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AERIAL SURVEY OF *PARTHENIUM HYSTEROPHORUS* L. POLLEN AT NAGPUR (MS)

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The *Parthenium hysterophorus* weed is known to cause tremendous health hazards. The whole weed is allergenic, especially the pollen grains which are highly allergenic, float freely in the air polluting it and causing severe allergic diseases like asthma, dermatitis and hay fever. Aerial survey of micro-flora was carried out at Nagpur during the year 1999. The study pertains to total 34 types of forms, out of which 27 belong to other types including fungal spores, hyphal fragments, *Parthenium* trichomes and unidentified pollen. Occurrence of airborne types was correlated with meteorological parameters such as temperature, wind velocity, relative humidity and rain fall. The percentage of *P. hysterophorus* pollen was found to be 2.49, which is highest next to Poaceae (4.17 %) among all other pollen grains. It was evident from the results that *P. hysterophorus* produces pollen grains abundantly and they were found to be dominant pollen types in air when compared with other pollen grains.

Keywords : Aerobiology; Allergenic.

Introduction

It is well known fact that among various organic microbodies, which occur in air, pollen grains are major components of allergens found suspended in the air. They cause a number of allergic manifestations such as Bronchial Asthma, Hay fever, Nasobronchial allergy, Conjunctivitis, Contact Dermatitis etc. Allergy due to pollen grains is symptomised by breathlessness, running and itching of nose and eyes and is termed as 'Pollinosis'. The high incidence of respiratory allergy is one of the major health problems in our country. In any research program aimed towards the diagnosis and therapeutic treatment of allergic disorders of patients caused by pollen grains, the first step is to identify and characterize the different airborne pollen types. Previous surveys conducted by different workers[1-3] were related to airspora at Nagpur in relation to climatic factors. The present investigation is carried out to understand the atmospheric concentration of *Parthenium hysterophorus* pollen and trichomes in relation to meteorological factors such as temperature, RH, wind velocity and rain fall.

Material and Methods

Using Rotorod Air Sampler carried out fortnightly air sampling. The locality in which an intensive survey of atmospheric pollen grains was carried out during Jan – Dec., 1999 were central and south western parts of Nagpur. The air sampling was carried out by operating Rotorod Air Sampler at about 20 feet constant height from ground level. The air sampling was done twice a day during this period between 8.30 – 9.00 am and 6.00 – 6.30 pm. During sampling period meteorological data was recorded regularly. After collection, slides were scanned under microscopes by using 450 X magnification. Identification of trapped pollen grains was done by comparing with standard pollen slides and with the help of literature[4-6]. Pollen concentration (No./m^3) was calculated by multiplying conversion factor i.e. 5 with pollen count. The meteorological data was collected from Meteorological Department, Nagpur.

Results and Discussion

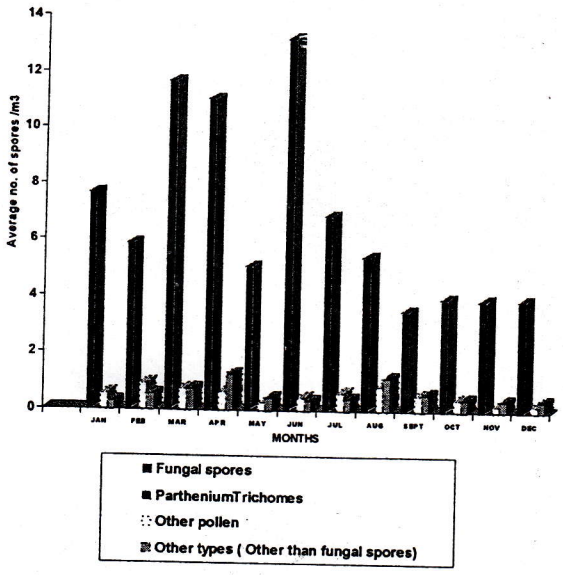
In the present study, about 37 % of the total pollen count was represented by herbaceous taxa, while the incidence of the pollen grains of trees and shrubs was relatively low. The high incidence of the pollen of herbs and the meager representation of the pollen of trees and shrub is in conformity with floral composition of the area. All pollen types belong to 20 different families, two of them are monocots while remaining 18 are of dicot. The two monocot families are *Poaceae and Cyperaceae*, while dicot families are *Amaranthaceae, Anacardiaceae, Apocyanaceae, Asteraceae, Caesalpinaceae, Caricaceae, Convolvulaceae, Euphorbiaceae, Labiatae, Malvaceae, Meliaceae, Mimosae, Moringaceae, Myrtaceae, Nyctaginaceae, Papaveraceae, Solanaceae and*

