

An Analysis of Observed Angiospermic Airborne Pollen of Spring Season Based Upon Their Mode of Pollination in Firozabad District of Uttar Pradesh

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ABSTRACT

A floristic survey in Firozabad district was carried out from three selected sites which are 15-20 km away from each other. The main objective behind the field study was to find out angiospermic species which may shed large number of pollen in the atmosphere and to note their specific pollination period and mode of pollination which was useful criterion in the identification of atmospheric pollen. We studied variations in concentration of airborne pollen and other particles of biological origin which are collectively known as Primary Biological Aerosol Particles (PBAP) in those three sites. During the annual cycle the frequency of pollen in the air was different in different seasons. It might be due to local climatological influence on flowering of plants. The maximum pollen types have been recovered during spring, followed by rainy, summer and winter. On the basis of mode of pollination in spring season 46.94% anemophilous, 40.94% entomophilous and 10.90% amphiphilous species were found. Maximum plants bloom, during spring and rainy season followed by summer and winter season.

Keywords: Amphiphilous, anemophilous, entomophilous, pollen, pollination

I. INTRODUCTION

The study of structural and applied aspects of pollen is termed as 'PALYNOLOGY'. It is classified into fundamental and applied categories and 'AEROBIOLOGY' which is the study of biological materials present in the air, (Erdtman, 1952) comes in applied category. Both these well defined branches now commonly known as 'AEROPALYNOLOGY' and is open the focus of study owing to their direct bearing with human health, crop production and economic welfare. Most recent aeropalynological works have been carried out in Logos (South west nigeria) (Adeniyi *et al* 2014). The biological particles or materials or bio aerosols, emitted from vegetation and by other living organisms are also known as Primary biological aerosol particles (PBAP) which include pollen grains, fungal spores, bacteria, viruses, cell fragments and protozoans (Despres *et al*.2012) and they are ubiquitous in the atmosphere (Gregory 1961, Womack *et al*. 2010). The main research interest regarding PBAP

have been directed to their effects on humans, animals and agriculture, their potential as agents of biological warfare (Lim *et al.* 2005). The concentration of pollen in the atmosphere is subject to variations with time because of the reproductive cycle of plants variations of pollen counts also depends on the distribution of vegetation and pollen dispersal mechanisms. Geographical variations are also responsible for pollen abundance (Latorre and Bianchi 1991).

II. METHODOLOGY

For pollen and spore trap three sites viz., Shikohabad, Firozabad and Jasrana were selected, which are semi-urban, urban and rural respectively and are 15-20 kms away from each other. Pollen sampling was conducted with the help of modified Durham Gravitational sampler which was placed 6.5-8.5 m above ground level. Two microscopic slides, coated with stained adhesive glycerine jelly were exposed daily for 24 hrs. These slides, contained trapped dust particles, pollen grains, fungal spores, hyphal fragments, insect scales, epidermal hairs, microscopic vegetative fragments and other miscellaneous particles. The pollen grains and spores so trapped were identified on the basis of their morphological characters and by comparing these with reference slides. Pollen count and frequency of different pollens have been calculated by following the procedure of Mansour and Hameed (2005).

III. OBSERVATIONS

Different categories of seasonal vegetation grown in ponds, on waste lands, roadsides, on railway tracks etc. Some seasonal vegetation of rainy season includes herbs and under shrubs and revives the germination of seeds and fruit stocks. The most widely distributed dormant vegetations of the locality are grasses which flower during rainy and post rainy seasons. Aerobiota of Firozabad district consisted 28.49% pollen, 60.35% fungal spores, 10.64% other bioparticles and 0.52% unidentified objects during research period.

During the spring season (February-April) nearly 70 pollen types have been recorded in the air of the district. Their frequency varies from minimum 0.09% (*Alangium salvifolium*) to maximum 14.21% (*Parthenium hysterophorus*). A sharp increase in the frequency of *Parthenium* might be due to its profuse flowering in this area. On the other hand, the pollen of *Cynodon dactylon* showed a considerable decline in the air of the district (5.96%). The arboreal pollen types show lower frequencies (<1%) except *Azadirachta indica* which exhibits a frequency of 2.31%. The overall total pollen count has been found to be higher at the rural site of Jasrana as compared to the semi-urban site of Shikohabad and the urban site of Firozabad.

