AEROMYCOLOGY OF SHILLONG-II

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Abstract

The prevalence of fungal population from March, 1974 to February, 1976 in the Shillong atmosphere by employing gravity petriplate method has been discussed. Colonies of *Aspergillus* sp. (54.11%), *Cladosporium* sp. (12.51%), *Mucor* sp. (8.14%), *Alternaria* sp. (4.90%) and *Penicillium* sp. (3.30) were most common and form about 59.39 per cent of the total air borne fungal population.

Introduction

In Shillong, the first aerobiological study on the incidence of air borne spore in the potato plantation fields and their correlation with infection of potato tubers by certain parasites was reported by Konger and Baruah (1958). Since then, the present author and his associates (Nameirakpam & Baruah, 1979; Nameirakpam, Baruah & Baruah, 1981; Nameirakpam, 1982, 1983, 1985) have made several attempts to study fungal airspora of Shillong. In India, the aeromycoflora of certain places like Calcutta (Sanyan & Thammaya, 1972), Gauhati (Baruah & Chetia, 1966), Delhi (Sandhu, Shivpuri & Sandhu, 1964; Agarwal, Shivpuri & Mukerji, 1969; Mukerji, Agarwal & Saxana, 1969) and Gorakhpur (Mishra & Kamal, 1968), etc. have been carried out by employing gravity petriplate exposure method for various purposes. Recently "Aeromycology of Shillong-I" has been published (Nameirakpam, 1985). In this paper, data on the spore count obtained by exposure of Vaseline coated slides at a height of 10.6m above the ground level was reported. The spores of Aspergilli (19.8%), *Cladosporium* (6.65%), *Alternaria* (0.66%), and *Curvularia* (6.21%) were most frequently isolated types and together formed 99.35 per cent of the total spore counts. The second paper in the series deals with the result of the colony count obtained by exposing nutrient petriplates from March, 1974 to February, 1976.

Material and method

A petridish (9 cm in diameter) containing Czapek's Dox Agar was exposed to atmosphere for 10 minutes on the roof of the Physics Block Building (10.6 m above ground level) of the St. Edmund's College, Shillong. Exposure was made at 10 a.m. 5 times a month at regular intervals with a total of 120 petriplate exposures covering two years. The exposed petridish was incubated in an inverted position at 28° C±1 °C for 7 days. The colonies developed were counted, identified and confirmed with the help of C. M. I., Kew, England.

Results

During 1974-75, a total of 60 petriplates containing nutrient medium (CDA) were exposed. A total of 3,402 colonies appeared in these petriplates, giving an average of 56

