

Comparative study of the aerospora of an urban complex in Hyderabad over a ten year period and its significance

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The study deals with comparison of ten years aerospora of an urban complex (Himayatnagar-Saifabad) of Hyderabad during the years 1980 and 1989-90. Grass pollen is the predominant type of this area both at the beginning and the end of study (35.12%, 1980; 31.31%, 1989-90). *Casuarina equisetifolia* (16.78%), *Ricinus communis* (10.55%), *Holoptelea integrifolia* (5.71%) and *Ailanthus excelsa* (4.49%) were fairly well represented by their pollen in 1980. The pollen of *Parthenium hysterophorus* which was only 2.77% in 1980 showed a steep rise (25.66%) in 1989-90. *Ricinus communis* (7.31%), *Casuarina equisetifolia* (5.79%), *Cocos nucifera* (5.33%) and *Amaranthus spinosus* (3.80%) were the other significant pollen type of 1989-90 calendar. The overall frequency of the pollen of herbaceous taxa, showed a perceptible increase (63.27%) in 1989-90 compared to (43.38%) in 1980.

Key-words—Aerospora, Grass pollen, Urban complex, Hyderabad.

INTRODUCTION

THE aerospora of an area reflects upon its floral composition. Changes in the composition of the ground flora may take place over a period of time due to urbanization, felling of trees, introduction of new types etc., which has its expression in the aerospora. The constantly changing aerospora, necessitates its continual monitoring for recognising the incidence of allergenic pollen/spore types. The need for renewed aerial surveys because of changing flora was also emphasized by Singh and Babu 1980 and Chaturvedi *et al.* (1987-88).

The present paper provides a critical account of the aerospora recovered during 1989 - 90, in an urban area of Hyderabad and its comparison with the earlier data obtained ten years back (i.e., 1980)

MATERIAL AND METHOD

Air-monitoring was conducted from November 1989 to October 1990 at one end of an urban area (covering Himayatnagar-Saifabad) in Hyderabad, using a gravimetric aeroscope (Nair *et al.*, 1986).

The slides smeared with glycerine jelly were exposed to the atmosphere every 24 hours and were later mounted in safranin- stained jelly. The slides thus prepared were

scanned (covering an area of 10cm² of the coverslip) and the results, analysed and quantified.

The vegetation of this urban area chiefly comprises of cultivated shrubs, trees, a wealth of garden plants and a host of weeds with grasses dominating.

RESULTS

Analysis of aerospora recovered during 1989-90.—The aerospora of the urban area during 1989-90 consisted of pollen grains (58.01%) as the dominant aerosporal element, followed by fungal spores (20.04%) and plant particles (10.53%). The other aerosporal elements were fungal hyphae (4.77%), epidermal shreds (4.25%), insect parts (1.68%) and algal filaments (0.72%).

The pollen grains of herbaceous taxa (63.27%) were represented in high numbers, followed by trees (27.69%) and shrubs (8.84%).

A total of 49 pollen types referable to 28 families were identified, of which grass pollen (31.31%) constitutes the predominant type. The pollen of *Parthenium hysterophorus* with 25.66% was next to grass pollen. *Ricinus communis* (7.31%), *Casuarina equisetifolia* (5.79%), *Cocos nucifera* (5.33%), *Amaranthus spinosus* (3.8%), *Syzygium cumini* (3.4%), *Ailanthus excelsa* (2.61%) and *Azadirachta indica* (2.6%) were the other

pollen types encountered. The month-wise representation of significant airborne pollen types during 1989-90 is shown in Table 1.

Table 1. Important airborne pollen types of the urban area : Month-wise Record (1989-90)

