The study of pollen is an important area of research. Various pollen morphological features such as shape, size, geometry, aperture pattern and exine configuration are very conservative features for the taxonomic assessment of plants. Pollen can be captured from the air. The analysis of atmospheric sample provide the presence of pollutants as well as molds, fungal spores and pollen grains as bio-particles; some of which may cause asthma, allergic diseases or respiratory troubles in human beings. In this connection, the study of pollen incidence in the atmosphere through aerobiological survey helped in the preparation of a pollen calendar of a particular area. A pollen calendar can be prepared by capturing the pollen grains from air throughout different seasons of the year with the help of Rotorod Sampler, Burkard Sampler or any other sampler devices. The pollen grains captured from the air are identified comparing the pollen grains of reference slides. The Reference slides of the pollen grains of a particular area are prepared following acetylation methods of Erdtman. Thus, it is possible to prepare a complete pollen calendar of the taxa growing in the surroundings. There are large number of plants growing in wild such as Alstonia scholaris, Catharanthus roseus, Acacia auriculaformis, Moringa oleifera, Carica papaya, Mangifera indica, Brassica campestris, Amaranthus sp. Cassia sp. Argemone mexicana and grasses which are responsible for allergic diseases as reported by many workers. The humid climate set up favours the growth of different fungal spores, a part of antigens. Besides different types of fungal spores, husk of Oryza sativa, Brassica campestris and Sesamum indicum coming from harvesting are causative factors for the expression of the allergic diseases or respiratory troubles to the farmers.

The diversity of flowering plants is also high. So, there is ample scope of work in the Arambagh region for finding out the reason of allergy caused by pollen grains in human beings. From the clinical viewpoint allergy is described as hypersensitivity reaction mediated through immunological mechanisms. Among different classes of immunoglobulin like IgA, IgG, IgM and IgG; the IgE is involved in accelerating allergic reactions in human body. Different workers isolated allergen protein from pollen grains of some plants like Catharanthus roseus, Mangifera indica etc. and they have found the IgE reactivity in animals along with the expression of some hypersensitive symptoms.

Keywords: pollen, taxonomic assessment, pollen incidence, allergy, allergen

Introduction

Hooghly district is located in latitude 22°45’N and longitude 88°45’E. Rivers Darakeswar and Mundeswari constitute main drainage of the district. Due to humid and tropical climatic set up with prolonged monsoon, the diversity of flowering plants in this district is high. Pollen grains, the first cell of gametophyte of angiosperms are disseminated in the atmosphere for the purpose of sexual
There are many plants in the Hooghly district and some rice, mustard, coconut, guava, *Alstonia scholaris*, *Ficus religiosa*, *Duranta indica*, *Moringa oleifera* etc. the pollen grains of which are responsible for allergy. Due to conducive climate set up of this geographical location, the concentration of airborne moulds in this area is high which may cause the respiratory troubles. In general, there is no cure for allergies, but certain treatments using antihistamines, decongestants, combination drugs are applied for the same. The medicines as brand name in the market for the treatment of allergy are Allegra, Fexidime, Telfast, Claritin, Tavist etc. Some medicines having chemical formula like Fexofenadine, Levocetrizin, Voltarin, Fexofenadine, Ambroxol etc. are generally used for the treatment of allergic patients.

The prevalence of allergic disease has increased worldwide during the last decades. Pollen allergy is the most typical form of allergic disease. The increase in its frequency during recent years is most evident. Antiallergens and the environment play an important role in the pathogenesis of respiratory allergies (Ridolo et al., 2007). The environmental factors play an important role in the problem of pollen allergy in large cities. It has been found that the polluted pollen is more effective than non-polluted one, and mature pollen has more allergy potency than immature one. During teaching and research experiences, we have seen that a large number of patients of different parts of Hooghly district, West Bengal, India are suffering from bronchial asthma and other respiratory troubles. There may be several causes such as pollutants, dust, industrial dusts, fungal spores, pollen grains etc. for bronchial asthma and related respiratory troubles. One of the most important reasons of these diseases is pollen allergy. Moreover, there are a good number of Rice Mills in this area, the dust or husk coming from processing of rice may cause the respiratory troubles to the workers of the Rice Mills. Although the study of pollen grains has role in the different fields like Melissio palynology, Forensic palynology, Paleo-palynology, thorough investigation on pollen allergy is still a challenging issue in the society.

