Aerospora and plant growth: Concepts and implications

Ingle Dnyaneshwar
Research scholar,Botany Shri JJT University, Jhunjhunu, Rajasthan
Dr.Mushtaq Ahmad Khah
Guide Department of Botany, Shri JJT University, Jhunjhunu, Rajasthan
Dr.R M Kadam
Co-guide Department of Botany M. G. Mahavidyalaya, Ahmedpur

Abstract:-Aerobiology is a branch of biology that studies organic particles, such as bacteria, fungal spores, very small insects, pollen grains and viruses, which are passively transported by the air. It is a discipline, which takes in to account the atmosphere transport of the microorganism causing bio deterioration, allergy and disease in animals and plants. The aerobiological observations are useful to interpret processes proceeding in biology, meteorology and ecology but also these disciplines are of great help in understanding of aerobiological processes. Aerospora are wide spread all over the world and high environmental burdens have been affected by various factors, such as wind, moisture, and temperature and air pollution on aerospora this leads to various changes with respect to aerospora species and quantities from one season to another. The concentration of airborne air born spores has been linked to wind, humidity, temperature rainfall, altitude, vegetation and various contaminations. The present study will investigate the effects of aeroflora on the growth and yield of plants in agricultural fields. The study would also try to reveals effects of pollutants of the responsible for the generation of aerospora. The aerospora studies are being carried out continuously and will also be helpful for allergy patients, allergologist, agriculturist, plant pathologist and related worker in the field.

Keywords:-Aerospora,Growth,Fungi,Spores,Plants

Introduction: - Aerobiology is a scientific and multi-disciplinary approach focused on the transport of organisms and biologically significant materials (Edmonds and Benning off The air surrounding us forms a major part of the global ecosystem and, depending upon its constituents, it regulates the quality of the environment. It has long been known that there are different types of particles present in the atmosphere. These particles may be biological (for example, pollen grains, fungal spores, viruses, actinomycetes and other bacteria, fern and moss spores, algal colonies, plant fragments, small seeds, protozoa, mites and insect fragments) or non-biological (for example, soot, diesel exhaust particles ashes, sand and mineral fragments such as silicate minerals). Aerobiology is a scientific discipline that deals with the transport of organisms and biologically significant materials through the atmosphere (Isard and Gage, 2001). Aerobiology also encompasses the generation, uptake, translocation, dispersion, viability, deposition and infection/infestation of seeds, viruses, fungi, bacteria and other agents, including insects such as aphids and mosquitoes, which act as virus vectors. Finally, this discipline deals with agriculturally significant insects such as locusts, bush flies and moths. Aerobiology is mainly an experimental science and it is interdisciplinary, with applied aspects. It involves the interests of allergists, plant pathologists, microbiologists, entomologists, palynologists, mycologists, air pollution specialists and biometeorologists. Aerobiology is basically concerned with the study of airborne organisms, with their sources; take off, dispersal, deposition and their effects on other organisms, a sequence termed the aerobiological pathway (Edmonds, 1979) and the effect of environmental factors on each of these stages. Broadly Aerobiology is classified into two categories i. e. Indoor or Intramural Aerobiology and Outdoor or Extramural Aerobiology. Intramural Aerobiology deals with the problems of contagious allergens and storage pathogens in a rather closed atmosphere.

Extramural Aerobiology concerns with dissemination, dispersion and consequences of microbial components in the outside air. The airborne particles released from its substrate or environment in different ways are transported up in the atmosphere due to turbulence and air currents. The concentration of particles in a volume of air above the ground depends on the amount of particles release from the source per unit time, on the meteorological conditions. It has been found that intramural aerosols have a large range that is smaller than in outdoor air. In many work environments very high total counts have been found which are much higher than usually found in outdoor environments. The composition and concentration of the airborne flora shows great variations depending on geographical locality, meteorological situation, time of day and sampling techniques used (Gregory, 1973). When a microorganism becomes airborne the immediate fate of the particle largely depends on the local meteorological conditions. The turbulence is dependent on the ground topography, the temperature in the air mass and the wind speed. Deposition mechanisms can be either dry or wet. Most wet deposition occurs as a result of washout by rain. The efficiency of raindrops to capture spores depends on the size of the spores and the raindrops, the rate and duration of rainfall, as well as the depth of the precipitation and spore layers. Wet and dry depositions are closer in number than has been suggested by their relative deposition rates because there are many more dry hours than wet hours. Spores delivered during rain will be more likely to initiate disease because leaves will be wet and infection can begin immediately. The uncertainty in estimating the rate of wet deposition is large and it is difficult to ascribe to this mechanism a representative role (Smith, 1981).The fungal spores and hyphal fragments are commonly recorded in the air and are important for the survival and subsequent continuation of generations. Many of the fungal spores are endowed with unique structures and capacity to survive under unfavourable environmental conditions and this probably accounts for the predominance in the air. Numerous airborne organisms, fragments as well as particles of biological origin passively float in the atmosphere. Small insects, bacteria, viruses, plant pollen, Diasporas fragment of tissue and such organic compounds mycotoxins or allergens can be found in the air. Along with temperature and relative humidity, the UV component of solar radiation,which is the most lethal, controls survival of spores in the atmosphere. Most spores, which will be transported through the atmosphere and deposited within a few hundred kilometres of the source, remain with the mixed layer of the atmosphere (Clarke *et al*., 1983)

