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Fungal Growth on Different Building Materials- Review

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Abstract: Buildings are generally constructed with cement and the interiors are designed with various types of wood includes peak, oak, maple, walnut, plywood and fiberboard. Due to the moisture content present in the environment leads to the deterioration of the material of wood by the growth of fungal and microbial growth. It affects the strength and shelf life of the building material. Generally the fungal deterioration of the designed woods are prevented by chemical coatings. Fungal and microbes can easily adapt to the environment to grow enormously. This paper reviewed the various types of fungal growth in building materials in constructions.

Keywords: Buildings, Interiors, Deterioration, Inactivation, Coating

I. INTRODUCTION

All the construction of buildings use the woods, plywood, boards etc... for the interior or exterior work to become a complete and beautiful place to live or use of buildings. Due to various human activities such as usage of water in large amount or sufficient in a regular space leads to exploitation and contamination of building material such as microbial and fungal growth which deteriorates the material. This ambient environment favors the growth of fungal and microbes which can cause health issues like respiratory disorder, allergy to living beings and affects the materials in a continuous mode of action. It can be done by association between fungal to the building material. However, all materials are not equally susceptible to mould growth. For each specific material, there is a critical moisture level for mould growth. If this is exceeded, there is a risk that mould fungi will develop on the material. Critical moisture conditions are also dependent on temperature. Critical moisture level is the level at which it favors the growth of contaminations. Mould fungi require more available water to grow at lower temperatures; consequently, critical moisture levels will be higher at lower temperatures than at higher temperatures (Johansson et al., 2013). The mould can be inactivated or inhibited by various compounds such as olive, garlic extract and golden seal extract.

II. FUNGAL GROWTH IN DAMP BUILDINGS

Fungal may be psychrophilic, mesophilic and thermophilic. The six identified damp buildings for the study of fungal growth. It has the capacity to grow on the cellulosic material by degrading the nutrients (or) organic material (Gravesan et al., 1979). The substrate plays a major role in the growth of fungi which favors the growth by pH and there is a block in metabolism of the fungal. Thus, primary colonisers, species of *Penicillium* and *Aspergillus*, appears first, then secondary colonisers, *Cladosporium* spp., and finally tertiary colonisers, *Ulocladium* spp. and *Stachybot-s* spp., appear on a very moist substrate. 44 samples were collected from the affected materials (gypsum board, plastic flooring, wallpaper and acoustical fibre board) and other constructional materials (plywood, wood, cardboard, concrete and mineral wool). The different samples were incubated both at dark and slight conditions for the observation of fungal and microbial growth.

III. ASSOCIATION FUNGAL GROWTH

Water is the main source for the deterioration of the material by the growth of fungal. Every building material should have the water activity and reacts to the relative humidity present in the environment. Fungal growth depends on the Substrate, pH and temperature at which they exposed (Nielsen et al., 2004). There is a lot of negative health impacts can be created by the fungal present in the building material such as institution, workplaces, and houses. The general guidelines of WHO have shoes the ill effects (respiratory defects) created by fungal and also increase the risk of mortality (WHO regional office for Europe in 2010). The fungal growth and their strains will increase the probability of airborne disease. Association between the fungal strains will cause the ill effects living beings by the production of mycotoxins. The sample were collected as plaster, concretes, wood, wall paper, Gypsum, mineral wood, glass fiber, plywood, brick and chipboard. The fungal in the samples were identified after 7 days of incubation at 26°C. Fungal growth was quantified and qualitatively analyzed for 10 samples which show that Wood, concrete and plaster shows the maximum effect of fungal growth (Andersen et al., 2011).

IV. EFFECT OF FUNGAL GROWTH FOR THE LIVING ORGANISMS

The mycotoxins produced by the fungal were inactivated by the extracts prepared from the various sources. There are lot of problems are produced in the environment, human and all living things by the fungal which are presented in the spent mushroom compost. Every fungal create its own effects. *Paenibacillus lentimorbus* organism which is obligate pathogen insect. It causes milky diseases (Harrison et al., 2000).some of the neurological infections and cancer are affected by *Bacillus licheniformis* organism which is majorly present in the spent mushroom substrate (Banerjee et al., 1988 & Younget al.,1982).

Generally humans and animals are infected by *Bacillus subtilis*, *Klebsiella/Enterobacter* sp. Organism (Kim et al., 2002).In human,47 years old man affected by some Fatal case of septicaemia due to *Sphingobacterium multivorum* organism (Freney et al.,1987). some of the respiratory problems are happened due to the *Sphingobacterium multivorum* organism for the patient who are affected by cystic fibrosis disease (Areekul et al.,1996).And also, *Microbacterium* sp.,*Stenotrophomonas* sp. Organisms are dangerous to the environment which is present in the spent mushroom substrate (J.R. Raob.,2003).

V. CRITICAL MOISTURE CONDITIONS FOR THE MOULD GROWTH IN BUILDING MATERIAL

Molds of fungal can be grown at various conditions like moisture and temperature. The atmospheric moisture created by the human activity. The critical moisture level is defined as the level at which the maximum growth of fungal observed. This can be decided by the temperature. If there is sufficient or amount of water is more the required temperature will be lowered. Generally various treatments are available to resist the mould growth in building material (vacher et al., 2010). The moisture content, growth rate of fungal and temperature in laboratory are considered as a isopleths (magan et al., 1984 and ayrest et al., 1969). 80% of relative humidity (RH) rapidly enhances the growth of microbial and fungal growth. Some of the strains of fungal leads to cytotoxicity to the living system and it's difficult to detect (Pasanen et al., 1992).

In laboratory condition not all the variables or conditions are constantly maintained it is due to mishandling, manual error and nature of surroundings. If the expected growth of fungi is low this shows that the critical moisture level is systematically low for a long period (Johansson et al., 2013).

VI. ANTIFUNGAL AGENTS

Use of essential oils, fungicidal, sanitizers, biocides and anti- mold coating is to prevent (or) kill the fungal growth to resist the deterioration of the building material. These agents can be coated directly on the surface of the building material. Mold *Trichoderma* species have a defined lignocellulosic system to reduce the cellulosic material in the wood surface. The growth of fungal significantly damages the structure and affects the esthetic value of the woods (Blanchette et al., 1992). *Aspergillus niger* is a producer of many pectinases and hemicellulose degrading enzymes, like xylanases and arabinases (Delgado et al., 1992; van Peij et al., 1997; Parenicov et al., 2000).Fungi on the wood surfaces contain simple sugars and starch is consumed by molds (Garg et al., 1995). The essential oil consists of terpenoids, steroids and other alcoholic components (salem et al., 2016). Above specified substance have the environmental impact due to their physical property when exposed to environment. It paves the alternative way for the use of natural agents like extract of garlic, golden seal, olive oil or olive extract and coconut oil. Garlic extract has allicin, a natural compound has the resistance to avoid of fungal species including *Aspergillus niger* (longo et al., 2012). Root of golden seal used as disinfectant and antifungal agent including *aspergillus niger*.

VII. CONCLUSION

The fungal observation on the samples were done by PDA, alkaline medium and based on the relative humidity method. In laboratory testing PDA and relative humidity method can be followed for the better results. The inactivation of fungi can be done by chemical and natural agents such as essential oils and Extracts of garlic, olive, golden seal and neem respectively. From these agents, natural agents is the best based on the high efficiency, availability and affordable to inactivate the fungal and mold growth on the building material.

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