SUMMARY

Aerobiology deals with airborne bioparticles including pollen grains and spores in terms of their sources, release, dispersal, deposition and impact on living organisms. Modern aerobiology has made significant contributions to the study of respiratory allergy. In India more than 10% of the population suffer from allergic disorders (Vishwanathan, 1964). Pollen grains are an important cause of respiratory allergy (Blackley, 1873), which are quite variable in different biozones from season to season, year to year depending on changes in ecological and climatic conditions. Allergen extracts have been in use for the diagnosis and treatment of allergy for over 75 years. So, from clinical point of view, it is important to know the details about the occurrence of pollen load in the atmosphere. Studies on airborne pollen grains have been done by many workers, though there are many associated areas which remain still unexplored. The present investigation was undertaken in an unexplored biozone of West Bengal for quantification of aeroallergen load in the atmosphere and their identification to fulfil the following objectives :

1. An ecofloristic survey of Jalpaiguri town, West Bengal, was carried out to make a list of angiospermous plants showing their habit, mode of pollination, flowering period, etc., which are essential prerequisites for aerobiological investigation.
2. Pollen morphological study of common plants of the local flora was done to identify the airborne pollen grains.
3. Airborne pollen grains of the study area were trapped by samplers and a pollen calendar was prepared to correlate the seasonal occurrence of the pollen types.
4. To determine the influence of meteorological factors on seasonal variation of pollen grains in the air.
5. To study the allergenicity of pollen grains by *in-vivo* (Skin-Prick) tests.

The entire work pertaining to the present investigation has been divided into two broad categories : (1) ecofloristic survey of the study area together with pollen morphological study of some common plants and (2) aerobiological survey in relation to pollen allergy.

In order to evaluate the aerobiological assemblage of Jalpaiguri town, a good knowledge of its ground flora and respective pollen grains were of prime importance. Accordingly, a detailed and systematic ecofloristic survey was carried out based on

visual observations to make a list of plants showing their habit, habitat, mode of pollination, frequency of occurrence, flowering period and climatic condition. A preliminary survey of the flora was done earlier by Choudhury (1969), Mukherjee (1972), Das (1986). Present floristic survey have recorded a total of 709 species under 491 genera and 134 families consisting of 29 monocot and 105 dicot families. In the present survey, Fabaceae was found to be the most dominant family followed in the degree of prevalenced by Asteraceae, Poaceae, Euphorbiaceae, Rubiacae, Caesalpiniaceae, Scrophulariaceas, Cyperaceae, Solanaceae and Verbenaceae. Annual herbs (285 species) was the most dominating flora followed by trees (135 sp.), shrubs and undershrubs (96 species), climbers (67 spp.) and grasses (30 spp.). Entomophilous plants were found to be predominant (477 spp.) followed by anemophilous (157 spp.), amphiphilous (52 spp.) plants. Hydrophilous (5 spp.) and cleistogamous (2 spp.) plants were relatively poor in distribution. Seasonal distribution of the flora showed maximum flowering peak in October (348 spp.) followed by September (315 spp.) and May (308 spp). A total of five species of aquatics were distributed in ponds, canals and rivers. Among 77 species of climbers and lianes, Cucurbitaceae and Convolvulaceae were the dominant families and their contribution to the aerobiological spectrum was less significant, because of their contribution to the aerobiological spectrum was less significant, because of their entomophilous nature. Herbs (annual, perennial and geophytic) were the most dominating flora consisting of 360 species with varied ecological distribution. Grasses (Poaceae) were the third largest family represented by 30 species. The grasses being largely anemophilous with abundant pollen production were found to be one of the large contributors in airborne pollen load. Trees were represented by 135 species which grew profusely along road sides, waste places as wild, cultivated or introduced plants. The vegetation of this area, therefore, is of a humid tropical type. Taking all the factors into consideration, it can be said that the distribution of vegetation was influenced by both biotic as well as geographical factors.