The aeropollen calendar of the spring season is represented by the pollen types of 02 grasses, 33 of non-arboreal and 35 of arboreal species. Out of these 70 types, 48 are entomophilous, 12 anemophilous and 10 amphiphilous in nature. 64 pollen types of dicotyledonous species, 05 of monocotyledonous species and one gymnospermous species (*Platyclusus orientalis*) showed their presence in the atmosphere (Table 1). The total pollen count of each species showed lesser values in the air as compared to the previous season but a marked increase in pollen types has been recorded (Fig. 1).

8.	<i>Alangium salviifolium</i> (L. f.) Wang.	Alangiaceae	Akorha	Tree	En	D(Ga)
9.	<i>Allium cepa</i> L.	Liliaceae	Piyaj	Herb	En	M
10.	<i>Althaea rosea</i> (L.) Cav.	Malvaceae	Gulkhera	Herb	En	D(Po)
11.	<i>Antigonon leptopus</i> Hook. & Arn.	Polygonaceae	Coral creeper	Shrub	En	D(Mo)
12.	<i>Argemone mexicana</i> L.	Papaveraceae	Satyanashi	Herb	En	D(Po)
13.	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Tree	Am	D(Po)
14.	<i>Bergera koenigii</i> L.	Rutaceae	Meetha neem	Shrub	En	D(Po)
15.	<i>Blumea lacera</i> DC.	Asteraceae	Kakranda	Herb	En	D(Ga)
16.	<i>Bombax malabaricum</i> DC.	Bombacaceae	Semul	Tree	En	D(Po)
17.	<i>Brassica</i> sp. L.	Brassicaceae	Sarson	Herb	En	D(Po)
18.	<i>Butea monosperma</i> (Lamk.) Taub.	Fabaceae	Tesu	Tree	En	D(Po)
19.	<i>Callistemon lanceolatus</i> DC.	Myrtaceae	Bottle brush	Tree	Am	D(Po)
20.	<i>Cannabis sativa</i> L.	Cannaceae	Bhang	Herb	An	D(Mo)
21.	<i>Capparis decidua</i> (Forsk.) Edgew.	Capparaceae	Kareel	Shrub	En	D(Po)
22.	<i>Carica papaya</i> L.	Caricaceae	Papita	Tree	En	D(Po)
23.	<i>Carthamus tinctorius</i> L.	Asteraceae	Kusum	Shrub	Am	D(Ga)
24.	<i>Cassia</i> sp. L.	Caesalpiniaceae	Amaltas	Tree	En	D(Po)
25.	<i>Casuarina equisetifolia</i> J. R. & G. Forst.	Caesalpiniaceae	Vilayati Jhau	Tree	An	D(Po)
26.	<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	Sadabahar	Shrub	En	D(Ga)
27.	<i>Chenopodium album</i> L.	Chenopodiaceae	Bathua	Herb	An	D(Mo)
28.	<i>Commelina forskalii</i> Vahl	Commelinaceae	Kankawwa	Herb	Am	M
29.	<i>Coriandrum sativum</i> L.	Apiaceae	Dhaniya	Herb	En	D(Po)
30.	<i>Cucumis sativus</i> L.	Cucurbitaceae	Khira	Herb	En	D(Po)
31.	<i>Cucurbita maxima</i> Duch.	Cucurbitaceae	Sitaphal	Herb	En	D(Po)
32.	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Doob ghas, Durva	Grass	An	M
33.	<i>Dalbergia sissoo</i> Roxb.	Fabaceae	Shisham	Tree	En	D(Po)
34.	<i>Datura metel</i> L.	Solanaceae	Dhatura	Shrub	En	D(Ga)
35.	<i>Delonix regia</i> (Boj.) Raf.	Caesalpiniaceae	Gulmohor	Tree	En	D(Po)
36.	<i>Eclipta prostrata</i> (L.) L.	Asteraceae	Mochkand	Herb	En	D(Ga)
37.	<i>Eucalyptus hybrida</i> Labill.	Myrtaceae	Safeda	Tree	Am	D(PO)
38.	<i>Foeniculum vulgare</i> Mill.	Apiaceae	Saunf	Herb	En	D(Po)
39.	<i>Helianthus annuus</i> L.	Asteraceae	Surajmukhi	Herb	En	D(Ga)
40.	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Gurhal	Shrub	En	D(Po)
41.	<i>Indigofera linifolia</i> Retz.	Fabaceae	Neel	Herb	En	D(Po)
42.	<i>Ipomoea fistulosa</i> Mart. ex Choisy	Convolvulaceae	Beshram	Shrub	En	D(Ga)
43.	<i>Launaea procumbens</i> L.	Asteraceae	Jangaligobi	Herb	En	D(Ga)
44.	<i>Leucas aspera</i> (Willd.) Spreng.	Lamiaceae	Chhota halkusa, Gopha	Herb	En	D(Ga)
45.	<i>Limonia acidissima</i> L.	Rutaceae	Kaith	Tree	En	D(Po)

