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Fungal pollution in indoor environments

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Abstract: *Fungi are a serious threat to public health in indoor environments. Many fungi are reported to cause allergy. There are many reports on fungi isolated from indoor environments .Fungi are able to grow on almost all natural and synthetic materials, especially if they are hygroscopic or wet. Inorganic materials get frequently colonized as they absorb dust and serve as good growth substrates for so many fungi. Wood is highly vulnerable to fungal attack. Cladosporium and Penicillium are reported to infest wooden building materials. Clean dried wood surfaces are more susceptible to fungi .Acylated wooden furnitures, wood polyethylene composites, plywood and modified wood products are susceptible to infestation by Aspergillus, Trichoderma and Penicillium .So, a project had been designed to isolate different fungal growth in the indoor environments. For that students' hostels had been taken for the study of fungal pollution in indoor environments.*

I. Introduction

Now a days, change in our life style resulted in a shift from open air environments to air tight, energy efficient environments at home and work places, where people spend a substantial portion of their time (Chao et al., 2003; Molhave, 2011). In these environments, improper maintenance, poor building design or occupant activities often result in a condition called as "Sick Building Syndrome" (SBS), where occupants experience adverse health effects that appear to link with the time spent in a building (Ebbehoj et al., 2002). The complaints may be localized to a particular room or widespread throughout a building and relief usually occurs soon after leaving the building (Bholah and Subratty, 2002; Bakke et al., 2008). Headaches, pressure on the head and throbbing and feelings of tiredness are the most common signs of SBS.

Various abiotic agents like dust, particulate matter, wall coverings, synthetic paints, glue, polishes, and Voltile Organic Compounds (VOCs) may contribute to indoor pollution and cause SBS (Chao et al., 2002; Horner, 2003). Most of the air pollution comes from sources inside the building itself like, hair spray, perfume, room deodorizer, paints, thinners, home appliances, photo copiers, printers, computers, and air purifiers (Rossnagel, 2000; Wilson and Straus, 2002;). The increase in temperature and humidity also affects the release of VOCs (Reijula, 2004). The outdoor air that enters a building can be a source of indoor air pollution. For example, outdoor air may contain pollutants from motor vehicle exhausts (Reynolds et al., 2001). Allergens detected in mattresses, floor dust and curtains are found to increase the risk for asthma (Adgate et al., 2008). This study is unique because it described culturable fungi obtained from indoor air of students' hostels and sit-outs, as little or no study have been carried out on this in any part of the world.

II. Materials And Methods

The investigation was carried out in Laboratory, Department of Botany, MMC, Patna, between July and August, 2014. The open plate method was adopted for the analysis. A total of sixty plates of Sabouraud dextrose agar (SDA) containing chloramphenicol (SC, Merck, Germany) and Potato dextrose agar (PDA, Merck, Germany) were prepared. Two plates each of the different agar mediums were exposed in indoor environments of hostels i.e. in rooms 1 to 27, i.e. altogether 54 plates in students residing rooms. Two plates each of the different agar mediums were exposed in common room, dining hall and mess kitchen. So altogether 60 plates were exposed for the experiment. The plates were exposed at least for 4 hours when students were present in these locations. The culture plates were incubated at room temperature (26-30^{0}C) until growth appeared. Physical counts of the fungal colonies were made and averages of the isolation for each set of samples obtained were taken. Isolates were identified based on cultural and microscopic characteristics with the aid of standard mycological texts and manuals.

III. Results And Discusions

A total of 114 colonies were isolated. The genera of isolated airborne fungi depending on frequency in number of colony counts were classified as predominant and less frequent isolates. The dominant species were members of the genera *Aspergillus* sp (50.9%) followed by *Penicillium* sp (18.4%), *Alternaria* sp (14.9%), *Rhizopus* sp(7.0%), *Torula sp*
(4.4%) Fusarium sp (2.6 %)**.** and *Cladosporium* sp (1.8%).

TABLE 1
Mean frequency and percentage of airborne fungal isolates from indoor environment.

