International Multidisciplinary E- Conference On Contribution of Various Aspects In Nation Building
In Association with International Journal of Scientific Research in Science and Technology
Volume 9 | Issue 5 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X (www.ijsrst.com)

An Analysis of Observed Angiospermic Airborne Pollen of Winter 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 lowest concentration of pollen was observed in winter season. On the basis of mode of pollination in winter season 60.05% anemophilous, 33.38% entomophilous and 5.26% 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 rescent 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). Geographical variations are also responsible for pollen abundance (Latorre and Bianchi 1991).

II. METHODOLOGY

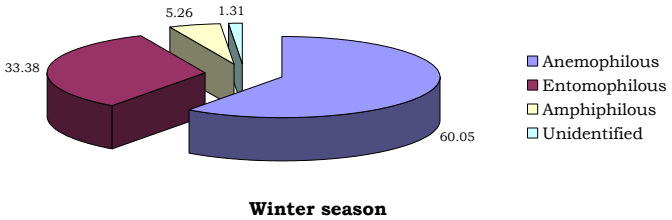
For pollen and spore trap three sites viz., Shikohabad, Firozabad and Jasrana were selected, which are semi-urban, urban and rural respectively and are 15-20 kms away from each other. Pollen sampling was conducted with the help of modified Durham Gravitational sampler which was placed 6.5-8.5 m above 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 miscellenious 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

The Firozabad district experiences four different seasons. Different categories of seasonal vegetation grown in ponds, on waste lands, roadsides, on railway tracks etc. Aerobiota of Firozabad district consisted 28.49% pollen, 60.35% fungal spores, 10.64% other bioparticles and 0.52% unidentified objects during research period. Seasonal vegetation includes the herbs and under-shrubs of the rainy, winter and summer seasons growing in different habitats of the district. The winter season vegetation starts to appear from the month of October because the temperature becomes comparatively low which initiates the germination of seeds of the winter plants. These produce flowers and fruits in the middle or at the end of the winter season. Common winter annuals encountered in the area are *Anagallis arvensis, Argemone mexicana*, *Asphodelus tenuifolius*, *Bergia ammanioides*, *Coronopus didymus*, *Fumaria officinalis*, *Gnaphalium luteo-album*, *Lathyrus sp*, *Lindenbergia indica*, *Medicago denticulata*, *Melilotus indica*, *Oxalis corniculata*, *Potentilla supine*, *Rumex dentatus*, *Sonchus oleraceus*, *Spergula arvensis*, *Stellaria media*, different species of *Vernonia.* The important field crops of this season are- *Avena sativa* (Jai), *Brassica campestris* (Peeli sarson), *B. nigra , Cicer arietinum* (Chana), *Hordeum vulgare* (Jaun), *Linum usitatissimum* (Alsi), *Pisum sativum* (Matar), *Triticum aestivum* (Gehun) and *Saccharum officinarum* (Ganna) etc.

During the winter season (November to January), pollen frequencies show increasing pattern but their counts decreased alongwith the decreased number of pollen types. The maximum pollen count (965) and frequency (22.99%) is of *Cynodon dactylon*– a moderate pollen count whereas the pollen count of *Parthenium hysterophorus* shows an appreciable decline (5.50%). *Achyranthes aspera, Chenopodium album, Ocimum* sp, *Saccharum munja, Sonchus oleraceous* and *Tridax procumbens* pollen types have been commonly observed at all the three sites (Table 1; Fig. 1)

The Pollen Calendar of winter aeropollen has been represented by 46 pollen types. Out of these, only 3 types belong to grasses, 30 to non-arboreal (herbs) and 13 to arboreal (shrubs and trees) species. Further, as regards the nature of pollination 30 species are entomophilous, 12 anemophilous and 4 amphiphilous. *Platycladus orientalis* (= *Thuja orientalis*) pollen was recovered during winters, exclusively.