46.	<i>Lindenbergia indica</i> (L.) Vatke	Scrophulariaceae	--	Herb	Am	D(Ga)
47.	<i>Madhuca indica</i> J. F. Gmel.	Sapotaceae	Mahua	Tree	En	D(Ga)
48.	<i>Malvastrum coromandelianum</i> (L.) Garcke	Malvaceae	--	Herb	En	D(Po)
49.	<i>Mangifera indica</i> L.	Anacardiaceae	Aam	Tree	En	D(Po)
50.	<i>Melia azedarach</i> L.	Meliaceae	Bakain	Tree	En	D(Po)
51.	<i>Moringa oleifera</i> Lamk.	Moringaceae	Sahjan	Tree	En	D(Po)
52.	<i>Ocimum</i> sp. L.	Lamiaceae	Tulsi	Herb	En	D(Ga)
53.	<i>Oxalis corniculata</i> L.	Oxalidaceae	Khat-mitthi	Herb	En	D(Po)
54.	<i>Papaver somniferum</i> L.	Papaveraceae	Afim, Post	Herb	En	D(Po)
55.	<i>Parthenium hysterophorus</i> L.	Asteraceae	Congress grass, Gajar ghas	Herb	An	D(Ga)
56.	<i>Phoenix acaulis</i> Roxb. ex Buch.-Ham.	Arecaceae	Khajeria	Tree	An	M
57.	<i>Platyclusus orientalis</i> (L.) Franco	Cupressaceae	Morpankhi	Shrub	An	Gy
58.	<i>Prosopis juliflora</i> (Sw.) DC.	Mimosaceae	Kabuli kikar	Tree	An	D(Po)
59.	<i>Punica granatum</i> L.	Punicaceae	Anar	Shrub	En	D(Po)
60.	<i>Ranunculus sceleratus</i> L.	Ranunculaceae	Jaldhania	Herb	En	D(Po)
61.	<i>Raphanus sativus</i> L.	Brassicaceae	Muli	Herb	Am	D(Po)
62.	<i>Ricinus communis</i> L.	Euphorbiaceae	Arandi	Shrub	An	D(Mo)
63.	<i>Solanum</i> sp. L.	Solanaceae	Makoi	Herb	Am	D(Ga)
64.	<i>Spergula arvensis</i> L.	Caryophyllaceae	Muchmuchia	Herb	An	D(Po)
65.	<i>Syzigium cumini</i> (L.) Skeels	Myrtaceae	Jamun	Tree	En	D(Po)
66.	<i>Tridax procumbens</i> L.	Asteraceae	Shavanti	Herb	An	D(Ga)
67.	<i>Trigonella foenum-graecum</i> L.	Fabaceae	Methi	Herb	Am	D(Po)
68.	<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Asgandh	Shrub	En	D(Mo)
69.	<i>Xanthium strumarium</i> L.	Asteraceae	Chhota gokhru	Herb	En	D(Ga)
70.	<i>Zea mays</i> L.	Poaceae	Makka	Grass	An	M

Am-Amphiphilous, **An**-Anemophilous, **D**-Dicot, **En**-Entomophilous, **Ga**-Gamopetalae, **Gy**-Gymnosperm, **M**-Monocot, **Mo**-Monochlamydeae, **Mp**-Mode of pollination, **Po**-Polypetaleae.

Total Pollen Types- **70**, Total Grasses- **02**, Total Herbs- **33**, Total Shrubs- **14**, Total Trees- **21**, Total Anemophilous- **12**, Total Entomophilous- **48**, Total Amphiphilous- **10**, Total Dicotyledons- **64**, Total Gymnosperm- **01**, Total Monocotyledons- **05**.

IV. REFERENCES

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