

AERIAL FUNGAL FLORA INSIDE THE CITY MARKET

BY

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The aeromycoflora of city market (Calcutta) was studied both qualitatively and quantitatively by the culture plate method. A total of 27 types of fungi were recorded in a one year study where it was found that the contributions from the members of Fungi Imperfecti was the maximum. A major occurrence was of *Aspergillus* spp. which was also found responsible for the maximum damage of vegetables and fruits. This organism occurred throughout the year but was especially abundant in the rainy season. *Aspergillus niger*, *A. parasiticus*, *Curvularia lunata*, *Cladosporium herbarum* and species of *Penicillium*, *Rhizopus* and *Mucor* were also frequently encountered during the study.

INTRODUCTION

The air-spores of enclosed spaces has been studied by several investigators (Cunningham, 1873 ; Maunsell, 1954 ; Richards, 1954 ; Baruah, 1961 ; Lacey, 1973 ; Tilak and Kulkarni, 1972 ; Tilak and Vishwe, 1975 and Rati *et al*, 1980).

The atmosphere around market area is full of different aerobiological entities. The fungi growing on the fruits, vegetables and grains constantly add their spores to the air-spores of the market. The earlier reports of such studies have been very scanty. However, the preliminary investigations of such nature were conducted by Sullia and Khan (1979) at Bangalore and Shastri (1981) at Aurangabad city. With the aim of providing data on the air-spores of a city market, aerobiological surveys were carried out at Calcutta for a period of one year which are reported here.

MATERIALS AND METHODS

The survey of fungal air-spores inside the city market (site 'A') was made between June, 1981 and May, 1982. Air samples were taken at fortnightly intervals by culture plate technique. Another set of exposures were also made just outside the city market (site 'B'). Malt extract agar (2%) with Streptomycin (25 mg/l) was used as the culture medium. Streptomycin was added to prevent contamination of plates by bacteria. Twenty plates were exposed for five minutes and the plates with samples were incubated at room tempera-

ture. Following incubation the developing colonies were counted and the isolates were identified according to Gilman (1959). Barnett (1960) and Clements and Shear (1964).

RESULTS

Twenty-seven species of fungi were isolated from the market environment which are listed in Table 1. Non-sporulating species were obtained but could

TABLE 1. Fungi isolated from the City Market at Calcutta From June, 1981 to May, 1982.

<i>Aspergillus niger</i>	<i>P. miczynskii</i>	<i>Fusarium solani</i>
<i>A. parasiticus</i>	<i>P. funiculosum</i>	<i>Trichoderma</i> sp.
<i>A. fumigatus</i>	<i>P. implicatum</i>	<i>Spicaria</i> sp.
<i>A. flavus</i>	<i>P. toridum</i>	<i>Helminthosporium</i> Sp.
<i>A. terreus</i>	<i>Curvularia lunata</i>	<i>Rhizopus</i> sp.
<i>A. ochraceus</i>	<i>C. geniculata</i>	<i>Mucor</i> sp.
<i>A. oryzae</i>	<i>Cladosporium herbarum</i>	<i>Syncephalastrum</i> Sp.
<i>Penicillium digitatum</i>	<i>Alternaria humicola</i>	White sterile forms
<i>P. expansum</i>	<i>Fusarium oxysporum</i>	Black sterile forms

not be identified. Fig. 1 illustrates the monthly distribution of fungal colonies isolated from the site 'A' (market) and site 'B' (outside). It can be seen that the fungal spores found indoors were always greater than those outdoors.