Table 1. Annual percentage of each type of total airspora at Nagpur during the year 1999.

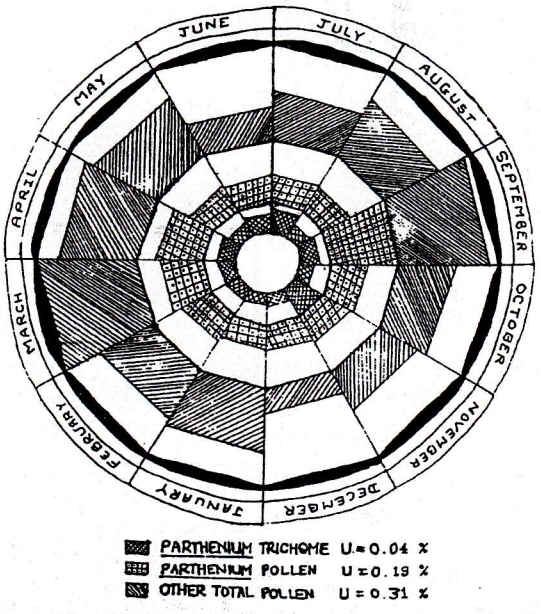
S. No.	COMPONENT	TOTAL	%
[A]	**POLLEN GRAINS**		
1	*Acacia arabica*	55	0.05
2	*Ageratum conyzoides*	240	0.23
3	*Alternanthera sp.*	230	0.22
4	*Argemone mexicana*	280	0.27
5	*Azadirchta indica*	105	0.10
6	*Bougainvillea sp.*	65	0.06
7	*Carica papaya*	55	0.05
8	*Cassia siamea*	210	0.20
9	*Clerodendron phlomoides*	120	0.11
10	*Cyperaceae*	395	0.37
11	*Datura metal*	80	0.08
12	*Delonix regia*	95	0.09
13	*Eucalyptus terreticornis*	75	0.07
14	*Ipomea sp.*	55	0.05
15	*Lantana camera*	165	0.16
16	*Mangifera indica*	150	0.14
17	*Moringa oliefera*	65	0.06
18	*Nerium indicum*	70	0.07
19	*Ocimum sp.*	45	0.04
20	*Parthenium hysterophorus*	2625	2.49
21	*Poaceae*	4400	4.17
22	*Ricinus communis*	75	0.07
23	*Sygizium cumini*	45	0.04
24	*Tridax sp.*	90	0.09
25	*Vitex negundo*	70	0.07
26	*Xanthium strumarium*	85	0.18
27	*Hibiscus rosasinensis*	70	0.07
	TOTAL	10115	9.59
[B]	**OTHER TYPES**		
1	Fungal spores	87610	83.06
2	Trichomes	1230	1.17
3	Insect parts	1995	1.89
4	Algal filaments	40	0.04
5	Hyphal fragments	2235	2.12
6	*Parthenium* trichomes	230	0.22
7	Unidentified pollen	2020	1.92
	TOTAL	105475	100.00

Table 2. Average monthly percentage contribution of total air-spora / m³ during the year 1999.

