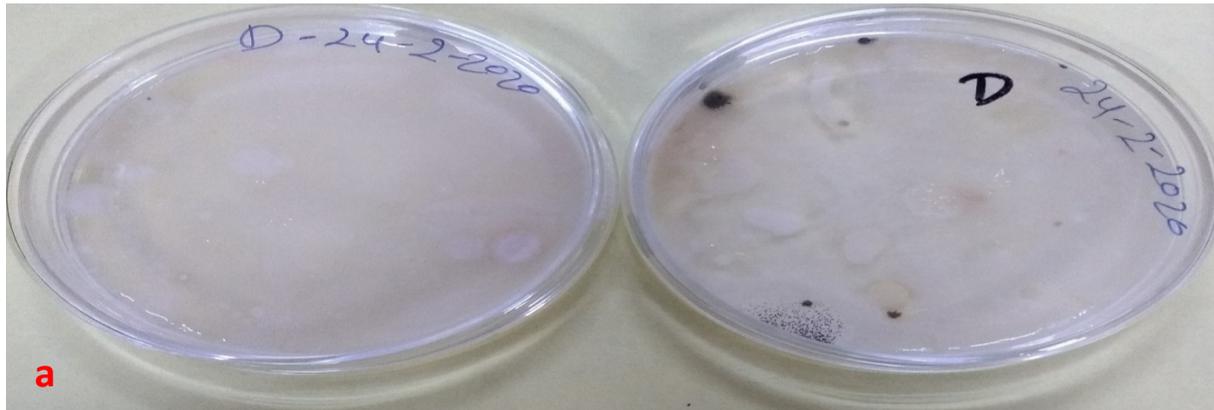


Fig. b. shows different fungal isolates from Jalahalli road

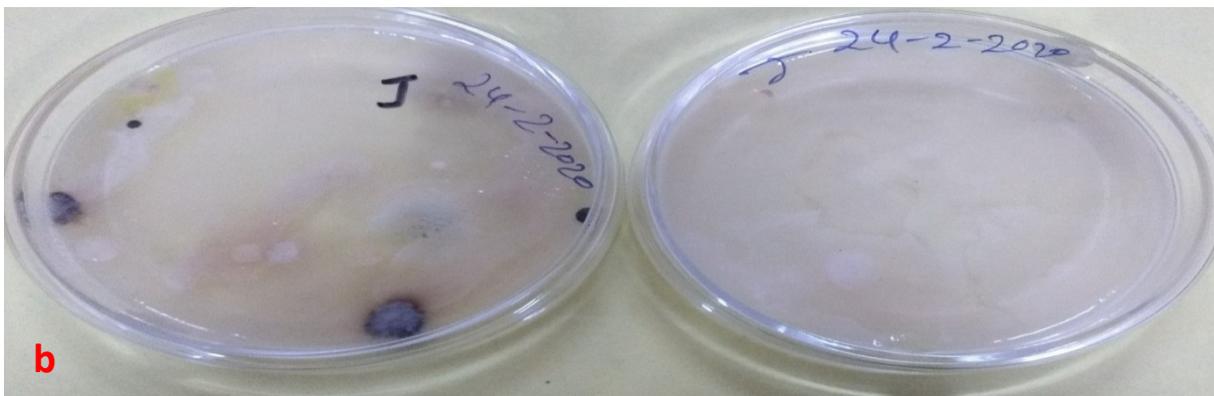


Fig. c. shows different fungal isolates from Lalbagh road

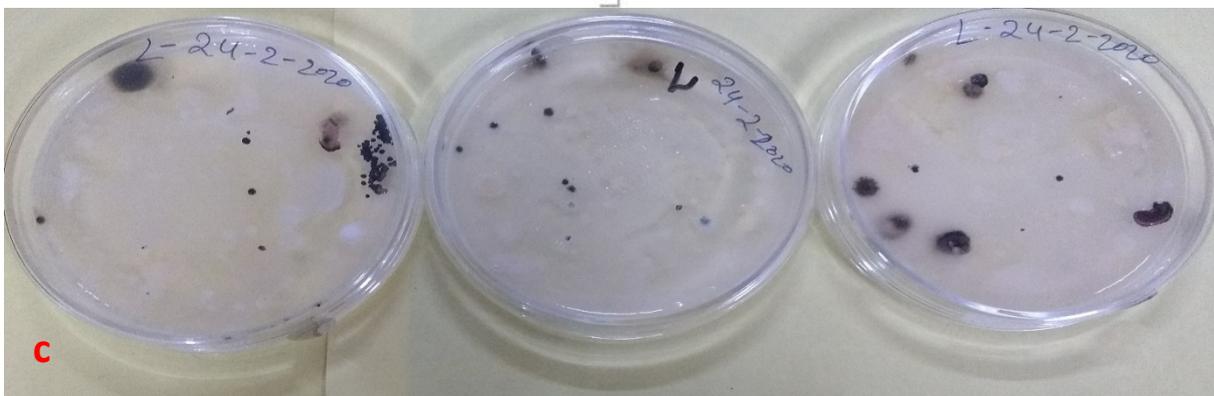
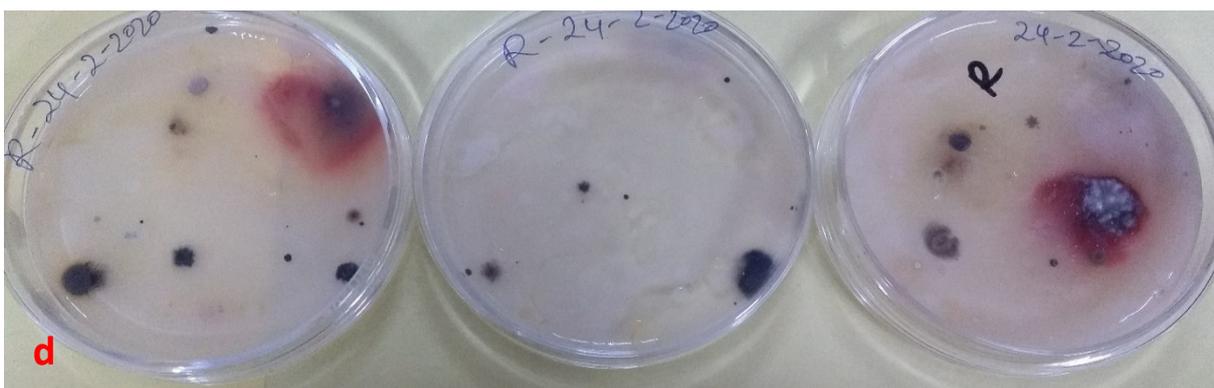


Fig. d. shows different fungal isolates from Richmond road



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