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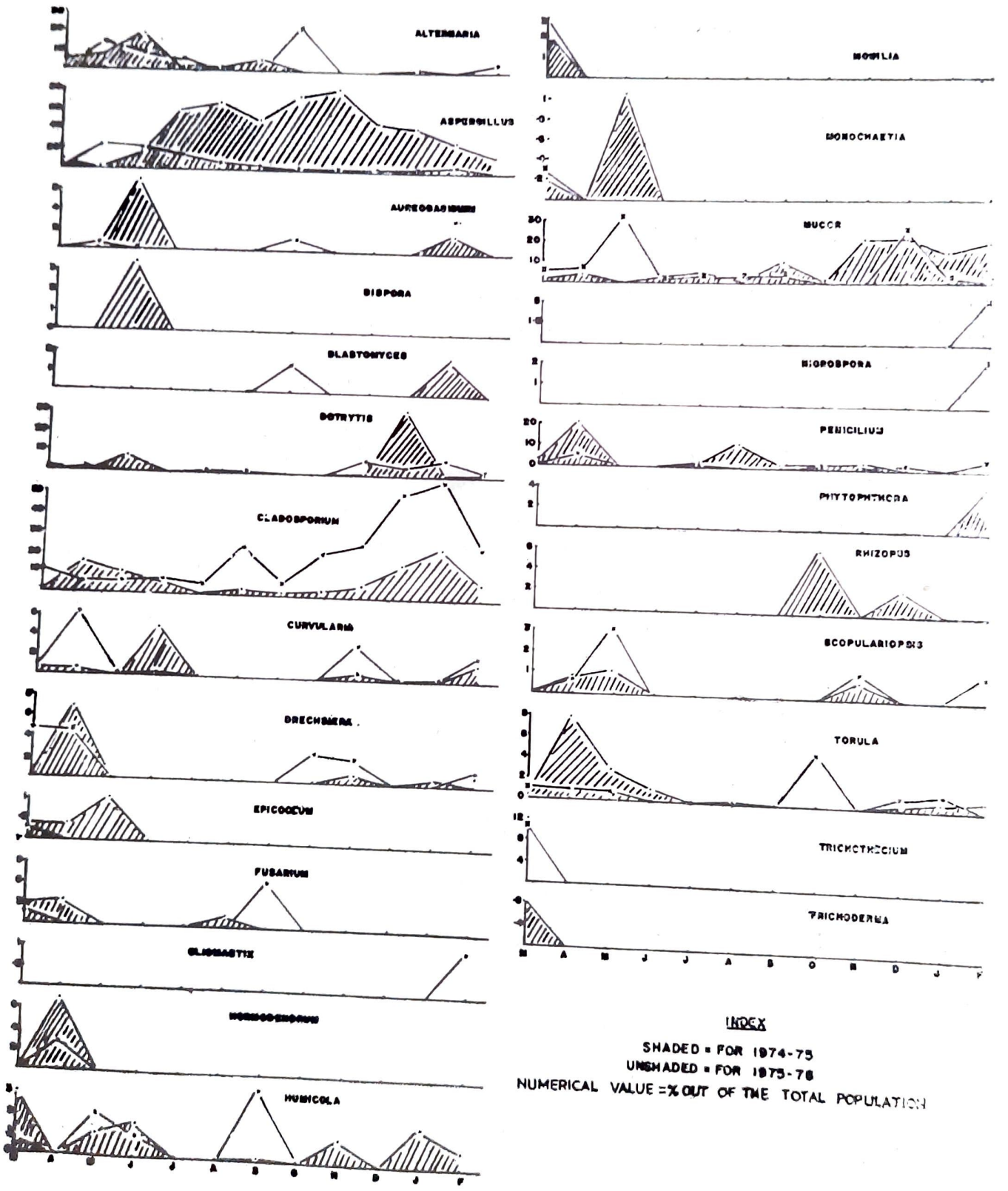
colonies per petriplate. During 1975-76, a total of 60 petriplate containing nutrient medium (CDA) were also exposed. A total of 2,288 colonies appeared in these petriplates, giving an average of 38 colonies per petriplate. In all, 26 fungal genera have been identified (Table 1). The correlation between montly frequency of individual fungal colonies to the total monthly count of the population has been given in the Text-fig. 1. The distribution pattern of different types of fungal colonies have been provided (Table 2 and 3).



Text-fig. 1—Correlation between monthly frequency of individual fungal colonies to the total monthly count of population.

Discussion

In the studies where culture plate method was employed to study outdoor air-spora, *Aspergillus* spp. have been found to contribute to a significant proportion of the total colonies. They were reported to occupy third and sixth places (Nameirakpam, 1981), usually next to *Cladosporium*, *Penicillium* and *Alternaria*. Sandhu, Shivpuri and Sandhu (1964) reported them as the third common type, the first two being *Alternaria* (30.6%) and *Cladosporium* (26.6%). However, Rajan, Nigam and Shukla (1952) reported *Aspergillus* as a dominent type. Rati and Ramalingam (1976) reported *Aspergillus* ranked next to *Cladosporium*. Earlier report from Shillong (Nameirakpam & Baruah, 1979) revealed twenty-nine *Aspergillus* species. The *Aspergillus* species contributed 20.34% of the total air-spora. In the present study, eighteen *Aspergillus* species were identified (Table 1) and the genus ranked first (48.47%) for 1974-75 and second (9.75%) for 1975-76 of the yearly total colony count (Table 2).

Table 1—Fungal species isolated from the outdoor air of Shillong during the period from March 1974 to February 1976 by Gravity Petriplate Method

