DIVERSITY OF MICROFUNGI ASSOCIATED WITH PLANT LITTER OF VERIOUS PLANT FROM MELGHAT FOREST DURING WINTER SEASON

C.V. Dadgale
Department of Botany, Late.B.S.Arts, Prof.N.G.Science & A.G.Commerce College, Sakharkherda.

Abstract

The aim of this study was to study the fungal species isolated from various plants of Melghat forest using macro and micro morphological characteristics. A cross sectional research design was used in the study and purposive sampling was employed to determine area of Melghat forest, Amravati and sub locations where sampling was done. Alternaria, Stigmella, Botrytis, Sirodesmium, Stemphylium, Rhizoctonia, Torula, Psudotorula, Bispora, Aspergillus, Paecilomyces, Phialomyces, Trichocladium, Chaetopsis, Curvularia, Basipetospora, Fusarium, Dictyoarthrinium, Endophragmia, Dictyosporium, Phragmotrichum, Pleiochaeta, Penicillium, Chalaropsis, Thielaviopsis, and Staphylotrichum species were isolated from five plant samples using potato dextrose agar and malt extract agar respectively. Pure cultures of the isolates were sub cultured and transferred onto differential media. Fungal slides were prepared from pure cultures on potato dextrose agar media after three days to identify micro morphological characteristics. Study revealed that 26 different genera have been found, it looks to be huge diversity observe for litter decomposition activity. Morphological characteristics as a primary tool for species identification should be embraced and more personnel with the knowledge are required since modern and faster techniques are scarce and expensive.

Plant Name: Tectona grandis, Terminalia tomentosa, Ougenia oojeinensis, Boswelia serrata, and Adina cardifolia.

Introduction:

Fungi are a diverse group of organisms ranging from microscopic forms to large mushrooms. Being a major group of decomposers they are essential for the survival of other organisms in the ecosystem, Fungi are important components of tropical ecosystems (Hawksworth 1991). By contributing to nutrient and carbon cycling and the maintenance of ecosystems, fungi play an important role in soil formation, fertility, structure, and improvement of any habitat (Pan et al. 2008). Saprotrophic litter fungi contribute substantially to these processes (Hedger 1985) because fine litter production represents the bulk of the input of biomass to the decomposition system in tropical forests.

Fungi are one of the most important organisms in the world, because of their vital role in ecosystem functions and human-related activities. Fungi play a significant role in the daily life of human beings besides their utilization in industry, agriculture, medicine, food industry, textiles, bioremediation, natural cycling and decomposing the dead organic matter present in soil and litter. (Molina et al. 1993; Keizer 1998; Pilz 2001; Cowan 2001; Chang and Miles 2004, Hunt 1999; Gates et al 2005).

Macrofungal biodiversity also play an important role in balancing ecological services. Fungi are one of the key functional components of forest ecosystems (Brown et al. 2006). They are omnipresent but drawing less attention than animal and plants. They are highly diverse in nature (Piepenbring 2007).

Decomposition on the forest floor is a very complex phenomenon and is achieved by different groups of microorganisms. The major component of the top soil consists of different parts of plant materials. These are immediately

colonized by diverse groups of microorganisms as they fall on the soil surface and soon after the processes of decomposition starts. Litter decomposition is also an important link in nutrient cycling of the forest (Grigal and McColl 1977). Litter decomposition is a critical process to function and integrity maintenance of all terrestrial ecosystems. The important ecological role is explicate mainly through the mineralization of organic matter, which returns the nutrients in inorganic form, but also through the formation of stable organic compounds in the soil. The decomposition is conditioned and regulated by a complex interaction of climate, litter quality and diversity of soil biota.

The aim of the study was to find out the very diverse fungal group, their litter decomposition rates, the qualitative changes during decomposition from the different plant to check their existence on earth.

