RESEARCH ARTICLE

AEROMYCOLOGICAL SURVEY IN DAIRY FARM NEAR BHEDAGHAT, JABALPUR

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ABSTRACT

Aeromycoflora of indoor and outdoor environments of a Dairy farm, Bhedaghat at Jabalpur were studied by Anderson Two Stage Air Sampler (Anderson 1958; 1966) for one year, from January – December, 2012. The indoor air showed higher number of spores than the outdoor air. Out of total 2080.2CFU/m^3 fungal colonies were recorded the incidence of spores was significantly higher in indoor air (1370.7 CFU/m^3) than outdoor air (709.5 CFU/m^3). Out of the total fungal counts, 4 spore types belonged to *Phycomycotina*, 4 spore types belonged to *Ascomycotina* and 25 spore types to *Deuteromycotina*. *Aspergillus* was the most dominant spore type with 26.90% of occurrence in the indoor and 22.26% of occurrence in the outdoor air. *Cladosporium* was the most dominant spore type with 44.92% of occurrence in the indoor and 16.23% of occurrence in the outdoor air. Other dominant fungal spore types present in air were *Penicillium, Curvularia, Fusarium*, *Rhizopus*and *Mucor.* Fungal colonies were recorded throughout the year but highest in the month of March. Aeromycological survey showed that dairy workers were exposed to large quantities of fungal spores in their working environments, which is a potential risk factor as causative agent to different types of health problems.

Keywords : Aeromycological, aeromycoflora, spores, indoor air, outdoor air, dairy Farm

INTRODUCTION

In India a large number of people are occupationally involved with different types of cattle sheds. In these sheds, a wide range of fungal growth substrates like moldy livestock foods, moldy hay, bedding of animals and their excreta are present, which could provide a huge airborne fungal spores load making these places unhygienic for the workers. Consistently more respiratory symptoms and impaired levels of respiratory function among the dairy farmers were reported by many researchers (Dalphin et. al., 1998 a,b; Wasteel et. al, 2000).

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The Indian cowsheds are generally places with high humidity where raw and decomposing cow-dung, straw, livestock foods and other materials provide suitable substrates for the growth of fungi (Adhikari et al., 1999). Fungal spores are universal atmospheric components both indoors and outdoors although their number and types vary with time of day, season, geographical location and local spore source which are variable. Fungi from a wide variety of genera have a great capacity to colonies much kind of substrates and develop in extreme environmental conditions (Comtois, 1990). Many fungi reported from air were potential to create health hazard to both humans and animals (Burr et al., 2007).

Dairy workers are very close to the dairy environment they may suffer from some allergic disorder or disease. A large no. of people work in cattle shed around the world, pulmonary function and higher frequency of respiratory symptoms have been

reported in dairy farmers (Adhikari et al., 2004). Higher frequencies of air borne fungal spores were recorded by many workers from occupational environments (Vittal and Glory 1985; Lacey and Crook 1988 and Singh and Singh, 1996) including a few studies from dairy barns (Hanhela et al., 1995 and Kullman et al. 1998).

MATERIAL AND METHODS

The present study was carried out in indoor and outdoor of a Dairy cattle shed in Bhedaghat, Jabalpur during January– December2012. Aeromycoflora was monitored from indoor and outdoor of dairy cattle shed via Anderson Two Stage air (Andersen, 1958; 1966) sampler fortnightly over the year January-December 2012. Samples for fungi were collected using SDA (Sabourauds Dextrose Agar) medium with streptomycin. The Petri plates were exposed for 10 minutes at 1.5m height above the ground level. After the exposure plates were incubated at 25 + ^{o}C for 3-5 days. After exposure fungal colonies were counted for individual species and CFU/m^3 (colony forming unit per cubic meter m^3). Microscopic slides stained with lactophenol and cotton blue were prepared from each CFU and observed microscopically.