Fungal genera	Average Number of isolates	Percentage
Aspergillus sp	58	50.9
Penicillium sp	21	18.4
Alternaria sp	17	14.9
Rhizopus sp	8	7.0
Torula sp	5	4.4
Fusarium sp	3	2.6
Cladosporium sp	2	1.8
Total	**114**	**100**

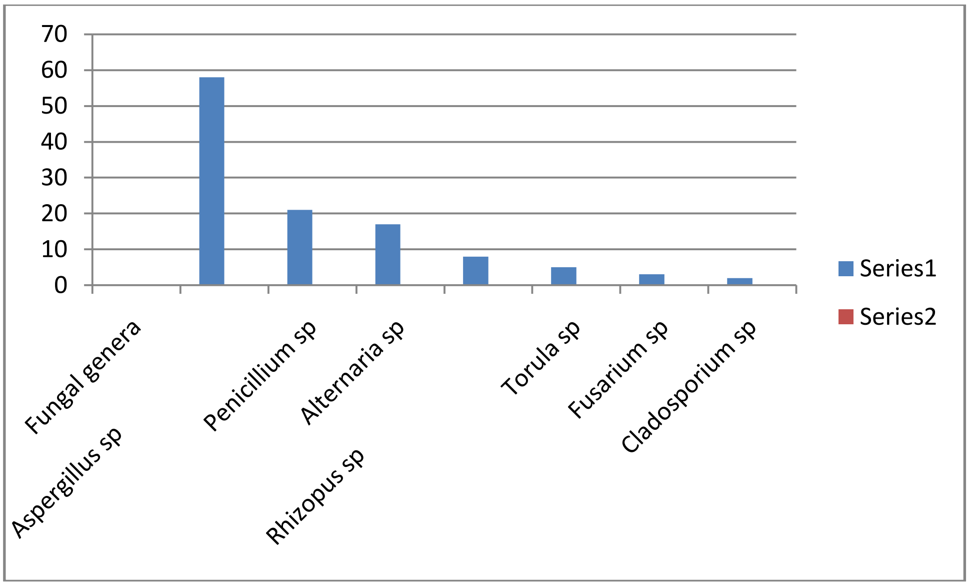

FIGURE. 1: Percentage distribution of indoor airborne fungal isolates

This study is unique because it described culturable fungi obtained from indoor air of students' hostels and sit-outs, as little or no study have been carried out on this in any part of the world. *Aspergillus* sp. (50.9%), *Penicillium* sp (18.4%), and *Alternaria* sp (14.9%)

were the dominant indoor fungi in this study. Other fungal isolates include *Rhizopus* sp (7.0%),Torula sp(4.4%), *Fusarium* spp (2.6%), and Cladosporium(1.8%),

These results are comparable to those from previous study (Shelton *et al*., 2002; Ayanbimpe *et al*., 2010; Chadeganipour *et al*., 2010) who also isolated similar fungi in indoor environments. Studies carried out in North, South and Central America

had shown that *Cladosporium* sp, *Penicillium* sp, *Aspergillus* sp and *Alternaria* were the prevalent indoor airborne fungi (Shelton *et al*., 2002). In a previous study in Germany, *Penicillium* sp and *Cladosporium* sp were dominant (Herbarth *et al*., 2003). In indoor air mycroflora of residential dwellings in Jos metropolis, Nigeria, Ayanbimpe *et al*. (2010) isolated *Chaetomium globosum*, *Aspergillus fumigatus*, *Stachybotrys alternans*, and *Alternaria alternata* as the predominant fungi species. Shukla and Shukla (2011) reported *Fusarium* sp *Alternaria* sp., *Rhizopus* sp., and *Aspergillus fumigatus* as the dominant fungi in airborne fungi spores in the atmosphere of Industrial town of Korba-Chhattisgarh, India. The presence of toxin producing fungi like *Aspergillus* sp and *Alternaria* sp in indoors should be a cause for concern considering the potential risk of mycotoxicosis (Ayanbimpe *et al*., 2010).

Most countries of the world have identified *Aternaria* sp, *Aspergillus* sp, *Cladosporium* sp, *Penicillium* sp and *Ulocladium* sp as the most common allergens in their environment (Chadeganipour *et al*., 2010).

Airborne fungi exposure cannot be completely wiped off but can be reduced.

