

Comparison of the aerosporal elements at two different heights from the ground level in a semi-urban area

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The present paper highlights the variation in the frequencies of different aerosporal elements encountered at two different heights (viz., 30 feet and 6 feet) from the ground level, in Safilguda, a semi-urban area in the vicinity of Secunderabad. Pollen grains constitute the dominant aerosporal elements at both the heights with 80.4% representation at 30 feet height and 50.2% at the lower height. The pollen of *Parthenium hysterophorus* was predominant at both the heights followed by grass pollen. The other aerosporal elements, viz., fungal spores, plant particles, epidermal shreds, fungal hyphae and insect parts were better represented at the lower height.

Key-words—Aerosporal elements, different heights, Safilguda, semi-urban area, Secunderabad.

INTRODUCTION

THE various biopollutants of the atmosphere, viz., pollen grains, fungal spores and other plant and insect particles are carried to long distances by wind currents. Subsequently, these particles settle down due to gravitational force and get deposited.

The turbulent meteorological conditions result in the variation of aerosporal concentration at different heights from the ground level. Studies on the vertical profiles of spore concentration above crop fields was mostly done by Subba Reddi and Ramakrishna (1978) and Subba Reddi *et al.* (1978) from Visakhapatnam and by Tilak and Kulkarni (1978) and Tilak and Ramachander Rao (1987) from Aurangabad. More recently Khandelwal (1988) has provided information on the vertical variation of aerosporal concentration at Lucknow.

The present paper deals with the record of the aerospora of a semi-urban area (Safilguda) at 30 feet and 6 feet height from the ground level during the period 1989-'90 and a critical comparison of the incidence of diverse aerosporal elements at the two heights.

MATERIAL AND METHOD

Two gravimetric aeroscopes (modified version of

Lakhanpal and Nair's 1958 fabrication) were employed in the present study.

- (i) The first aeroscope was installed on the roof of a house at Safilguda, at about 30 feet from the ground level and monitoring of aerospora was carried out from May 1989 to April 1990.
- (ii) The second aeroscope was set up at a lower height, i.e., 6 feet from the ground level at the same site, and the aerospora was monitored for a period of one year from October 1989 to September 1990.

The slides smeared with glycerine jelly were exposed to the atmosphere for every 24 hours and the aerosporal elements caught were mounted in safranin stained glycerine jelly. The slides covering an area of 10 cm² of the coverslip were then critically scanned.

OBSERVATIONS

At 30 feet from the ground level, pollen grains

Table 1. Percentage of major pollen groups at different heights

Sl. No.	Types	30 feet height	6 feet height
1.	Herbaceous pollen	95.94	95.09
2.	Pollen of shrubs	2.13	3.02
3.	Pollen of trees	1.92	1.86

(80.4%) constitute the dominant aerosporal elements, followed by fungal spores and plant particles. Fungal hyphae, epidermal shreds, insect parts and algal filaments

were the other components of the aerospora (Text-fig.3).

The incidence of herbaceous pollen (95.94%) was very high when compared to that of shrubs and trees (Table 1).

Table 2. Incidence of airborne pollen at two different heights (1989-90)

