Chapter I.

REVIEW OF LITERATURE

R E V I E W O F L I T E R A T U R E

Aerobiology deals with study of dispersal of fungal spores, pollen grains, insect scales, algal components etc.. The studies are made both from outdoor and indoor environment.

One of the daily duties prescribed by Aryan scripture is offerings to fire known as "Agnihotra". According to 'Taittiriyanayaka' Agnihotra is performed daily in morning and evening for purification of air in the house and surroundings. The gases produced by burning various substances would kill or inhibit microbes in atmosphere. The need of Agnihotra on the basis of its utility adopting some ultramodern techniques has been stressed through their studies by research institutes in West Germany and few universities of U.S.A..

The credit for establishing the subject of microbiology of atmosphere as a special branch of study goes to Meir et.al. (1933) of United States.

Blackley (1873) from his findings made it clear that the airborne fungal spores were an etiological elements in hayfever and asthama.

Leeuwen (1924) from Holland presented a work in which he claimed that asthama was particularly prevelent in the low lands and it was due to higher concentrations of fungal spores in damp and low lying places.

Honsen (1928) reported several cases of asthama in Germany due to spores of Aspergillus and Penicillium.

Feinberg and associates (1935-37) were the first who made a systematic and comprehensive study of fungal allergy. Further research of Feinberg (1946) and Durham (1947) have established beyond doubt that fungal spores play an important role in etiology of allergy. The choice of fungi is undoubtedly of great importance in the study of fungal allergy hence the knowledge of fungi present in air and their seasonal variation must be investigated.

The illustrative review of the aerobiological work at Cradiff, since 1942-72 was given by Harvey (1970). Aerobiological studies of microbiodata of stratosphere were conducted by Imeshenetsis et. al.

(1973). Investigations of the long distance dispersal of biological material from Australia to Newzealand had been performed by Close et. al. (1978).

Indian aerobiological research has relatively short history.

The first systematic aerobiological work was carried out by Cunningham (1873). His work was quite comprehensive. He analysed microorganic contents of air over Presidency Jail Calcutta. He observed a large number of spores and other vegetable cells which were in living state.

After Cunningham's (1873) pioneering investigations to correlate number and types of airborne microbes and disease incidence there appear a long gap.

Investigations in India later on were mainly initiated by late Prof. K.C. Mehta of Agra College, Agra. He found that rust spores were incapable of surviving during the high temperature of summer in plains of North India. Our present knowledge of the rust of the cereals in India is due to extensive aerobiological researches carried out by Mehta.

After Mehta's pioneering work systematic studies on airspora were initiated by several workers.

Among the plant pathogens wheat rust is the best aerobiologiclly investigated one. Mention may be made of the work done in India by Padmanabhan et. al. (1953), Rajan, Nigam and Shukla (1952), Sanghavi, Sethi and Kasliwal (1957), Sreeramulu and his Co-workers (1958 and onwards), Shivapuri et. al. (1960), Sengupta and Chattopadhyaya (1963), Ramlingam (1966), Mishra and Srivastava (1970), Tilak and Kulkarni (1979), Patil and Kulkarni (1980 and 1988) etc.

Bhatia and Gaur (1979) have pointed out the importance of structural aspects in atmospheric spores. The shape, size, numbers and nature of microbes serve as an important criteria for their availability in the air. They have surveyed the atmospheric spores at Modinagar by exposure of adhesive coated slides and petridishes.

Many human allergenic diseases such as asthama and seasonal allergic rhinities are attributed to inhalation of airborne fungal spores and pollen grains as evident from the work of Shivapuri (1964), Baruah and Chetia (1966), Tilak and Vishwe (1980), Chanda and Ganguly (1976), Agarwal et. al. (1969 and 1973), Gaur (1978), Nair (1963), Reddi (1974), Chaubal and Deodikar (1964), Agashe et. al. (1980), Ramalingam

(1966). The importance of pollen grain as allergens has been emphasized and pollen calendars of various regions have been prepared (Sanghavi et. al. 1957, Shukla and Mishra 1980).

Airborne fungal spores responsible for allergic disorders have been investigated by Gupta et. al. (1960), from Jaipur, Chitaley and Bajaj (1973, 1974, 1975) from Nagpur region, Tilak (1974) from Aurangabad, Agarwal et. al. (1969) from Delhi, Vishnumitre and Khandelwal (1973) from Lucknow and many others from different parts of India.

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.

In Delhi the result of skin test with 24 pollen antigens in 100 cases of rhinities and asthama were reported by Shivapuri and Dua (1963). Further studies on etiology of diagnosis of offending allergens in 200 patients have been conducted by Shivapuri and Singh (1965). Agarwal and Shivapuri

(1974) detected 19 fungal extracts of allergic significance.

Very little work has been done in India on quantitative estimation of pollen production especially related to allergic diseases. Mandal and Chanda (1977) have been reported pollen production in Antirrhinum majus. While Janakibai and Subba Reddi (1979) have reported the quantitative estimation of same plants with reference to pollen productivity. Nair and Rastogi (1963) reported pollen production in some allergenic plants.

The work on the algal airspora in India is very scanty. Mittal et al. (1973, 1974) studied the aeroallergenic algae of Delhi metropolitan region. Tilak and Vishwe (1978) presented a preliminary report of airborne algae from Aurangabad. The absence of algae at higher attitudes can passively be explained due to heavier nature of algal propagules than those of bacteria and fungi. Ramlingam (1971) reported five algal types from the airspora of Mysore. Agnihotri et al. (1977) investigated the lichen components of airspora with reference to allerginicity in hilly district of Uttarpradesh.