Month	Number of pollen types	Predominant pollen type	Other significant pollen types
November	21	Grass	<i>Ricinus</i> , <i>Tinospora</i>
December	12	Grass	<i>Ricinus</i>
January	22	<i>Ailanthus</i>	<i>Holoptelea</i> , <i>Casuarina</i> , Grass, <i>Ricinus</i> , <i>Parthenium</i>
February	23	<i>Casuarina</i>	Grass, <i>Ailanthus</i> , <i>Ricinus</i> , <i>Holoptelea</i> .
March	23	Grass	<i>Parthenium</i> , <i>Azadirachta</i> , <i>Dodonaea</i> , <i>Ricinus</i> , <i>Prosopis</i> , <i>Croton</i> , <i>Polyalthia</i> .
April	20	Grass	<i>Azadirachta</i> , <i>Cocos</i> , <i>Eucalyptus</i> , <i>Prosopis</i> , <i>Ricinus</i> .
May	17	<i>Cocos</i>	Grass, <i>Eucalyptus</i> , <i>Parthenium</i> , <i>Ricinus</i> .
June	18	<i>Parthenium</i>	Grass, <i>Syzygium</i> , <i>Cassia</i> , <i>Cocos</i> , <i>Ricinus</i> , <i>Cyperus</i> , <i>Amaranthus</i> , <i>Delonix</i> , <i>Dichrostachys</i> , <i>Oldenlandia</i> , <i>Acacia</i> .
July	26	<i>Parthenium</i>	Grass, <i>Ricinus</i> , <i>Amaranthus</i> , <i>Syzygium</i> , <i>Cocos</i> , <i>Casuarina</i> , <i>Acacia</i> , <i>Prosopis</i> , <i>Peltophorum</i> , <i>Cyperus</i> , <i>Cassia</i> , <i>Delonix</i> .
August	19	Grass	<i>Parthenium</i> , <i>Amaranthus</i> , <i>Casuarina</i> , <i>Cocos</i> , <i>Ricinus</i> , <i>Prosopis</i> , <i>Peltophorum</i> , <i>Phoenix</i> .
September	20	Grass	<i>Parthenium</i> , <i>Ricinus</i> , <i>Cocos</i> , <i>Amaranthus</i> , <i>Mimusops</i> , <i>Cassia</i> .
October	15	Grass	<i>Ricinus</i> , <i>Parthenium</i> .

Both qualitatively (26 types) and quantitatively (1784/10 cm²), the highest record of pollen grains was in July. *Parthenium*, *Amaranthus* and *Ricinus* had their peak in July. High incidence of grass pollen was encountered in March, April and then from June to September.

Ailanthus, *Azadirachta*, *Casuarina* and *Holoptelea* pollen were observed in high numbers during January to April. *Albizia*, *Moringa*, *Morus*, *Polyalthia*, *Prosopis* and *Psidium* were the co-dominant types encountered during this period. The pollen of *Cocos* and *Eucalyptus*

showed the peak incidence in May.

The highest monthly incidence of fungal spores in the atmosphere was observed during March (379/10 cm²) and 24 fungal spores were identified from the aerospora during 1989-90. *Alternaria* (20.9%) dominated and followed by smut spores (20.29%) and uredospores (19.87%). *Nigrospora* (11.93%), *Drechslera* (9.65%) and *Curvularia* (6.95%) were also found in fair abundance throughout the year.

Bispora was found almost throughout the year except in April. *Pithomyces*, *Trichoconis*, *Cladosporium*, *Phaeotrichoconis*, *Papularia*, *Sporidesmium*, *Torula*, *Epicoccum*, *Pleospora*, *Tetraploa*, *Aspergillus*, *Cercospora*, *Melanospora*, *Spegazzinia*, *Periconia* and teliospores of *Puccinia* and *Ravenelia* were the other fungal spores recorded during 1989-90.

The following pollen and spore types recorded in the present study have been proved to be allergenic to human beings, viz., *Parthenium hysterophorus*, *Amaranthus spinosus*, *Cyperus rotundus*, *Brassica* sp., *Ricinus communis*, *Prosopis juliflora*, *Dodonaea viscosa*, *Ailanthus excelsa*, *Casuarina equisetifolia*, *Delonix regia*, *Holoptelea integrifolia*, *Morus alba*, *Croton bonplandianum*, *Moringa oleifera*, *Xanthium strumarium*, *Phoenix sylvestris*, *Syzygium cumini*, *Alternaria*, *Cladosporium*, *Curvularia*, *Drechslera*, *Nigrospora*, *Epicoccum*, and *Aspergillus* (Raja Rajeswari et al., 1979; Singh, 1986; Tilak et al., 1980; Singh et al., 1987).

COMPARISON WITH AEROSPORA RECOVERED IN 1980

A comparison of the present aerospore survey with the earlier survey of the same broad area conducted during 1980 by Mutha Reddy and Ramanujam (1989) reveals the following.