S. No.	Air – spora/m³	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Temperature (Max) in °C		25 - 31	30-31	34-41	38-42	42-44	33-44	30-37	29-31	30-40	31-35	27-32	28-29
1	Fungal Spores	4.78	7.67	5.89	11.68	11.04	5.07	13.23	6.87	5.45	3.52	3.97	3.91
2	*Parthenium* Pollen	0.16	0.18	0.21	0.29	0.19	0.16	0.17	0.18	0.38	0.20	0.18	0.18
3	*Parthenium* Trichomes	0.01	0.01	0.02	0.02	0.01	0.02	0.03	0.01	0.02	0.01	0.04	0.01
4	Other Pollen	0.65	0.56	0.93	0.76	0.68	0.29	0.46	0.65	0.88	0.57	0.44	0.23
5	Other types other than fungal spores	0.29	0.30	0.58	0.76	1.28	0.47	0.37	0.44	1.18	0.61	0.45	0.40



Histogram- I. Monthwise average no. of the spores/m³.



Variation in concentration and percentage contribution of *Parthenium* pollen, *Parthenium* trichomes and other pollen grains to the total air-spora during the year 1999.

Verbenaceae (Plate – I and II).

Apart from 27 types of pollen grains, miscellaneous types such as fungal spores, trichomes, insect scales, hyphal fragments and *Parthenium* trichomes were also observed (Table 1, Plate – III). Unidentified pollen grains were kept along with the miscellaneous group in the category as other types.

Pollen grains contributed 9.59 % of the total airspora. From the pollen calendar it was noted that pollen grains of *Poaceae* were encountered throughout the year and dominated throughout the investigation period by contributing 4.17 % to the total airspora. Next dominating