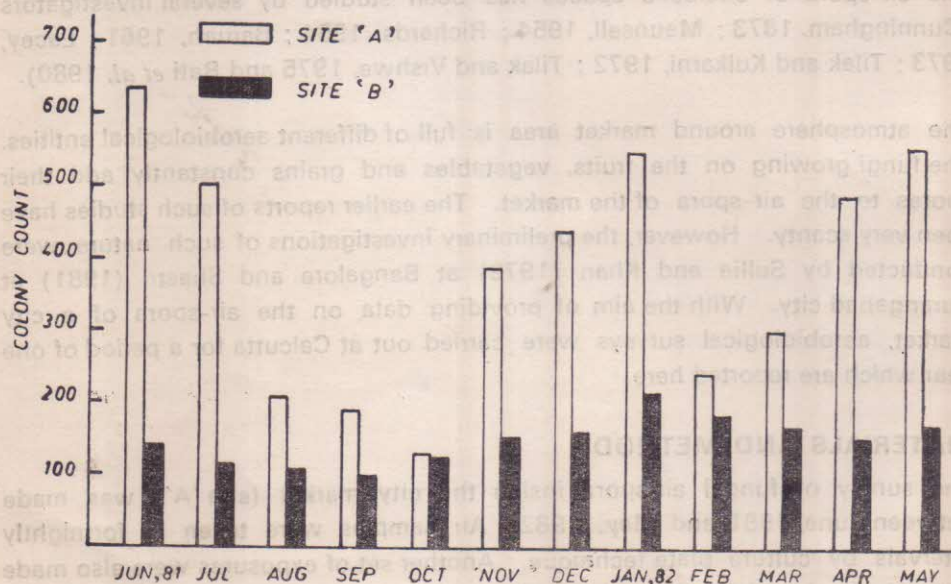


Fig 1. The monthly distribution of fungal colonies isolated from sites A and B.

Among the fungal isolates, a few genera occurred regularly and predominantly. There were others, which occurred occasionally while others occurred only

rarely. *Aspergillus*, *Penicillium*, *Curvularia*, *Rhizopus*—*Mucor* and *Cladosporium* were the predominating genera observed regularly during the survey of which *Cladosporium* was obtained only in the winter months. The percentages of each of the five most prevalent genera isolated at each sampling location both indoor and outdoor places are given in Fig. 2. From the Fig. 2, it appears that

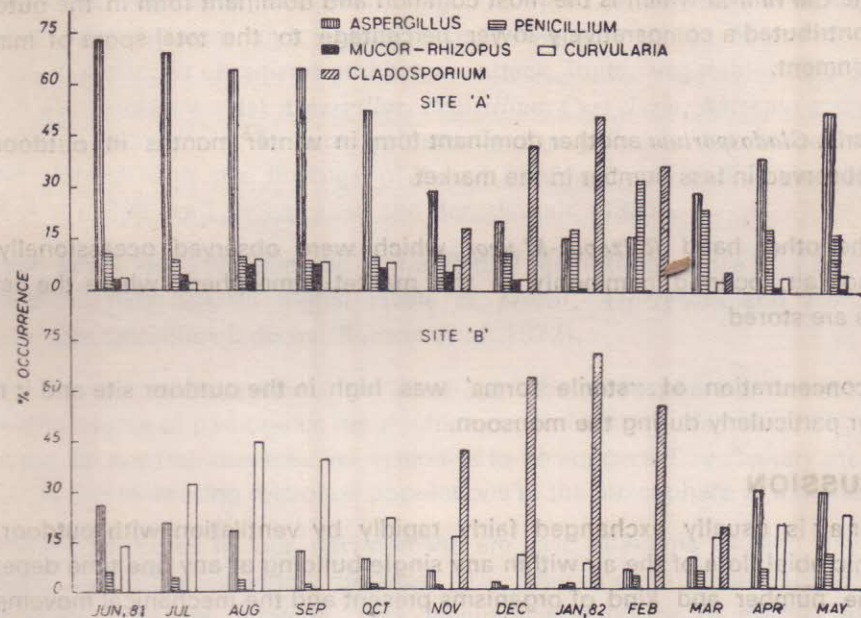


Fig. 2. The percentage occurrence of the common and dominant genera at the sites A and B.

Aspergillus, *Penicillium*, *Curvularia*, *Rhizopus*—*Mucor* and *Cladosporium* were the most common types in both the sites A and B but a conspicuous difference was noticed in the quantity of the air spora between open air and market place.

The *Aspergilli* were found to be the chief constituents of the aerial fungal spora of market contributing approximately 46.6% of the total number. The commonly occurring *Aspergillus* species were *A. niger*, *A. terreus*, *A. parasiticus*, and *A. fumigatus* which the latter two are known to be potential pathogens and concentration of these hazardous moulds were much higher than the outdoor air.

