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STUDY OF SOME AIRBORNE FUNGI OF NETAJI SCIENCE COLLEGE MULCHERA CAMPUS AREA DURING MONSOON PERIOD.

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Abstract:
In our everyday life we are exposed to various bio-aerosols. The common bio-aerosols include dust, different chemicals, pollen grains and most importantly fungal spores which cause allergy and other nasal complications. The fungi release spores into the air which are very small in size and are inhaled easily by human beings. Such entry of fungi into the human body is normally called as air borne fungi. The airborne fungi are ubiquitous and present in various indoor and outdoor environments. The fungal contamination in bioaerosols is much potential and is recognized as a serious problem of occupational health.

In the present work different fungal members present in the class rooms and open area of Netaji Subhashchandra Science College, Mulchera are observed and identified. As the present work has been undertaken during monsoon period, which is most suitable time for the growth, germination and development of Fungal spores, the study is much useful to know the presence of various fungal members and whether they are potential in causing moderate or serious health problems.

This is the preliminary work made for the identification of different kinds of air borne fungi in the college premises. An attempt has been made to describe the nature and types of fungi that are potentially active in causing allergy to the people in the study area.

Key-words: Aerobiology, airborne fungi, allergen.

Introduction:

Aerobiology is a branch of science which deals with the study of source of organisms or other materials, their release into atmosphere, dispersion, deposition and their impact on various kinds of living beings like animals, plants and human beings. The biologically important pollutants of the atmosphere include pollen, fungal spores, insects etc. The pollen and fungal spores together have enormous importance in inciting the disorders in human beings which is a growing concern of human health hazard.

On an average human being can live five weeks without food, five days without water, but hardly for five minutes without air. If the food is spoiled and smells one can refuse to eat it, if water is impure, one can object to drink, but if the air is polluted, one cannot stop breathing, one has to inhale it for survival, whether it is pure or impure.

The term aerobiology was coined in the 1930s, to embrace studies of fungal spores, pollen grains and bacteria in the atmosphere. The scope of aerobiology has later been widened to include various other biological particulates like viruses, algae, fungi, lichen spores (soredia), pollen, seeds, plant propagules, protozoan cysts, minute insects etc. Abiotic particulates or gases affecting living organisms are also included in concept of aerobiology (Nilsson, 1978).

The aerobiological process (Frinking and Risdijk, 1977) comprises five main steps- Source, Release, Flight, Deposition, and Impact. Each step is affected by environmental factors.

The data and the information regarding the nature and composition of airspora began to accumulate only after 1866. Broadly Aerobiological investigations are classified in two categories- If the

aerobiological investigations are conducted inside the building or in a rather closed atmosphere like libraries, ware-houses, cattle-sheds, sheep sheds, poultry, vegetable markets, fruit markets and cinema halls etc., for the detection and trapping of the airborne biologically significant organisms or particles, then it is called the indoor or intramural aerobiology.

If the investigations are carried out in the outdoor air for the detection and trapping of the air-borne microorganisms present in the atmosphere then it is called as the 'outdoor or extramural aerobiology'.

Fungal Allergy:

The term 'allergy' was coined by Van Pirquet in (1906). It is defined as 'an accelerated or altered reaction of a person to a second or subsequent exposure to a substance to which his body has already become sensitized by a previous exposure. Hay fever (Seasonal allergic rhinitis) and allergic bronchial asthma are well known examples of allergic disorders caused by substances termed as allergens. The common examples of such allergens are pollen, fungal spores, insects, dust, feathers, cosmetics, synthetic fibers, food articles, drugs and chemical etc.

The atmosphere contains different types of biopollutants of which fungal spores constitute a major portion. Results of the investigations all over the world have established, beyond doubt, that the aerial fungal spores play an important role in the etiology of allergic manifestations.

With regard to fungal allergy, probably the first case of fungal sensitivity was reported as early as in 1873 by Blackly. He found a number of mould spores on the slides that were actually exposed for pollen counting. The first case of fungal allergy was found in Holland. Asthma was caused by 'Miasmata' or 'Climate allergen'. A patient who was sensitive to feathers failed to get a relief in her symptoms even after substituting the feather pillow with kapok cotton pillow. It was then discovered that this new sensitivity was due to moulds growing on the kapok.

Cadham (1924) reported three cases of allergy due to the organism causing wheat rust i.e. *Puccinia graminis*. He was actually the first to use antigenic extracts of the air-borne fungi for the purpose.