Sl. No.	Types	30 feet height		6 feet height	
		Total	(%)	Total	(%)
1.	<i>Parthenium hysterophorus</i>	89836	(75.71)	6424	(70.37)
2.	Grass pollen	20402	(17.19)	1667	(18.26)
3.	<i>Ricinus communis</i>	2190	(1.85)	242	(2.65)
4.	Amaranth/Chenopods	1437	(1.21)	326	(3.57)
5.	<i>Tridax procumbens</i>	704	(0.59)	147	(1.61)
6.	<i>Cyperus rotundus</i>	647	(0.55)	26	(0.28)
7.	<i>Prosopis juliflora</i>	574	(0.48)	66	(0.72)
8.	<i>Croton bonplandianum</i>	459	(0.39)	39	(0.43)
9.	<i>Azadirachta indica</i>	410	(0.35)	19	(0.21)
10.	<i>Casuarina equisetifolia</i>	397	(0.33)	28	(0.31)
11.	<i>Holoptelea integrifolia</i>	264	(0.22)	15	(0.16)
12.	<i>Cassia auriculata</i>	169	(0.14)	25	(0.27)
13.	<i>Acacia</i> sp.	154	(0.13)	5	(0.055)
14.	<i>Brassica nigra</i>	122	(0.10)	12	(0.13)
15.	<i>Lantana camara</i>	116	(0.098)	4	(0.004)
16.	<i>Psidium guajava</i>	106	(0.090)	5	(0.055)
17.	<i>Ailanthus excelsa</i>	76	(0.064)	1	(0.011)
18.	<i>Alternanthera sessilis</i>	60	(0.05)	-	-
19.	<i>Eucalyptus globulus</i>	57	(0.048)	1	(0.011)
20.	<i>Borassus flabellifer</i>	53	(0.045)	1	(0.011)
21.	<i>Morus alba</i>	45	(0.038)	-	-
22.	<i>Celosia argentea</i>	38	(0.032)	9	(0.10)
23.	<i>Justicia procumbens</i>	38	(0.032)	-	-
24.	<i>Crotalaria</i> sp.	33	(0.028)	4	(0.044)
25.	<i>Oldenlandia umbellata</i>	32	(0.027)	15	(0.16)
26.	<i>Peltophorum ferrugineum</i>	22	(0.019)	1	(0.011)
27.	<i>Cocos nucifera</i>	21	(0.018)	19	(0.21)
28.	<i>Pithecellobium dulce</i>	17	(0.014)	1	(0.011)
29.	<i>Delonix regia</i>	15	(0.013)	1	(0.011)
30.	<i>Moringa oleifera</i>	15	(0.013)	4	(0.044)
31.	<i>Dodonaea viscosa</i>	13	(0.011)	-	-
32.	<i>Dendrophthoe falcata</i> (Loranthus)	11	(0.009)	2	(0.022)
33.	<i>Tinospora cordifolia</i>	11	(0.009)	4	(0.044)
34.	<i>Terminalia catappa</i>	11	(0.009)	-	-
35.	<i>Albizia lebbek</i>	10	(0.008)	2	(0.022)
36.	<i>Ocimum</i> sp.	10	(0.008)	-	-
37.	<i>Datura mete</i>	8	(0.007)	1	(0.011)
38.	<i>Xanthrium strumarium</i>	8	(0.007)	2	(0.022)
39.	<i>Manilkara zapota</i>	5	(0.004)	-	-
40.	<i>Enterolobium saman</i>	4	(0.003)	-	-
41.	<i>Coriandrum sativum</i>	4	(0.003)	2	(0.022)
42.	<i>Asteracantha longifolia</i>	4	(0.003)	-	-
43.	<i>Cajanus cajan</i>	-	-	4	(0.044)
44.	<i>Cyanotis cristata</i>	3	(0.0025)	-	-
45.	<i>Mimusops elengi</i>	3	(0.0025)	-	-
46.	<i>Bombax ceiba</i>	-	-	1	(0.011)
47.	<i>Borreria hispida</i>	1	(0.001)	-	-
48.	<i>Tribulus terrestris</i>	1	(0.001)	-	-

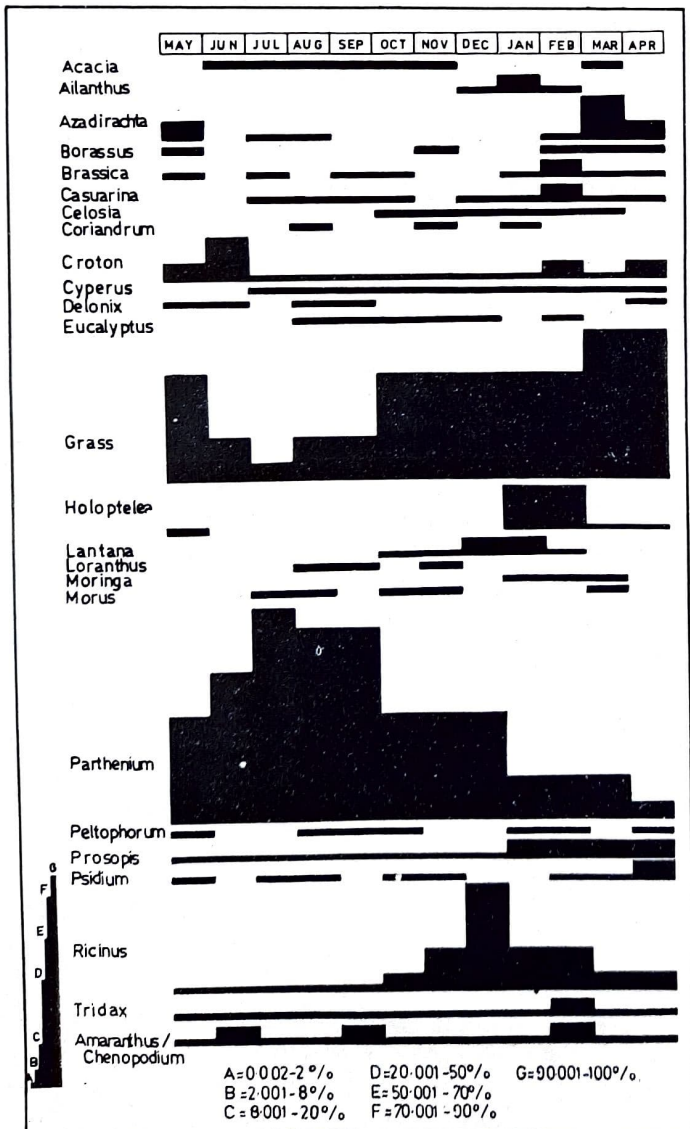
Sl. No.	Types	30 feet height		6 feet height	
		Total	(%)	Total	(%)
49.	<i>Ipomoea</i> sp.	1	(0.001)	-	-
50.	<i>Hibiscus rosa-sinensis</i>	-	-	1	(0.011)
51.	Anacardiaceae	16	(0.013)	-	-
52.	Sapindaceae	6	(0.005)	-	-
53.	Acanthaceae	1	(0.001)	1	(0.011)
54.	Unknown types	12	(0.010)	2	(0.022)
Total		118653		9129	