Pollen grains constitute the dominant aerospore elements during both the years, although their frequency in 1989-90 (58.01%) was higher than in 1980. However, if comparison is made only between the total number of pollen grains during these two years of survey, 1980 showed a much higher number of pollen than 1989-90. Fungal spores and insect parts were better represented in 1980 and fungal hyphae and epidermal shreds during 1989-90 (Table 2). Plant particles and algal filaments, however, had more or less similar representation during both the years.

A perceptible increase in the frequency of pollen of herbaceous taxa in 1989-90 (63.27%) as compared to 1980 (43.38%) and relative decrease in tree pollen (27.69% in 1989-90; 38.36% in 1980) and shrubs (8.84% in 1989-90; 10.5% in 1980) was documented.

Table 2. Percentage contribution of various aerospore elements during 1980 and 1989-90 in an urban area of Hyderabad

Types	1980	1989-90
1. Pollen grains	45.03%	58.01%
2. Fungal spores	30.87%	20.04%
3. Plant particles	10.64%	10.53%
4. Insect parts	8.61%	1.68%
5. Fungal hyphae	2.60%	4.77%
6. Epidermal shreds	1.60%	4.25%
7. Algal filaments	0.63%	0.72%

Altogether 38 air borne pollen types were encountered during 1980, and 49 during 1989-90. Grass pollen was found to be predominant both at the beginning (35.12%) and end of this ten year period (31.31%).

During 1980, *Parthenium* pollen was 2.77% of the total aerospora as against 25.66% recorded in the present study, indicating a steep increase in its incidence in a ten year span. Its frequency however, was found to be similar both at the beginning and end of this ten year period with peaks in July and March (Text-fig. 1).

The pollen grains of *Casuarina*, *Ricinus*, *Holoptelea*, *Ailanthus*, *Peltophorum* and *Cyperus* had better

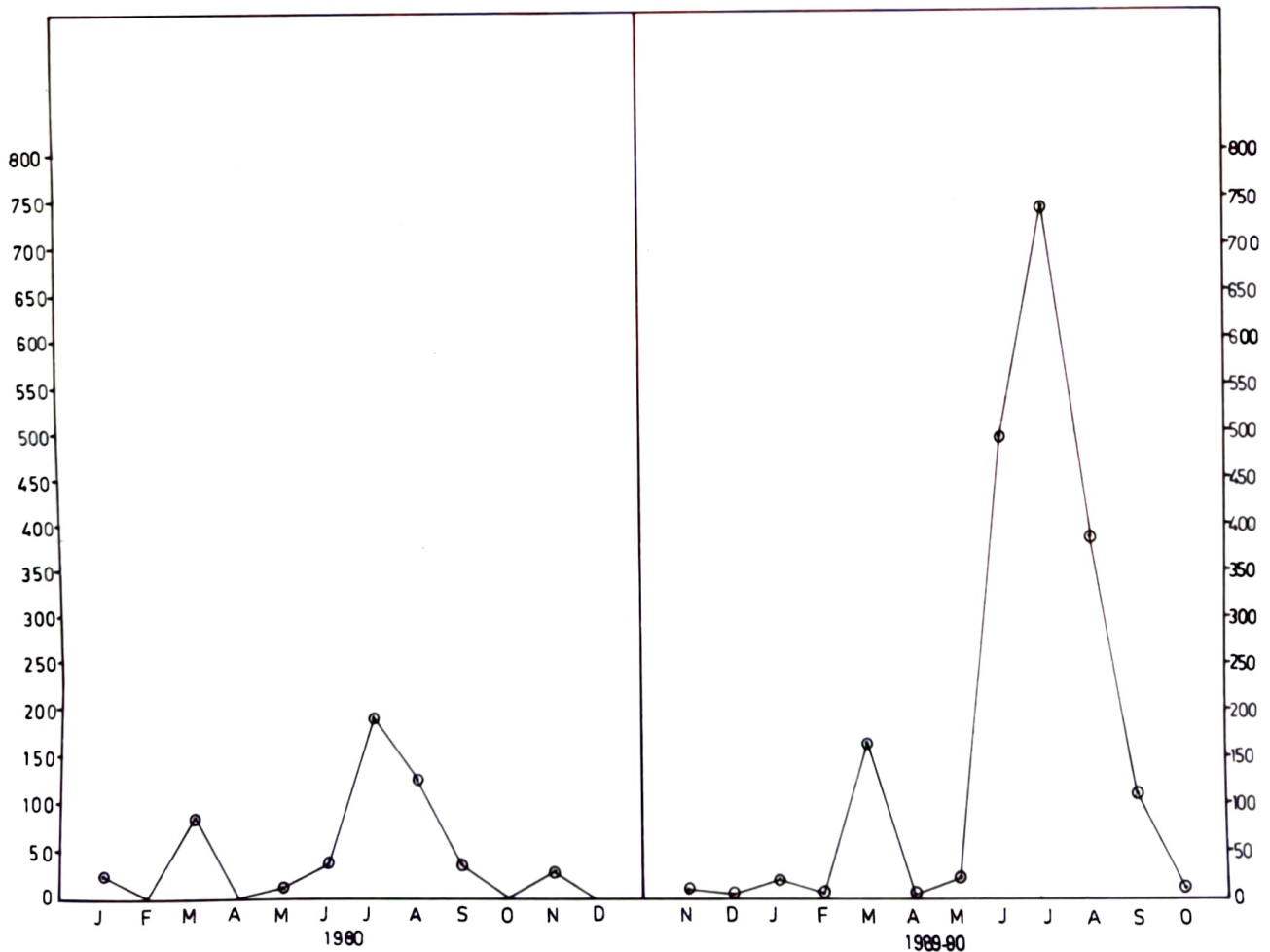
representation during 1980. *Cocos*, *Syzygium* and *Eucalyptus*, on the other hand, were better represented during 1989-90 (Table 3).