The first comprehensive studies in aero biology in relation to allergy in India was carried out by Kasliwal et al. (1955, 1961) and reported that the airborne fungal spores or fragments of mycelium are known to be the cause of respiratory allergy in susceptible individuals.

The incidence of allergic disorders in India is very well documented and is reported to be quite high during recent years. Despite the well-known fact that fungal spores play an important role in the etiology of respiratory allergy, very little work has been done in different parts of this country to identify the local allergenic fungal spores.

The present study includes isolation, culturing and observation of different airborne fungi present inside the class room and in an open area of college premises.

Review of Literature:

Aerobiological studies to ascertain the concentration of fungal spores in the air have been made by several workers (Tiwari and Jadhav, 2004; Kawasaki et al, 2010; Kakde and Kakde, 2012). Jagannath (2001) studied airspora of Ahmedpur. Deshmukh (2002) made studies in aeromycology over some crops of Jalgaon District. Indoor airborne fungal studies at Allahabad university library was made by Sahane et al. (2001). Indoor airborne fungal studies at Alahabad university library was made by Sahane et al.(2001). Aeromycoflora studies of Dongargarh by Sharma (2011) revealed the presence of about 18 fungal types, out of which, maximum genera are anamorphic, 3 species of *Aspergillus* (*A.niger,*

A.flavus and *A.vesicolor*) contributed maximum and *Cladosporium* and *Curvularia* represented moderate percent.

Seasonal distribution of airborne fungi in the outdoor environment of Trabzon city, Turkey was identified by Topbas et al. (2006). In 2009, Panda et al. reported seasonal incidence of airborne fungi in the coastal belt of Orissa. They reported that the fungal genera present in the air vary with the season, in summer it was *Penicillium*, *Alternaria* and *Fusarium*, in Autumn and Winter *Penicillium* and in Spring *Alternaria* were the most prevalent.

A survey of airborne fungal spores in the Korba town by Shukla and Shukla (2011) by using rotorod air sampler revealed the presence of around 24 genera, of which *Fusarium*, *Alternaria* and *Aspergillus* spore percentage was more than others. Pathak (2012) also reported similar genera along with *Penicilium* and yeast in the dental college hospital area of Indore. Thirumala et al. (2013) studied the distribution and species diversity pattern of airborne fungi at Hill fort region of Channagiri. They used Potato Dextrose Agar medium for sampling. The study reports that environmental conditions play an important role in the distribution of fungal spores. Most numbers of fungi reported by them were of anamorphic groups. *Aspergillus* species showed maximum contribution where as *Rhizopus* showed minimum contribution. Similar studies were made by Sandip et al. (2016) at Sironcha in the Gadchiroli district of Maharastra.

More recently, aeromycological survey was made from vegetable market by Sanjay and Sandip (2022).

Material and Methods:

Fungal spores were collected and observed at N.S. Science College, Mulchera during monsoon period from July to August 2019. The main aim of the present study was to isolate the fungus from air. Rainfall and relative humidity have the most profound effect on the amount of fungal spores. The study area for air exposure was divided in two groups:

1. Indoor (Classrooms) – 5 Plates
2. Outdoor (open area within college campus) - 5 Plates

For isolation of fungi from air Potato Dextrose Agar (PDA) mixture having 5.6 pH was used. For 2kg peeled crushed potato, 20g Dextrose and 15g agar was added and the contents are dissolved in 1Lt. distilled water. About 20mL of melted PDA medium was poured in Petri plates and the medium was allowed to solidify. Six plates were air exposed in class room for 5 min and 6 plates were air exposed in the open area of college campus. The plates were incubated at 28ºC for 24 hours. Observed fungi were identified on the basis of morphological appearance using image interpretation system (Petra Perner et.al., 2003).

Results and Discussion:

In the present study about 16 fungal colonies were isolated from indoor (class rooms) and outdoor (college campus) area of Netaji Science College, Mulchera. The number and diversity of fungal colonies in indoor sampling plates were less as compared to outdoor sampling plates. Major fungi appeared on the plates belonged to Oomycetes and Deuteromycetes groups. *Rhizopus* spp, *Mucor* spp & *Aspergillus* spp has showed maximum growth, *Alternaria* & *Cladosporium* showed moderate growth while *Fusarium* & *Curvularia* showed minimum growth. Sharma (2011) recorded similar results and observed moderate diversity of fungi in Dongargarh. Roymon et al. (2007) reported the presence of fungi in the air samples taken from public places. Bavaji et al. (2012) recorded the presence of *Aspergillus,*

Alternaria and *Curvularia* in common and public places of Tirupati (A.P). *Penicillium* and *Fusarium* were less common.

