INTRAMURAL INVESTIGATIONS OF AIRBORN MYCOFLORA OF POULTRY FARM AT NAGBHID (MS), INDIA

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Abstract: Intramural aeromycological investigations have been carried out by using volumetric Tilak Air Sampler for a period of six months from June 2016 to November 2016 in indoor environment of Poultry farm in Nagbhid region. Sixty nine spore types belonging to class Phycomycotina, Ascomycotina, Deuteromycotina, Basidiomycotina and other types have been encountered. Half year findings revealed *Aspergilli* 41.3% to be dominant followed by *cladosporium*18.21 % *Basidiospores* 4.71 % *Nigrospora* 3.65%, *Alternaria* 3.5% and *Helminthosporium*1.21%, *Haplosporella* 1.09%, *Diplodia* 1.8% to be less respectively. 21 types of*Ascospores* which were present from July to September 2016 due to rainfall 164mm, higher relative humidity 85% and Moderate temperature 22°C and absent in the Nov 2016.*Ascospore* act as bio-indicators for the rain fall increase in RH and decrease in temperature thus environmental parameters play very important role in the occurrences of aerospora.
Class wise percentage contribution of aerospora in the order of dominance have been revealed Deuteromycotina 49.82% followed by Ascomycotina30% other types 6.67%, Basidiomycotina 4% and Phycomycotina 2% however myxomycotina members have not been found during the study period. The occurrence of aeromycoflora in intramural environment due to high humidity and suitable temperature for their growth and dispersion.

Keywords: Aeromycology, Intramural environment, Mycoflora, Bioindicator, Nagbhid.

Introduction: Aerobiology is a scientific and multidisciplinary approach focusing on the source, release, up-lift, transport, deposition and impact of organisms and biologically significant materials which affect plants, animals and human beings (Tilak1987).The airborn fungal spores are adapted to transfer by means of air in greater extents comparatively to any other biological components which are transferred by wind such as pollen, insect, bacteria etc.Due to inhalation of aerospora toxicity is caused such as aspergillosis, allergic asthma, and some of saprophytic fungi are opportunistic pathogens which cause's skin diseases or any other internal organ diseases. Because of this they are termed as bio-contaminants, although they are indicator of pollution. (Ananthanarayan and Panikar, 2009).Dust particles including variety of microorganisms i.e. fungi producing spores, pollen grains get airborn are called Aeromicrobiota or aerospora.Aerospora implicating with changing environment and lifestyle act as significant cause of allergy. With the alarming increase in allergic disorders, such as allergic rhinitis, bronchial asthma and atopic dermatitis covering as high as 30% of the population world over, there is an increasing interest in the study of incidence, concentration and movements of bioparticulate matter in the earth atmosphere and their impact on human health. These aerobiological investigations carried out in Maharashtra through the school of Aerobiology by prof. Tilak, who was honoured as father of Indian Aerobiology at Magadha University, Bodh Gaya, included crop aerobiology for cropprotection, aerobiology of historical managements, medical aerobiology, and veterinary aerobiology and so on.

In addition to outdoor sources, microbes indoors can originate from indoor sources. These can be the occupants themselves and their activities, as well as indoor plants (Lehtonen et al., 1993).Other factors influencing the microbial population include farm maintenance, cleanliness, indoor temperature and relative humidity (RH), type of furniture and litter floor (Dharmage et al., 1999; Smedje &Norback, 2001).The highest number of airborne fungal spores was found in temperate and tropical region and the least in desert. (Lacey 1981).There is impact of aerobiocomponents on plants, animals and human beings (Agarwal et al 1969). Air

monitoring for knowing the diversity, abundance and variation of airborn mycoflora according to seasonal changes. The continuous air sampling is needed and estimation of qualitative and quantitative of aerospora.

Material and Methods: The 'Volumetric Tilak air sampler' (Tilak and Kulkarni, 1970) is an electrically operated device was fixed in middle of the poultry farm it is located in Nagbhid tehsil (between 19.30'N & 20.45'N latitude and 78.46'E longitude) of Chandrapur district of Maharashtra at the height of 1.5 meter from ground level and runs continuously for the period of six month from June 2016 to November 2016. The glycerine jelly mounted 14 slides were prepared from Vaseline coated cello tape on drum by impingement process, cello tape removed from rotating drum of the sampler at the end of 7th dayrespectively. The mounted slides were scanned by Binocular research microscope and microphotographs were captured by using microcamera which directly attached to the microscope.