1.1	*Alternaria alternata* (=*A. tenuis*)	2.16	*A. ustus* group
1.2	*A. brassicae*	2.17	*A. versicolor*
1.3	*A. brassicicola*	2.18	*A. wentii*
1.4	*A. gomphrenae*	3.0	*Aureobasidium pullulans*
1.5	*A. humicola*	4.1	*Bispora punctata*
1.6	*A. longipes*	4.2	*Bispora* sp.
1.7	*A. solani*	5.0	*Blastomyces dermatitis*
1.8	*A. tenuissima*	6.1	*Botrytis state of Sclerotinia fuckeliana* (=*Botrytis cinersa*)
1.9	*Alternaria* sp.	6.2	*B. alli*
2.1	*Aspergillus candidus*	6.3	*Botrytis* sp.
2.2	*A. carbonarius*	7.1	*Cladosporium chlorocephallum*
2.3	*A. flavipes*	7.2	*C. cladosporioides*
2.4	*A. flavus*	7.3	*C. herbarum*
2.5	*A. fumigatus*	7.4	*C. lignicolum*
2.6	*A fumigatus* series	7.5	*C. oxysporum*
2.7	*A. humicola*	7.6	*C. sphaerospermum*
2.8	*A. janus* group	7.7	*C. tenuissimum*
2.9	*A. nidulans* group	7.8	*Cladosporium* sp.
2.10	*A. niger*	8.1	*Curvularia brachyspora*
2.11	*A. ochraceus*	8.2	*C. lunata*
2.12	*A. ornatus*	8.3	*C. lunata* var. *aeria*
2.13	*A. restrictus*	8.4	*C. oryzae*
2.14	*A. sparsus*	8.5	*C. pallescens*

Table 1 (*Contd.*)

2.15	*A. sulphureus*	8.3	*Curvularia* sp.
9.1	*Drechslera australiensis*	17.10	*M. plumbeus*
9.2	*D.* state of *Cochliobolus spicifier*	17.11	*M. prainii*
9.3	*D. ellisii*	17.12	*M. ramificus*
9.4	*D. papendorfii*	17.13	*M. recurvus*
9.5	*Drechslera* sp.	17.14	*M. varians*
10.0	*Epicoccum nigrum*	17.15	*Mucor* sp.
11.1	*Fusarium merismoides*	13.0	*Myrothecium roridum*
11.2	*F. oxysporum*	19.0	*Nigrospora* state of *Khuskia oryzae*
12.0	*Gliomastix murorum*	20.1	*Penicillium brefeldianum*
13.1	*Hormodendrum nigrescens*	20.2	*P. citrinus*
13.2	*Hormodendrum* sp.	20.3	*P. decumbens*
14.1	*Humicola fuscoatra*	20.4	*P. italicum*
14.2	*H. grisea*	20.5	*P. javanicum*
14.3	*H. nigrescens*	20.6	*P. lilacinum*
14.4	*Humicola* sp.	20.7	*P. nigricans*
15.1	*Monilia grisea*	20.8	*P. wortmanni*
15.2	*Monilia* sp.	20.9	*Penicillium* sp.
16.0	*Monochaetia karsteni*	21.0	*Phytophthora infestans*
17.1	*Mucor ambiguus*	22.1	*Rhizopus nigricans*
17.2	*M. fragilis*	22.2	*Rhizopus* sp.
17.3	*M. globosus*	25.0	*Scopulariopsis brumptii* (= *Masoniella grisea*)
17.4	*M. griseo-lilacinus*		
17.5	*M. griseo-ochraceus* var. *minuta*	24.1	*Torula ellisii*
17.6	*M. janssenii*	24.2	*T. herbarum*
17.7	*M. javanicus*	24.3	*Torula* sp.
17.8	*M. lamprosporus*	25.0	*Trichoderma viride*
17.9	*M. petrinsularis*	26.0	*Trichothecium roseum*

Chitaley and Bajaj (1974) observed *Alternaria* almost throughout the year in the Petriplate. The maximum concentration was observed in the month of April, when temperature at ground level varied between 21 °C to 40 °C and relative humidity between 15 to 35 per cent. It appears more commonly in spring season. Barat (1969) observed the frequency of *Alternaria* was much higher in the sub-urban parts of West Bengal than in Calcutta. At Shillong, *Alternaria* ranked seventh (1.44% for 1974-75) and fourth (8.35% for 1975-76) places respectively in their contribution to yearly total population (Table 2).

The fungus might have originated from cereals growing in the vicinity of trapping site or ornamental plants growing in the campus.

Chakravarty (1974) observed occurrence of *Curvularia* in a uniform frequency in Calcutta and its suburbs. While Chitaley and Bajaj (1974) reported *Curvularia* and *Fusarium* did not show any definite distribution pattern. At Shillong also *Curvularia* and *Fusarium* showed similar results as reported from Nagpur (Chitaley & Bajaj, 1974).