There are number of reports of the occurrence of various plants and animal parts specially insects in the atmosphere. These includes epidermal hairs, Xylem elements and fibers, collenchyma, sclerenchyma, parenchyma cells and other tissues. Ramlingam (1971) reported presence of such particles from air of Mysore. Tilak (1974) reported such plant parts from air of Aurangabad.

Many airborne microbes are responsible for biodeterioration of storage materials, equipments, library materials and archives. Very little attention have been paid on this aspect. Rajan et. al. (1952) from Kanpur were pioneering investigators of indoor aerobiology.

Lynderberg and Archev (1931) first pointed out that indoor air is one of the worst cause of biodeterioration of library books even when it is too dry or too wet. It was equally dameging. Increase in humidity is favourable for growth of molds and mildews which cause loosing of paste and glue, weakening of fibers of paper and leather.

Studies on airspora inside green house were carried out previously by Pady and Karmarkar (1961). Concentrations of such biopollutants were maximum in

early hour of morning compared to evening. it may be due to high humidity inside the green house. It was observed that the incidence of these biopollutants were relatively higher in all indoor environment.

Studies in the microbial pollution of air inside a warehouse were carried at Aurangabad to find out the composition of airborne biopollutants, their seasonal variations and incidence of diseases of cereal grains in storage. Tilak and Chakare (1979), Tilak and Kulkarni (1972) investigated the role of microbial organisms in deterioration of paintings at Ajantha caves. Tilak et. al. (1972) extended the work to Ajantha and Ellora caves.

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

Aerobiology of vegetable market was investigated by Shastri (1981). The close relation between concentrations of spores in the air, meteorological factors and affected vegetable is interesting. Sulia and Khan (1980) surveyed airspora of Banglore market.

The house dust contains mold spores. Their importance in dust allergy has been a subject of controversy. Voorhorst et al. (1964) clearly pointed out for the first time the importance of house mites as major allergen in the house of man and confirmed by skin test.

Tilak et. al. (1980) reported the role of allergens inside the hospital wards. Tilak, Tailab and Bhasale (1980) reported the correlation between the airborne pollengrains and clinical results. Tilak, Babu and Tailab (1980) carried out survey of allergenic fungal spores inside the hospital wards at Government Hospital Aurangabad.

The present investigation deals with the study of microbial content inside the library of Willingdon College, Sangli.

The deterioration of library collections by microorganisms has attracted the attention of man in recent years. It has been a serious problem from ancient times. The effects are directed towards reduction of these losses by finding out conditions, causes and environmental factors which contribute to the biodeterioration of books and the binding material like leather, rexin and cloth.

For recording the progress of mankind books have been in use for centuries and exchanging information in future also.

The chief fibers in use today are cotton, flax (liner) hemp esparto straw and wood. In raw state all except cotton are improved form of cellulose, usually lignocellulose and need some form of chemical treatment to liberate the fibers in the form most suitable for making a good quality paper.

Depending upon the nature and environmental conditions paper is subjected to attack from several sources. Which can be broadly classified as physical, chemical and biological. Heat, moisture, sunlight, dust and dirt are physical sources which are known to damage the paper and cause the deterioration. Similarly acidic and other gases present in the air and deleterious chemicals added during paper manufacturing are responsible for affecting storage life of paper.

The cause of deterioration of records are three fold i.e. unfavourable storage facilities, careless handling and ill protection. Some other factors like the presence of light, too much of dry or

damp atmosphere, fluctuating levels of temperature and dust elements.

The injurious insects, white ants or termites, bookworms, fungus, silverfish causes deterioration of books and paper.

The biological agents and their role in biodeterioration of library materials have been reviewed by Greathouse (1950), Gallow (1963) and Flyate (1968). According to these workers fungi, bacteria and actinomycetes are the major agents.

The presence of actinomycetes in library has been reported by Kowalik and Sadurska (1956) and Beijakova (1961), Aleksi (1965) reported species of 18 fungi on stored manuscripts.

According to Gregory (1973) microbial concentrations in indoors varies greatly with amount of mechanical and human activity. In library some fungi destroy cellulose decomposing binding materials, leather and plastic materials (Armitage, 1949; Kowalik et al., 1962).

Plumbe (1964) stated that fungal spores are always present in the atmosphere of library. On getting favourable conditions they proliferate on book covers and cause deterioration.

The biological agents in relation to deterioration of books inside the library have not been studied thoroughly.

In India Kathapalia (1960) and Mukharji (1973) first showed the deterioration of papers by activity of microorganisms.

The biodeterioration agent inside the library were first investigated by Tilak and Vishwe (1975). Tilak et. al. (1981) collected 11 types of biodeteriorant inside library which are suspected to cause deterioration of books studied at Aurangabad.

Fungi on papers and books belong to the species of Alternaria, Monilia, Fusarium, Chaetomium, Myrothecium, Torulla, Cladosporium, Rhizopus, Epicoccum, Aspergillus, Paecilomyces. Most of these are active cellulose decomposing. Many are also pigment forming and stain paper usually with yellow, brown and black spot. Some form colourless colonies but action of fungi is very slow and require several months for damage to be detected by ordinary means. Fungi are also associated with foxing and brown spotting.

Bose and Yadav (1973) have shown the biological deterioration of cellulosic material of

library book is caused by enzyme cellulase and it is correlated with cellulolytic activity of organisms.

So the main intention of the present work is to record the aeroflora inside library building of Willingdon College, Sangli, their effects on books and the persons visiting library very often.