



CHAPTER- I

REVIEW OF LITERATURE

REVIEW OF LITERATURE

The atmosphere abounds in micro-organisms and other organic matter including pollen grains and spores. The study of pollen grains and spores in the air is called aeropalynology. It is an applied branch of palynology which deals with study of an array of microbiological matter, among which are the bacteria, viruses, pollen grains, spores and detached parts of plants and animals in atmosphere. Of these, airborne pollen grains and spores have a special significance due to the fact that they are the main cause of certain forms of human allergy, like hay-fever, asthma and rarely eczema.

As early as 1729 Micheli found that clouds of fungal spores are liberated into the air (Committee, 1941), Hogg (1849) Caught germs and spores of fungi on glycerine coated microscope slides. Ransome (1857) filtered air through distilled water. Pouchet (1859) collected the organic matter of the air by means of an aspirator. Pasteur (1860) made aerobiological observations in the Alps at elevations up to 2,000 meters and also sampled the air at lower level by passing it through a nitrocellulose filter. Blackley (1873) collected pollen grains from the air on the adhesive coated microscope slides at Manchester,, England and even attempted upper air tests by means of kites.

Aeropalynology has been reviewed by Hyde (1969). Ogden, Raynor and Hayes have conducted extensive surveys of

air borne pollen (1957-1973) and concluded that large amount of pollen is transported in an orderly fashion from their source of origin but often, the transport is in the form of large discrete clouds. Pollen and spores are found in the atmosphere near its source and this fact should be used for searching possible cause of pollinosis.

The term aerobiology came into use during 1930 as a collective term for studies in air spora, like air borne fungal spores, pollen grains and other micro-organisms. Jacob (1951) elaborated the term to include dispersion of insect populations, fungal spores, pollens, bacteria and viruses. Pollen aerobiology is a science with well defined boundries and has applications in several unrelated fields. Many pollen aerobiologists often neglect the important role of pollen grains as male gametophyte and lay more emphasis on its possible role in allergy.

Aerobiology is the study of air borne micro-organisms in both outdoor and indoor environments, including their transport chemical composition and impact on humanbeings. The air spora could broadly classified into two categories, the intramural and extramural aerobiology. The intramural dealing with the study of microbial population of indoor air while extramural is concerned with that of outdoor air.

An international project for studies of pollen and spore incidence has been recently started (1977) in France. In India (1979) the co-ordinated project has been undertaken for the survey

of pollen and fungal spores at 40 different regional centres which would analyse the composition of aerospora with the ultimate aim of providing data of aeroallergens and plant pathogens to Medical Institutes and Plant Pathologists.

The knowledge regarding the composition of air spora can be said to have started with Ehrenbergs (1872) first published account on the micro-organisms which he had collected from atmospheric dust and Cuningham's (1873) analysis of micro-organic content of air over presidency jails, Calcutta.

In early years of this century it became possible to assess the truth of the ancient belief that the wind brings diseases. Several air spora studies showed that changes in the atmospheric condition like temperature, humidity, rainfall and wind brings about changes in its spore contents. The credit for establishing the subject of microbiology of the atmosphere as a specialised branch, goes to Meier (1933) of United States and Stepanov (1935) of Russia.

Man's interferences in the ecological system has created a need to monitor air spora in order to undertake appropriate measures to prevent serious damage by pathogens, through developing a system to predict the onset and prevent the diseases. The aerobiology which has now developed into a fertile field of research is comparatively recent in its origin and it has evoked world wide interest. The important contributions are of Gregory (1952) and Hirst (1953) in United Kingdom, Pady (1951) in United States Meredith (1961) in West Indies and Sreeramulu (1958) in

India. Ainsworth (1952) studied the incidence of air borne Caldosporium spores in London.

Cammack (1958) studied the factors affecting infection gradients from a point source of Puccinia polyspora which gave a lead to the understanding of air borne plant diseases problem in Africa. The data obtained from the work carried out by Pady et. al. (1969) Jack and Danieel (1974) had been successfully used in adopting control measures of various plant diseases in United States. Green (1976) showed the correlation of air borne rust incolumn with the meterological condition in Canada. Relation between the meterological condition and the air borne fungal flora of the Athens Metropolitan area had been established by Bartzokas (1975). Investigations by Kuribayashi (1952) and Suzuki (1969) on air spora over rice fields in Japan have served a great deal in forcasting the outbreak of rice blast disease.