Winter season

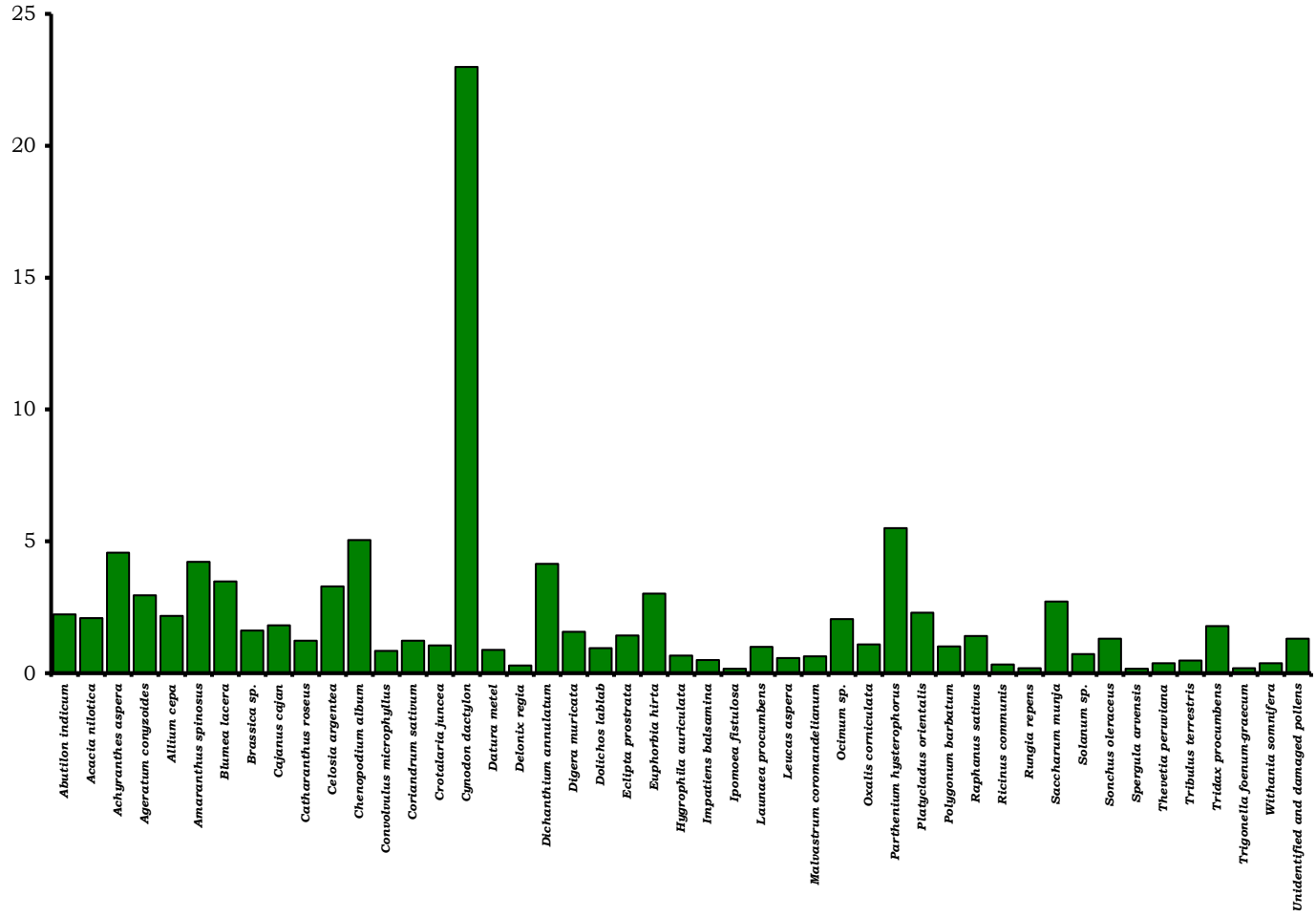


Fig. 8 : Pollen frequencies of different plant species observed during winter season.

Table 8: Aero pollen calendar of winter season.

Sl. No.	Pollen Grains	Family	Local Name	Habit	Mp	D/M
1.	Abutilon indicum (L.) Sweet	Malvaceae	Atibala, Kanghi	Shrub	En	D(Po)
2.	Acacia nilotica (L.) Willd. ex Del subsp.	Mimosaceae	Desi babool	Tree	En	D(Po)
3.	Achyranthes aspera L.	Amaranthaceae	Latjeera, Apamarg	Herb	En	D(Mo)
4.	Ageratum conyzoides L.	Asteraceae	Uchunti	Herb	Am	D(Ga)
5.	Allium cepa L.	Liliaceae	Piyaz	Herb	En	M
6.	Amaranthus spinosus L.	Amaranthaceae	Kantewali chaulai	Herb	An	D(Mo)
7.	Blumea lacera DC.	Asteraceae	Kakranda	Herb	En	D(Ga)
8.	Brassica sp. L.	Brassicaceae	Sarson	Herb	En	D(Po)
9.	Cajanus cajan (L.) Millsp.	Fabaceae	Arhar	Shrub	En	D(Po)
10.	Catharanthus roseus (L.) G. Don	Apocynaceae	Sadabahar	Shrub	En	D(Ga)

