ALLERGENIC POLLEN GRAINS IN THE AIR OF DISTRICT FIROZABAD AND THEIR IMPACT ON HUMAN HEALTH

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ABSTRACT

The role of pollen grains as a causative agent of respiratory allergic disorders such as asthma and rhinitis is common and very well established. The aim of the present study is the systemic field studies of the known allergenic plants growing in Firozabad district of Uttar Pradesh which cause significant amounts of sensitization in human beings. An aeropalynological survey of the atmosphere at three different sites viz., Shikohabad, Firozabad and Jasrana tehsils of Firozabad district were carried from July 2007 to June 2009. A total 119 pollen types were identified at the family, genus or species level. Of these 66 pollen types are well known allergens responsible for nasobronchial allergy in human beings. Pollen grains of Poaceae were more abundant (42.92%), followed by Asteraceae family (31.49%) and Amaranthaceae/Chenopodiaceae (16.75%). The pollen of herbs (49.97%) was found dominant followed by grasses (26.08%), trees (12.18%) and shrubs (9.95%). The pollen diversity was maximum (70 types) during spring season and minimum during winter season (43 types). October showed highest pollen count (3540) whereas January the least (1178).

Keywords: *Airborne pollen, poaceae, allergy*

INTRODUCTION

The air contains an enormous number of particles of various origins, shapes and size which formed a suspension constituting atmospheric aerosols (Mandal *et al*., 2006). The airborne particles of biological origin which are transported passively with the air current and are responsible for different types of allergies such as hay fever (Garcio-Mozo *et al*., 2006 and Leuschner *et al*., 2000). In India an increase in allergic diseases from 10 to 30 % has been reported from the last several years (Sharma *et al*., 2006). The pollen grains and fragments transported by air generally range between 10-50 µm in size (Perveen *et al*., 2007). The substances present in the atmosphere responsible for allergy are aeroallergens such as pollen and fungal spores, mites, insect fragments and biomass of animals which may initiate allergic responses in susceptible individuals and are the major sources of morbidity among atopic individuals. Such studies were conducted at different places in India by Shivpuri *et al*., (1979) at Delhi, Shukla and Mishra (1980) Singh *et al*., (1981) at Kanpur, Reddi *et al*., (1988) at Vishakhapatnam. The workers have done an aerobiological survey and reported 10-20 types of pollen were the major sources of allergic problems. This study was also initiated during the survey of air pollen spectra to alarm or to preventive measures against allergic disorders in susceptible human beings of the area.

MATERIALS AND METHODS

Firozabad is situated in the western part of Uttar Pradesh at an altitude of nearly 163 m above mean sea level and between 27º, 7N′ and 79E′ longitude. Extensive field surveys on the flora of Firozabad district were carried out for 2 years (July, 2007 to June, 2009) at regular intervals to find out the plant species in relation to their pollination mechanisms and flowering season. The phenology of the plants such as flowering period, mode of pollination, prevalence, nature and habit were recorded along with their local name. For this study modified Durham Gravitational Settling Sampler was used which were placed at height of 20 feet above ground to have free flow of air all around at each site. The slides were exposed for 24 hours. The exposed slides were mounted with glycerin jelly. Pollen grains were counted under light microscope and were identified by comparing them with reference slides prepared by acetolysis methods of Erdtman (1960). Pollens of allergic significance were sorted out and a check list of allergic pollen producing plants is prepared with the help of available literature.

RESULTS AND DISCUSSION

Aerobiological monitoring of the atmosphere of Firozabad district was initiated in July 2007 to June 2009. During the study a total of 66 pollen types from 34 families were identified (Table 1). They are allergenically significant from published literature (Devi *et al*., 1996, Agnihotri and Singh 1971, Chanda and Mandal 1981, Nair and Rastogi 1963, Shivpuri and Singh 1971). The most abundant pollen types originated from Poaceae family (42.92%) represented by *Cynodon dactylon*, *Dichanthium annulatum*, *Digitaria setigera* and *Saccharum officinarum*, followed by Asteraceae (31.49%) represented by *Parthenium hysterophorus*, *Blumea lacera*, *Eclipta prostrata*, *Launaea procumbens*, *Tridax procumbens* and *Xanthium strumarium*, Amaranthaceae/Chenopodiaceae (16.75%) represented by *Achyranthes aspera*, *Amaranthus spinosus*, *Celosia argentea*, *Digera muricata*, *Gomphrena globosa* and *Chenopodium album* . Other dominant pollen types were *Cassia* sp. (6.42%), *Abutilon indicum* (6.22%), *Psidium guajava* (5.70%), *Euphorbia hirta* (5.15%), *Acacia nilotica* (4.87%), *Cyperus rotundus* (4.75%), *Croton bonplandianum* (4.23%), *Argemone mexicana* (4.20%) and *Platycladus orientalis* (4.02%). Apart from all these, there were some whose identity could not be established even at the family level because of their ill defined structure. They were classified as “unidentified”. A high concentration of Poaceous pollen grains in the atmosphere of Firozabad district and its suburbs, probably because of their wide distribution and strictly anemophilous nature. This high representation in the pollen spectrum can be explained partially due to local vegetation and the consecutive flowering patterns of different grass species is responsible for the long pollination period. Similarly, Poaceous pollen grains have been reported to be the most dominant types in aeropalynological surveys by other authors (Celenk and Bicakei 2005, Recio *et al*., 2006 and Mandal *et al*., 2008).