In Finland, the different meterological factors in relation to the spore production and deposition of Fomes annosus has been studied by Kallio (1873). As early in 1874 Airy has given the microscopical examination of the air borne pollen. Hall (1917, 1918, 1922) has discussed the role of farm weeds and walnut pollen in causing hayfever and has given a list of such plant. Scheppegrell (1917, 1922) has discussed the causes and prevention of allergy in the Rocky mountains and Pacific States and also wrote voluminously on this and asthma. Key (1918) has given the etiology of winter hay-fever, Selifridge (1920) has reported

vasomotor disturbances of the nose with the special reference to the hay fever. Kelly (1928) has given different methods for collecting and preserving pollen to be used in its treatment. Rowe (1928) studied the relation between the flora and atmospheric pollen while Penfund and Efron (1929) formulated a standardized method for analysis of the atmospheric pollen. Subsequently a very large number of authors have investigated the significance of air borne spores in various forms of allergic diseases such as hayfever (Philips 1922, Balyeat 1926, 1927, Balyet and Steman 1927, Duke 1926, 1928, Patterson and Gay 1930) and Asthma (Balyet 1926 , 1927, Balyeat and Steman 1927) Duke 1926,1928). Sultzberger and Weinberg (1930) tried to find out the role of the insect body parts in causing the dermatitis. Wouldhouse (1935) has reviewed most of the earlier literature on pollen and allergy and has given a voluminous account of hayfever causing pollen, their structure, identification and significance in Science and Medicine.

Aeropalynological studies have been conducted extensively, since last 4-5 decades in U.S.A.(Wouldhouse 1935) and other parts of world. Kaphala and Koovikko (1973) encountered the pollen counts in Finland. The effect of different meteorological factors on air spores and the diurnal and seasonal variations of mold spores were determined by Makinen and Ollikainen (1972) in Finland. Makinen (1976) has published the preventive measure for allergic patients, in weekly pollen bulletins. Stix (1963) analysed the pollen and spore content of the air at different places in Western Germany.

Illustrative review of the aerobiological work at Cradiff, since 1942-72 was given by Harvey (1970). Aerobiological studies of the microbiota of Stratosphere were conducted by Imshenetsii et.al.(1973). Investigations of the long distance dispersal of biological materials from Australia to Newzealand had been performed by Close et.al. (1978).

From India, Cunningham (1873) is the pioneering research worker on aerobiological studies over Calcutta. He published his comprehensive work in the form of book entitled "Microscopic examinations of air". After a long gap, Prof. K.C.Mehta of Agra University during 1940 started aerobiological work as studies on air spora in relation to phytopathological problems. Mehta (1940, 1952) tackled the problem of wheat rust in India. His most significant findings were why the rust did not survive in hot summer. He suggested the complete replacement of wheat in hills by some other crops or growing only those wheat varieties which are resistant to rust. After Mehta's (1952) pioneering work, several workers in India do the aerobiological work as systematic studies on air spora. Among the work done from India, wheat rust is the best aerobiologically investigated one. Joshi et.al. (1972,1974, 1975) and Nagarajan and Singh (1973) and Nagarajan et.al.(1976) have concluded that the brown and black rusts of wheat are disseminated from South to Central India. Prasada (1973) have reached to the conclusion that rust in India may have its source in West Asia. Mehta (1940,1952) tackled the problem of wheat rust.

Aerobiology of the vegetable market was investigated by Shastri (1981). Sulia and Khan (1980) surveyed the air spora at Bangalore Market. Recently Bhatia and Gaur (1979) have surveyed the atmospheric spores at Modinagar.

Airspora of Poultry shed is studied by Rati, Jayprakash and Ramlingam (1980). They concluded that the concentration of microbes inside poultry shed was 10-100 times higher than that of adjacent outdoor environment.

Rajan et.al. (1952) from Kanpur was pioneering investigator of indoor aerobiology. Many air borne microbes are responsible for biodeterioration of storage materials, equipments, library materials and archives. Very little attention has been paid to this aspect. Kathapalia (1960) pointed out biodeterioration of library materials by microbes. Tilak and Vishwe (1975) investigated the role of air borne microbes inside library.