Pollen morphological studies of 108 common plant species of Jalpaiguri town was carried out based primarily on apertural character. It was noted that some taxonomically divergent plant types possessed similar type of pollen grains, thus rendering difficulty in classification, particularly with reference to 3-colporate pollen grains. Similar difficulties were also encountered with stenopalynous families like Cyperaceae, Poaceae, etc., and also with echinate pollen grains of Malvaceae and

Convolvulaceae or pantoporate pollen grains of Chenopodiaceae, Amaranthaceae and Caryophyllaceae. In the present investigation a pollen key was formulates to help in the identification of airborne pollen grains.

In the second part of the study, a two-year (October, 1995 – September, 1997) aeropalynological survey of Jalpaiguri town was carried out using both by Gravity slide and Rotorod Samplers, placed on the roof of a domestic house 4m above ground level. A total of 39 pollen types were identified from Gravity slides and 32 pollen types from Rotorod Sampler represented in terms of annual mean concentration per day per cubic meter of air. In gravity slides the most abundant types originated from Poaceae (18.32 – 18.51%), followed by Asteraceae (6.56 – 7.25%), Solanaceae (4.44 – 6.52%), *Cannabis sativa* (3.36 – 6.32%), *Cassia* sp. (4.45 – 5.16%) etc. in both the years. There was an increase in the total pollen count from first (5833) to the second year (5914), probably due to less rainfall, moderate relative humidity and moderate wind speed. The incidence of all the pollen types in both the years differed slightly. It was found that the pollen grains of shrubs and trees were higher in number in both the years followed by herbs and weeds and grasses. The seasonal periodicities were studied for all the pollen types. The total pollen count changed throughout the year with maximum concentration in between November and February, probably due to moderately low temperature (12.7-27.7^{0}C), low relative humidity (50-82%) and low rainfall (5.0-14.5mm). The minimum concentration was noted during July to August due to heavy rainfall (662.3 – 968.1mm) and high relative humidity (87-88%). So the meteorological parameters like temperature, rainfall and relative humidity probably were responsible for fluctuations in pollen concentration

Using Rotorod Sampler a total of 32 pollen types were identified. April and May recorded the highest pollen count i.e. 736 and 724m^{-3} of air respectively. This was followed by March and June (528m^{-3} each), November (376m^{-3}), October (368m^{-3}) and January (344m^{-3}). Among the 32 identified pollen, Poaceae, *Areca catechu* and Solanaceae were found round the year with varying frequencies. The pollen frequencies in different months demonstrated a relatively significant variation which are probably related to the length of flowering period, pollen productivity and their extent of dispersal.

As per frequency of dominant pollen types, six different distinct pollen seasons were recognized in terms of their respective high value and the corresponding season.

The degree of allergenicity of some airborne pollen grains of Jalpaiguri town was established by skin prick test performed on a varying number of patients with relevant case histories. Out of the 22 tested pollen types 18 common airborne pollen types induced a positive response in skin prick test. The strongest hypersensitivity was produced by the pollen extract of *Saccharum spontaneum* (48.08%), followed by *Azadirachta indica* (45.41%), *Areca catechu* (40.29%), *Cocos nucifera* (35.54%), *Borassus flabellifer* (34.34%), *Eucalyptus globulosus* (30.48%), *Cassia siamea* (30.76%) etc. Some dominant airborne pollen types like *Bombax ceiba, Trema orientalis, Acacia auriculiformis, Chenopodium album* etc., produced little hypersensitivity, whereas some less abundant types like *Azadirachta indica, Eucalyptus globulosus, Cocos nucifera* etc., induced strong hypersensitivity. Pollen extracts of *Melastoma malabathrica, Camellia sinensis* and *Cymbopogon pendulus* were found to be allergenically insignificant.

It was also observed that out of the three $(NH_4)_2SO_4$ cut fractions, the fraction two was found to be allergenically most potent while performing skin-prick test among eight selected pollen types.

Results of the above investigations show that the degree of frequency of airborne pollen grains depends partly on meteorological parameters. A calendar of allergenic pollen grains will be helpful to the clinicians to correlate the patient's allergic attack with the seasonal occurrence. It was observed that *Saccharum spontaneum, Azadirachta indica, Areca catechu, Cocos nucifera, Borassus flabellifer, Cassia siamea* and *Eucalyptus globulosus* were the common airborne allergenic pollen found in air in various seasons showing high positive skin reaction. The present study is expected to be useful for the diagnosis and treatment of sensitive patients suffering from respiratory allergy.