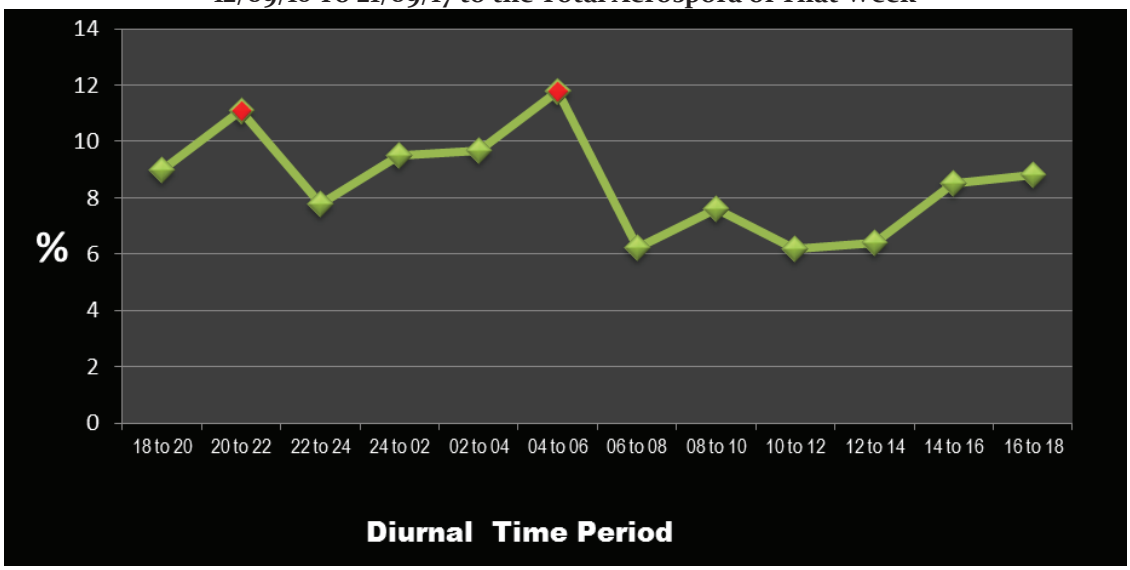
Aeromicrobiota including airborn fungal spores were observed qualitatively and quantitatively recorded and identified by using the standard literature and reference materials. The Spores per cubic meter were calculated by the following formula: Spores/m3 = No. of same type of spore X 14(Where 14 is the conversion factor for Tilak Air Sampler). Permanent slides are prepared from cellotape mounts in melted glycerine jelly. (Glycerine jelly is solid at N.T.P. and melted at about 45^{o}C). Add 3-4 drops of melted glycerine jelly over the tape by a dropper. Put a rectangular cover slip and press it to remove the air bubbles. The jelly solidifies when it attains room temperature and the slide is now ready for microscopic examination and analysis.

Result and Discussion: Sixty nine spore types belonging to class Phycomycotina, Ascomycotina, Basidiomycotina Deuteromycotina and other types have been encountered. 64 Fungal spores were identified and others were separated from fungal spore which includes Pollen, Insect parts, hyphal fragments, airborn mites and some unidentified spores. A clear variation was seen among the fungal spores with respect to changing environmental conditions. Some spores were observed throughout the half year like *Alternaria, Ascospores, Basidiospores, Bitrimonospora, Bispora, Cladosporium, Curvularia Didymosporium, Diplodia, Ganoderma, Helminthosporium, Hytridium, Haplosporella, and Smut spores*. Some spores are seasonal; *Ascospores, Cercospora* and *Chaetomium* were dominant observed in July, August and November month.21 types of Ascomycotina includes higher percentage contribution were *Ascospores* (18.81%), *Didymospheria* (17.29%) *Bitrimonospora* (8.32%) and *leptospheria* (2.31%), *histridium* (1.84%) were less.39 types of spores from Deuteromycotina highest percentage contribution to be *Aspergilli* (41.3%), *Cladosporium* (18.21%), *Nigrospora* (3.65%) and lowest to be *Helminthosporium* (1.21%), *Haplosporella* (1.09 %,), *Diplodia* (1.8%) respectively. Majority of Fungi are air borne and they vary greatly according to weather conditions and climatic factors. Many types of fungal spores are recorded from different environment (Hazarika et al., 2008; Cholke and Mahajan, 2008). Twenty one types of ascospores are observed from which some ascospores are found only in rainy months and they provide specialize information as a bioindicator for rain fall. In July month rain fall is about 164mm in this particular month spore count ascospores are 21588spores/m^3 to be highest followed by August (21350spores/m^3), September (20763spores/m^3), November (19521spores/m^3)and Lowest at starting of rainy season i.e. in June month (16324spores/m^3) respectively.