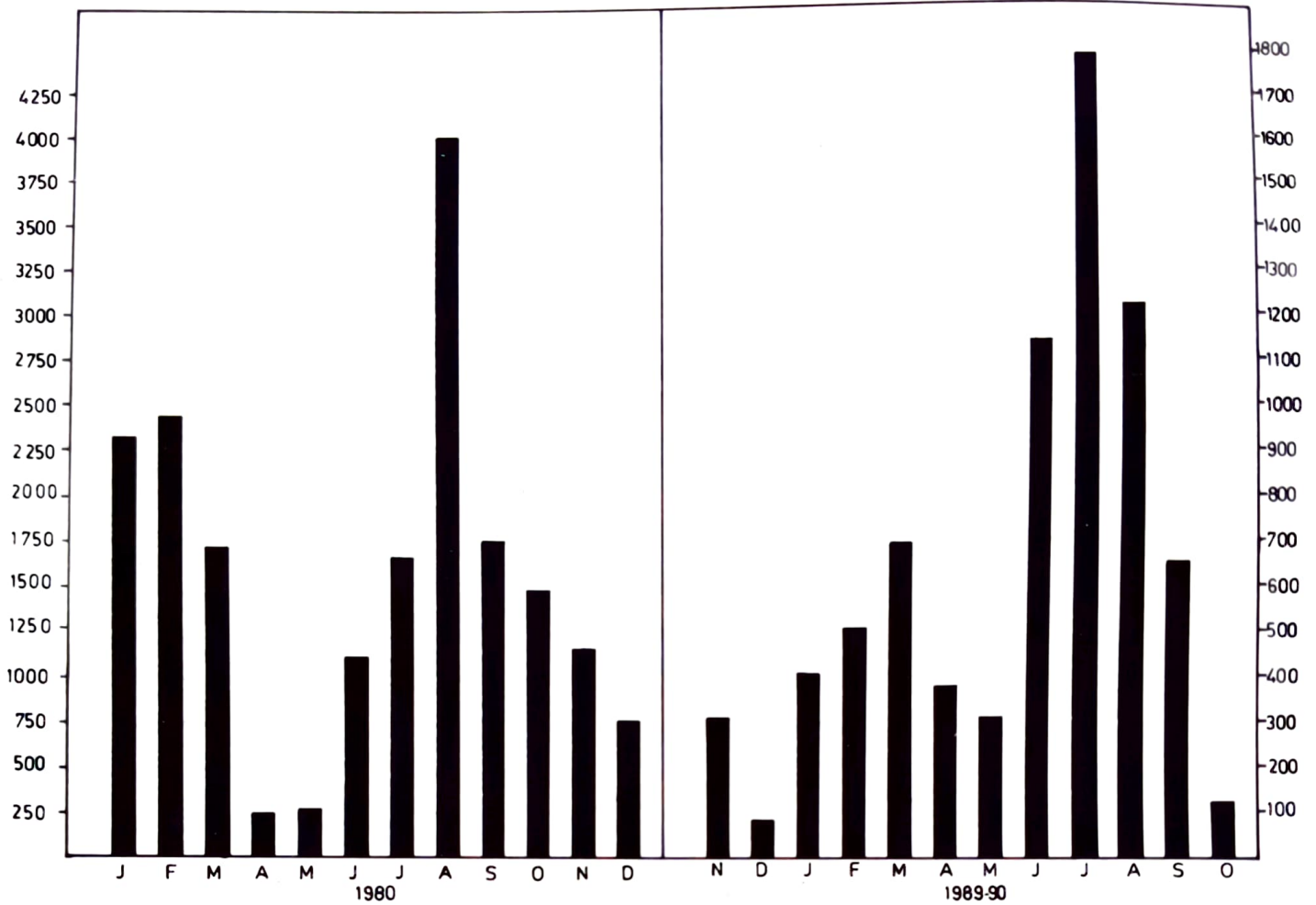
About 19 new pollen types were recorded in the presented study viz., *Polyalthia longifolia*, *Cassia auriculata*, *Crotalaria* sp., *Mimusops elengi*, *Phoenix sylvestris*, *Brassica* sp., *Dichrostachys cinerea*, *Oldenlandia umbellata*, *Tinospora cordifolia*, *Pongamia pinnata*, *Croton bonplandianum*, *Lantana camara* *Alternanthera sessilis*, *Ocimum* sp., *Dodonaea viscosa*, *Justicia procumbens*, *Ageratum conyzoides*, *Celosia argentea* and *Asteracantha longifolia*. However, the pollen of *Cassia siamea*, *Kigelia pinnata*, *Parkia biglandulosa*, *Dalbergia sissoo* and *Tribulus terrestris* recorded earlier were absent during 1989-90.

