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DIVERSITY OF MACROFUNGI ON TREES AND WASTE WOOD LOGS CAN HELP ELIMINATE DEAD TREES AND GENERATE ECONOMIC RETURNS

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Abstract: In order to know the Biodiversity of macro fungi naturally occurring on deteriorated waste woods and dead tree logs at Panchgaon, a study was conducted in rainy seasons in the last few years. *Ganoderma lucidum* (Curtis) P. Karst. *Ganoderma curtisii* (Berk.) Murrill, *G. applanatum* (Pers.) Pat. *Ganoderma carnosum* Pat. (Ganodermataceae) *Schizophyllum commune* Fries (Schizophyllaceae) are commonly present and showed diverse occurrence on deteriorating and tree logs of Kikar - *Acacia karoo* Hayne, Indian Rosewood - *Dalbergia sissoo* Roxb., golden rain tree, canafistula - *Cassia fistula* L., (Fabaceae), Indian lilac *Azadirachta indica* A. Juss (Meliaceae), white mulberry - *Morus alba* L. (Moraceae). In view of their importance of deteriorating the tree logs, they may be a tool of forest solid waste management as one can see deteriorated woods dumped everywhere. Also the observed macro fungi have medicinal potential, of value both in local and export markets that can directly help the villagers to generate additional income and enhance their socio-cultural perspective if educated about use of these macro fungi.

Keywords – Waste woods, Macro fungi, Ganodermataceae, Schizophyllaceae.

I INTRODUCTION

Macro fungi are the fungi which have the capacity to digest moist wood, cause it to rot are called wood-decay fungi. Some macro fungal species attack on dead wood. The Lignicolous macro fungi have the capacity to grow on dead wood and can permeate a fibrous structure which can cause actual decay/deterioration. Many lignicolous fungi use wood in different ways, for instance, some attack the carbohydrates in wood and some others decay lignin (Viitanen, et al. 2010). In which many fungi attack alive trees but others attack trees which is not in living stage and no physiology going on. Eriksson et al., (1990) mentioned that macro fungi responsible for producing brown rot preferably invade in which basidiomycetaceae members can show most efficient capability lignin degradation. Jasalavich et al. (2000) mentioned that fungi responsible for producing /causing white rots have potential to get all major components of cell wall having both lignin and carbohydrates for their nutrients (Jasalavich et al., 2000).

Macro fungi are part of the forest ecosystem they grow on trees in a stack, called Shelf fungi which attack and digest the trunk or branches of a tree. Macro fungi have potential of bioremediation (Maygaonkar et al., 2012) but also they are serious tree pathogens also (Hoff, 2004). Manoharachary and Gopal (1991) observed many *Agaricus* species from Andhra Pradesh. Till present scenario, more than 2000 macro fungi have been documented from bio-geographical regions of India. The central Indian region for this purpose has not extensively investigated for the forest mushroom flora (Kaul 1999).

Such a valuable wealth of Panchgaon, Gurgaon remains untouched and also in the category of neglect. The latitude of Gurgaon, Haryana (India), is located with the GPS coordinates of 28° 27' 27.0828" N and 77° 1' 34.8384" E. As yet, this remains unexplored. Therefore, the study was undertaken to find out macro fungal species for cleaner ecosystem useful in the solid waste management of deteriorated woods. So far, in present investigation attention was given to a collection of macro fungi and their detail mycological investigations.

II MATERIALS AND METHODS

A. Collection of wood decaying macro fungi

Ten types of wood decaying macro fungi were collected from forming biodiversity of macro fungi occurring on deteriorated waste woods and dead tree logs in rainy seasons from 2014-17 in polyethene bags from different parts of Panchgaon area. The micro fungal samples were collected from dead trees/damp places/ wood logs/alive trees. The colour of the material, date of the collection, host/locality were documented following to Gilbertson and Ryvardeen (1986).