Table 1: List of the known allergenic plants of different families collected from district Firozabad of Uttar Pradesh from July, 2007 to June, 2009 with their Botanical Names, Local Names, Habit, Flowering Period, Mode of Pollination and Prevalence/Nature.

Sr. No.	Taxon	Local Name	Habit	Flowering Period	Mp	P/N
	ACANTHACEAE					
1.	*Adhatoda vasica* Nees	Adusa	Shrub	Oct-Mar	En	**A/Wi**
2.	*Peristrophe bicalyculata* (Retz.) Nees	Missi	Herb	Aug-Nov	En	**Co/We**
	AMARANTHACEAE					
3.	*Achyranthes aspera* L.	Latjeera, Apamarg	Herb	Jan-Dec	An	**A/We**
4.	*Alternanthera sessilis* (L.) DC.	Kanchari	Herb	Aug-Dec	An	**Co/We**
5.	*Amaranthus spinosus* L.	Kantewali chauali	Herb	Aug-Jan	An	**A/We**
	ANACARDIACEAE					
6.	*Mangifera indica* L.	Aam	Tree	Feb-Jul	En	**A/Cu,Wi**
	APIACEAE					
7.	*Coriandrum sativum* L.	Dhaniya	Herb	Nov-May	En	**Co/Cu**
	APOCYNACEAE					
8.	*Catharanthus roseus* (L.) G. Don	Sadabahar	Shrub	Jan-Dec	En	**F/O,We**
	ASTERACEAE					
9.	*Ageratum conyzoides* L.	Uchunti	Herb	Jan-Apr	Am	**Co/We**
10.	*Eclipta prostrata* (L.) L.	Mochkand	Herb	Jan-Dec	En	**Co/Wi**
11.	*Parthenium hysterophorus* L.	Congress grass, Gajar ghas	Herb	Jan-Dec	An	**A/We**
12.	*Tagetes erecta* L.	Genda	Herb	Jan-Dec	En	**Co/O**
13.	*Tridax procumbens* L.	Shavanti	Herb	Dec-Apr	An	**A/Wi**
14.	*Vernonia cinerea* (L.) Less.	Phoolni	Herb	Sep-Mar	An	**A/Wi**
15.	*Xanthium strumarium* L.	Chhota gokhru	Herb	Mar-May	En	**A/We**
	BRASSICACEAE					
16.	*Brassica campestris* L. Prain	Peelisarson	Herb	Jan-Feb	En	**A/Cu**
	CAESALPINIACEAE					
17.	*Bauhinia variegata* L.	Kachnar	Tree	Feb-Apr	En	**F/Cu**
18.	*Cassia fistula* L.	Amaltas	Tree	Apr-Sep	En	**Co/Cu,O**
19.	*C. occidentalis* L.	Bara pawar	Shrub	July-Oct	En	**Co/We**
20.	*C. siamea* Lamk.	Kossod	Tree	May-Aug	En	**F/O**
21.	*Delonix regia* (Boj.) Raf.	Gulmohor	Tree	Apr-Dec	En	**Co/O**
	CANNACEAE					
22.	*Cannabis sativa* L.	Bhang	Herb	Feb-Apr	An	**A/We,Cu**
	CAPPARACEAE					
23.	*Cleome viscosa* L.	Hulhul	Herb	July-Sep	En	**Co/We**
	CARICACEAE					
24.	*Carica papaya* L.	Papita	Tree	Jan-Dec	En	**Co/Cu,Wi**
	CHENOPODIACEAE					
25.	*Chenopodium album* L.	Bathua	Herb	Dec-Mar	An	**Co/We**
26.	*C. murale* L.	Khartua	Herb	Dec-Mar	An	**Co/We**
	CONVOLVULACEAE					
27.	*Convolvulus microphyllus* L.	--	Herb	Mar-Nov	En	**Co/Wi**
28.	*Ipomoea fistulosa* Mart. ex Choisy	Besharam	Shrub	July-Mar	En	**Co/Wi**
29.	*I. purpurea* (L.) Roth	Morning glory	Herb	Dec-Mar	En	**Co/O**
	CUCURBITACEAE					
30.	*Cucurbita maxima* Duch.	Sitaphal	Herb (Cr)	Oct-Nov Mar-Jun	En	**R/Cu,Wi**
	CYPERACEAE					

