Chapter – I

INTRODUCTION
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The term "Aerobiology" was coined by F.C. Meier of U.S.A. in late 1930. It is defined as a scientific multidisciplinary biological science, which deals with the source, release, dispersion, and deposition of different micro-organisms found in the air and their impact on the ecosystem or life of plants, animals and human beings. (Edmonds, 1979).

Aerobiology can also be defined as a study of bioaerosoles which are found suspended in the air (Davies, 1974). Gregory (1952) used the term "Air spora" to describe the airborne pollen
grains and fungal spores. The term has been extended to include investigations on airborne materials of biological significance by International Biological Programme (I B P). Thus, it is not only the study of microbes but also include the pollution due to gases like smoke dust, radio nucleotides, etc. which exert specific effect on aeromicrobiota (Tilak, 1982). The role of environmental parameters affecting the life is also considered under this newly started branch of life sciences (Singh, 1989).

Aerobiological investigations can be broadly divided into two viz. Indoor or Intramural Aerobiology and outdoor or Extramural Aerobiology. Intramural Aerobiology deals with the problems of contagious disease by airborne materials inside a close system like building, hospital, glass house, etc. while Extramural Aerobiology is concerned with the distribution survey of biological materials in outside environment like fields and forests.

During the early civilizations man has shown interest in pollen and several beneficial properties have been attributed to it. The pollen has been used as useful and accessible parameter in tracing man's cultural history and earth's changing ecology. However, after the mid 19th century airborne pollen has been recognized as detrimental to human health.
Pollen grains are the smallest reproductive structure produced in the anther (the male part) of the seed plants that transfer the male genome to the female organ by various agencies such as wind, water, insects, birds, and human beings, etc. Pollen grains constitute a very small percentage of the spore, yet contributes significantly to pollution. Pollen grains, though constituting a very small percentage of the air spora, is one of the most important natural sources of atmospheric pollution concerned with inhalant allergy and thus, pollen grains found in the air of a geographic area are widely known to be the cause of various allergic complaints like hay fever, eczema, asthma and urticaria. Allergic response to hay fever and pollinosis was generally recognized as the most prevalent and important of all the allergies (Stanley and Linskens, 1974).

The term ‘allergy’ was coined by Von Pirquet in 1906. It was derived from two Greek words ‘allos’ meaning ‘other’ and ‘ergia’ meaning energy (Compton, 1955). In a simple language allergy means development of hypersensitivity to usually harmless substances which subsequently behave as poison for that individual and are called “allergens” (Shivpuri, 1968). The term “allergens” has also been defined as an altered and accelerated reaction of a person to a second or subsequent exposure to a
substance to which his/her body had already become sensitized by a previous exposure (Agarwal & Shivpuri, 1974). Although, allergens are usually harmless substances for normal persons; any contact with them causes an excessive reaction to susceptible persons. The common examples of allergens are pollen grains, fungal spores, algal forms, insect’s parts, houses dust, chemical, etc. (Kasliwal & Solomon, 1958; Baruah & Bora, 1967-68; Smith, 1981). The term “Pollinosis” now has been used to indicate the disorders of seasonal allergy caused by inhalation of pollen grains. Shivpuri (1964) coined the term “Seasonal allergic Rhinitis” in places of “hay fever” to define the symptom complex characterized by itching and watering of the eyes or irritation of throat.

Thommen (1939) formulated five criteria that facilitate the Pollinosis. The characteristics of the plants under these criteria should be:

i) Abundance of plants in a given area
ii) Production of large quantity of pollen
iii) Dissemination of pollen by wind
iv) Production of pollen grains and
v) Presence of allergic pollen.
However, the insect pollinated plants such as Carica papaya and Argemone mexicana could produce respiratory allergic disorders under favourable conditions (Shivpuri, 1964; Shivpuri & Singh, 1971).

The term 'Aeropalynology' was coined by Erdtman (1952) to cover the study of airborne pollen and spores and associated plant material. Aeropalynological studies indicate that pollen grains of a large number of plants are important in the studies of allergy. The distribution pattern of such types of plants in a flora varies with the place of investigation. Shivpuri (1964) found allergenic significance only on a few plants out of 900 plants recorded from Delhi area. Further, the incidence of pollen in the air is directly related to the flowering of plant in ground flora (Kumar & Nair, 1985). Incidence of pollen allergens in an area depends upon the local vegetation and of surrounding area. Airborne Pollen flora varies from area to area and season to season (Baruah & Chetia, 1966, Bora & Baruah, 1980, Shukla & Mishra, 1978; Kundu et al, 1981; Singh, 1987; Banik & Chanda, 1987). In order to identify the offending agents such pollen grains, it is necessary to monitor airborne pollen, their prevalence and emission patterns through systematic air sampling. To assess the relative abundance and blooming phenology of the local plants,
the pollination calendar of the area concerned is a prerequisite (Singh et al, 1979; Singh 1983a; Singh and Singh, 1987).