Studies in the microbial pollution of air inside a warehouse were carried at Aurangabad to find out the composition of air borne biopollutants, their seasonal variations and incidence of diseases of cereal grains in storage (Tilak and Chakre 1978). Tilak and Kulkarni (1972) investigated the role of microbial organisms in deterioration of paintings at Ajanta Caves. Tilak et.al. (1972) extended the work to Ajanta and Ellora Caves.

Many human allergic diseases such as asthma and seasonal allergic rhinitis are attributed to inhalation of air borne fungal

spores and pollen grains, Shivpuri (1964), Baruan and Chetia (1966), Shivpuri and Singh (1971), Tilak and Vishwe (1980) Chanda (1972,1973) Chanda and Ganguly (1976), Chanda and Mandal (1978), Agarwal et.al. (1969, 1973), Gaur (1978), Nair (1963) Reddi (1974), Chaubal and Deodikar (1964), Agashe et.al. (1980), Appana (1980), Bora and Bauruah (1980) Gupta et.al. (1960), Ramlingam (1966) Shivpuri and Agarwal (1969). In Delhi atmosphere, 38 pollen types were identified by Singh and Shivpuri (1971).

In India, the diagnosis of pollen allergy is due to clinical investigations utilizing pollen spore antigen for the treatment of patients of respiratory allergy and this is mainly through the efforts of workers at V.P.Chest Institute, Delhi and others at Jaipur, Calcutta, Lucknow, and Aurangabad. Shivpuri and Dua (1963) reported in 100 cases of rhinitis and asthma results of 24 pollen antigens. Shivpuri and Singh (1965) further studied on etiology of diagnosis of allergens in patients. Agarwal and Shivpuri (1974) detected 19 fungal extracts of allergic significance.

The work done on qualitative estimation of pollen production especially related to allergic diseases is very little in India. Jankibai and Subba Reddi (1980) reported the quantitative estimation of pollen productivity. Nair and Rastogi (1963) reported the same, Tilak et.al. (1980) reported the role of allergens inside the hospital ward.

Spore dispersal studies were carried out by Sreeramula and Ramlingam (1961) conducting experiments in which known quantities of spores of Lycopodium and Podaxis were liberated. Spore discharge of fungi was studied by Srinivasulu (1967). Recently Tilak (1980) in his key note address has reviewed aerobiological research and training in India.

The work on the algal airspora in India is very scanty. Mittal et.al. (1973,1974) studied the aeroallergenic algae of Delhi metropolitan region. Marathe and Reddy (1980) identified 21 algal types from Nagpur. Tilak and Vishwe (1978) presented a preliminary reports of air borne algae from Aurangabad. Ramlingam reported (1971) five algal types from the air spora of Mysore, Tilak and Vishwe (1978) reported diatoms and Gleospora. Ramlingam (1971) reported soredia of Lichens from air spora of Mysore. Agnihotri et.al.(1978) also investigated from Uttar Pradesh.

Various workers reported the occurrence of various plant and animal parts specially insects. Ramilngam (1971) reported the presence of 10.6% of such particles from air of Mysore. Tilak (1974) from Aurangabad and Tilak and Bhalke (1979) reported various insect scale and parts from Aurangabad.

In Kolhapur the aerobiological work was done by Patil and Kulkarni (1981). They carried out air spora of Hospital. Kulkarni and Kulkarni (1985) investigated the aeromycological survey of Kolhapur City during the year 1976-77. Patil and Kulkarni (1988) investigated the aeromycological survey over the Tomato field at

Nipani. P.D.Chaubal and S.B.Gadve (1979) worked on study of aeropalynology and pollen allergy in Kolhapur Part-II Air borne Pollen flora), Chaubal and Kotmire (1982) worked on aerobiological studies at Kolhapur ,Chaubal and Gadve (1984) investigated study of pollen allergy in Kolhapur during monsoon.

The present investigation is on aeropalynological studies of Kolhapur City mainly on aeromycoflora of seed godown which contains Wheat, Rice and Jowar grains at Shahu Market Yard, Kolhapur.