The pollen calendar of Safilguda, depicting the monitoring of various pollen types at 30 feet height during 1989-90, is shown in Text-figure 1. A total of 50 pollen types referable to 32 families were identified at this level of which *Parthenium hysterophorus* (75.71%) constituted the most predominant type. The other significant types include grass (17.19%), *Ricinus* (1.85%),

Amaranth/Chenopods (1.21%), *Tridax* (0.59%), *Cyperus* (0.55%) and *Prosopis* (0.48%) (Table 2).

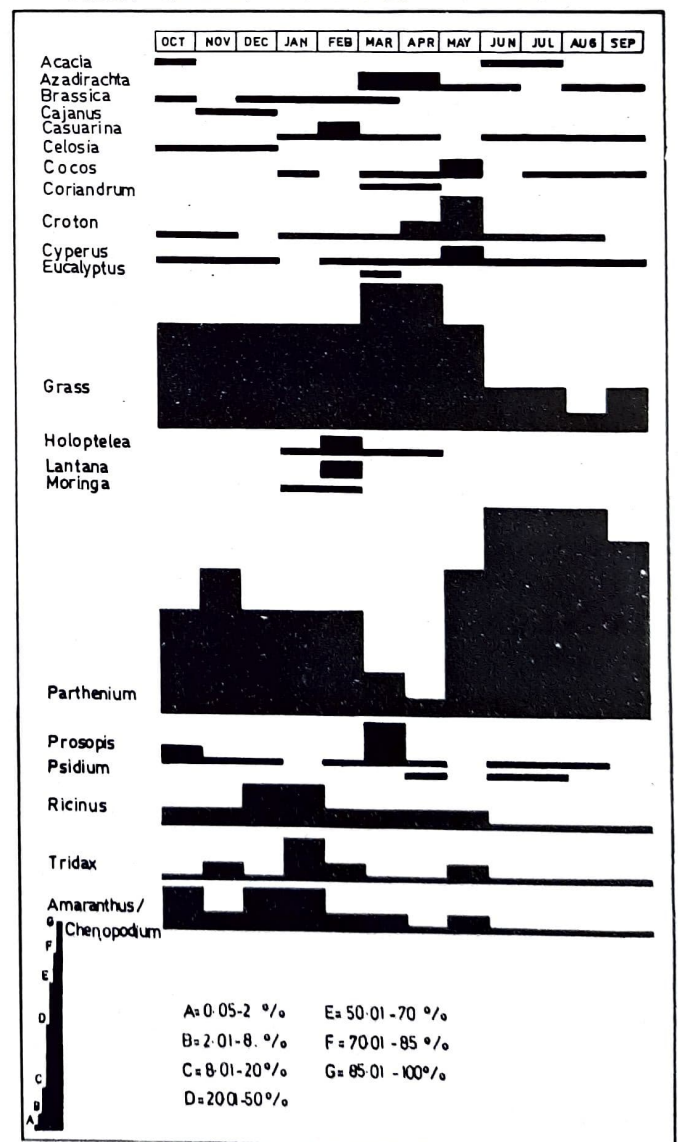
At the 30 feet height, *Parthenium* pollen dominated the aerospora from June to September, with a peak representation in the month of August, while grass pollen dominated during the rest of the year (Text-fig. 1).