The aerobiological process comprises of five main steps viz source, release, flight, deposition and impaction. Each step is affected by environmental factors. Thus, aerobiology is a typical interdisciplinary subject with numerous aspects and characterized by continuous interaction between biological components and their physical and chemical environment (Nilsson, 1992).

The close relationship between pollen/ spore frequency and allergy symptoms has been known for more than 100 years (Blackley, 1873). A growing numbers of the population appear to be hypersensitive to pollen grains, spores, and other microorganisms. By long term monitoring the occurrence of these allergens, their dispersal, interaction with environmental factors, annual and seasonal variation, etc. can be made known to the sufferers and their doctor with this knowledge coupled with pollen and spore forecasts. An allergic patient will be in a better position to understand his or her reaction and take measures to avoid unnecessary exposure, take the right medicine in time and thus minimize some of the daily troubles.
Prevalence of major allergic disorders in U.S.A. affects 10% of the population (Vaughan and Black, 1954). According to Patterson (1972) even the two disorder viz., allergic rhinitis and bronchial asthma affect 20% and 3.4% of the population of United States respectively. Further, Solomon (1975) (cited in Shivpuri, 1978) states that 20% of the population of United States suffers from atopic dermatitis more than half of which has co-existing Rhinitis also.

Extensive studies on the airborne pollen grains have been conducted in the USA, UK, other European countries, Middle east countries and Far east countries by several workers (Lyon, Kramer & Evers meyer, 1985). Durham (1935,1944) conducted extensive field surveys of pollen and spore in the atmosphere of North America by employing volumetric and gravity slide methods and collected numerous pollen and fungal spores from different localities. Gregory and Hirst (1957) surveyed the air spora of Rothamsted in U.K. because of its importance in studying respiratory allergy and disease of plants.

In India, a survey carried out in New Delhi by Indian Council of Medical Research showed that about 1% of the urban population suffers from bronchial asthma, whereas at Patna 1.6%
of the urban population and 2.7% of the rural population was found to be suffering from bronchial asthma (Vishwanathan, Modi, Prasad & Sinha, 1965).

According to Shivpuri (1978) at least 15% of the population of India suffers from major or minor allergic diseases at one time or other. The common allergens can be classified into four types Viz.: (i) inhalants (ii) ingestants (iii) contactants and (iv) injectants. The inhalants play a part chiefly in precipitating attacks of respiratory allergy such as Rhinitis or bronchial asthma. The examples are pollen grains, fungal spores, house dust mites, etc.

A study of the atmospheric pollen forms an essential part of all pollen surveys. A single season’s records of the succession of species of pollen which invade the atmosphere of any given locality furnishes a valuable information regarding its hay fever potentialities. Each year the cycle faithfully repeats, with only such minor fluctuations, as may be one to thousand varieties. Consequently, information gained in this way is of much more direct application to the handling of hay fever patients than the most exhaustive botanical studies (Wodehouse, 1965).
The significance of aerobiological studies involving Pollen, fungal spores, mites, dried plant fragments, etc. in tackling problems of respiratory allergy is a well established fact (Sashikumar and Sashikumar, 1998).

Allergy is a local problem. The very first pre-requisite for the diagnosis and treatment of respiratory allergy patient is the knowledge of season and prevalence of the airborne allergens to which the patients of a given locality are exposed with.

An allergen in not the pollen grain itself, but factors located on or within it Allergens in pollen grains contain proteins or glycoproteins which have the properties to elicit the formation in susceptible individual of specific skin sensitizing or reagenic antibodies, through the body's immune system (Chanda, 1992).

According to Rao and Sangeetaa (1992) only a few plants like Amaranthus spinosa, (Amita, 1988), Xanthium strumarium (Jaggi, 1985; Jaggi & Gangal, 1985), Ageratum conyzoides (Jaggi & Gangal, 1987) and Artemisia scoparia (Arora and Gangal, 1988) have been worked out in detailed where the pollen protein were separated to identify the allergenic components.
Dutta et al (1982) reported biochemical analysis of allergenic pollen of *Carica papaya* and *Holoptelea integrifolia* following the method of Lawry *et al*, (1951)

Randhawa and Iyer (1964) employed “the chromatography technique for the qualitative and quantitative analysis of amino acids present in the pollen grains”.

So far, no work has been done on the Aerobiological and Biochemical aspects of Allergenic Plants found in Thoubal District, except Singh and Singh (1987), Singh (1989).

In the light of the above facts, the present investigations was, therefore, undertaken with the following objectives:

1. To study physiography, climate and seasons of Thoubal district and to prepare flowering calendar of the plants growing in the district for identification of air borne pollen grains.

2. To monitor and identify airborne pollen grains (outdoor & indoor) found in Thoubal district and co-relate with environmental parameters.
3. To analyse free amino acids contents of known allergenic airborne pollen grains found in Thoubal district.

4. To develop a meaningful suggestion for the application of the above findings in the diagnosis and treatment of respiratory pollen allergy patients of Thoubal district, Manipur.