Table 2—Some important types of fungal air-spora isolated during March, 1974 to February, 1976 and their contribution to yearly total (in Percentage)

Fungal type	Yearly total (1974-75)	Percentage (1974-75)	Yearly total (1975-76)	Percentage (1975-76)
Alternaria	49	1.44	191	8.35
Aspergillus	1649	48.47	223	9.75
Aureobasidium	9	0.26	4	0.17
Bispora	3	0.09	—	—
Blastomyces	—	—	3	0.13
Botrytis	65	1.91	46	2.01
Cladosporium	215	6.32	428	18.71
Curvularia	14	0.41	36	1.57
Drechslera	24	0.71	39	1.70
Epicocum	3	0.09	1	0.40
Fusarium	3	0.09	4	0.17
Gliomastrix	—	—	1	0.04
Hormodendrum	17	0.50	11	0.48
Humicola	22	0.65	11	0.48
Monilia	1	0.03	1	0.04
Monochaetia	2	0.06	1	0.04
Mucor	262	7.70	196	8.57
Myrothecium	—	—	5	0.22
Nigrospora	—	—	2	0.09
Penicillium	162	4.76	34	1.99
Phytophthora	1	0.03	—	—
Rhizopus	54	1.59	—	—
Scopulariopsis	5	0.15	7	0.31
Torula	56	165	14	0.61
Trichoderma	4	1.12	—	—
Trichothecium	—	—	29	1.27

Results represent fungi isolated 5 times in a month by employing petriplate method.

Chitaley and Bajaj (1974) observed *Mucor* a number of times in the air of Nagpur but of less significance. Earlier report from Shillong (Konger & Baruah, 1958) had recorded *Mucor* species both from the air over potato plantation field and store chamber. In the present study, *Mucor* was present throughout the year and placed third in rank in both years (Table 2).

Earlier report from Shillong (Nameirakpam, Baruah & Baruah, 1981) had identified eight species of *Cladosporium* from culture plate method. Although *Cladosporium* was recorded throughout the investigation period (except September, 1974 for the indoor catch) individual species showed a marked seasonal frequency. *Cladosporium* accounted for 11.3 % (outdoor catch) and 8.52 % (indoor catch) of the total fungal colonies. In the present study also, same types of species were identified as in previous report (Table 1). *Cladosporium* was placed fourth (1974-75) and second (1975-76) rank respectively.

In the series of two papers, results obtained by exposure of slide and culture plate have been given and discussed separately. The data presented here is based on samplers collected 5 times a month at regular intervals by exposing one petriplate at 10 a.m. for 10 minutes. If circadian periodicity of fungus spore occurs in Shillong atmosphere, this counting procedure may not be entirely satisfactory, as it would miss both night and day spore peaks. It is desirable to know when peak production of spores occur in Shillong, but it is of even greater importance to know the percentage viability of the spores. The exposure of nutrient plate simultaneously with vaselined slide provides some data of fungi that grow readily on the medium used. Evidence obtained suggest that at this hour of the day there is a great loss of viability in September to December but only slightly loss in April to May (Table 3). In this connection, Chitaley & Bajaj (1974) state— "In the

Table 3—Fungal colony density identified from the outdoor air of Shillong by employing petridish method

Months	No. of colonies		Percentage out of yearly total	
	1974—75	1975—76	1974—75	1975—76
March	447	256	13.14	11.19
April	237	313	6.97	13.69
May	85	91	2.50	3.98
June	55	176	1.60	7.69
July	246	546	7.23	23.86
August	356	191	10.46	8.35
September	457	145	13.43	6.34
October	827	38	24.31	1.66
November	233	88	6.85	3.85
December	151	304	4.44	13.29
January	105	77	3.09	3.37
February	207	92	6.08	4.02

plate method, the size of the plate is limiting factor, and a colony may result from a unit of spore or a clump of spores or from even hyphal fragment. But at the sametime, it throws light on the viability aspect of spores. The slides on the other hand have low retentivity, but permit more correct evaluation of concentration of spores as both viable and non-viable spores are caught. Since the purposes and limitations of these two methods are different any quantitative comparison of results is likely to create indifferent impressions". However, both methods have led the author to the conclusion that there were two peak periods of fungal spore concentration in Shillong-one from March to May (pre-monsoon and the other from October to November (retreating monsoon).

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