Many people are unaware of the role of fungi play around them and researches on fungal diseases are not given the seriousness they deserve especially in developing countries.

Hence, there is the need for regular surveillance of the air to ascertain the level of contamination and probable risk of exposure of residents to fungi. Projections of the percentage prevalence of fungi in the school environment, the environment may be prone

to some fungi related health issues of various forms and levels, like the superficial mycoses, cutaneous mycoses, subcutaneous mycoses to systematic or deep mycoses; which is able to infect internal organs and become widely disseminated throughout the body, this type is often fatal.

References

[1]. Adgate J.L., Ramachandran G., Cho S.J., Ryan A.D., Grengs J. (2008) Allergen levels in inner city homes: baseline concentrations and evaluation of intervention effectiveness. Journal of Exposure Analysis and Environmental Epidemiology. 18:430–440.

[2]. Ayanbimpe, G. M., Wapara, S.D. and Kuchin, D. (2010) Indoor air mycoflora residential dwellings in Jos Metropolis. African Health Sciences, 10(2): 172-176.

[3]. Bholah R., Subratty A.H. (2002) Indoor biological contaminants and symptoms of sick building syndrome in office buildings in Mauritius. International Journal of Environmental Health Research. 12:93–98.

[4]. Bakke J.V., Norbäck D., Wieslander G., Hollund B.E., Florvaag E., Haugen E.N., Moen B.E. (2008) Symptoms, complaints, ocular and nasal physiological signs in university staff in relation to indoor environment – temperature and gender interactions. Indoor Air. 18:131–143.

[5]. Chadeganipour, M., Shadzi, S. Nilipour, S. and Ahmadi, G. (2010) Airborne fungi in Isfahan and evaluation of allergenic responses of their extracts in animal model. J Microbiol., 3 (4): 155-160.

[6]. Chao H.J., Schwartz J., Milton D.K., Burge H.A. (2002) Populations and determinants of airborne fungi in large office buildings. Environmental Health Perspectives. 110:777–782.

[7]. Chao H.J., Schwartz J., Milton D.K., Burge H.A. (2003) The work environment and workers health in four large office buildings. Environmental Health Perspectives. 111:1242–1248.

[8]. Ebbehoj N.E., Hansen M.O., Sigsgaard T., Larsen L. (2002) Building-related symptoms and molds: a two-step intervention study. Indoor Air. 12:273–277.

[9]. Herbarth, O., Schlink, U., Muller, A. and Richter, M. (2003) Sptiotemporal distribution of airborne mould spores in apartments. Mycol Res., 107(11): 1361-1371.

[10]. Horner W.E. (2003) Assessment of the indoor environment: evaluation of mold growth indoors. Immunology and Allergy Clinics of North America. 23:519–531.

[11]. Molhave L. Sick building syndrome. Encyclopedia of Environmental Health. 2011:61–67.

[12]. Reijula K. (2004) Moisture-problem buildings with molds causing work-related diseases. Advances in Applied Microbiology. 55:175–189.

[13]. Reynolds S.J., Black D.W., Borin S.S., Breuer G., Burmeister L.F., Fuortes L.J., Smith T.F., Stein M.A., Subramanian P., Thorne P.S., Whitten P. (2001) Indoor environmental quality in six commercial office buildings in the Midwest United States. Applied Occupational and Environmental Hygiene.16:1065–1077.

[14]. Rossnagel B. (2000) IAQ priorities for mold, yeast, bacteria spores. Occupational Health Safety. 69:58–60.

[15]. Shelton, B.G., Kirkland, K.H., Flanders, W.D. and Morris, G.K (2002) Profile of airborne fungi in buildings and outdoor environments in the United States. Applied Environmental Microbiology, 68 (4): 1743 – 1753.

[16]. Shukla, S. and Shukla, R.V. (2011) Airborne fungi spores in the atmosphere of industrial town, Korba-Chhattisgah, India. Microbiology Journal, 1 (1): 33-39

[17]. Wilson S.C., Straus D.C. (2002) The presence of fungi associated with sick building syndrome in North American zoological institutions. Journal of Zoo and Wildlife. 33:322–327.