

REVIEW
OF
LITREATURE

Aerobiology has been ever increasing interest by botanists, plant pathologists, genetists, meteorologists, etc. as it is an integrated multidisciplinary approach. History of aerobiology has enterprising aspects. Hippocrates, the father of medical science, was aware of that, men were attacked by epidemic fever when they inhaled air infected with such pollutants are hostile to the human race. This was the first instance that gave an idea about atmosphere as a corridor for microorganisms.

The term aerobiology came into use since 1930's as a collective term for the studies of airspora which constitutes airborne fungal spores, pollen grains and other airborne microorganisms in the atmosphere. Now a day much more work has been done on aerobiology. But the study of airspora shows connection with ancient literature. In 'Ayurveda' and 'Atharvaveda' which dates back about 1000 B.C., it has been clearly suggested that inhalation of contaminated air causes respiratory diseases. Aryan people performed daily an event known as 'Agnihotra' in the morning and evening; for purification of air in the house and surrounding area. Thus the ancient literature has touched the concept of modern aerobiology. Lucretius (55 B.C.) was the first one to suggest the effect of contaminated air in causing respiratory diseases. Even in Vedas (1500 – 500 B.C.) from India, are references of plant diseases and their preventive measures.

Recent studies in the field of aerobiology have its origin in the pioneering experiments of Spallazinni (1776) and Louis Pasteur (1861). Louis Pasteur proved in his classical experiments in combating theory of spontaneous generation of life and developing germ theory of diseases. Several groups of investigators with varied objectives, has gathered a large amount of information on microbial population of atmosphere, now commonly designated as 'Airspora'.

At present, the existing knowledge on the airspora composition can be said to have started from 1870's when Ehrenburg (1872) first published information on the microorganisms, which he has found in the atmospheric dust. Then Cunningham (1873) analyzed micro-organic content of air over Presidency Jails, Kolkata. After that, Miquel (1883) was the first who made long term survey of atmosphere by volumetric method. Hesse (1984, 1988) used a volumetric apparatus for air sampling in Germany.

Meier Fred C. (1933) of U.S. Department of Agriculture has got the credit for introducing the term 'aerobiology' and establishing this science as a specialized branch. Also Stepnov K.M. (1935) of U.S.S.R. made extensive research on this field.

International Status of Aeromycology: -

As the fungal spores are responsible for the plant diseases and allergies to plants, animals and human being, now a day's much more attention is given from aeromycological point of view. Extensive studies have been made to understand the airspora by Gregory (1952), Hirst (1953) at Rothamsted U.K; Pady and Kramer (1960) at Kansas U.S.A. and Meredith (1962) at Jamaica, West Indies.

Hamilton (1959) reported daily occurrence of pollen and fungal spores in the air over London using Hirst Spore Trap. Davies (1969) surveyed the frequency of pollen and fungal spores in the atmosphere of Britain city. Eversmeyer and Kramer (1987) surveyed vertical concentration of fungal spores on wheat field near Manhattan, U.S.A. at different heights using volumetric sampler. E L Ghazaly and Fawzy (1988) and Halwagy (1988) in Kuwait studied the analysis of air borne bioparticulates using volumetric sampler.

Indian Status of Aeromycology: -

In India, the first systematic aerobiological work was carried out by Cunningham (1873) in Kolkata city. His work was published in the form of book entitled as "Microscopic Examination of Air".

Cunningham studied a large number of spores and other vegetable cells in living states, but he was unable to show relationship between the number and types of air borne particles and prevalence of so called 'Zymotic diseases'. After his pioneering work, late Prof. K.C. Mehta, Agra College, Agra, initiated systematic studies on airspora during 1940's. Mehta (1940 -1952) carried out extensive studies on cereal rust and hence our present knowledge of rust of cereals is due to researches carried out by Mehta.

Later on much more systematic studies on airspora was done by several workers like Padmanabhan et al.(1953), Rajan, Nigam and Shukla (1952), Sanghavi, Sethi and Kasliwal (1957), Konger and Baruah (1958), Sreeramulu et al. (1959

onwards), Sengupta (1963), Ramlingam (1966), Mehrotra and Claudius (1968), Tilak and his coworkers (1967 onwards), Mishra and Shrivastava (1969), Chanda S. (1978), Pathak et al. (1978), Ramakrishna Reddy (1987), Agashe et al. (1988), Verma et al. (1990), Raha and Bhattacharya (1997). Recently, Sharma (1994), Singh (1994), Reddy (1995), Zahid et al. (1997), Kakade and Saoji (1996), Patel (2002), Giri et al. (2003), Vittal (2004), Reddy (2005), Tilak (1996, 1998, 2005), Tiwari et. al. (1991, 1995, 1997, and 2004) and Hogale (2008) were carried out aeromycological studies. The origin of recent studies in Aerobiology had its origin about a century ago. However the science of Aerobiology has emerged as specialized branch only in last 40 years or so.