Class wise qualitative and quantitative estimation have been revealed as Class wise percentage contribution of aerospora in the order of dominance have been revealed Deuteromycotina 49.82% followed by Ascomycotina30% other types 6.67%, Basidiomycotina 4% and Phycomycotina 2% however myxomycotina members have not been found during the study period. Half yearly total spore count of class arranged in decreasing order to be Deuteromycotina (839301spores/m3) Basidiomycotina (47094spores/m^3), Ascomycotina (104879spores/m^3), other types (39666spores/m^3) and Phycomycotina (2008spores/m^3) respectively. Other types including fungal hyphae, epidermal hairs, Insect parts, pollen grains, mites have been reported.

The dominant airborn fungal genera of this Deuteromycotina group include *Alternaria, Aspergilli Cladosporium, Curvularia, Fusarium, Helminthosporium and Trichothecium*. These results are in confirmation with the earlier findings (Adams *et al*, 2013; Luka *et al*., 2014).The study of Skin Prick Test showed that varied range of fungal spores and its mycelium such as *Cladosporium, Aspergillus, Penicillium, Basidiospores* and *Uredospores* were proved to be allergic for different age group of peoples (Chakraborti et al., 2012). The above types of spores were high percentage concentration in present study.The most common fungus *Aspergillus* contributed highest 41.7% of the total aerospora followed by *Cladosporium* (14.5%), *Basidiospores*(11.2%). The genera, *Alternaria, Curvularia, and Monotospora* were recorded most significant or equally dominant. It was confirmed by Bhajbhuje (2013); Lanjewar and Sharma (2014).

Fig 1: Diurnal Periodicity Curve of Average Percentage Contribution of *Nigrospora* in the Intramural Environment of Poultry Farm From 12/09/16 To 21/09/17 to the Total Aerospora of That Week

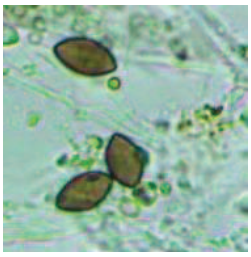


The diurnal periodicity curve of *Nigrospora* from 12thseptember to 22ndSeptember 2016 in the intramural environment of poultry farm revealed bihourly variation in percentage contribution and attained main peak point (11.64%) between 04 to 06 hrs in the poultry of Nagbhid tehsil, Chandrapur and subsidiary peak (10.34%) have been recorded between 20 to 22 hrs.From these observations it may be concluded that *Nigrospora* belongs to "night aerospora" group.

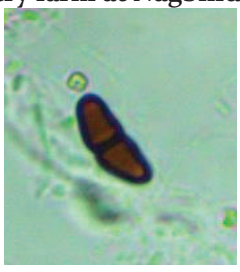
Conclusion: This study concluded that there is rich mycoflora biodiversity in the indoor environment of poultry farm. Indoor air quality is essential for indoor survivals. Present investigation clearly shown that environmental microfungal population is seemed to act as anbioindicator of the level of environmental bio-pollutionand helpful as a bioindicator for rainfall. However bihourly qualitative and quantitative observations are very important for providing data of growth, liberation and dispersion of mycoflora.

Table 1: Microphotographs of Airborn Fungal Spores Class Wise Obtained during Study Period From June to November 2016 poultry farm at Nagbhid, Chandrapur M.S.

Apiorhynocostoma (Petrak)



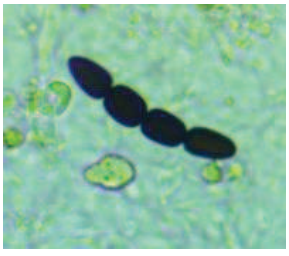
Chaetomium Kunz ex. Fr.



Didymosphaeria Fuck.