POLLEN CALENDAR OF SAFILGUDA (30 Ft Ht) 1989-90.



Text-figure 1. Pollen calendar showing frequency of airborne pollen grains (% per month) at 30 feet from the ground level.

POLLEN CALENDAR OF SAFILGUDA (6 Ft. Ht.) 1989-90



Text-figure 2. Pollen calendar showing frequency of airborne pollen grains (% per month) at 6 feet from the ground level.

Table 3. Incidence of airborne fungal spores at 2 different heights (1989-90)

Sl. No.	Types	30 feet height		6 feet height	
		Total	(%)	Total	(%)
1.	<i>Alternaria</i>	2756	(25.08)	1239	(30.42)
2.	<i>Drechslera</i>	1650	(15.02)	559	(13.72)
3.	Uredospores	1281	(11.66)	584	(14.34)
4.	Smut spores	938	(8.54)	430	(10.56)
5.	<i>Curvularia</i>	897	(8.16)	440	(10.80)
6.	<i>Nigrospora</i>	734	(6.68)	359	(8.81)
7.	<i>Trichoconis</i>	548	(4.99)	10	(0.25)
8.	<i>Pithomyces</i>	536	(4.88)	75	(1.84)
9.	<i>Cladosporium</i>	472	(4.30)	160	(3.93)
10.	<i>Sporidesmium</i>	392	(3.57)	54	(1.33)
11.	<i>Papularia</i>	155	(1.41)	18	(0.44)
12.	<i>Bispora</i>	154	(1.40)	52	(1.28)
13.	<i>Aspergillus</i>	86	(0.78)	-	-
14.	<i>Pleospora</i>	79	(0.72)	6	(0.37)
15.	<i>Phaeotrichoconis</i>	76	(0.69)	17	(0.42)
16.	<i>Tetraploa</i>	49	(0.45)	11	(0.27)
17.	<i>Spegazzinia</i>	47	(0.43)	-	-
18.	<i>Torula</i>	32	(0.29)	22	(0.54)
19.	<i>Bipolaris</i>	26	(0.24)	3	(0.07)
20.	<i>Epicoccum</i>	19	(0.17)	7	(0.17)
21.	<i>Periconia</i>	13	(0.12)	1	(0.02)
22.	<i>Fusarium</i>	11	(0.10)	6	(0.15)
23.	<i>Melanospora</i>	7	(0.06)	-	-
24.	<i>Cercospora</i>	5	(0.05)	-	-
25.	<i>Ravenalia</i> teliospore	4	(0.04)	-	-
26.	<i>Puccinia</i> teliospore	2	(0.02)	-	-
27.	Unknown types	18	(0.16)	7	(0.17)
Total		10987		4073	

The pollen of *Tridax*, Amaranth/Chenopods, *Croton*, *Ricinus* and *Prosopis* were encountered throughout the year. Except in May and June, the pollen of *Cyperus* was recorded throughout the year. High concentration of *Azadirachta* pollen was noted in March, while *Casuarina* was best represented in September. A peak in the incidence of *Holoptelea* and *Prosopis* pollen was noted in January. The pollen of *Ailanthus* was encountered from December to February in the aerospora while those of *Terminalia* were observed only in May. The pollen of *Eucalyptus*, *Moringa*, *Delonix*, *Peltophorum*, *Dendrophthoe*, *Dodonaea*, *Morus*, *Borassus* and *Cocos* were less frequently encountered at this height.

The highest pollen catch was recorded in August (51,080/10 cm²) with a number of pollen types (viz. *Parthenium*, *Cyperus*, Amaranth/Chenopod and grass) showing a peak representation in this month. The least catch, however, was in May (776/10 cm²).