Airborne Pathogens and Allergens:-The classification of airborne pathogens and allergens is broadly defined here to include all microbes that can transmit diseases by the airborne route, all allergenic airborne microbes, and all organisms or microbial products that cause respiratory disease or cause respiratory irritation. Pathogens are parasitical disease-causing infectious microorganisms. Allergens are microbes or materials from microbes and other organisms that induce allergies or allergic reactions. Respiratory irritants are a loosely defined class of microbes or agents that cause temporary symptoms and are considered here to be included under a broader definition of allergens. Although most airborne pathogens and allergens cause respiratory diseases, some may cause other types of infections like skin diseases, eye and ear infections, and even some gastrointestinal infections. The single defining characteristic of these agents is that they are transported in whole or in part by the airborne route, either by natural or man-made mechanisms. Airborne microorganisms consist of viruses, bacteria, fungi, pollen, and sometimes protozoa. Bacteria can be subdivided into bacterial spores and nonsporulating bacteria. Bacterial spores include an important class of bacteria called actinomycetes. The remaining allergens and respiratory irritants are not microbes but consist of material or parts of organisms that include dust mites, dander, insect allergens, toxins, mycotoxins,endotoxins, and *microbial volatile organic compounds* (MVOCs). Three microbial groups, viruses, bacteria, and fungi, include all the airborne

pathogens and many of the most common airborne allergens. No protozoa have been identified as being a major airborne hazard. Pollen, dust mites, and dander form a separate group of allergens and respiratory irritants.

Plant growth against aerospora:-Airspora constitutes fungal spores, pollen, bacteria, hyphal fragments, insect's scales, etc. Some of them are toxic and causing serious health hazards in human being, as well due to their higher concentration in the air creates environmental pollution. Among them fungal forms were taken into consideration to find out the status of various types of allergic and pathogenic spores at various places and their role in causing health hazards to plants and human beings. In vegetables and fruit market, airspora contain mostly fungal spores which are known to cause the diseases to vegetables and fruits and various allergies to human beings.

Shukla et al. (1978) while studying the phyllospheremycoflora colonizing the leaf litter of sal reported that the fungal population was low in summer and winter, and was highest in the early rainy season. The importance of rising temperature and decreasing relative humidity for the decline in spores during summer has also been emphasized by Sharma &Dwivedi (1972). *Alternariaalternata,* the major contributor, along with *Aspergillusfumigatus*, occurred throughout both years of the study but they were abundant in summer. Gupta et al. (1960) also reported that *Alternaria* exhibited a peak in March-April at Jaipur, and Vishnu-Mittre&Khandelwal (1973) recorded it to be maximal in May at Lucknow. These workers, however, did not identify *Alternaria* up to a specific level. *Aspergillusfuniculosus. Curvularialunata* and *C. pallescens* were recorded to occur in high concentrationsin the rainy season. Jogdand (1984) reported greatest concentration of ascospores over others during rainy season while investigating aerospora on Jowar crop.

Conclusion:-Some of these fungal spores are allergenic causing diseases to human and plant also while some pollen grains are also allergenic. Appearance of these particles is characteristic and metrological useful factor. By knowing the period and allergenic characteristic one can prepare a personal calendar to avoid allergenic diseases as well as meteorologically forecasting the weather conditions and to control the plant diseases.

References

1.Clarke, J. F., Clark, T. L., Ching, J. K. S., Haagenson, P.L., Husar, R. B. and Patterson, D. E. 1983. Assessment of model simulation of long-distance transport. Atmos. Environ., 17:2449–2462.

2.Edmonds R.L. and Benninghoff W.S., (1973) Aerobiology and its modern applications, *Ann. Arbor. Mich.* S., 1-18.

3.Edmonds, R. L. 1979. Aerobiology - The ecologyal systems approach. Dowden Hutchinson & Ross In. Pennsylvania. pp. 336.

4.Gupta. K. D., Sogani, I**.** C. ***8:***Kasliwal, R. M. 1960. Survey of the allergenic mold spores at Jaipur. - Ind. J. Chest Dis. 2: 237-241.

5.Sharma. P. D. &Dwivedi. R. S. 1972. Succession of microfungi on decaying *Setariaglauca*Beaur. - Trop. Ecol. 13: 183-201.

6.Shukla. A. N., Tandon. R. N. & Gupta. R. C. 1978. Phyllospheremycoflora colonizing the leaf litter of sal (*Shoriarobusta*Gacrtn.) in relation to some of the environmental factors. - Trop. Ecol. 19: 1-6.