

## AEROBIOLOGY OF SANTINIKETAN, WEST BENGAL

BY

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This paper deals with the atmospheric pollen and fungal spore incidence in Santiniketan, West Bengal during the year 1987. Altogether 38 airborne pollen/spore types were recorded from Santiniketan using a Rotorod Air Sampler. The total airspora trapped in Santiniketan amounted to 2203 with optimum concentration by *Alternaria* (31.32%) followed by *Curvularia* (14.16%), *Cladosporium* (6.03%), *Helminthosporium* (4.45%), etc. Pollen of Poaceae (grass family) have been recorded in highest frequency (11.10%) followed by Amaranthaceae, Asteraceae, etc. This study was performed with a view to formulate a pollen-spore calendar to be used for the identification of suspected aeroallergens from this part of West Bengal.

### INTRODUCTION

The air around us incorporates within it an invisible biomass of particulate materials of plant and animal origin, e.g. pollen grains, fungal spores, wings and scales of insects etc. the study of which is covered by the science of aerobiology. It draws informations from various disciplines like ecology, palynology, mycology and plant pathology, biochemistry, immunology and clinical medicine.

The airborne pollen and spores are known to be the main cause of allergy (hayfever, asthma, eczema, urticaria, etc.) in man, which warrants an understanding of the aerospora as an essential prerequisite to the clinical practice of allergy. The airborne fungal spores are the units of dissemination of fungal diseases and therefore such knowledge is of primary importance in tackling the problem of plant pathogenicity. Sreeramulu (1967) surveyed the aerobiological work carried out in India. Chanda and Mandal (1980) performed the aerobiological work in West Bengal with reference to upper respiratory tract allergy and organic environmental pollution. The present paper deals with the survey of airborne spores and pollen grains in Santiniketan, West Bengal during the year 1987 with a view to formulate a pollen-spore calendar to be used by clinicians for diagnosis of causative allergens.

## GEOGRAPHY AND CLIMATE OF SATINIKETAN

Santiniketan, situated in Birbhum district of West Bengal, have attracted the attention of authors as this is the small pocket of one of the smallest districts of West Bengal which is full of natural resources. Further, the biozone Santiniketan was selected for our investigation because some local people and staff members of Visva-Bharati have reported high incidence of asthma and respiratory disorder, as such the pollen calendar for that area was the most essential prerequisite. The district extends over about 4528.61 sq.km. and is situated between 87°10'' and 88°2'' east longitude and between 23°33'' and 24°35'' north latitude. The district is practically triangular in shape with the river Ajoy at its base and is bisected longitudinally by a railway line which run from south to north. The mean minimum temperature varies on an average from 10°C in January to 26.3°C in July and mean maximum varies on an average from 26.2°C in December to 42.9°C in May. The annual average rainfall is 109.00 mm of which 106.80 mm falls in May, 270.00 mm in June, 258.00 mm in July, 238.00 mm in August and 225.50 mm in September. With regard to the temperature, rainfall and various phases of the life cycles of the plants, the year can be divided into five seasons.

1. *Summer (April-June)* - A dry hot season with low relative humidity and desiccating high winds. May and June are the hottest months of the year. The maximum temperature usually ranges from 38.5°C to 42. °C.
2. *Rains (July-September)*—A warm rainy season with high relative humidity and relatively high temperature. This is the season of monsoon. About 80% of the total annual rainfall occurs during this period.
3. *Autumn (October-November)* - A dry season and is distinguished by moderate temperature, moderate relative humidity and low rainfall.
4. *Winter (December-Mid February)* - A dry and cold season which is characterised by low rainfall but with somewhat high relative humidity. January is the coldest month of the year when the mean minimum and the mean maximum temperature are the lowest, being 10°C to 20°C.
5. *Spring (Mid February-March)* - This is the season when climatic condition are more or less the same as in autumn.

## MATERIALS AND METHODS

Atmospheric pollen and fungal spore trapping was done by the Rotorod air sampler of Perkins (1957). Samples were taken twice daily once in the morning and once in the evening for half an hour. The trapped bioparticles were characterised into pollen grains and fungal spores. The reference slides were used to identify the trapped pollen grains and spores prevalent in the atmosphere of Santiniketan (De *et al* 1988). The kind and distribution of

apertures and various patterns of ornamentation of pollen grains and fungal spores have been considered as the basic criteria for identification. The total area of the slide on which the airspora deposited was scanned to identify and record the number of airborne particles. The counting was normally done by using the 40x objective and 10x eye piece on an Olympus Microscope. The statistical data about the type and frequency of trapped pollen grains were recorded which yielded an image of pollen incidence in the air. It was possible to identify most of the atmospheric pollen grains and spores either up to family, genus or even up to species level. Those grains which could not be identified were collectively termed as unidentified types.

#### RESULTS AND DISCUSSION

The pollen-spore calendar for the period from January-August 1987 showed that the atmosphere of Santiniketan has never been found to be free of pollen and fungal spores. Altogether 38 pollen and spore types were recorded from the atmosphere of Santiniketan by using Rotorod sampler and total pollen/spore trapped was 2203 (Table 1). The maximum contribution was from the fungal spores (67.55%) followed by weed and herbs pollen (11.64%), shrubs and trees (7.61%) and Poaceae (11.80%). The unidentified pollen type contributed a total of 31 pollen with 1.40%.

