



Aeropalynological study of Bhiwandi, Maharashtra, India

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Abstract: Airborne pollen plays an important role in the evaluation of the vegetation characteristics of a study area. Some pollen and spore allergens trigger allergic reactions and diseases and impact negatively on human health. A preliminary survey of pollen constituents of the atmosphere was carried out in the city of Bhiwandi in order to determine the prevalence and Abundance of pollen in the atmosphere. The study reveals that the air is dominated by the pollen Of Poaceae followed by Astereceae and Leguminaceae.

Key words: Pollen, allergens, Bhiwandi, Poaceae, Astereceae, Leguminaceae

INTRODUCTION:

Pollen is an evolutionary development found in highly derived plants-gymnosperms and angiosperms that acts as a vehicle for the transportation of male gametes to ovule for fertilization. Pollination can occur by means of various agencies like the wind (anemophily), water (hydrophily), or pollinators like bats (chiropterophily), insects (entomophily), snails (malacophily), etc. (Manisha Ahlawat *et al*,2010).The respiratory system is the target organ of various bioparticulates and chemical pollutants present in the air. The bioparticulates include pollen, fungal spores, mites, insect debris, etc. Among these, pollen grains are the earliest known allergens and a major cause of allergies historically known as “hay fever” (M. Ahlawat *et al*, 2010). Pollen grains have an array of proteins and glycoprotein which play an important role in the pollen-stigma interaction. But when inhaled by human beings, these proteins pose a great burden on the respiratory tract causing disorders like allergic rhinitis and bronchial asthma. Therefore, monitoring of pollen in the atmosphere (Aeropalynological studies) is important in order to obtain information regarding their types and prevalence along with seasonal and annual variations. The information obtained is used in the preparation of pollen calendars which are of great help to clinicians in the diagnosis and treatment of respiratory allergies. The concentration of airborne pollen grains varies not only from place to place but also within the same area due to both environmental and anthropogenic reasons. In order to

identify the dominant pollen allergens, aerobiological surveys have been conducted in different parts of Bhiwandi. Keeping this in view, the present study was undertaken to survey the atmosphere of Bhiwandi city, for a period of one year (July'18- June'19) and find out the dominant pollen allergens. The data collected will be of great interest not only to the botanists but also to the clinicians and allergic patients. It will help in establishing the correlation between pollen allergens in air and symptoms of hypersensitive patients, thus achieving effective management of allergic disorders. For the effective management of these ailments, detailed information on the type and concentration of airborne pollen is a prerequisite. Therefore, Aeropalynological studies are important to understand the pollen spectrum of different geographical areas (Tripathi *et al* 2004).

MATERIALS AND METHOD:

Description of sampling site:

The survey was carried out in Bhiwandi city located in west Maharashtra. The city is situated 19.296664°N, 73.063121°E. and covers an area of 698.72 sq.km. The population as per the 2011 census is 740,000. For the present investigation, the entire city was selected as a sampling site to carry out the survey. The selection of sampling sites was done with the aim to predict the correlation of pollen concentration with the density of surrounding vegetation, indicating that changes in the floral composition of a given area which has a direct influence on its aeropalynological spectrum.

Pollen Count

The sampling was performed using a slide sampler. Airborne pollen was deposited on micro slides smeared with Safranin-stained glycerin jelly through a slit on top of the sampler. The sampling was carried out for 5 minutes for each site at human height. The pollen concentration obtained was expressed as pollen grains per cubic meter of air.

Pollen Identification

The identification of pollen types was done with the help of reference slides prepared directly from known plants. Continuous observation of the flowering periods of plants in the vicinity has made it possible to access the major contributing sources of each type of pollen appearing on the sample slides. Besides this, pollen atlases available on the internet and published literature were also consulted.

RESULTS & OBSERVATIONS:

As a result of the study, a total of 28 pollen types were identified at the family and genus levels. Of the total types, 12% belonged to trees, 53% to herbs, and the rest to shrubs & Climber.