Two distinct pollen seasons were recognised in the urban complex under study.

- January to March (1980 and 1989-90)
- August to October (1980)/June to August (1989-90)

The peak incidence of pollen grains (Text-fig. 2) was recorded in August (1980) and July (1989-90). Such fluctuations in the monthly incidence of pollen are attributed to meteorological factors (Khandelwal, 1986).

**Text-figure 1.** Frequency of airborne *Parthenium* pollen at Hyderabad during 1980 and 1989-90.



Text-Figure. 2. Incidence of airborne pollen grains at Hyderabad during 1980 and 1989-90.

Table 3. Incidence of airborne pollen during 1980 and 1989-90 in an urban area of Hyderabad

S. no.	Types	1980	1989-90
1.	Grass pollen	6699 (35.12)	2387 (31.31)
2.	<i>Casuarina equisetifolia</i>	3201 (16.78)	441 (5.79)
3.	<i>Ricinus communis</i>	2012 (10.55)	557 (7.31)
4.	<i>Holoptelea integrifolia</i>	1089 (5.71)	97 (1.27)
5.	<i>Ailanthus excelsa</i>	858 (4.49)	199 (2.61)
6.	<i>Parthenium hysterophorus</i>	529 (2.77)	1956 (25.66)
7.	<i>Peltophorum pterocarpum</i>	423 (2.21)	41 (0.54)
8.	<i>Cyperus rotundus</i>	396 (2.07)	65 (0.85)
9.	<i>Azadirachta indica</i>	396 (2.07)	198 (2.60)
10.	<i>Prosopis juliflora</i>	375 (1.96)	103 (1.35)
11.	<i>Amaranthus spinosus</i>	361 (1.89)	290 (3.80)
12.	<i>Delonix regia</i>	237 (1.43)	39 (0.51)
13.	<i>Cocos nucifera</i>	136 (0.71)	406 (5.33)
14.	<i>Xanthium strumarium</i>	114 (0.59)	1 (0.013)
15.	<i>Cassia siamea</i>	68 (0.35)	—
16.	<i>Kigelia pinnata</i>	63 (0.33)	—
17.	<i>Acacia arabica</i>	60 (0.31)	52 (0.68)
18.	<i>Moringa oleifera</i>	49 (0.25)	11 (0.14)
19.	<i>Syzygium cumini</i>	48 (0.25)	259 (3.40)
20.	<i>Tridax procumbens</i>	44 (0.23)	38 (0.50)
21.	<i>Parkia biglandulosa</i>	38 (0.19)	—
22.	<i>Ficus</i> sp.	33 (0.17)	—
23.	<i>Dalbergia sissoo</i>	33 (0.17)	—
24.	<i>Dendrophthoe falcata</i>	29 (0.15)	12 (0.16)
25.	<i>Borassus flabellifer</i>	18 (0.09)	8 (0.10)
26.	<i>Psidium guajava</i>	16 (0.08)	17 (0.22)
27.	<i>Pithecellobium dulce</i>	15 (0.07)	6 (0.078)
28.	<i>Albizia lebbek</i>	11 (0.05)	14 (0.18)
29.	<i>Ziziphus mauritiana</i>	11 (0.05)	10 (0.13)
30.	<i>Eucalyptus globulus</i>	0 (0.04)	108 (1.42)