RESULTS & DISCUSSION:

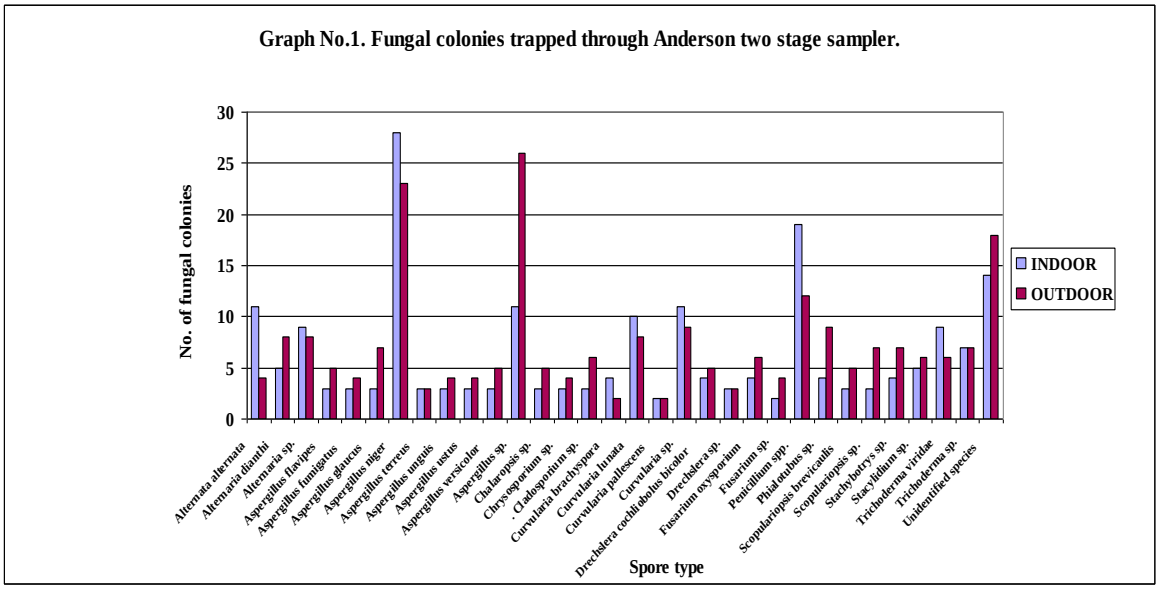
The aeromycological survey indicates the concentration and variation of fungi prevailing at indoor and outdoor of cattle shed of dairy farm. The present study revealed that total 31 fungal species belonging to 3 genera, 4 spore types belonged to phycomycotina, 2 spore types to ascomycotina and 25 spore types to deuteromycotina were isolated in indoor and outdoor air of cattle shed.

The total concentration fungal spores isolated in indoor air are 1370.7 CFU/m^3 while it was 709.5 CFU/m^3 in outdoor air. The dominant fungi were isolated from indoor *Aspergillusniger* (26.90%), *Penicilliumnotatum* (17.09%), *Cladosporiumherbarum* (16.23%), *Aspergillusfumigatus* (9.75%), *Rhizopusstolonifer* (6.94%), *Fusariumsolani* (6.72%), *Curvularialunata* (6.65%) and *Trichodermaviridae* (5.81%) followed by other species are given in table-1.a

Table-1: List of viable fungal spores in indoor and outdoor of dairy farm

S.No.	Fungal isolates	Total		Total %
		Indoor	Outdoor	
	Zygomycotina			
1	*Mucor Sp.*	6	6	9.20
2	*Mucormucedo*	8	3	6.91
3	Rhizopusnigricans	8	5	8.92
4	Rhizopusstolonifer	13	4	10.67
	Ascomycotina			
5	Candida sp.	4	2	3.95
6	*Chetomium* sp.	6	3	5.81
	Deuteromycotina			
7	*Alternaria sp.*	10	3	8.20
8	*Alternariaalternata*	12	4	10.30
9	*Alternariacitri*	5	3	5.27
10	*Alternariasolani*	12	3	9.47
11	*Aspergillus sp.*	15	5	12.96
12	*Aspergillusflavus*	11	7	12.96
13	*Aspergillusfumigatus*	19	11	20.28
14	*Aspergillusnidulans*	7	1	4.33
15	*Aspergillusniger*	53	23	49.16
16	*Aspergillusterrus*	10	2	7.17
17	*Aspergillususstus*	9	1	5.45
18	*Aspergillusversicolor*	9	8	12.69
19	*Cladosporium sp.*	10	5	10.66
20	*C.cladosporoides*	6	12	14.74
21	*C.herbarum*	31	46	61.15
22	*Curvularia spp.*	7		3.95
23	*Curvularialunata*	13	5	11.96
24	*Dreschlera*	6	3	6.08
25	*Fusariumsolani*	14	5	11.64
26	*Nigrospora*	6	1	3.86
27	*Penicilliumnotatum*	32	8	25.20
28	P.rysogenum	12	9	14.55
29	Phoma	9	4	8.35
30	Trichodermaviridae	11	2	7.93
31	Trichoderma sp.	9	2	6.67
32	**Unknown Spores**	8	5	9.27
	Grand Total	**391**	**201**	**399.36**

