

Chapter IV.

DISCUSSION

D I S C U S S I O N

Aerobiological investigations are broadly distinguished as indoor or intramural and outdoor or extramural depending upon the studies of a closed system or in open space like fields and forests. Another way of studying aerobiology is botanical aerobiology dealing with dispersal of microorganisms causing plant diseases, dispersion of pollen causing allergenic reactions on animals or human beings; medical aerobiology dealing with influence of pollen, spores, mites, dusts on human beings and animals and transmission of bacteria and viruses; technical or industrial aerobiology of which outdoor studies are concerned with influence of air pollutants on the environment and indoor studies concerned with effect on human beings and the experimental aerobiology dealing with fundamental concepts like mathematical formation, development of methods, instrumentation and method of modeling of aerobiological systems.

An entirely new field of research of the application of aerobiology has merged in relation to biodeterioration of materials in stores, equipments,

paintings and frescoes and library materials in which the substrates and organisms interact. The investigations of Hueck (1968), Eggins (1968), Wessel (1954), Ionita (1973), Lazer and Dimitru (1972), Mukherjee (1973) and Tilak and his associates (1972, 76,77) have greatly contributed to this enterprising aspect. The biodeterioration includes mildewing or rotting, mechanical damage, staining or spoilage of materials etc. The analysis of the composition, seasonal variations and the concentration of various types of biodeteriorating microorganisms in the indoor air and the microflora during packing, storage and transit are gaining greater importance.

In spite of radio, television, the cinema and other diversions and entertainment public demand for library service has grown enormously because of acceptance of libraries as central in education and research, community development and nation building programmes. It is therefore, most necessary that the library administration has to enable the readers to enjoy and extract the maximum benefit from libraries. The libraries have to be maintained in a decent condition for the people who use them.

The libraries have an addition to books

different periodicals, journals, newspapers etc. for reading and references. This represents the life-long labour and researches undertaken by philosophers, soges, scientists and literatures. It is a difficult task of librarians to preserve this treasure of knowledge which is in the form of written record.

The books like human beings have got a body and soul. The body is represented by the material of which it is made i.e. the paper, the binding and the ink. The actual thought content to be found in the written pages of the books is the soul of the book. The soul remains safe as long the body is in good condition. So the books demand proper care.

The paper, parchment, tracing, cloth, leather and ink are the main constituents of a book.

The paper which is the chief constituent of a book is made up of plant fibres. The chief fibres in use today are cotton, flax (linen), hemp, espanto, 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 fibre in the form most suitable for making a good quality paper to make it more attractive, some glue is

used on the surface. The length of these fibres determines the mechanical strength of paper. Long fibres are found in good quality paper.

The cellulose which constitutes 50% or more of the cell wall material of plants represents the major portion of vegetable organic debris. The fungi are active agents in the destruction of organic debris and help in removal of organic waste the returns of CO₂ to the atmosphere which is needed for plants in photosynthesis and formation of humus. Thus fungi through their digestive and respiratory activity are beneficial to man. But they are equally ~~dis~~asterous in paper industry as it is problem of combating fungus activities at every step in the process of paper manufacturing, starting with the living tree itself which provide the fibres necessary in the paper industry. The paper used in book manufacturing may some times be badly damaged by fungi. According to Greathouse (1950), Gallow (1963) and Flyate (1968) fungi, bacteria and actinomycetes are the major agents of biodeterioration of library materials. They form pigments and stain the paper usually with yellow, brown and black spots. They are also associated with foxing and brown spotting.

Certain fungi possess the cellulose digesting enzyme commonly referred to as cellulase. De Bary (1886) first reported this enzyme which has capacity to dissolve the plant cell walls. Ward (1888) and Behrens (1898) confirmed De Barry's findings. Despite the many failures encountered in the isolation of cellulase, its occurrence in many fungi is an established fact. Gallow and Burgess state that about half of the "commonly occurring fungi" possess the capacity for digesting cellulose. In their survey of the cellulolytic activity of 453 cultures of fungi (majority of which were fungi imperfecti) White and others (1948) obtained similar findings.

Today, cellulose digesting species have been demonstrated among the large groups of fungi except the Myxomycetes. The extent to which Phycomycetes digest cellulose is also uncertain. Among the fungi that digest cellulose most rapidly are members of the Ascomycetes (e.g. species of Chaetomium) and the Basidiomycetes.