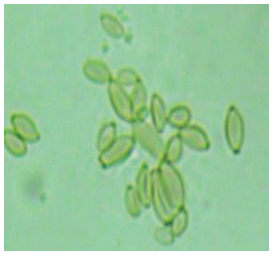
Hysterium Tode. ex Fr

Pleospora Rabh

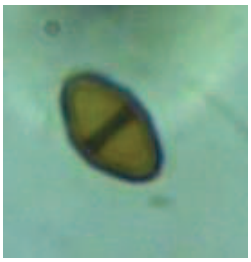


Sporormia de not

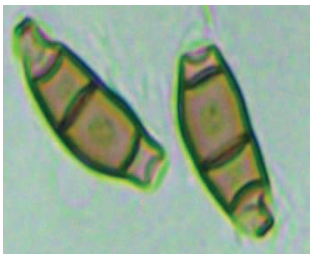
Alternaria Nees.



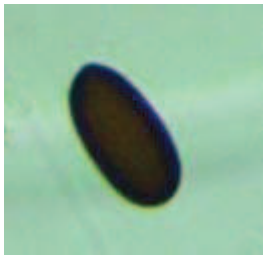
Cladosporium Link



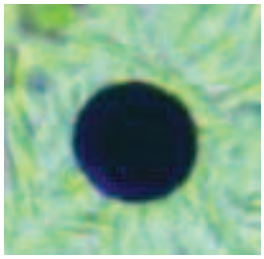
CordanaPreuss



CurvulariaBoed



Haplosporella Torula



NigrosporaZimm

References:

1. Ananthanarayan R and Paniker C (2009) Textbook of Microbiology, University Press, 8th Ed. Pp.600-617.
2. Lanjewar S, Sharma K (2014) Intramural aeromycoflora of rice mill of Chhattisgarh, *DAMA International*, 1 (1) : 39-45.
3. Luka RS, Sharma K, Tiwari P (2014) Aeromycoflora of JackmanMomorial Hospital, Bilaspur, *Scholar Academic Jour. of Pharmacy (SAJP)*, 3(1) : 6
4. Bhajbhuje MN (2013) Biodiversity of Fungal Flora of Industrial Polluted Environment *International Journal of Environment Science*, 2 (2): 104-114.
5. Rafał L et. al.(2002) Fungal Fragments as Indoor Air Biocontaminants*Applied and environmental microbiology* 3522–3531 Vol. 68, No. 7.
6. Spieksma, F. T. M., Proc. of Symp. on Aerobiology, Munich,1980, pp. 307–315.
7. Karvala K, et. al.(2010)New-onset adult asthma in relation to damp and moldy workplaces. *Int. Arch. Occup. Environ. Health.*, 83 : 855-865.
8. Chelak EP, Sharma K (2012) Aeromycological study of Chandragiri hill top, Chhattisgarh. *International Multidisciplinary Res. Jour.*, 2(11): 15-16.
9. Chakrabarti H, Das S and Bhattacharya S (2012) Outdoor airborne fungal spora load in a suburb of Kolkata, India: its variation, meterological determinants and health impact. *Int Jour Environ Health Res*., 22,No.1: 37-50.
10. Cholke PB and Mahajan MC (2008) Study of airomycoflora inside poultry shed, *Indian J. Aerobio*., 21, No.2:73-78.
11. Dharmage S., Bailey M., Raven J., Mitakakis T., Thien F., Forbes A., Guest D., Abramson M., Walters EH. Prevalence and residential determinants of fungi within homes in Melbourne, Australia. Clinical and Experimental Allergy. 29(11):1481-9, 1999
12. Smedje G and Norbäck D. 2001a. Irritants and allergens at school in relation to furnishings and cleaning. Indoor Air. Vol. 11, pp 127-133. Smedje G and Norbäck D. 2001b. Incidence of asthma diagnosis and self-reported allergy in relation to the school environment- a four-year follow-up study in schoolchildren. Int J Tubercl Lung Dis. Vol. 5, pp. 1059-1066.
13. Grinn-Gofron A, Strzelczak A and Wolski T (2011) The relationships between air pollutants, meteorological parameters and concentration of airborne fungal spores. *Environment pollution*, 159: 602-608.
14. Tilak, S. T. and Kulkarni, R. L., *Curr. Sci*., 1972, **41**, 850–851.

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