B. Anatomical study of macro fungi

The external appearance of macro fungi on decaying woods was studied with the help of hand lens. The shape size measurements of fructifications were done through scale. The color and size of spore were recorded using research microscope and an ocular micrometer. Microscopic studies were performed. The macro fungal species were identified/confirmed through the aid of relevant literature viz., Rattan 1977; Johansen and Ryvardeen 1980 Kolandavelu and Natrajan 1998 Lim et. al., 2001; Kuo,2003; Zmitrovich et al., 2006 and Ostry 2011.

III RESULTS AND DISCUSSION

A total of 10 macro fungi were found to be commonly present in Panchgaon area. Presence of *Ganoderma lucidum* Curtis P.Karst (Figure 1) *Ganoderma curtisii* Berk. Murrill, figure 2, *G. applanatum* Pers. Pat. figure 3, *Ganoderma carnosum* Pat. (Ganodermataceae) figure 4, *Schizophyllum commune* Fries (Schizophyllaceae) figure 5 was common and showed diverse occurrence on deteriorating and tree Logs of kikar acacia karoo hayne, Indian Rosewood-Dalbergia sissoo Roxb. golden rain tree, canafistula *Cassia fistula* L., (Fabaceae), Indian lilac *Azadirachta indica* A. Juss (Meliaceae), white mulberry-*Morus alba* L.(Moraceae). The other macrofungal species viz., *Amanita vaginata* (Bull.) Fr., *Armillaria gallica* Marxm. & Romagn. Bulbous, *Marasmius rotula* Scop. Fr. *Daldinia concentrica* Bolton Ces and De Not, *Pleurotus dryinus* Pers. P. Kumm showed its presence in this area but was lesser in occurrence.



Figure 1 *Ganoderma lucidum* in different habitats at Panchgaon



Figure 2 *Ganoderma curtisii* in different habitats at Panchgaon





Figure 3 *Ganoderma applanatum* in different habitats at Panchgaon



Figure 4 Habitat of *Ganoderma carnosum* Pat. at different locations of Panchgaon

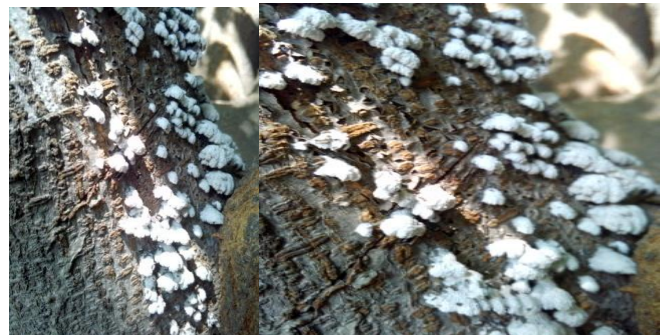


Figure 5 *Schizophyllum commune* Fries growing on trees along with their habitats at Panchgaon

IV MYCOLOGICAL DESCRIPTION

A. *Ganoderma lucidum*

Found growing on deteriorating and dry wood of Indian Rosewood-Dalbergia sissoo Roxb. Fruiting body Covers up to 30 cm in size, having kidney-shaped shiny cap, Stems are present, 3-15 cm long, up to 4 cm thick, twisted, equal or irregular. The caps angled distinctively angled on each side. Brownish Flesh, when young it is fairly soft .Shortly it gets dried and becomes much tough. Spore's dimension: Ovoid to ellipsoidal and flattened at one direction and thin walled 7-13 x 6-8 μ m.

B. *Ganoderma curtisii*

Found growing on deteriorating and dry wood of Indian lilac Azadirachta indica A. Juss of Meliaceae. A wood-decaying polypore, having stipe, without purple to red looking which G. lucidum shows.

The flesh showing sponginess in locations of pore tissue area but firm in the stipe. The pores bruise brown when decayed but pores in the hymenium, cap being offset. The hymenium is decurrent with a bare stipe and with brown spore print.