**Current status of knowledge: International status**

Now a day's study of pollen is an important area of research. Various pollen morphological features such as symmetry, shape, apertural pattern and exine configuration are very conservative features for the taxonomic assessment of the plants (Perveen, 2006; Bera et al., 2007; Keshavarzi et al., 2012). A number of authors Wodehouse (1935), Erdtman (1952), Rowley (1960), Tsukada (1964), Kremp (1965), Faegri and Iversen (1975), Walker and Doyle (1975), Moore and Webb (1978) and other workers studied the pollen morphology of angiospermic plants. Kholer and Lange (1979) distinguished cereal from grass pollen by LM and SEM. Pollen morphology of 49 species of family Gramineae from Venezuelan mountain have examined by Salgado-Labouriau and Rinaldi (1990) and Salgado-Labouriau et al. (1993). Pollen allergies and airborne pollen were monitored at the University of Rome in 1999 in order to determine the concentration and the quality of air borne pollen belonging to allergenic plants by Caiola et al. (2002). Sanchez-Mesa et al. (2005) reported that the occurrence of symptoms in pollen allergy patients in urban areas might be affected by local environmental factors such as sources of pollution, natural and ornamental vegetation etc. Birch (*Betula* sp.) pollen grains are the main cause of seasonal allergies in northern and central Europe. The allergen particles released from the grains are often well distributed in the air. Due to their size, airborne protein particles can easily penetrate into the lower parts of
...ery airways and may lead to symptoms of asthma (Mohan et al., 2005). In the subtropical climate of South Asia, grasses of the subfamily Panicoideae are common.

The effect of pollen from Gramineae extracts are responsible for local allergy (Potter and Prescott, 2007). D’Arcangeli (2001) of Italy reported the atmospheric pollen season causes hay fever. In China the airborne pollen are the major inhalant allergens, and they can elicit hypersensitivity such as asthma, rhinitis, and hay fever which result from a serial of complicated immune factors in atopic individuals who contact with pollen allergens frequently and there are about 10,000,000 patients with pollenosis in China (Ji-li Gang Liu et al., 1996). According to Caimmi et al. (2012) Cupressaceae pollen allergy is a worldwide winter pollenosis. Exposure to cypress pollen has increased enormously during recent decades, and cypress pollen allergy has become a major health problem, especially in Mediterranean countries.

**Aerobiological studies**

The diversified character of morphs provide an important basis for generic and specific delimitations.

On the basis of aperture and exine ornamentation different pollen types have been recognized in angiospermic taxa by Sharma (1968). In India many workers (1942), Nair (1962), Choudhuri and Malik (1965), Choudhuri (1965) worked out on pollen morphology in some species of Hombaceae. In West Himala Chand (1962, 1966) and Datta and Chanda (1980) conducted study on pollen morphology of some angiospermic plants for its taxonomic assessment. Pal et al. (1993) also conducted cytological investigation in *Ficus religiosa* to assess any correlation between pollen morphology and cytological data. The centre for Biochemical Technology, Delhi has published a book on pollen calendars of 12 different states in India (Singh et al., 1992) which is useful for clinicians as well as allergic patients to establish chronological correlation between the concentration of pollen in air and seasonal allergic symptoms. A pollen calendar is useful for allergy clinics (Tilak, 2012). Pollen calendar is compiled based on data and knowledge obtained from field botanical survey of the area under investigation combined with data from aerobiological survey (Agashe, 2012). Recent surveys carried out in India revealed 20 to 30% of the population suffers from allergic rhinitis and 15% develop asthma (Singh and Kumar, 2004).