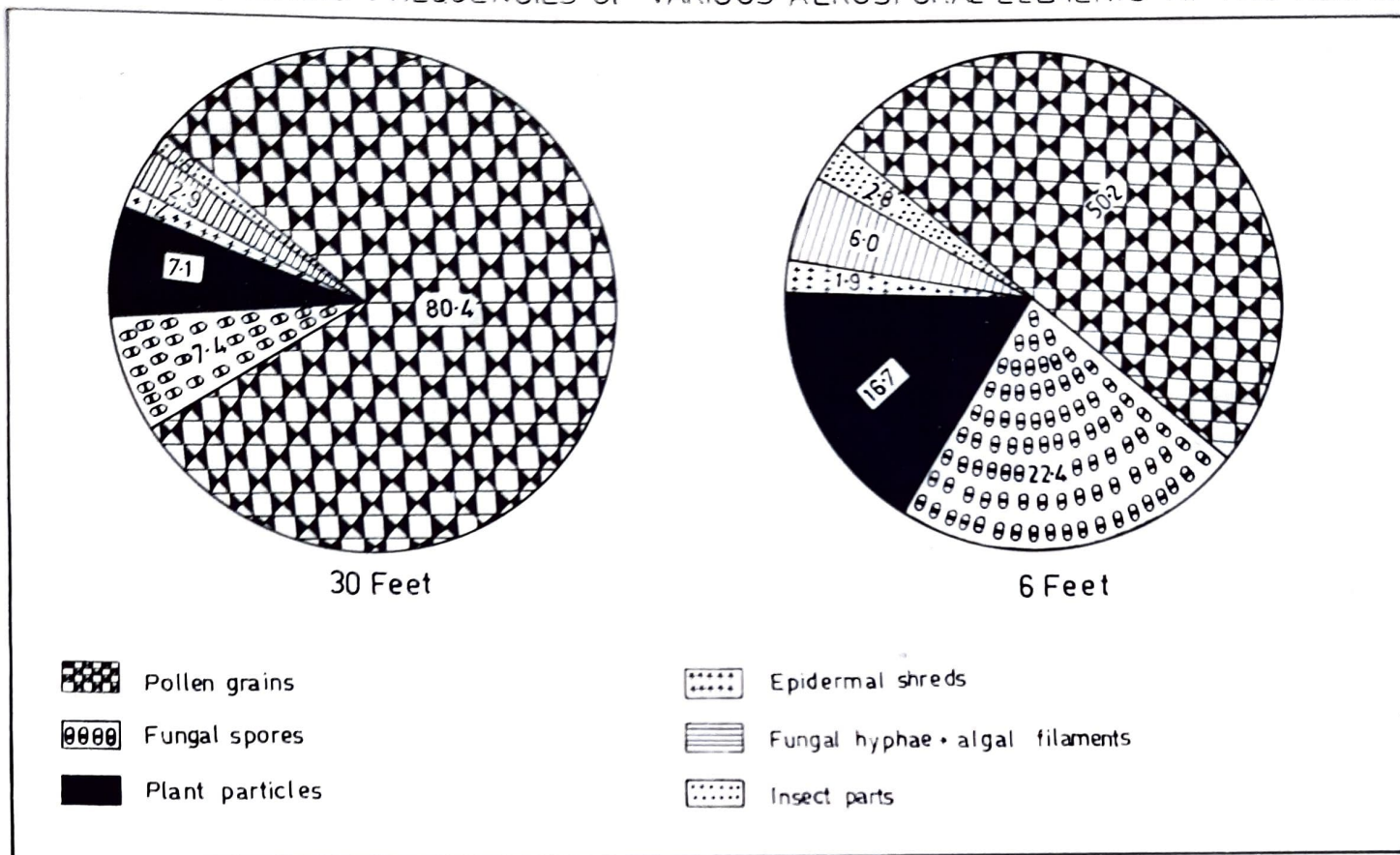
Twenty six fungal spore types were identified of

which *Alternaria* (25.08%) constitute the predominant type, followed by *Drechslera* (15.02%) and Uredospores (11.66%). Smut spores (8.54%), *Curvularia* (8.16%), *Nigrospora* (6.68%) and *Trichoconis* (4.99%) were fairly well represented (Table 3). The frequency of fungal spores in the atmosphere was very high from September to January with a peak in October (1826/10 cm²).

The aerospora at 6 feet height was chiefly made up of pollen grains (50.23%), followed by fungal spores and plant particles. Fungal hyphae, insect parts, epidermal shreds and algal filaments were the other aerosporal entities encountered at this height (Text-fig.3).

