

Study of the pollen diversity of the vegetation of Midnapore town during post-monsoon season

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Abstract

The monitoring of plant species of Midnapore town during the post monsoon season revealed that the vegetation cover varies from leaf shedding tree species to herbaceous ground cover and shrubs. These plants shed pollen grains for reproductive purpose that can prove to be potent allergy causing agent affecting human beings. The microscopic study of the pollen grains from various plant species revealed the structural differences and ornamentation which can be utilised for understanding the detailing of pollen adherence. The post-monsoon season marks the onset of cough and cold in many people which is also considered as allergic symptoms. Viral infections during this season change abruptly affects the normal functioning of the body inducing fever, runny nose, etc. these along with allergens enhances the chain effect including rhinitis, watery eyes and respiratory symptoms in atopic patients. This study is aimed to investigate the pollen diversity of Midnapore during post-monsoon season and detailed characterization of the pollen ornamentation pattern.

Pollen grains play an essential role in the gene flow within plant populations. Studying of pollen is important in many ways for assessing environment, including plant–pollinator interactions, biodiversity, and impact of climate and pollution on wild cultivated crops

and communities. Moreover, pollen grains can be called as seasonal air pollutant that can trigger seasonal allergies^{7,16}. According to researchers these pollen allergies are actually “seasonal allergic rhinitis” and sometimes is also mentioned as “hay fever”. Due to its

widespread exposure transmitted through air, pollen allergy is among the most common outdoor allergic disease; one in every seven people in the world suffers from a pollen allergy^{4,10}.

Many people suffer from pollen allergies all the year-round, while others get triggered during certain periods, mostly during pollen showering season. Thus it is utmost necessary to monitor the pollen prevalence in air from different plant species for avoidance and timely treatment of allergic symptoms. Studies of different pollen grains can provide information on spatial and temporal distribution of plant population as well as on the environmental and biological processes influencing them^{4,10}. Moreover it has been mentioned by doctors and researchers that this corona-virus pandemic is exaggerated during the pollinating season and affects the immune-sensitive population markedly^{1,6}. With the exposure to airborne pollen enhances susceptibility to different infection related with respiratory and viral illness^{3,5,15}.

Post monsoon season is mainly the time during when people suffers with different flu³. So a wide dissemination of the potential dire effects of virus-pollen co-exposure ought to be urgently and clearly communicated^{1,6}. That's the reason behind choosing particularly this season for the study. Each geographical region has a succession of different flowering species following the climatic condition of that area. Midnapore, the district town of Paschim Medinipur which is characterized by hard rock uplands, lateritic area, covered with alluvial and deltaic plains is selected for the study region⁸. This area is covered predominantly with Sal

(*Shorea robusta*) and plants of this region are of tropical dry-deciduous type. The local flora of this region is *Bombax ceiba*, *Madhuca latifolia*, *Pterocarpus marsupium*, *Terminalia arjuna*. Most common plantation of this area include *Eucalyptus globulus*, Akashmoni (*Acacia auriculiformis*) and Kaju (*Anacardium occidentale*)^{2,8,10}. Beside this a huge varieties of herbs and shrubs are also found in this region. So the present study was conducted with the aim of studying vegetation of Midnapore town along with providing records of the allergenic potential of the pollens and to analyze pollen type through light microscopy and scanning electron microscopy.

Selection of study area and season :

Midnapore town was selected as the study area based on the wide variety of vegetation and few of their flowering during the post monsoon season (October and November), located at latitude 22.4257°N and longitude 87.3199°E.

Vegetation analysis :

The urban flora made of exotic species of herbs, shrubs and trees were studied. Several tree species with scattered cover of variety of palm species, semi-arid shrubs and herbaceous ground cover were seen. Cultivated crop and ornamental plants also form a distinct part of vegetation cover.

Collection of pollen grains and alkali maceration :

Inflorescence of various herbs, shrubs and trees during flowering were collected,

from which anther lobes were isolated and were stored in -20°C freezer. Pollen material was subjected to alkali maceration. Anthers from various plants were crushed in acetic acid and centrifuged for 15 minutes at 2000 rpm. Pellet after washing was collected and dissolved in 10% KOH solution. It was kept in 80°C waterbath until the solution turns brownish, followed by centrifugation. After the pellet was washed and bleached in HCl, the pollen grains were mounted in glycerine and viewed under microscope.

Structural analysis using Light Microscope (LM) and Scanning Electron Microscope (SEM) :

The ornamentation and apertures of pollen grains of different species were studied using light microscopy and SEM.