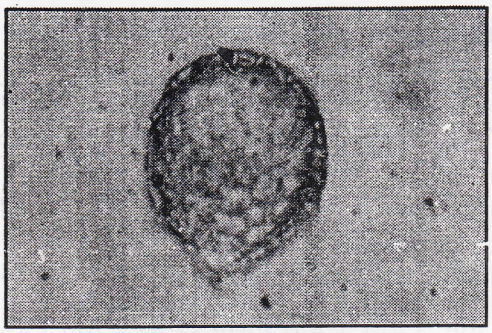


Fig. 1(a). *Delonix regia*

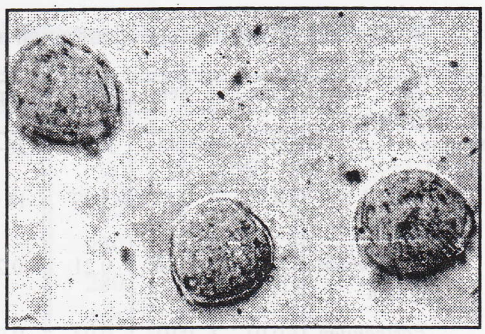


Fig. 1(b). *Datura alba*

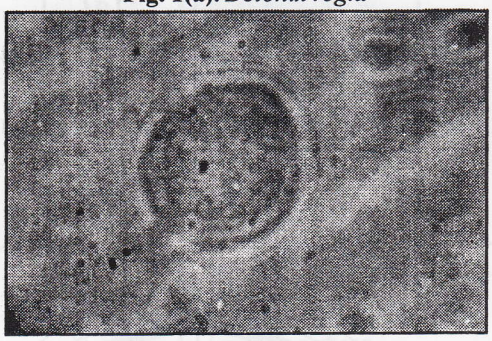


Fig. 1(c). *Cassia siamea*

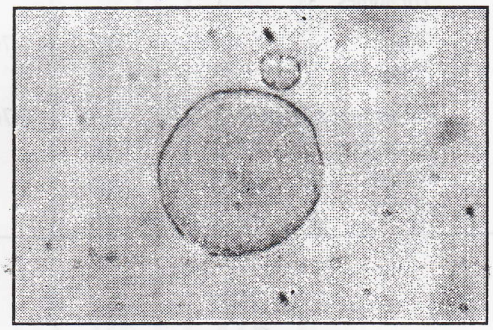


Fig. 1(d). *Carica papaya*

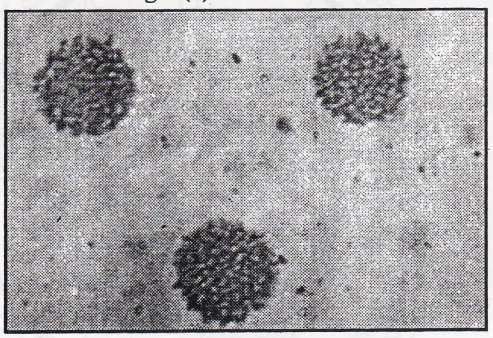


Fig. 1(e). *Bougainvillea sp.*

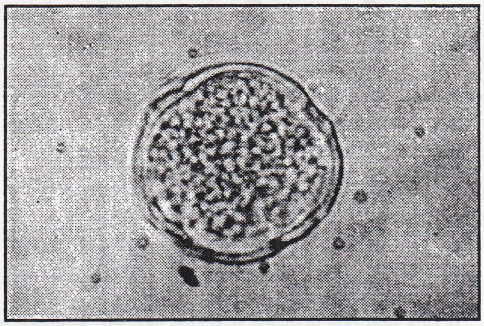


Fig. 1(f). *Azadirachata indica*

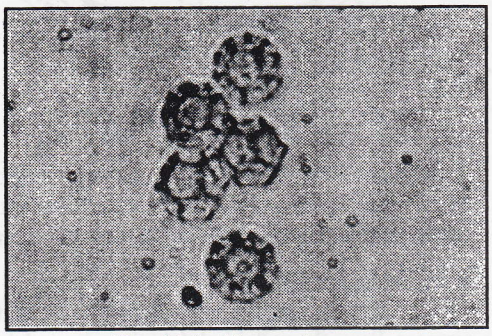


Fig. 1(g). *Alternathera sp.*

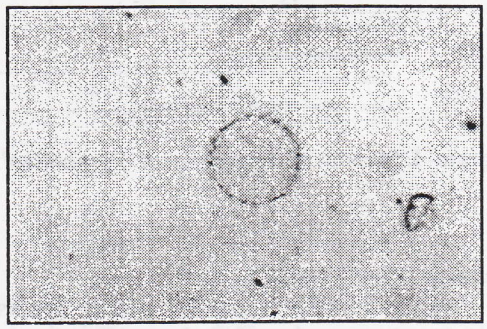


Fig. 1(h). *Ageratum conyzoides*

Plate-I. Photographs showing airborne pollen grains.

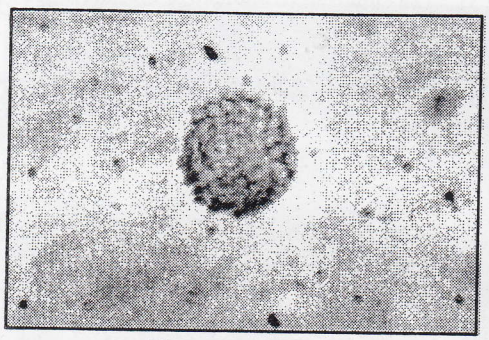


Fig. 1(i). *Tridax sp.*

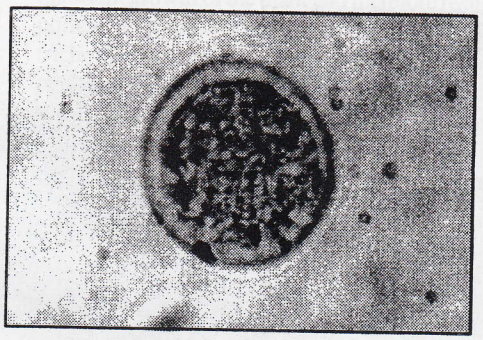


Fig. 1(j). *Poaceae*

Fig. 1(k). *Pharthenium hysterophorus*

Fig. 1(l). *Ocimum*

Fig. 1(m). *Nerium indicum*

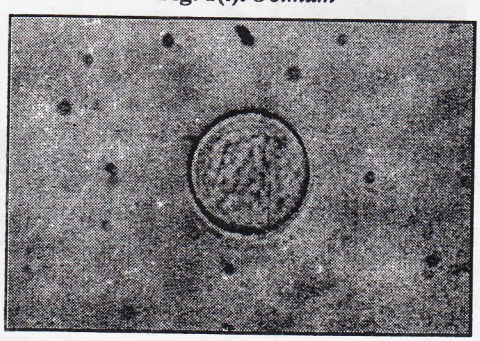


Fig. 1(n). *Mangifera indica*

Fig. 1 (o). *Lantana camera*

Fig. 1p. *Hibiscus rosa-sinensis*

Plate-II. Photographs showing airborne pollen grains.