The fast growing fungi *Rhizopus* and *Mucor* were recovered on the PDA culture plates. All isolated fungi were mesophilic in nature. The dead organic matter from plants present around the sampling area supported the growth of these mesophilic fungi, particularly in the outdoor samples.

Some of the isolated fungi cause serious disease in animals and human beings. Human showed severe allergic reactions after inhalation of fungal spores. *Rhizopus*, *Mucor* and *Absidia* cause face or oropharyngeal cavity infection (phycomycosis) in human. Mycotoxin produced by *Aspergillus* spp., *Alternaria* spp, *Fusarim* spp. were involved in food poisoning.

Conclusion:

A significant number of fungal diversity has been observed at both indoor and outdoor sampling areas of Netaji Subhashchandra Science College, Mulchera. The abundance and growth pattern of these fungal members, however, is quite different. Some members showed maximum growth, while moderate growth observed in some other. A few members showed minimum growth. This indicates that growth of these fungal members is controlled by many factors besides relative humidity.

An image interpretation system has been used in the present study, for the identification of airborne fungi. It is very much useful for identification and registration of biological members and microorganisms which show an influence on human health. This paper describes various fungi that are identified from the point of visual inspection and gives the basic and broad idea of airborne fungal pathogenic members that cause allergy and other human diseases. However, a standard mechanism for exact identification of airborne fungal pathogens is needed.

The study indicated the presence of many pathogenic fungi in the atmosphere of the college campus area, which are potential to cause many serious diseases to animals and human beings. They also cause severe economic loss to human property as they damage paper, clothes and stored food items.

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Plates of indoor samples

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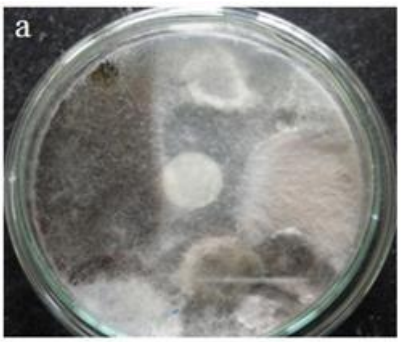
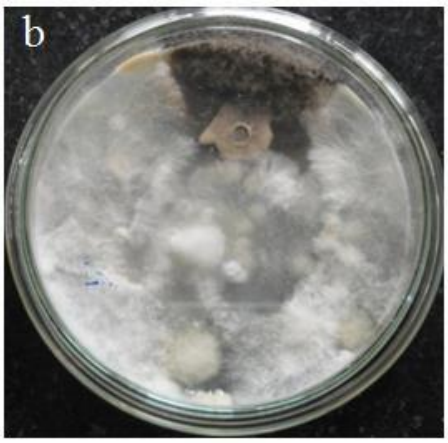
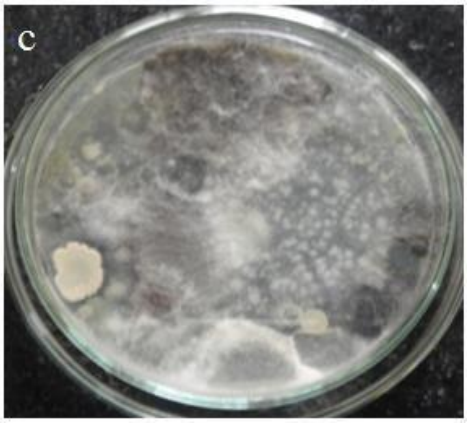