31.	<i>Morus alba</i>	8 (0.04)	15 (0.20)
32.	<i>Enterolobium saman</i>	5 (0.02)	3 (0.039)
33.	<i>Tribulus terrestris</i>	5 (0.05)	—
34.	<i>Coriandrum sativum</i>	2 (0.01)	9 (0.12)

Table 3 contd.

35.	<i>Cassia auriculata</i>	—	80 (1.05)
36.	<i>Crotalaria sp.</i>	—	27 (0.35)
37.	<i>Mimusops elengi</i>	—	20 (0.26)
38.	<i>Polyalthia longifolia</i>	—	17 (0.22)
39.	<i>Phoenix sylvestris</i>	—	17 (0.22)
40.	<i>Brassica nigra</i>	—	15 (0.20)
41.	<i>Oldenlandia umbellata</i>	—	13 (0.17)
42.	<i>Dichrostachys cinerea</i>	—	13 (0.17)
43.	<i>Tinospora cordifolia</i>	—	12 (0.16)
44.	<i>Pongamia pinnata</i>	—	9 (0.12)
45.	<i>Croton bonplandianum</i>	—	7 (0.092)
46.	<i>Lantana camara</i>	—	7 (0.092)
47.	<i>Alternanthera sessilis</i>	—	6 (0.078)
48.	<i>Ocimum sp.</i>	—	4 (0.052)
49.	<i>Dodonaea viscosa</i>	—	3 (0.039)
50.	<i>Justicia procumbens</i>	—	2 (0.026)
51.	<i>Ageratum conyzoides</i>	—	2 (0.026)
52.	<i>Celosia argentea</i>	—	1 (0.013)
53.	<i>Asteracantha longifolia</i>	—	1 (0.013)
54.	Meliaceae type	117 (0.61)	—
55.	Euphorbiaceae	57 (0.29)	—
56.	Anacardiaceae	—	8 (0.10)
57.	Acanthaceae	7 (0.03)	—
58.	Myrtaceae	7 (0.03)	—
59.	Asteraceae	—	2 (0.026)
60.	Unknown types	1468 (7.69)	15 (0.20)

DISCUSSION

The present study is significant inasmuch as a number of new pollen types including allergenic ones, viz., *Dodonaea viscosa*, *Croton bonplandianum*, *Phoenix sylvestris* and *Brassica sp.*, were recorded in the aerospora of the urban area. The steep increase in the incidence of the pollen of *Parthenium hysterophorus* strongly points towards unabated spread and multiplica-

tion of this allergenic weed in the area.

A decrease or absence in the incidence of pollen types of some arborescent taxa, viz., *Ailanthus*, *Kigelia*, *Dalbergia*, *Parkia* etc., in the present study may be attributed to the large scale felling of trees in the urban complex during recent years. Since a number of these aerosporal elements are allergenic to humans, the need for their continual and repeated monitoring in the proper diagnosis and clinical treatment of varied cases of pollinosis needs no overemphasis.

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