The outdoor air sampling of dairy farm, showed dominant fungal spores is *Cladosporiumherbarum* (44.92%), *Aspergillusniger* (22.26%), *Aspergillus fumigatus* (10.535), *Cladosporiumclado- sporoids* (11.85%), *Aspergillusflavus* (7.17%), *Mucormucedo* (6.11%). *Curvularialunata* (5.31%) and *Fusariumsolani* (4.92%). Few fungal spore types remained unidentified and placed in the group of "Unknown spores".



In the present investigation *Aspergillusniger* (26.90%) and *Penicilliumnotatum* (17.09) showed highest contribution in indoor air of dairy cattle shed (Verma, 1998; Adhikari, 2004 and Reddi, 2004) while Cladosporium most abundant in outdoor (Reddi, 2004). Other researchers (Lugauskas, 2004; Karwowska, 2005; Abd-Elall, 2009 and Matkovic, 2009) reported the dominance of *Aspergillus*and *Penicillium* in indoor of cattle houses but higher concentration of *Phoma* uniquely observed in cattle shed. Phoma spores can be recommended for the primary skin prick testing in dairy farmers of this area while evaluating the mold allergen sensitivity.

In the present study it is seen that *Aspergillusniger*and *A. fumigatus* are distributed throughout the year. This is seemed to be the serious condition where these two organisms are the principal etiological agent of invasive aspergillosis (Tome et. al., 2000 and Pini et. al., 20004). Aspergillosis has shown to bring about the mycosis and other allergic disease in cattle where infection was primarily respiratory spreading to the lungs (Shreeramulu, 1961). The mycotoxins released from *Aspergillus sp*. are considered as established biological occupational carcinogenic capable of causing liver and lung cancer. *A. fumigatus* is also a great hazard to animals and its toxin cause respiratory disease in animals (Zhang et. al., 1997).

The Deuteromycotina was most abundant in indoor than the outdoor air;Zygomycotina forming next abundant group in indoor air than outdoor air. The Ascomycotina was much less in Dairy. Dairy indoor environment showed a fairly large number of forms some of which are allergenic because fungi exist as saprophytes on specialized substrate such as Keratinized animal tissue and dung.

This study also provided the information regarding the density and monthly distribution of indoor and outdoor aero fungi in cattle shed. During these twelve months Jan-Dec. 2012, highest number of fungal colonies were recorded in March month i.e.335.35 CFU/m^3 and lowest number of fungal colonies in June month i.e. 81.19 CFU/m^3 data showing climatic condition of March month is more suitable for growth of these fungal spores.

CONCLUSION:

In view of present result and discussion, it is concluded that indoor airspora in Dairy farms is rich in percentage contribution than the outdoor airspora. Wet and humid environment provide suitable condition for growth of fungi consequently increasing the airborne spores load. As above mention that cattle houses are considered occupational environments with high levels of exposure to fungi. Activities in these indoor places such as cleaning and feeding animals increase occupational risk of exposure to

airborne microorganisms. Although atmospheric sampling and preliminary data suggests that fungal spores causing some allergenic disease so it is necessary to aware people from such allergies so identification of airborne fungal pathogens and their effects on Dairy workers and animals health will thus prevent and reduce the number of disease. Such investigation have brought out utility of inter disciplinary approach of Aeromycology.

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