The vegetation analysis of Midnapore town provides a wide variety of plant species contributing to the biodiversity. A number of plant species were identified out of which few had been in their flowering period during post-monsoon from which anthers were taken and the pollen grains were analyzed. During the month of Oct. and Nov. the land was covered with some herbaceous species like *Lindernia crustacea*, *Sida*, *Eragrostis tenella*, *Cynodon dactylon*, *Mitracarpus hirtus*, *Tridax procumbens*, *Polypogon* sp., some

Table: The suture types and number of pores and colpi of the pollen grains studied under light microscope

<i>Name of plant species</i>	<i>Suture type</i>	<i>Nature of pores and colpi</i>
<i>Acacia auriculiformis</i>	Porate	3-4 Porate
<i>Clitoria ternatea</i>	Porate	Porate (broad)
<i>Cynodon dactylon</i>	Porate	Uniporate
<i>Cyperus rotundus</i>	Porate	Biporate
<i>Cassia</i> sp.	Colporate	Tricolporate
<i>Crotalaria pallida</i>	Colporate	Bicolporate
<i>Lantana camara</i>	Colporate	Tricolporate
<i>Mimosa pudica</i>	Porate	Almost 6 pores in different angles
<i>Crotalaria</i> sp.	Colporate	Tricolporate
<i>Hibiscus</i> sp.	Porate	Pantoporate
<i>Peltophorum pterocarpum</i>	Colporate	Tricolporate
<i>Delonix regia</i>	Colporate	Tricolporate
<i>Mikania micrantha</i>	Colporate	Tricolporate
<i>Mitracarpus hirtus</i>	Colporate	Tetracolporate
<i>Tridax procumbens</i>	Porate	Pantoporate
<i>Sida</i> sp.	Porate	Pantoporate

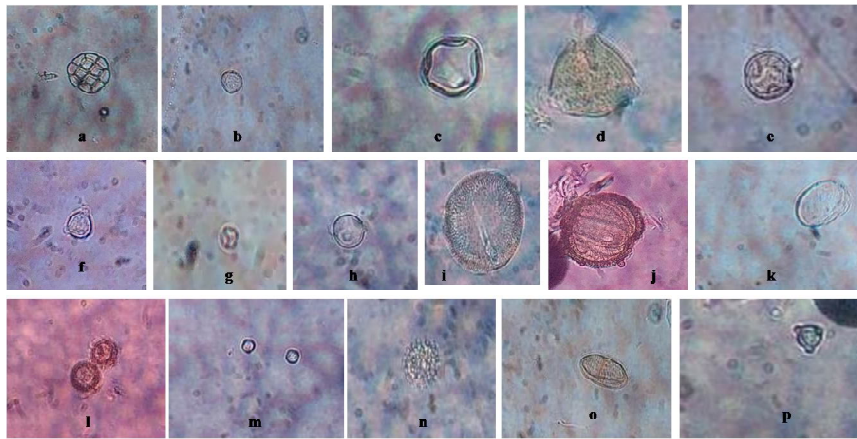


Figure 1: The light microscopic study pollen grains of (a) *Acacia auriculiformis*, (b,e) *Cyperus rotundus*, (c) *Cassia chordata*, (d) *Cassia sophera*, (f) *Crotalaria pallida*, (g) *Mimosa pudica*, (h) *Crotalaria* sp. (i) *Luffa cylindrica*, (j) *Peltophorum pterocarpum*, (k) *Mikania micrantha*, (l) *Mitracarpus hirtus*, (m) *Scoparia dulcis*, (n) *Tridax procumbens*, (o) Grass family, (p) *Sida* sp.