11.	Celosia argentea L.	Amaranthaceae	Chilmil, Safed murgha	Herb	An	D(Mo)
12.	Chenopodium album L.	Chenopodiaceae	Bathua	Herb	An	D(Mo)
13.	Convolvulus microphyllus L.	Convolvulaceae	--	Herb	En	D(Ga)
14.	Coriandrum sativum L.	Apiaceae	Dhaniya	Herb	En	D(Po)
15.	Crotalaria juncea L.	Fabaceae	Sanai	Shrub	En	D(Po)
16.	Cynodon dactylon (L.) Pers.	Poaceae	Doob ghas, Durva	Grass	An	M
17.	Datura metel L.	Solanaceae	Dhatura	Shrub	En	D(Ga)
18.	Delonix regia (Boj.) Raf.	Caesalpiniaceae	Gulmohor	Tree	En	D(Po)
19.	Dichanthium annulatum (Forssk.) Stapf	Poaceae	Zarga, Apang	Grass	An	M
20.	Digera muricata (L.) Mart.	Amaranthaceae	Latmahuria	Herb	En	D(Mo)
21.	Dolichos lablab L.	Fabaceae	Sem	Shrub	En	D(Po)
22.	Eclipta prostrata (L.) L.	Asteraceae	Mochkand	Herb	En	D(Ga)
23.	Euphorbia hirta L.	Euphorbiaceae	Laldudhi	Herb	An	D(Mo)
24.	Hygrophila auriculata (Schum.) Heine	Acanthaceae	Talmakhana	Herb	En	D(Ga)
25.	Impatiens balsamina L.	Balsaminaceae	Gul-mehndi	Herb	En	D(Mo)
26.	Ipomoea fistulosa Mart. ex Choisy	Convolvulaceae	Beshram	Shrub	En	D(Ga)
27.	Launaea procumbens L.	Asteraceae	Jangligobi	Herb	En	D(Ga)
28.	Leucas aspera (Willd.) Spreng.	Lamiaceae	Chhota halkusa, Gopha	Herb	En	D(Ga)
29.	Malvastrum coromandelianum (L.) Garcke	Malvaceae	--	Herb	En	D(Po)
30.	Ocimum sp. L.	Lamiaceae	Tulsi	Herb	En	D(Ga)
31.	Oxalis corniculata L.	Oxalidaceae	Khat-mitthi	Herb	En	D(Po)
32.	Parthenium hysterophorus L.	Asteraceae	Congress grass, gajar ghas	Herb	An	D(Ga)
33.	Platycladus orientalis L. Franco	Cupressaceae	Morpankhi	Shrub	An	Gy
34.	Polygonum barbatum L.	Polygonaceae	Jalbahar	Herb	En	D(Mo)
35.	Raphanus sativus L.	Brassicaceae	Muli	Herb	Am	D(Po)
36.	Ricinus communis L.	Euphorbiaceae	Arandi	Shrub	An	D(Mo)
37.	Rungia repens (L.) Nees	Acanthaceae	Kharmor	Herb	En	D(Ga)
38.	Saccharum munja Roxb.	Poaceae	Munj	Grass	An	M
39.	Solanum sp. L.	Solanaceae	Makoi	Herb	Am	D(Ga)
40.	Sonchus oleraceus L.	Asteraceae	Pilidudhi	Herb	En	D(Ga)
41.	Spergula arvensis L.	Caryophyllaceae	Muchmuchia	Herb	An	D(Po)
42.	Thevetia peruviana (Pers.) K. Schum.	Apocynaceae	Peeli kaner	Shrub	En	D(Ga)
43.	Tribulus terrestris L.	Zygophyllaceae	Gokhru	Herb	En	D(Po)
44.	Tridax procumbens L.	Asteraceae	Shavanti	Herb	An	D(Ga)

45.	Trigonella foenum-graecum L.	Fabaceae	Methi	Herb	Am	D(Po)
46.	Withania somnifera (L.) Dunal	Solanaceae	Asgand	Shrub	En	D(Mo)

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

Total Pollen Types- **46**, Total Grasses- **03**, Total Herbs- **30**, Total Shrubs- **11**, Total Trees- **02**, Total Anemophilous- **12**, Total Entomophilous- **30**, Total Amphiphilous- **04**, Total Dicotyledons- **41**, Total Gymnosperm- **01**, Total Monocotyledons- **04**.

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