The most common and dominant fungal spores were *Alternaria* (31.32%), *Curvularia* (14.16%), *Helminthosporium* (4.45%), *Sporidesmium*, *Cladosporium* (6.03%), *Papularia* (4.13%) and *Bispora* (2.90%) etc. The incidence of grass pollen grains (11.80%) in the air is followed by Asteraceae (4.94%), Amaranthaceae, Arecaceae, Chenopodiaceae etc. The family Poaceae being a strictly stenopalynous family, generic and specific identification were not possible. The percentage of grass pollen is 11.8%. The most common wild grasses of Santiniketan are *Cynodon dactylon*, *Eleusine* sp., *Eragrostis* sp., *Setaria glauca*, *Saccharum* sp., *Panicum* sp. etc. The most important tree pollen contribution is of Arecaceae group consisting of *Cocos nucifera* and *Phoenix sylvestris*. The weed and herbs collectively constitute 11.64% of the total airborne pollen. The major contributors are *Amaranthus spinosus*, *Argemone maxicana*, *Chenopodium* sp., *Croton bonplandianum*, *Cyperus* sp., *Parthenium hysterophorus*.

The important tree species are *Acacia auriculiformis*, *Albizia lebeck*, *Casuarina equisetifolia*, *Cassia fistula*, *Eucalyptus* sp., *Lagerstroemia* sp., *Shorea robusta*, *Terminalia* sp. etc and their pollen occur in large number. This study reveals the existence of a very rich aerial biopollutants in Santiniketan similar to comparable surveys conducted in other parts of the country. The atmosphere of West Bengal has never been found to be free of pollen but there are low and high pollen days according to their occurrence (Mandal and Chanda, 1981; Kundu *et al.* 1982; Mandal and Yonzone, 1987; Chanda and Mandal, 1986).

Table 1. Monthly frequency of aerial biopollutants of Santiniketan (January—August 1987)

Pollen/Spore type	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Total	%
<i>Acacia auriculiformis</i>	—	—	—	—	—	—	—	3	3	0.13
<i>Achyranthus aspera</i>	—	—	6	4	1	—	3	3	14	0.63
<i>Albizia lebbbeck</i>	—	—	—	35	9	5	—	—	47	2.13
<i>Alternaria</i> sp.	—	12	34	134	364	107	9	30	690	31.32
<i>Amaranthus</i> sp.	—	—	—	—	11	1	2	10	24	1.08
Arecaceae	—	—	—	5	—	—	—	2	7	0.31
<i>Argemone mexicana</i>	—	—	—	—	9	10	—	—	19	0.86
Asteraceae	7	12	8	41	23	9	5	4	109	4.94
<i>Bispora</i> sp.	—	5	—	—	26	4	9	20	64	2.90
Caesalpinaceae	—	—	—	—	—	2	2	2	6	0.27
<i>Casuarina equisetifolia</i>	—	—	—	—	2	—	—	—	2	0.09
<i>Cassia</i> sp.	—	—	—	—	15	—	1	1	17	0.77
<i>Chenopodium</i> sp.	2	8	7	—	—	—	—	—	17	0.77
<i>Cladosporium</i> sp.	—	5	25	63	14	5	—	21	133	6.03
Convolvulaceae	—	—	—	—	1	1	—	—	2	0.09
<i>Curvularia</i> sp.	16	—	14	2	44	90	34	112	312	14.16
Cyperaceae	—	—	—	—	2	—	6	6	14	0.63
<i>Eucalyptus</i> sp.	—	—	6	—	—	—	3	2	11	0.49
Euphorbiaceae	—	—	—	—	3	1	1	2	7	0.31
<i>Gomphrena</i> sp.	—	—	—	—	—	10	6	—	16	0.72
<i>Helminthosporium</i> sp.	—	—	—	19	33	19	20	11	102	4.45
<i>Impatiens</i> sp.	—	—	—	—	—	—	—	2	2	0.09
<i>Kleinhovia hospita</i>	—	—	—	—	—	—	—	2	2	0.09
<i>Lagerstroemia</i> sp.	—	—	—	—	—	—	—	7	7	0.31
<i>Lantana camara</i>	—	—	5	—	—	—	—	—	5	0.22
<i>Morus</i> sp.	7	2	6	—	—	—	—	—	15	0.68
Papilionaceae	—	—	—	4	—	5	3	—	12	0.54
Poaceae	26	17	39	53	38	17	21	49	260	11.80
<i>Papularia</i> sp.	26	4	1	—	2	6	19	33	91	4.13
<i>Salmalia malabarica</i>	—	7	—	—	5	—	—	—	12	0.54
<i>Shorea robusta</i>	—	—	3	1	1	—	—	—	5	0.22
<i>Sporidesmium</i> sp.	—	—	—	15	27	16	4	1	63	2.85
<i>Tectona grandis</i>	—	—	—	—	—	—	—	8	8	0.36
<i>Terminalia</i> sp.	—	—	—	—	12	3	—	—	15	0.68
<i>Tridax procumbens</i>	—	—	2	—	13	—	—	2	17	0.77
<i>Tetracoccusporium</i> sp.	—	—	4	21	1	4	—	1	31	1.40
<i>Tetraploa</i> sp.	—	—	—	2	3	—	—	2	7	0.31
<i>Xanthium strumarium</i>	—	—	—	—	—	—	2	2	4	0.18
Unidentified	—	—	—	—	11	6	10	4	31	1.40
Grand Total	84	72	160	397	670	321	160	339	2203	
%	3.81	3.26	7.26	18.02	30.41	14.57	7.26	15.38		

It may be concluded that the atmosphere of Santiniketan contains varying quantities of different types of pollen and spores. Pollen-spore calendar shows that the types mark their presence with low or high frequency all the months round. The types exhibit monthly fluctuations and also composition. The study was performed with an object to identify suspected aeroallergens from this hitherto unexplored area.

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