Aspergillus spores were recorded throughout the period but the concentration was maximum from March to October. *Aspergillus niger* contributed to the major percentage of frequency was also responsible for maximum damage of fruits and vegetables. Heavy concentration of *A. niger* spores were found in rainy season and at the same time their frequent occurrence was also noted on the onion bulbs.

Penicillium was next in the order of abundance and the number was also much higher than the outdoor air. The prevalence of *Penicillium* spores in the winter months can be explained by the occurrence of *Penicillium* spores on orange as the local source.

But the *Curvularia* which is the most common and dominant form in the outdoor air, contributed a comparatively lower percentage to the total spora of market environment.

Similarly, *Cladosporium* another dominant form in winter months in outdoor air was observed in less number in the market.

On the other hand *Rhizopus-Mucor* which were observed occasionally in outdoor air, occurred commonly in the market atmosphere, where the cereal grains are stored.

The concentration of 'sterile forms' was high in the outdoor site and it rose further particularly during the monsoon.

DISCUSSION

Indoor air is usually exchanged fairly rapidly by ventilation with outdoor air. The microbial flora of the air within any single building at any one time depends on the number and kind of organisms present and the mechanical movements within the enclosed space (Madeline and Linton, 1974). In buildings, housing animals and birds, the microbial population of air is particularly high (fungal spores ranging from 95,000 x 16,000,000 spores/m³ for animals; *Aspergillus* 50.8%, *Mucor* 24%) owing to the presence of hay, straw or other fodder, bedding and dried excreta and contaminations from animals. Baruah (1961) and Lacey (1973) have reported that hay making and harvesting can increase spore numbers outdoors from about 10⁵/m³ air to 10⁸/m³ while handling mouldy hay or grain indoors can result in up to 3 x 10⁹ spores/m³ air. The present study agrees with the high concentration in enclosed space like cowshed and farm buildings. This may be due to the local spore sources like infected fruits, vegetables, cereal grains etc.

Hence, besides the environmental conditions like temperature and humidity mycoflora from atmosphere may have a definite impact on the type and the magnitude of loss to fruits, vegetables and grains. Sinha (1946) also noted the presence of *Aspergillus* and *Penicillium* in the mango store houses and *Aspergillus*, *Alternaria* and *Rhizopus* from the store houses of apples. Narania and Reddy (1981) observed that *Aspergillus*—*Penicillium*, *Rhizopus*, *Fusarium* and *Curvularia* were abundant in the aeromycoflora of cold storage in Hydera-

bad and were responsible for maximum loss of apples. Shastri (1981) reported *Cladosporium*, *Torula* and *Aspergillus* as a dominant types from the vegetable market of Aurangabad.

The spores present in the atmosphere of a market may come in contact with stored fruits, vegetables and grains etc. In view of the closed nature and various other external and internal factors, the atmosphere of a market may be rich in particular organisms and it may attack fruits, vegetables and grains. In our observation we get *Aspergillus*, *Penicillium*, *Curvularia*, *Rhizopus* and *Cladosporium* in abundance. The predominance of *Aspergillus* in the indoor atmosphere agreed with the findings of Baruah (1961), Noble and Clayton (1963), Rati *et al* (1980) and Jayaprakash and Ramalingam (1981).

Indoor spore densities include a fraction of the outdoor spore load of *Cladosporium* but they contain higher levels of *Mucor*, *Aspergillus* and *Penicillium* which may reproduce indoors (Benson *et al*, 1972).

From the above discussion it is clear that the atmosphere of a market is a potential source of pathogenic fungi which cause fruit rot diseases. Thus, any attempt to control diseases in market is to be supported by sanitary measures to check the increasing microbial populations in the atmosphere of a market.

Some fungal spores in our environment are also allergens causing hay-fever, asthma and other respiratory diseases. The sources of pathogens are not rarely man-made. Indoors, storage and mechanical handling of already infected material may cause various occupational diseases. The existence of close relation between spore frequency and allergy symptoms has been known and proved for more than 100 years. Continuous sampling, daily and weekly reports, calendars and forecasts have become more and more common in preventive health service.

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