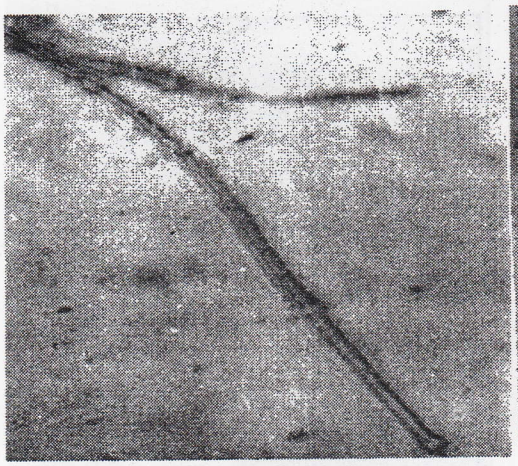


Fig. 1(q). Hyphal fragments

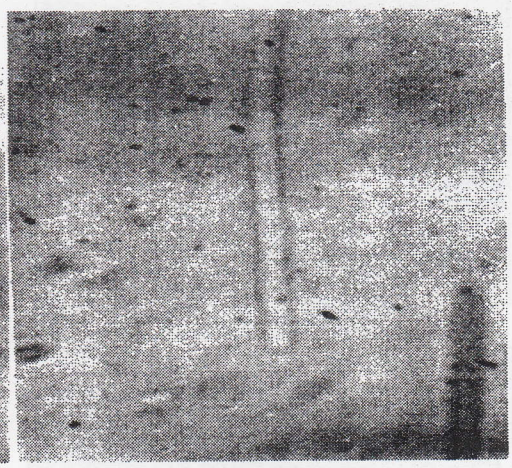


Fig. 1(r). Algal fragments

Fig. 1(s). Insect scale

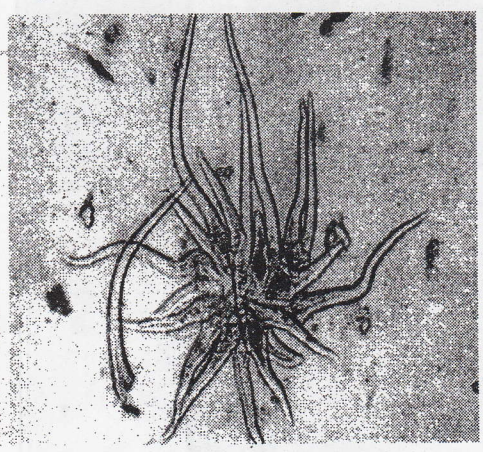


Fig. 1(t). Trichomes

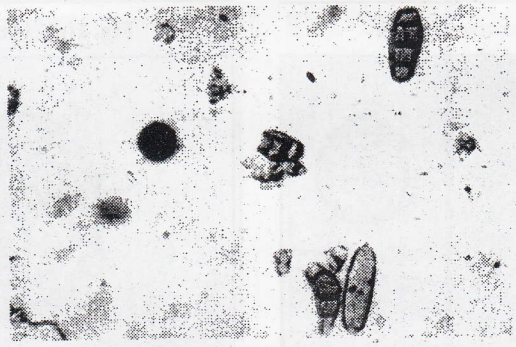


Fig. 1(u). Fungal spores

Plate-III. Photographs showing other biocomponents of air.

was pollen grains of *Parthenium hysterophorus* i.e. (2.49 %), (Table 1).

The pollen grains of *Poaceae, Cyperaceae and Parthenium* were encountered throughout the year during the investigation period while those of *Argemone mexicana, Cassia and Clerodendron* were found almost round the year except a few months. The break in the occurrence of the pollen grains in air may be due to the variation in the climatic conditions.