Status of Aerobiology in Maharashtra: -

In Maharashtra state the aeromycological studies were first time carried out by Karla and Dumbery (1857). They conducted the survey of composition of airspora at Pune. Later on substantial work was done by Karnik (1962), Chaubal and Deodikar (1964), Tilak and Srinivasulu (1967), Talde (1969), Tilak and Kulkarni (1978), Chitale and Bajaj (1975), Gaikwad (1974), Pande (1976), Mane (1978), Vishwe (1979), Chakre (1979), Lakhe (1980), Shastri (1981), Mulik (1982), Babu (1983), Pillai (1983), Bale (1984), Khot (1985), Bhate (1986), Ramchander Rao (1987), Mrs. Siddiqui (1988), Mrs. Modak (1989), Mahabale (1990), Bapat (1991), Kotwal (1992), Baviskar (1993), Aher (1993), Nagia (1994), Pardeshi and Sathe (1995), Khilare (1996), Qudsia (1997), Deshmukh (2000-02), Tiwari et.al. (2004), Khedkar (2005), Mundhe (2005), Prabhudesai (2006), Chavan (2006) and Hogale (2008).

In India much more work has been carried out in the study of airspora of both Extramural and Intramural locations. In Intramural Studies, many workers investigated number of closed systems. Pioneering investigations of Rajan et al. (1952) from Kanpur, Kathapalia (1960) detected the role of microbes in biodeterioration of library materials, for the first time in India. Tilak et.al. (1980) studied the problem of deterioration of wall paintings of Ajanta and Sculptures of Ellora at Aurangabad to find out microbial biodeteriorants. Jogdand (1987) conducted intramural investigation of house dust mites by undertaking house dust survey, clinical investigations & seasonal variations.

Allergic disorders are prominent in Indian subcontinent. Agarwal and Shivpuri (1974), Agarwal (1966), Bhati and Gaur (1979), Tilak et.al. (1974-80), Agashe (1980) has carried out extensive work regarding this at Delhi, Lukhnow, Kolkata and Aurangabad. M.Babu (1983) has carried out extensive work in this field at Aurangabad. The data in Relation to hospital indoor biopollutants is collected by Patil and Kulkarni (1981), Mulik (1982), Chaubal & Kotmire (1983) and Patil (1988). Khilare (1996) studied the aerobiology of four indoor spots at Kolhapur city. Hogale (2008) studied aeromycology of four different spots from Karad and adjoining area.

The Extramural studies have been carried out with reference to diseases of Wheat, Rice, Jowar, Bajara, Sugarcane, Cotton, Banana, Sunflower, Citrus, Groundnut, Potato, Mung and vegetables like Tomato, Brinjal, etc. by various investigators. Sreeramulu and Seshavataram (1962) studied the airspora of paddy field at Pentapadu. Agarwal and Gupta (1966) studied airspora over chili field near Agra. Kulkarni (1971) reported airspora over some vegetable and sugarcane fields of Aurangabad. Gaikwad (1974) studied airspora of sorghum field at Ahmedpur. Pande (1976) reported airspora over the orange field at Nanded. Mane (1978) reported airspora over bajara field at Vaijapur. Lakhe (1980) worked on airspora over jowar field at Udgir.

Khot (1985) carried out aeromycological studies over some vegetable fields at Ambejogai. Mrs. Deshpande (1992) also studied airspora over sunflower and Groundnut field at Ambejogai. Baviskar (1993) reported airspora over groundnut field at Chalisgaon. Sewaliker (1995) also studied airspora over wheat and maize fields at Aurangabad. Nagia (1994) reported airspora over sunflower field at Mumbai. Study of airspora over groundnut and sunflower field at Jalgaon were carried out by Pardeshi (1995). Qudsia (1997) studied airspora over vegetable fields at Aurangabad. Ambore (2003) studied airspora over maize and wheat fields at Kanchanwadi, Aurangabad. Munde (2005) studied airspora over sunflower and chili at Parli Vaijanath.

