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Research Article

AEROMYCOLOGICAL SURVEY IN THE INTRA AND EXTRA-MURAL ENVIRONMENT OF DAIRY AND DETERMINATED FUNGAL ALLERGY WITH SKIN PRICK TEST AND IGE ESTIMATION

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ABSTRACT

Today, most of the people suffering from the seasonal rhinitis, bronchial asthma, respiratory allergy and related symptoms. Airborne Fungal spores play a significant role in developing symptoms and mild to severe. Fungal spores are most common in air and due to their presence in air almost throughout the year, they cause allergy in susceptible human being. The presence of fungal spores in atmosphere differs in different seasons. In present study, fungal spectrum in intramural (indoor) and extramural (outdoor) of Dairy Farms at Jabalpur has been evaluated using Anderson Two Stage Air Sampler. A total CFU for indoor and outdoor were calculated as 7977.8/m³ and 5069.1/m³. In term of fungal composition *Aspergillus niger*, *A. fumigatus*, *Alternaria alternata* in indoor while *Curvularia lunata*, *Cladosporium* sp. in outdoor of dairy were dominant. Incidence of more number of fungi had found as a tendency of attraction towards the moisture availability in the dairy environment. In this research paper allergenic effect of fungal spores on dairy workers were also investigated, 40 workers interviewed, 17 workers complained about fungal allergy, 12 workers were selected for Skin prick test involving 18 fungal antigens to ascertain fungal allergy. Higher responses were recorded with *Mucor mucedo*, *Aspergillus niger* and *Cladosporium herbarum* shown by SPT on dairy workers. The IgE level was determined only in those workers who consistently showed fungal allergies in Spt.

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INTRODUCTION

Among the living particles which are present in the atmosphere, fungal spores are to be found in the open air as well as inside buildings (Simeray *et al.*, 1993) Allergy problems linked to the inhaling of indoor fungal spores are quite familiar. Fungi in the air have been proposed as a cause of increasing adverse health effects. Many fungi have been reported to cause several types of human health problems such as infections, allergies, atopic dermatitis as well as health effects (Scheynius *et al.*, 2002).

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). Dairy workers are very close to the dairy environment and hence they may suffer from some allergic disorder or disease. A large number of people work in cattle shed around the world and pulmonary malfunction and higher frequency of respiratory disorder symptoms have been

reported in dairy farmers (Adhikari *et al.*, 2004). Allergy represents a major health problem affecting more than 25% of the population worldwide. Allergic patients (type I) are characterized by the increased production of immunoglobulin E (IgE) antibodies against antigens (allergens) from different sources, e.g., pollen, mites, fungi, insects, animal dander and foods. The type I allergy (immediate) leads to allergic manifestations, e.g., allergic rhinitis, asthma, atopic dermatitis, urticaria and anaphylactic shock triggered by allergen induced cross linking of effectors cell bound IgE antibodies and the release of inflammatory mediators such as histamine and leukotrienes (Dong and Flavell, 2001; Johnson and Calame, 2003).

MATERIAL AND METHODS

In present study an aeromycological survey was carried out intramural (indoor) and extramural (outdoor) of Marwaha dairy farm, Jabalpur (M.P.). The sampling was started from January–December in all three seasons in the year 2012. Air sampling

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was carried out fortnightly using Anderson two stage air samplers (Anderson, 1958 & 1966) during the period from January to December 2012. Air sample were collected from indoor and outdoor of dairy. Sabourauds dextrose agar media (Chaudhary, 2000) was used for isolation of fungi. The culture plates were incubated in inverted position at 28.C for 3-5 days depending on growth of colonies. Colonies were counted and identified. The total number of colony forming units (CFU) per plates was calculated. The pure culture was maintained at 4°C and identified with the help of standard literature (Elis, 1971 and Tilak, 1989).

The skin prick test was performed on the forearms. After cleaning the forearms with alcohol antigen were placed and sites were pricked with 18 antigens. Prick test were also done with a positive control to confirm the state of reactivity of skin. Histamine diphosphate and buffered saline were used as positive and negative controls, respectively. The results were recorded after 30 minutes and allergenic reactions were graded as +, ++, +++, ++++ on the basis of wheal formation. The estimation of IgE level as an indicator of allergic reactions due to the active fungal protein compound (antigen) was analyzed in shortlisted dairy worker's serum based on the results of skin prick tests as well as level of IgG during ELISA.

RESULT AND DISCUSSION

During the investigation, a total numbers of CFU for indoor and outdoor environment was calculated as 7977.8 /m³ and 5069.1 /m³ respectively. From indoor environment the most productive months were September and February. The overall comparison of sampling results of indoor environment is presented in Fig-1. The graph shows that *Mucor mucedo* was the abundant species throughout the year followed by *Rhizopus nigricans* and *Aspergillus niger*. When the outdoor environment was seen as a whole, it can be seen that *Cladosporium cladosporioides* was the highest abundant fungi in all seasons (especially in rainy season). *Curvularia lunata* and *Mucor mucedo* were the other fungi in outdoor environment (Fig-2). Subba Reddi *et al.* (2004) also found higher fungal counts in indoor environments as compared to outdoor environments in cattle shed and posh house. Further, *Aspergillus* and *Penicillium* were the dominant fungi in indoor environments.