In the present investigation, climatic factors such as temperature, RH, wind velocity and rain fall shown a slight influence on the atmospheric concentration of the pollen grains. Atmospheric temperature is probably the most important factor.

The maximum concentration of *Parthenium* pollen (0.38%) was recorded in Sept. and *Parthenium* trichomes (0.04%) was recorded in Nov., where as minimum concentration of *Parthenium* pollen (0.16%) was recorded in Jan. and June, *Parthenium* trichomes (0.01%) was recorded in Feb., May, Aug., Oct. and Dec. (Table – 2, Histogram – I).

Mishra *et al.*[7] also observed highest concentration of *P. hysterophorus* while studying airborne pollen flora at Jabalpur which flowers throughout the year and produces an enormous amount of pollen grains. Anemophilous mode of pollination is also one of the factors which accounts for its higher concentration. The same results were observed by Sudha and Agashe[8] and Ommachan *et al.*[9].

The pollen grains of *Parthenium* were encountered throughout the period of investigation. It was observed that there is fluctuation in the concentration of *Parthenium* pollen daily. The discharge of the pollen grain was greatly influenced by meteorological factors such as temperature, RH, rainfall and wind velocity. There is proportional rise in the pollen with the rise in temperature. (40 – 45 °C) shows the correlation between the concentration of air borne pollen and temperature. When the temperature ranges from 25 – 30 °C the decrease in concentration of *Parthenium* pollen (0.16%) was observed. (Table 2, Histogram - I).

The peak period of the incidence of *Parthenium* pollen in the air may be variable, however, it coincided with the matured stage of flower. The sufficient and well distributed rain either in July or August promoted the luxuriant growth of the plant and therefore resulted in good pollen catch (0.38%) in the month of Sept. *Parthenium* trichomes were also reported in the air throughout the period of the investigation. The concentration of the *Parthenium* trichomes to the total air spora was 0.22% per annum. The maximum spore concentration (13.23%) was recorded in July and minimum (3.52%) was recorded in Oct. The total count of this group (83.06%) was necessary to get a clear and complete picture of air spora. Besides *Parthenium* pollen and *Parthenium* trichomes other types were also recorded such as fungal spores, trichomes, insect parts, algal filaments, hyphal filaments and unidentified pollens (Table 1).

Thus, from the observation it was noticed that the concentration of *P. hysterophorus* pollen was quite high at Nagpur as compared to other pollen types due to the luxuriant or uncontrolled growth of this plant and there by creating more problem to human beings and animal health.

References

1. Trivedi T K, Munshi S K and Paradkar S A 1980, Airspora over agricultural fields. *Adv. in pollen spore research* **5** –7 137 – 143.
2. Patil G V 1982, Atmospheric biopollution at Nagpur. *Proc. Nat.Conf. Env. Biopoll.* Aurangabad, PP: 193 – 197.
3. Gore S G and Patil G V 1986, Airspora at Nagpur in relation to climatic factors. *Proc. Spl. Ind. Geo. Conf.*, Poona , 39 –47.
4. Erdtman G 1952, Pollen morphology and plant taxonomy of Angiosperms, Stockholm and Waltham, Mass. U.S. A., PP.539.
5. Erdtman G 1957, Pollen and spore morphology and plant taxonomy. The Ronald Press Co., New York.
6. Nair P K K 1970, Pollen morphology of Angiosperms. A Historical and Phylogenetic study. National Bot. Gardens, Lucknow. Scholar Pub. House., India.
7. Mishra R P, Singh B and Oommachan M 2002, Airborne pollen flora of Jabalpur – The Central India. *Aerobiologia* **18** 73 –81.
8. Sudha P and Agashe S N 1996, A report on seasonal periodicity of pollen grains in Bangalore. I*nd. J. Aerobio.* **9** (1, 2) 5-8.
9. Oommachan M and Srivastava J L 1996, Flora of Jabalpur, Sci. Publishers, Jodhpur, PP. 354.