C. *G. applanatum (Pers.) Pat.*

Found growing as wood-decaying fungus, causing a rott of heartwood , resulting the white to straw coloration rotting in sapwood /heartwood; showing diversity on golden rain tree- canafistula -Cassia fistula L. of Fabaceae, Indian lilac Azadirachta indica A.Juss - Meliaceae; 30-45 cm Cap; Fan-shaped more or less, irregular but semicircular, having dull unvarnished outer crust. It is often furrowed in the different zones, greyish brown-brownish. The surface of pore white which turns dirty yellowish in colour, having 4-6 tiny (nearly not visible to the naked eye) circular pores/mm; Stem- absent; Brown to cinnamon brown flesh and it is very tough.If treated with a solution of KOH tubes and flesh turns black. Brown/reddish brown spore print. Microscopically: Spores 7-11 x 6.4-7 μ , more or less elliptical having a truncated end but showing smooth on lower magnifications. Setae and cystidia not found to be present.

D. *Ganoderma carnosum Pat.*

Found growing on old dead Kikar trees of Panchgaon -Acacia karoo having 5-19 cm cap which being oval to rounded /reniform to flabellate. The stalk and upper surface shiny. The lower surface pale greyish/white to cream, Its margin narrow when young it has white colour later yellowish/brown-red 4-15 cm long stipe cylindrical when compressed but often nodulose and tapering toward the base. The size of spore 10-12.5 x 7.4-8.4 μ m and broadly elliptical shape.

E. *Schizophyllum commune*

Found growing on dead stems of white mulberry-Morus alba L. at Panchgaon area. This was having many tiny fruiting projections but lacking stems. Found attached himself

as tiny bracket fungi. Fruiting Body is 1-4 cm wide and white to greyish. The inner surface structured with gill like folds which split down at mid portion. The flesh tough/ leathery. Spore Print white. The spores 3-6 x 1-1.4 μ , cylindrical to elliptical and smooth. Cystidia not present.

Several workers have studied macro fungi diversity on different decaying woods and reported their observations viz., Armillaria sp. and Fomitopsis pinicola (Prihoda, 1950); Fomitopsis pinicola (Rypáček, 1957); Calocera viscosa Renvall, 1995) causing brown rot to spruce tree; Auricularia, Calocybe, Calvatia, Coprinus, Lycoperdon, Macropleiota, Termitomyces and Podaxis (Hedawoo and Mohite, 2008); Agaricus, Coprinus, Cyathus, Lycoperdon, Schizophyllum, Daldinia, Polyporus and Ganoderma (Hadawoo, 2010);, Australohydnum dregeanum, Hjortstamia friesii, Schizopora flavipora (Tiwari et al., 2010) and Fomitopsis betulina (Pleszczyńska et al., 2017). Nagadesi and Arya (2012) collected wood deteriorating fungal species in between October 2006 and January 2011 from Ratanmahal Wildlife Sanctuary (RWLS) which were viz. Aurificaria indica, Fomitopsis cupreorosea Microporus affinis, Ganoderma curtisii, Microporus alboater, Phellinus shaferi. Marzuki et al (2017) reported 19 fungal species which grow on timber viz., Xylaria apiculata, Auricularia polytricha, Boletinus merulioides, Tyromyces chioneus, Ganoderma lucidum, Marasmiellus candidus. But in the present investigation, five macrofungi were found to be dominant may be due to the prevailing climatic conditions at Panchgaon and season of our collection.

The Lucidum species of Ganoderma have been in wide circulation as a herbal medicine since time immemorial as the great Japanese and Chinese emperors were drinking to achieve longer life and were attaining enhance vitality. Singh (2010) at Forest Pathology Division, Forest Research Institute, Dehradun reported Ganoderma lucidum Capsule Preparation (200 mg powder is used for preparing 1 capsule so, from 468g (468000 mg) powder, 2340 capsules can be made. Output cost: Selling price of 1 capsule in market = Rs. 2.5/- Selling price of 2340 capsule in market = Rs. 5850/- Total profit = output cost - input cost = Rs. 5850-1718 = Rs. 4132/ (Singh et al., 2010).

So for if awareness is increased on the medicinal potential of different naturally growing all these 10 fungi is and also on deteriorating woods of value both in local and export markets, can directly help the villagers to generate additional income and enhance their socioeconomic status.

V CONCLUSION

The outcome of this investigation clearly highlights that all the ten macrofungi have ability to degrade wood, which means that these macrofungi have an important role in forest conservation, in terms of wood and litter

decomposition having huge potential for management of waste woods.

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