

A STUDY OF THE ATMOSPHERIC FUNGAL FLORA OF KARACHI CANTT.

S. IFTIKHAR AHMAD, M. SAYEED QURAIISHI AND S. M. MURTUZA

Central Laboratories, Pakistan Council of Scientific and Industrial Research, Karachi

(Received May 20, 1960)

A survey of the fungal population of the atmosphere at Karachi has been made. During one year 44 species of fungi have been recorded. These include 6 species new to Pakistan and two quite new species of *Curvularia*. Five strains having ochraceous shades but belonging to *Aspergillus sulphureous* were also discovered.

In order to explain the appearance of spontaneous pathogenic as well as saprophytic infections of which the etiological factors are not known, the study of the fungal spores of atmosphere is of immense importance. Considerable attention has been paid to it by previous workers and the study of atmospheric fungal spores, in connection with the wheat rust, found great importance in India. It is considered of interest to study the nature and type of atmospheric fungi in relation to those which are isolated from the deteriorated material and it was found that, to a large extent, the deterioration was due to the atmospheric micro-organisms specially fungi.

The results of study of the atmospheric fungi over a period of one year at these laboratories in Karachi Cantt. from October, 1958 to September, 1959 are as follows.

Petri plate method was adopted for counting the atmospheric fungal population. Petri plates of 3½ inches diameter were used; 20 ml. of the Czapek's agar was poured in the sterilized petri plates under aseptic conditions and these were kept for about 4 days to test the sterility of the medium. The petri plates were simultaneously exposed for about 10 minutes against the wind current at 11 a.m. fortnightly at a height of 10 feet

from the ground. The petri plates were incubated at room temperatures for seven days, and afterwards pure sub-cultures were made and specimens examined for identification. 2-5

A summary of the results of observations on the total number of colonies in different months and the number of colonies in descending order are represented by Tables 1 and 2, respectively.

This clearly shows that the fungal population in May is the highest and in February the lowest. Fungal population in April and September, June and December, January, July and November do not differ considerably in themselves; February, and October give low figures than those observed in other months. It may be noted that there is a periodic rise and fall in the number of organisms.

Table 1 may be explained by a diagrammatic representation of the fungal distribution in Karachi-Cantt. all the year round (Fig. 1). In this diagram the year is represented by a circle and the months are plotted at equal distance from one another. The fungal population is shown inside the circle by arrows from the respective months. The shaded portion from the middle of October to middle of February indicates winter. Summer is represented by the remaining circle out of which

TABLE 1.—FUNGAL POPULATION DURING DIFFERENT MONTHS.

1958			1959									G. total
Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	
10	14	20	15	6	22	25	28	20	14	17	24	215

TABLE 2.—FUNGAL POPULATION DURING DIFFERENT MONTHS IN DESCENDING ORDER.

May	Apr.	Sept.	Mar.	June	Dec.	Aug.	Jan.	July	Nov.	Oct.	Feb.	Total
28	25	24	22	20	20	17	15	14	14	10	6	215

the dotted portion (middle of June to middle of August) distinguishes the annual precipitation.

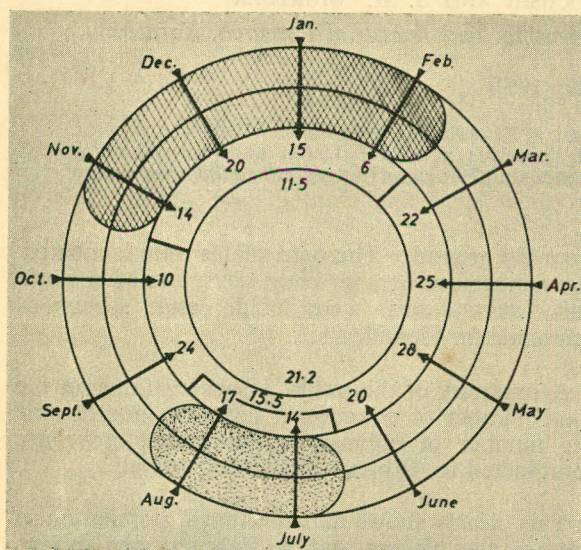


Fig. 1.—A diagrammatic representation of the fungal distribution in Karachi Cantt. through the year.

The average of the colonies found in the winter is 11.5, in the summer including the rains it is 21.2, and in the rainy season it is 15.5. There may be two reasons which may explain the cause of the higher frequency of the fungal colonies in summer:

1. The wind velocity during summer is higher and so a greater number of the dust particles (to which the spores adhere) as well as the spores themselves strike the petri plates and therefore comparatively large number of spores are deposited on the medium surface.

2. During summer as the spore production in nature rises, the number of spores deposited on the medium surface naturally increases.

The winter gives comparatively poorer frequency of the fungal colonies, particularly because of the natural low spore production in cooler temperature in contrast to that in higher.

In the case of rainy season the fungal population lies between that of summer and winter which may

TABLE 3.—COLONIES OF DIFFERENT TYPES OF FUNGI.