31.	*Cyperus esculentus* L.	Chichoda	Grass	Oct-Jun	An	**Co/Wi**
32.	*C. rotundus* L.	Motha, Nagarmotha	Herb	July-Dec	An	**A/We**
	EUPHORBIACEAE					
33.	*Croton bonplandianum* Baill.	Kala bhangra	Herb	Jul-Oct	An	**Co/We**
34.	*Ricinus communis* L.	Arandi	Shrub	Nov-Feb	An	**Co/Wi**
	FABACEAE					
35.	*Dalbergia sissoo* Roxb.	Shisham	Tree	Mar-July	En	**Co/Cu**
36.	*Pongamia pinnata* (L.) Pierre	Papri, Karanj	Tree	Mar-Jul	En	**R/Cu,O**
	LAMIACEAE					
37.	*Ocimum tenuifolium* L.	Tulsi	Herb	Feb-May	En	**Co/O**
	LILIACEAE					
38.	*Asparagus racemosus* Willd.	Shatawar	Herb (Cl)	July-Oct	En	**Co/O**
	MELIACEAE					
39.	*Azadirachta indica* A. Juss.	Neem	Tree	Mar-May	Am	**Co/Cu**
40.	*Melia azedarach* L.	Bakain	Tree	Mar-Jun	En	**R/Cu**
	MIMOSACEAE					
41.	*Acacia auriculiformis* A. Cunn.	Babul	Tree	October	En	**Co/Cu,Wi**
42.	*A. nilotica* (L.) Willd. ex Del subsp.	Desi Babul	Tree	July-Feb	En	**Co/O,Wi**
43.	*Albizzia lebbeck* (L.) Benth.	Siras	Tree	Apr- Oct	An	**R/O,Cu**
44.	*Prosopis juliflora* (Sw.) DC.	Kabuli kikar	Tree	Feb-Sep	An	**A/Wi**
	MORACEAE					
45.	*Morus alba* L.	Shahtoot	Tree	Feb-May	En	**Co/Cu,O**
	MORINGACEAE					
46.	*Moringa oleifera* Lamk.	Sahjan	Tree	Mar-July	En	**F/Cu**
	MYRTACEAE					
47.	*Callistemon lanceolatus* DC.	Bottle brush	Tree	Oct-Feb	Am	**A/Cu,O**
48.	*Eucalyptus hybrida* Labill.	Safeda	Tree	Nov, Feb-Mar	Am	**A/Cu,O**
49.	*Syzygium cumini* (L.) Skeels	Jamun	Tree	Apr-July	En	**F/Wi,C**
	NYCTAGINACEAE					
50.	*Boerhaavia diffusa* L.	Santhi, Punarnava	Herb	Jan-Dec	En	**Co/Wi**
51.	*Bougainvillea spectabilis* Willd.	Baganbilia	Shrub (Cl)	Jan-Dec	En	**Co/O**
	PAPAVERACEAE					
52.	*Argemone mexicana* L.	Satyanashi	Herb	Oct-May	En	**Co/We**
	POACEAE					
53.	*Cynodon dactylon* (L.) Pers.	Doobghas, Durva	Grass (Cr)	Jan-Dec	An	**A/We**
54.	*Dichanthium annulatum* (Forssk.) Stapf	Zarga, Apang	Grass	May-Dec	An	**A/W**
55.	*Oryza sativa* L.	Chawal, Dhan	Herb	Sep-Dec	An	**Co/Cu,Wi**
56.	*Pennisetum typhoides* (Burm. f.) Stapf & C.E. Hubb.	Bajra	Grass	Sep-Oct	An	**R/Cu**
57.	*Sorghum vulgare* Pers.	Jowar	Grass	Sep-Oct	An	**Co/Wi**
58.	*Triticum aestivum* L. emend. Thell	Gehun	Grass	Feb-Apr	An	**A/Cu**
59.	*Zea mays* L.	Makka	Grass	Oct-Feb	An	**Co/Cu**
	POLYGONACEAE					
60.	*Polygonum barbatum* L.	Jalbahar	Herb	Sep-Jan	En	**Co/Wi**
	ROSACEAE					
61.	*Rosa damascene* Mill.	Gulab	Herb	Jan-Dec	En	**Co/O,Cu**
	RUTACEAE					
62.	*Murraya paniculata* (L.) Jack	Kamini	Shrub	May-Oct	En	**R/O**
	SAPOTACEAE					
63.	*Mimusops elengi* L.	Maulshari	Tree	May-Jan	En	**Co/O**

	SIMAROUBACEAE					
64.	*Ailanthus excelsa* Roxb.	Arru	Tree	Feb-Jun	En	**Co/O**
	SOLANACEAE					
65.	*Datura metel* L.	Dhatura	Shrub	Dec-Feb	En	**Co/Wi**
	VERBENACEAE					
66.	***Lantana camara* L.**	**Kurri**	**Shrub (Cr)**	**Jun-Sep**	**En**	**Co/Wi**

A-Abundant, **Am**-Amphiphilous, **An**-Anemophilous, **Cl**-Climber, **Co**-Common, **Cr**-Creeper, **Cu**-Cultivated, **En**-Entomophilous, **F**-Frequent, **Mp**-Mode of pollination, **N**-Nature, **O**-Ornamental, **P**-Prevalance, **R**-Rare, **Wi**-Wild, **We**-Weed.

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