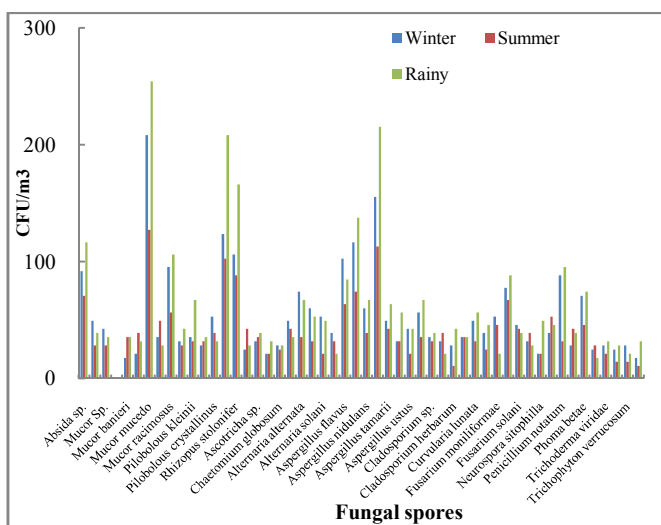


Fig 1 Seasonal occurrence of airborne fungal spores during 2012 from (Marwaha dairy) In door

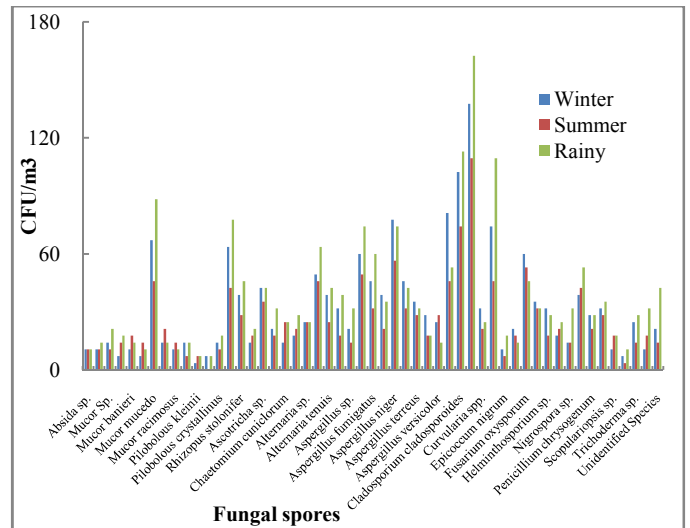


Fig 2 Seasonal occurrence of airborne fungal spores during 2012 from (Marwaha dairy) Outdoor

Among 40 workers interviewed, 17 workers complained for allergic symptoms at least once a year. Those who are involved directly with cattle i.e. dung handlers, milkmen and animal care takers were found to suffer more with allergic symptoms. Out of such 17 workers, 12 were shortlisted for the skin prick tests based on severity of complaints of allergic symptoms. The workers of Marwaha dairy subjected to skin prick tests involving 18 fungal antigens. Higher responses were recorded with *Mucor mucedo*, *Aspergillus niger*, *A. versicolor*, *Cladosporium herbarum*, *Curvularia lunata*, *Candida albicans* and *Trichoderma sp.* Present study were found similar to findings of Singhal and Rajkumar (2003) showed that most common fungal spores with significant skin prick test results were *Mucor sp.*, *Aspergillus fumigatus*, *Rhizopus* and *Fusarium*. *Alternaria* and *Cladosporium* also showed significant positive reactions in the people of Spain and Portugal (D'amato and Spieksma, 1995).

When the quantitative determination of IgE was done using ELISA method, a more definitive result was obtained. The IgE level was determined only in those workers who consistently showed fungal allergies in skin prick tests responses during ELISA. Total 5 workers were shortlisted among 12 workers for the quantitative estimation of IgE level in blood serum. *Mucor mucedo*, *Alternaria tenuis* and *Penicillium sp.* produced higher levels of IgE in more patients than other fungi group. In other studies where the correlation of skin tests with specific IgE level was under investigation against fungal antigens, no positive correlation could be scored when *Alternaria* and *Aspergillus* were used as fungal antigens (Gioulekas *et al.*, 2004).

CONCLUSION

The results conclude that the air borne fungal spores in dairies of Jabalpur pose a great threat to the dairy workers. Longer time of exposure to such environment can trigger higher immunological responses which cause allergies, and if not treated early, can worsen the health situation with severe respiratory diseases. Further investigation in this direction is needed as some of the fungi failed to show allergenic effects during the present investigation. Further, purified fungal antigens can make such studies more useful and easier.

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