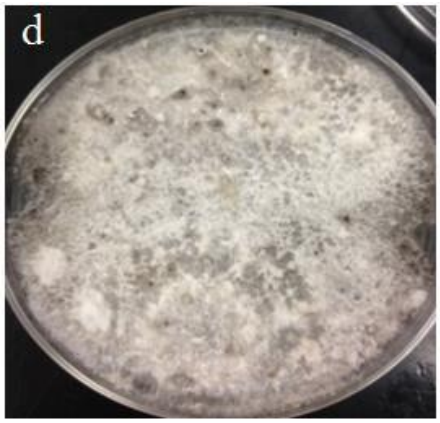
Fusarium



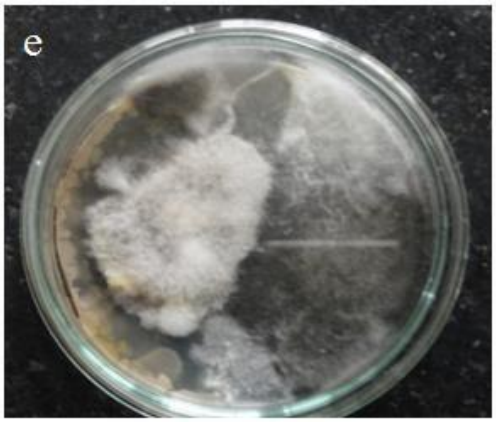
Mucor



Aspergillus



Penicillium



Alternaria

Fig.1: PDA culture plates (a – e) containing fungal growth (indoor sampling) **Plates of outdoor samples**

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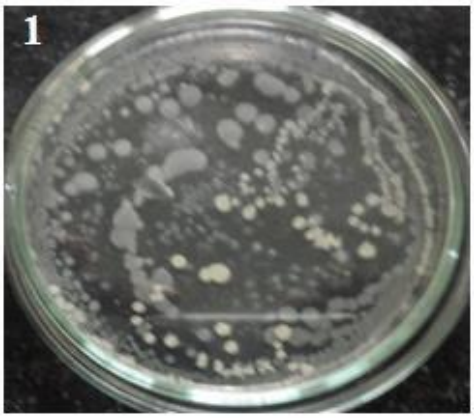
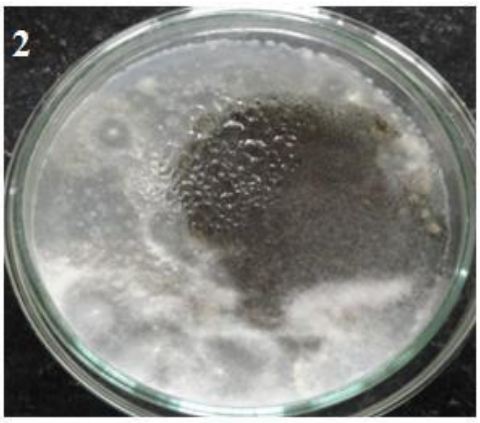
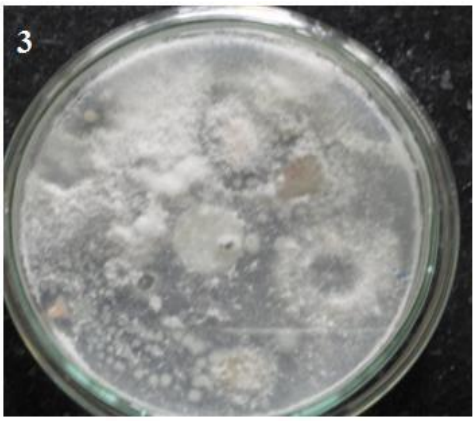


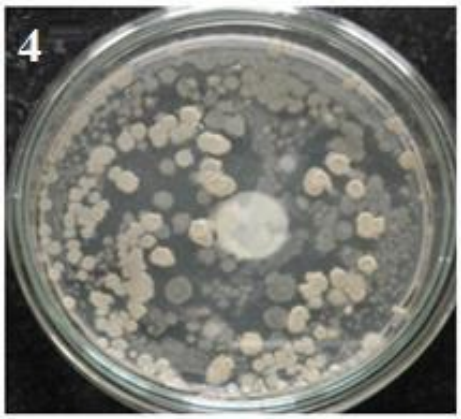
Absidia



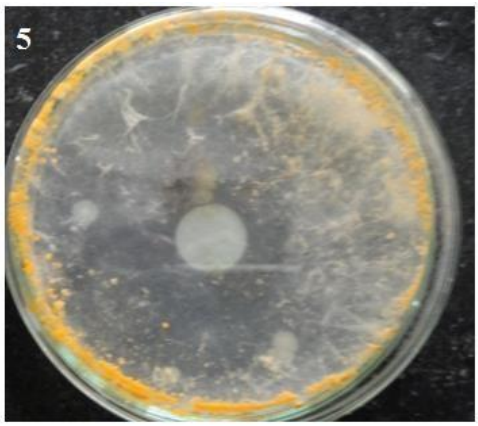
Rhizopus



Mucor



Unidentified basidiospores



Unidentified ascospores

Fig.2 : PDA culture plates (1 – 5) containing fungal colonies (Outdoor Sampling)

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