Relative Percent Contribution**Pollen types identified from the atmosphere of Bhiwandi city**

Sr. No	Name of the Genus	Family	Season	Habit
1	<i>Bougainvillea spectabilis</i>	Nyctaginaceae	Annual	Shrub
2	<i>Ceacalpinia Pulcherrima</i>	Caecalpinaceae/faba ceae	June-October	Shrub
3	<i>Callistemon linearis</i>	Myrtaceae	March -May	Shrub
4	<i>Celosia argenta</i>	Amaranthaceae	Annual	Herb
5	<i>Cleome viscosa</i>	Capparadaceae	Annual	Herb
6	<i>Clerodendron inermae</i>	Verbenaceae	Throughout the year	Shrub
7	<i>Poa pratensis</i>	Poaceae	Perennial	Herb
8	<i>Ipomea asarifolia</i>	Convovulaceae	Annual	Herb
9	<i>Cyperus rotundus</i>	Cyperaceae	Perennial	Herb
10	<i>Hibiscus rosa-sinesis</i>	Malvaceae	Annual	Shrub
11	<i>Lantana aculeata</i>	Verbenaceae	Perennial	Shrub
12	<i>Zizyphus sp.</i>	Rhamnaceae	Annual	Tree
13	<i>Ocimum Sp.</i>	Labiataeae	Annual/Perennial	Herb
14	<i>Agrostis capillaris</i>	Poaceae	Annual	Herb
15	<i>Ixora coccinea</i>	Rubiaceae	Annual	Shrub
16	<i>Clitoria ternatea</i>	Fabaceae /Leguminaceae	Perennial	Herb
17	<i>Quisqualis indica</i>	Combretaceae	Perennial	Climber
18	<i>Pancratium maritimum</i>	Amaryllidaceae	May-June	Herb
19	<i>Vinca rosea/ Catheranthus roseus</i>	Apocynaceae	perennial	Herb
20	<i>Terminalia catappa</i>	Combretaceae	Perennial	Tree
21	<i>Commelia erecta</i>	Commelinaceae	Perennial	Shrub

22	<i>Tridax procumbens</i>	Asteraceae	Perennial	Herb
23	<i>Acacia acuminata</i>	Fabaceae/ Leguminaceae	Perennial	Shrub
24	<i>Albizia julibrissin</i>	Fabaceae/ Leguminaceae	Perennial	Tree
25	<i>Anacyclus pyrethrum</i>	Asteraceae	Perennial	Herb
26	<i>Cathamus tinctorius</i>	Asteraceae	Annual	Herb
27	<i>Cynodon dactylon</i>	Poaceae	Annual	Herb
28	<i>Digitaria ciliaris</i>	Poaceae	Annual	Herb

annual pollen concentration. Of these, Families like Verbenaceae, Fabaceae, Combretaceae, pollen had the maximum contribution, followed by, Palmae, Nyctaginaceae, Amaranthaceae, Rhamnaceae, and Rubiaceae.

DISCUSSION AND CONCLUSION:

During the present study, a total of 28 pollen types were identified with Poaceae, Astereceae, and Leguminaceae as major contributors to the airspora. Apart from these, there were few pollen types whose identity could not be established because of their distorted structure, so they were classified as “unidentified”. Pollen of grasses could not be identified up to the generic level due to their stenopalynous nature. In Bhiwandi city, the contribution of tree pollen was quite high as compared to shrubs and herbs (Molina. R.*et al* 1996) Current status of airborne pollen grains in Kolkata with special reference to Pollen counts not only revealed seasonal variations but also exhibited significant spatial variations. Of the sampling site, the high pollen load is due to its proximity to vacant lands inhabited by annuals and perennial weeds. Moreover, surrounding cultivated fields also contribute significantly to the pollen catch. This shows a positive correlation between pollen concentration and the density of surrounding vegetation as also reported by other workers (Mandal *et al* 2006). Of the total pollen types encountered, pollen belonging to the herbs contributed the maximum to total airspora. The high concentration of this pollen is probably due to the fact that it is a high pollen producer and grows luxuriantly in vacant places and along roadsides. The high representation of pollens belonging to herbs and shrubs in the pollen spectrum is due to their wider distribution long pollination period and strictly anemophilous nature (Tilak, S.T. *et al* 1980). Aeroallergenic pollen’s significant contribution of herbs to the pollen load is because this aggressive colonizer has invaded practically every part of the city and flowers almost throughout the year because of its thermos-insensitive nature. In spite of regular eradication programs carried out in the city, it still shows its dominance. The

aerobiological sampling of different geographical regions is essential to identify the dominant pollen types of an area and assess their allergenicity. The data collected is also of great help to allergologists in identifying the potential allergy risk seasons and thus managing respiratory disorders of local inhabitants. All above-identified pollen can also be used for the preparation of a pollen calendar.

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