See (1919) isolated fungi from paper and books and found them to be species of Chaetomium, Myxotridium, Eidamella, Aspergillus, Acrostalagmus, Spicatia, Cephalothecium, Stachybotrys, Dematium,

Cladosporium, Stemphyllium, Alternaria, Stysanus and Fusarium. Sattory and others (1935) reported that species of Cladosporium, Fusarium, Aspergillus and Monilia and a actinomycete may cause destruction of paper and that such organisms produce yellow, brown, black or colourless spots on manufactured paper known as "Foxing". The action of such fungi is reported to be very slow, as much as two years elapsing before any damage can be detected. Verona (1938) also studied the deterioration of paper and books by fungi and named new species of Phoma, Coniosporium and Cephalosporium which he had isolated from such materials.

To protect the contents from moisture and growth of fungi, the papers are coated with asphalt which is assumed to be fungicidal or at least fungistatic. But these papers are even found to be damaged by fungi and Gray and Martin (1947) have isolated 19 fungi of the genera Penicillium, Aspergillus, Chaetomium, Sepedomium and Trichodesma.

Not only the paper is deteriorated by activity of these fungi but Armitage (1949), Kowalik and Sadurska (1956) and Niuksha (1961) observed that fungi play an important role in spoilage of binding material, leather and plastic material.

The investigations in India on deterioration of papers by the activity of microorganisms were known by the works of Kathapalia (1960), Mukharji (1973) and Tilak and his associates 1981, 1984. Their observations show that organisms causing decomposition of cellulose included Chaetomium, Myxotrichum, Epidamella, Aspergillus, Spicaria, Cephalothecium, Torula, Stachybotrys, Cladosporium, Alternaria and Fusarium. Most of them were well known for their cellulose destroying activity and pigment formation which stain paper yellow, brown and black.

The main intention of the present work is to record the biopollutants inside Willingdon College, library Sangli.

It was interesting to note that the percentage contribution of common cellulose destroying fungi in the air inside library was (11.12%).

The spore population during monsoon in general was maximum (42.52%) followed by winter (31.68%) and summer (26.65%). During monsoon the spore concentration was high due to optimum temperature (24.40°C) and humidity (60.55%). With increase in the rainfall and hence humidity inside library the spore concentration inside library shows corresponding

increase. Thus it was observed that the rainfall and hence the relative humidity inside the library show direct relationship with increase in spore concentration.

For the most part, the common infectious diseases of the man are caused by bacteria and viruses. While the majority of plant diseases are caused by fungi. It is interesting to note that air borne fungal spores when inhaled produce allergic symptoms in sensitive individuals without growing or reproducing in the heart tissues. Such spores are wide spread and frequent in the atmosphere. The first comprehensive aerobiological investigation with reference to fungal spore allergy was that of Kasliwal et al. (1955) reporting air borne fungal spores or mycelial fragments responsible for respiratory allergy in sensitive individuals. According to Tilak (1989) Rhizopus, Chaetomium, Pleospora, Rust spores, Smut spores, Alternaria, Aspergillus, Cladosporium, Curvularia, Epicoccum, Helminthosporium, Nigrospora, Stemphyllium are the fungi having highly allergenic nature.

In the present investigation most of these allergic fungal spores are recorded inside Willingdon College library. As part of investigation for any

allergic reaction of these fungal spores, some persons visiting the library regularly and those working in the library for not less than 20 years were interviewed. Fifty percent of them were not suffering from any allergic reaction of these air borne fungal spores. Rest of the 50% were either suffering from temporary skin irritation or respiratory asthma whenever the concentration of these spores increased in the air inside library. Most probably these air borne fungal spores and hyphae might have been responsible for these allergic reactions.

In addition to fungal spores and hyphae the air inside library also contain insect parts, insect scales, algal fragments, epidermal hair and plant fibres. It is well known that some insects are the sworn enemies of books and include cockroaches, white ants, silver fish, termites and beetle. They destroy the paper as well as binding of the books and hence responsible for book deterioration.

The librarians have to be fully conversant with these knotty problems so that they can take the proper care of the books.