Aeromycological work carried out all over world:-

The quantitative assessment of pathogen in air by aerobiological techniques has been found valuable for disease forecasting system. A successful attempt was made by Berger (1969) to forecast *Cercospora blight* of Celery in Florida by using

spore trap record. Berger (1970) also studied the epidemiology of *Helminthosporium* at Florida sweet corn. Likewise the studies of Meredith (1971), Pady et.al. (1963), Schenck (1968), Burleigh et.al. (1967), Jack et.al. (1974) have been successfully used in adopting control measures of various plant diseases in U.S.A.

Meredith (1962), Lawrence and Meredith (1970) studied airspora over banana which are useful in protection of Banana plantation in Jamaica. Investigations of Kurubayashi et.al. (1952) and Suzaki (1969) served a great deal in forecasting the outbreak of rice blast disease.

Aeromycological Work in India:-

Aeromycological investigations in India were confined to economically important crops and cereals as well as to study the allergic nature of fungal spores. Among the plant pathogens, wheat rust is the best acrobiologically investigated one. The pioneer study was made by Prof. K.C. Mehta in (1942-1952). He investigated three rusts of Wheat and Barley by using aero scopes.

Seshavatham (1965) reported content of dust liberated during threshing of paddy. Agarwal and Gupta (1966) studied *Alternaria* and *Colletotrichum* over Chilli fields near Agra. Gregory (1973) observed special dispersion mechanism about some spores i.e. those spores show aggregation of several spores forming one dispersal unit. This mechanism was shown by the spores of *Alternaria*, *Aspergillus*, *Cldosporium*, *Phoma*, *Penicillium* and smut spores. Nagarjan and Singh (1976) developed a method to predict appearance of stem rust of wheat about a month in advance prior to appearance in the field. Shonai and Ramlingam (1979) have conducted detailed aerobiological and epidemiological studies on various diseases of sorghum.

Mallaiah (1989) detected an aerial dissemination of *Cercospora* species using spore trap. He also studied seasonal & diurnal changes of the aero allergens over groundnut fields. Sharma (1994) studied incidence of fungal spores in the air of Guwahati. Singh and Singh (1994) have reviewed the aerobiology of vegetable diseases from Manipur. Jagannathan and Gaikwad (2003) studied safflower fields for *Alternaria* leaf spots.

Aeromycological studies carried out in Maharashtra:-

In Maharashtra, major work on aeromycological studies has been carried out at Aurangabad as compared to other regions. Both the Intramural and Extramural airspora have been studied by number of workers from Aurangabad region. Tilak and Bhalke (1981), Aher (1993) studied Aeromycology of Aurangabad. Tilak (1982) reported the occurrence of 38 ascospore types from airspora of Aurangabad of which 26 constituted new report to the airspora.

Mulik (1982) studied different fungal spores from library area at Satara. Tilak and Jogdand (1987) investigated incidence, percentage contribution, seasonal variation and the role played by rust and smut spores as pathogens on jowar crop. They also studied atmospheric concentration of Uredospores over jowar field and showed its relevance with the disease incidence. Chaubal and Kotmire (1983) studied various fungal spores at Kolhapur city. Patil & Kulkarni (1988) carried aeromycological survey over tobacco field from Nipani. Patil A.S. (1988) studied aeromycology of Library at Karad region.

Tilak and Jogdand (1989) investigated aerobiology, epidemiology and forecasting of some jowar diseases like leaf spots caused by *Puccinia*, *Curvularia*, *Alternaria*, *Ascochyta* and *Helminthosporium*, ergot caused by *Claviceps*, seed mold caused by *Curvularia*. Khilare (1996) studied fungal airspora of Kolhapur city. Kakade & Saoji (1996) studied the fungal airspora of vegetable and fruit market during Monsoon season at Nagpur city.

Patel (2002) studied the Aeromycology over some vegetable fields of Maharashtra. Ambore (2003) studied the Aeromycology of some crops in Kanchanwadi, Aurangabad. Chavan (2006) studied Aeromycology over the rice field at Raigad; Konkan. Singh (2006) has focused attention on aerobiological approach to fungal diseases of cereals (Rice, Maize), pulses, vegetables (Tomato and Mustard, Cabbage and Potato) and crash crops like Sugarcane. Hogale (2008) studied the aerobiology of Karad city and adjoining area.