Aerobiologists reported that the pollen grains of *Alstonia scholaris*, *Catharanthus roseus*, *Accacia auriculiformis*, *Moringa oleifera*, *Carica papaya*, *Mangifera indica* and *Brassica campestris* are allergenic in nature (Chakraborty et al., 2005; Ghosh et al., 2007; Talukdar et al., 2012). In the agricultural area of Eastern India, *Phoenix sylvestris* Roxb. or date sugar palm is grown or cultivated and seasonal allergic rhinitis is common during the pollen season (Chakraborty et al., 2006). The pollen calendar of Agra was recorded with special reference to allergenic significance. Pollen grains of 35 species belonging to 23 angiosperm families have been identified out of a total catch of 24,220/m³ of air annually. High occurrence of pollen grains in air belonged to Asteraceae (5222/m³) and Parthenium hysterophorus contributed the maximum (17.91%) of the total airspora. Higher counts of pollen were found in ecozones surrounded by agricultural fields, parks and gardens. Patients of bronchial asthma with rhinitis (62.30%) were maximum followed by bronchial asthma (25.61%) and allergic rhinitis (12.07%). Maximum number of patients...
The response between the age group of 31-40 years and females were more sensitive than females. Maximum sensitivity was caused by *Amaranthus spinosus*, followed by *P. hysterophorus*, *Chenopodium album*, *Datura soya* and *Cassia occidentalis* (Chaudhary et al., 2006). *Callistemon roseus* G. Don (CR) or *Cassia nigra* plants are widely grown/cultivated as garden plants in the tropics and subtropics. In spite of its predominantly entomophilous nature, CR pollen had been recorded in the airborne and allergenic (Giloshi et al., 2007).

The qualitative and quantitative analysis of spore and pollen grains present in the spider webs was studied in grasslands by Reddy et al. (2009). A continuous aerobiological survey at Central Calcutta for two consecutive years (1985-1987) was done by using a *Thurber type* Day Recording Volumetric Spore Trap. A total of 65 pollen taxa was identified of which pollen of *Ficus orientalis* showed a maximum frequency (about 66%) followed by Poaceae and Cyperaceae. A pollen calendar was prepared and seasonal periodicities were unraveled. Some entomophilous pollen types e.g. *Delonix regia*, *Hougainvillea spectabilis* were also observed (Hark and Chanda, 2009). A quantitative survey of pollen flora in the atmosphere of Korba-Chhattisgarh, India was done by Shukla and Shukla (2010). Plant pollen is one of the most common causes of seasonal allergic disease worldwide. Mango flower pollen has allergic effects in humans (Halukdar et al., 2012). The study of atmospheric pollen incidence will be helpful for proper diagnosis and treatment of allergic patients.

**Regional status**

An aerobiological survey of Hooghly district was conducted from February, 1999 to January, 2000. The aim of the study was to identify various air borne allergens in the atmosphere. 52 types of pollen grains and 14 types of airborne fungi were recorded from the atmosphere (Tripathi and Chakravorty, 2001). The pollen morphology and exine structure of some plant taxa growing in the area of Arambagh of Hooghly district, West Bengal, India were studied using light microscopy (LM) during the period of September 2012 to February 2013 for the taxonomic assessment of the groups of plants (Bhattacharya-Sasmal et al., 2013). Pollen morphology of the honey samples collected from Arambagh region of Hooghly district, India were studied (Pal, 2005).

**Objectives of the study**

1. Description of the pollen grains of flowering plants in different seasons of the year.
2. Enumeration of the diagnostic features of the pollen grains of a species.
3. Preparation of the pollen identification key of the flora.
4. Monitoring of pollen incidence in the air.

**Significance and social relevance of the study**

To offer an useful pollen calendar of the Hooghly district which may provide pollen season for grasses, weeds and trees in this area. The pollen flora of this district will be an important aid to identify the honey pollen. The pollen calendar can be utilized for enhancement of crop yield. Pollen morphological data will be helpful for the taxonomic assessment of the plants. Monitoring of atmospheric pollen incidence will be helpful for the treatment of allergic patients.

**Conclusion**

Pollen morphological features such as shape, size, symmetry, apertural pattern and exine configuration are very conservative features for the taxonomic assessment of plants. Atmospheric air provides the presence of pollutants, microbes, fungal spores and pollen grains. Different pollen


Choudhuri SK (1965). Pollen morphological studies of the...