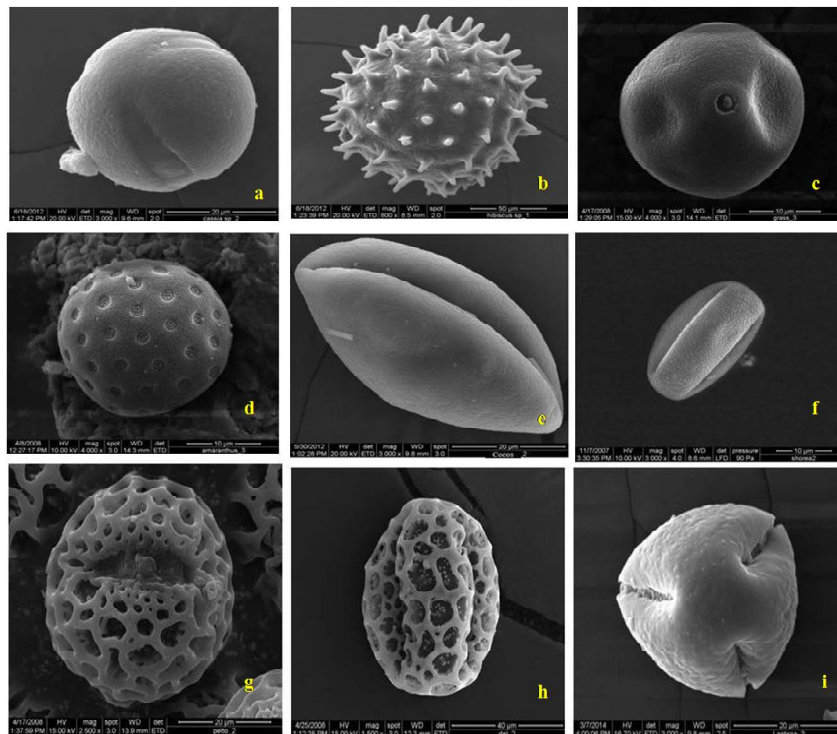


Figure 2: The Scanning electron microscopic study of (a) *Cassia sophera*, (b) *Hibiscus* sp, (c) Grass family, (d) *Amaranthus* sp, (e) *Cocos* sp, (f) *Shorea* sp, (g) *Peltophorum pterocarpum*, (h) *Delonix regia*, (i) *Lantana camara*.

variety of *Cleome* was also noted. Small weeds like *Triumfetta sp.*, *Scoparia dulcis*, *Acalypha*, etc. were also seen.

The typical weather condition of the town mixed with dryness and spotted rainfall during this period supports the growth of shrubs aiding to flowering. Plants like *Hibiscus vitifolius*, *Vernonia sp.*, dense cover of *Mimosa pudica*, *Urena lobata*, *Cassia sophera*, *Lantana camara*, etc. had a good pollen showering period after the monsoons. Hard shrubs like few variety of *Cassia*, *Crotalaria sp.*, etc were also found in flowering condition during this time. Lianas like *Mikania*, *Luffa cylindrica*, *Clitoria sp.* were seen in patches. Chief dry tree species *Sal* and teak were accompanied by other trees like *Bombax ceiba*, *Madhuca indica*, *Ashoka*, *Azadirachta indica*, *Acacia auriculiformis*, *Anacardia*, *Cassia fistula*, *Delonix regia*, *Dalbergia sissoo*, *Peltophorum pterocarpum*, *Terminalia*, etc. Dense cover of some reported allergenic plants like *Eucalyptus globulus*, *Parthenium*, etc. were also noted flowering during this post-monsoon season.

The microscopic study of the pollen grains revealed a lot of detailing that can provide an understanding of the ornamentation of the pollen grains. In the table, the suture types on the pollen grains and their numbers are mentioned. In Figure 1, the light microscopic study provides the top view and side view of pollen grains of few plants denoting the suture types. In Figure 2 the detailing of some pollen grains are shown by the scanning electron microscopic study.

The villagers of the town have an easy access to the forest cutting down trees and

hardy shrubs for using them as firewood is quite threatening for the forest cover converting the dry vegetation to barren lands. Many of the reported plants also regarded as potential allergy causing agents. Moreover, the post monsoon season is regarded as a season of flu and fever which are also the symptoms of allergic hay fever, runny nose with watery eyes and respiratory troubles. This season marks the onset of pollinosis which can exaggerate the cough and cold for many allergenic patients which are still unknown.

The exine ornamentation is clearly visible after the scanning electron microscopic study where in some pollen grains of *Shorea sp*, *Cocos sp*, *Lantana camara* and *Cassia sp*, the outer layer is plain and simple but in case of *Hibiscus sp* the outer layer bears spike like structures. In case of pollen grains of grass family the outer layer is sunken at places, in *Amaranthus sp* pollen a beautiful porous outer layer is seen and in case of *Peltophorum pterocarpum* and *Delonix regia* a honey comb maze outer ornamentation is seen.

Study of pollen grains of local vegetation and their pollination season has immense importance in the multidisciplinary fields of research. On one hand it gives valuable information for plant taxonomy, evolution etc. on the other hand it is important for the study of allergy. Air-borne pollen grains are a major cause of allergy. Preliminary step for this study is the identification of pollen grains and knowledge about their pollination season. Marked increase in cough and cold related symptoms are observed during the post monsoon season in West Bengal. This study provides basic information related to the vegetation and plants flowering during post-

monsoon season as well as ornamentation patterns of various pollen grains. Further study will open up new avenues in the research of pollen related allergies amongst the local population.

I would like to thank the Hon'ble Vice Chancellor of Vidyasagar University for providing me infrastructural facility to carry out the research work.

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