Text-figure 2 is the pollen calendar of Safilguda depicting the monitoring of various pollen types at 6 feet height during 1989-90. At this height also, the incidence of herbaceous pollen (95.09%) was very high when compared to that of shrubs and trees (Table 1). 37 pollen types referable to 25 families were recorded at this level. The pollen of *Parthenium hysterophorus* (70.37%) was predominant, followed by grass (18.26%) and those of

SPECTRA SHOWING FREQUENCIES OF VARIOUS AEROSPORAL ELEMENTS AT TWO HEIGHTS



Text-figure 3. Spectra showing frequencies of various aerosporal elements at two heights.

Amaranth/ Chenopod (3.57%), *Ricinus* (2.65%) and *Tridax* (1.61%) were also frequently encountered (Table 2). Except in March and April, wherein grass pollen dominated, the pollen of *Parthenium* dominated the aerospora during the rest of the year, at the lower height (Text-fig.2). The highest monthly incidence of *Parthenium* pollen was during July (1537/10 cm²) and that of grass in October (371/10 cm²) at 6 feet height. *Tridax*, Amaranth/Chenopod and *Ricinus* were the other types recorded throughout the year.

Prosopis pollen had a numerical peak in October and *Casuarina* in June. The pollen of *Holoptelea* was encountered from January to April. *Ailanthus*, *Moringa*, *Cocos*, *Borassus*, *Delonix*, *Peltophorum* and *Eucalyptus* were poorly represented at the lower height. The maximum pollen catch was recorded in June (1920/10 cm²) and the least catch was in May (147/10 cm²).

Twenty fungal spore types were identified at the lower height. *Alternaria* (30.4%) represents the dominant spore type. Uredospores (14.34%), *Drechslera* (13.72%), *Curvularia* (10.8%), smut spores (10.56%) and *Nigrospora* (8.81%) were also well represented (Table 3). The minimum catch of fungal spores was in January (676/10cm²) and the least in July (157/10 cm²).

DISCUSSION

At both the heights, the aerospora is predominantly made up of diverse pollen grains, followed by fungal spores. The percent contribution of pollen grains (80.4%) to the total aerospora at 30 feet was appreciably higher than at 6 feet (50.23%). Higher incidence of pollen grains at the higher level when compared to the ground level, was also reported, at Lucknow, by Khandelwal (1988).

The rest of the categories of aerosporal elements, viz., fungal spores, plant particles, fungal hyphae, epidermal shreds and insect remains, except algal filaments had better representation at the lower height. Reduction in fungal spore concentration with increased height was also observed at Lucknow by Khandelwal *et al.* (1988) and at Waltair by Janaki Bai *et al.* (1981). The incidence of algal filaments at both the levels, however, did not show much difference.

At both 30 feet and 6 feet heights, the incidence of herbaceous pollen was very high (96% and 95% respectively) in comparison to that of the shrubs (2% and 3% respectively) and trees (about 2% each). The high incidence of the pollen of herbs is in conformity with the overall floral composition of the area.

While 50 pollen types were encountered at 30 feet height, only 37 types were recorded at 6 feet height. The

pollen of *Parthenium hysterophorus* was predominant at both the levels followed by grass. The predominance of *Parthenium* pollen in the atmosphere was also reported from Bangalore (Agashe & Abraham, 1988).

Terminalia catappa, *Alternanthera sessilis*, *Morus alba*, *Justicia procumbens*, *Dodonaea viscosa* and *Ocimum* sp., fairly well represented by their pollen at 30 feet were not encountered at the lower height. On the contrary, the pollen types of *Cajanus cajan*, *Bombax ceiba* and *Hibiscus rosa-sinensis* were recorded only at 6 feet height.

Among the fungal spores, *Alternaria* was predominant at both the heights. Many of the fungal sporomorphs were common at both the levels. *Aspergillus*, *Spegazzinia*, *Cercospora*, *Melanospora* and teliospores of *Ravenalia* and *Puccinia*, however, were encountered only at the higher level. Variation in the vertical spore profiles, were attributed to the origin of spore source, time of spore liberation and the prevailing weather conditions (Subba Reddi & Ramakrishna, 1978). High incidence of fungal spores in the atmosphere was observed in October, November and January at both the heights.

The concentration of plant particles in the atmosphere was high during April, May and October at both the heights. Epidermal shreds had a peak incidence in

May at 30 feet and in April at 6 feet height. Although the frequency pattern of various aerospore elements at both the heights is similar, their relative concentration in the ambient air at 30 feet height is significantly higher than at 6 feet.

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