S. No.	Organisms	Number of colonies	S. No.	Organisms	Number of colonies
1.	<i>Absidia</i> sp.	.. 2	23.	<i>Fusarium solani</i> .	2
2.	<i>Actinomyces</i> sp.	.. 5	24.	<i>Fusarium semitectum</i>	2
3.	<i>Alternaria</i> sp.	.. 15	25.	<i>Fusarium dimerum</i>	2
4.	<i>Alternaria tenuis</i>	.. 7	26.	<i>Fusarium equiseti</i>	3
5.	<i>Alternaria humicola</i>	.. 2	27.	<i>Fusarium sporotrichioides</i>	3
6.	<i>Aspergillus candidus</i>	.. 2	28.	<i>Helminthosporium</i> sp. (1)	6
7.	<i>Aspergillus flavus</i>	.. 18	29.	<i>Helminthosporium</i> sp (2)	5
8.	<i>Aspergillus fumigatus</i> .	.. 4	30.	<i>Helminthosporium</i> sp (3)	9
9.	<i>Aspergillus nidulans</i>	.. 4	31.	<i>Humicola</i> sp. ..	4
10.	<i>Aspergillus niger</i>	.. 17	32.	<i>Mycelia sterlia</i> ..	4
11.	<i>Aspergillus ochraceous</i>	.. 7	33.	<i>Neurospora citophila</i>	5
12.	<i>Aspergillus stellatus</i>	.. 2	34.	<i>Paecilomyces varioti</i> .	1
13.	<i>Aspergillus sulphureous</i>	.. 2	35.	<i>Pencillium citrinum</i>	2
14.	<i>Aspergillus sydowi</i>	.. 6	36.	<i>Pencillium</i> sp. (1)	5
15.	<i>Aspergillus tamaritii</i>	.. 3	37.	<i>Pencillium</i> sp (2)	2
16.	<i>Aspergillus terreus</i>	.. 3	38.	<i>Pencillium</i> sp. (3)	1
17.	<i>Circinella</i> sp.	.. 2	39.	<i>Phoma</i> sp.	2
18.	<i>Cladosporium sphaerosperumum</i>	10	40.	<i>Rhizoctonia</i> sp.	2
19.	<i>Cladosporium</i> sp:	.. 13	41.	<i>Rhizopus arrhizus</i>	2
20.	<i>Curvularia</i> sp. nov. (1)	.. 2	42.	<i>Rhizopus nigricans</i>	7
21.	<i>Curvularia</i> sp. nov. (2)	.. 1	43.	<i>Trichoderma koningi</i>	2
22.	<i>Curvularia</i> sp.	.. 8	44.	<i>Trichoderma</i> Sp.	3

be explained by the following factors :

1. Rainy season of Karachi comprises a part of the summer and accordingly production of spores in nature remains higher and so the number of fungal colonies is more when compared to that of winter.

2. During rains the dust particles settle along with the rain droplets decreasing the percentage of the atmospheric fungal spores and we get less fungal colonies compared to the dry months of summer but still higher than the winter.

Data on the total number of types of fungi identified are recorded in Table 3.

Forty four species of fungi were recorded during the entire period of exposure. Out of the fungi collected, *Aspergilli* are the most dominating. They are of common occurrence on the deteriorated materials like cotton textile, water-proof canvas and cordage etc. The other groups which were also found in abundance are *Alternaria*, *Helminthosporium*, *Curvularia* and *Fusarium* which are also responsible for the cellulose decomposition and are usually found on various cotton products deteriorated under exposed conditions. *Helminthosporium* is most abundant in the air and occasionally found on exposed cotton textiles.

Total number of new records of fungi during the atmospheric survey was 16. Out of these 9 species were such which were not reported from Pakistan previously and they are : *Absidia* sp., *Aspergillus stellatus*, *Circinella* sp., *Cladosporium sphaerospermum*, *Fusarium equiseti*, *Fusarium sporotrichioides*, *Humicola* sp., *Neurospora citophila* and *Paecilomyces varioti*.

Out of the remaining seven species two were of the genus *Curvularia* which were quite new species and have been dealt in separate papers. Remaining 5 species were interesting strains of *Aspergillus*

sulphureous series. These strains were ochraceous in shade but several microscopic details pleaded their inclusion under *Aspergillus sulphureous* series. Their study was taken separately and an exhaustive paper is under publication.

Summary

A survey of the fungal population of the atmosphere was made for a period of one year and 44 species of fungi were recorded. Sixteen species new to Pakistan were reported. Out of these, two quite new species of *Curvularia* were encountered and five interesting strains, having ochraceous shades but belonging to *Aspergillus sulphureous* series were found. The fungal population showed a periodic rise and fall and also a significant numerical variation between months. Maximum number of fungal colonies were found during summer and minimum during winter which may be due to the difference in the wind velocity during these seasons and the difference in the production of spores in nature. Generally the same fungi are found in the atmosphere which have been encountered in the deteriorated cotton textile etc.

Acknowledgement.—The authors desire to record their thanks to Dr. Salimuzzaman Siddiqui for his help and suggestions. Thanks are also due to the Director, Commonwealth Mycological Institute, for his help in the identification of fungi.

References

1. H. A. Hyde and D. A. Williams, *Nature* (1949).
2. Sultan Ahmad, *Fungi of West Pakistan*, (1956).
3. Ernst A. Thearn Bessey, *Morphology and Taxonomy of Fungi* (1952).
4. G. Smith, *Industrial Mycology* (1954).
5. Thom & Raper, *A Manual of Aspergilli* (1945).