Material and Method:

Study site:

Melghat was declared a tiger reserve and was among the first nine tiger reserves notified in 1973-74 under the Project Tiger. It is located at 21°26′45″N 77°11′50″ ECoordinates: in northern part of Amravati District of Maharashtra State in India. The Tapti River and the Gawilgadh ridge of the Satpura Range form the boundaries of the reserve. In 1985 Melghat Wildlife Sanctuary was created. The Tapi river flows through the northern end of the Melghat Tiger Reserve, through a forest which lies within the catchment area of the river system. Many different kinds of wildlife, both flora and fauna, are found here.

The study was conducted in 2013-2014 at Melghat. Melghat was declared a tiger reserve and was among the first nine tiger reserves notified in 1973-74 under the Project Tiger. Presently, the total area of the reserve is around 1677 km^2. It is located at latitude 21°26′45″N and longitude 77°11′50″E in northern part of Amravati District of Maharashtra State in India and at an altitude of 1088 m above the sea level.

At the northern extreme of the Amravati district of Maharashtra, on the border of Madhya Pradesh, lies the Melghat in the South-western Satpura mountain ranges. Melghat means 'meeting of the ghats', which describes the area as a large tract of unending hills and ravines scarred by jagged cliffs and steep climbs. Many different kinds of wildlife, both flora and fauna, are found here.

The forest is tropical dry deciduous in nature, dominated by teak (Tectona grandis). The reserve is a catchment area for five major rivers: the Khandu, Khapra, Sipna, Gadga and Dolar, all of which are tributaries of the river Tapti.

Climate of MTR is varying due to variation in altitude, aspect and distinct seasons Monsoon or rainy, winter, summer seasons. The area experiences a good rainfall during monsoon which varies from 950 mm to 1400 mm with average number of rainy days about 65 to 60. Temperature varies considerably with altitude. The high hills plateau and valleys to the North of Gavilgarh ridge are cooler in summer than the southern foothills. The plateau and high hills enjoy almost equitable pleasant climate throughout the year. The average mean maximum annual temperature is 46^o C. and the average mean minimum temperature is 4^o C. The geological formation and the soil largely determine the type of vegetation it is going to support. The most of the area has the soil of trap origin. These soils are rich in mineral and have a high water holding capacity. They have a high rate of exchangeable calcium and ph varing from 6.5 to 7.5 thus supporting the best form of teak. The following three types of soil are found in the area. Bouldery soil, Lateritic sandy loam soil, and Clay soils.

The present study was carried out during the winter season of month October to January.

Study design

Plant litter sample has been collected from the different region of the Melghat forest randomly. In the preliminary study, during 15 October to 30 January total five plant litter sample collected from different region of Melghat forest.

Field sampling

Field sampling was carried out during 20 November to 25 November 2013, and each sampling was done by a random sampling method. With the help of local people collection of sample is made easy. *Tectona grandis* (teak) is the most dominant species. The associates of *Tectona grandis* differ depending upon lattitude, gradient and other physiographic feature of the habitat. *Tectona grandis, Terminalia tomentosa, Ougenia oojeinensis,*

Boswelia serrata, Adina cardifolia total five plants litter has been collected.

Collection of Litter Samples:

Litter samples were collected during winter for study the seasonal variation in the decomposition. Each sample, which contained variously decayed material, will be divided into several groups based on external appearance and the degree of decomposition. Litter sample belonging to the following three groups were used for fungal isolation: 1) Newly fallen i.e. relatively undecomposed, 2) Middle stage decaying which were partly discolored, i.e. slightly decomposed, and 3) Old decaying fallen which were highly discolored, i.e. Decomposed litter (Tokumasu 1990).

Litter of plants leaf, stem, and bark were collected and photographed from various parts of Melghat region in winter seasons to study the biodiversity due to seasonal variation. Samples of litter were dried and brought to laboratory in sterile paper bags and stored at 4°C till further use. Litter were collected and photographed.

Study on litter decomposing fungi:

The fungi were isolated from leaf litter on culture media, then purified and identified as per methods briefly described below.

Direct observation:

Total forty five (5×3×3) litter samplings were made during the period of study. Litter samples were collected at random from the study site and brought to the laboratory in sterile polythene bags. The litter was sorted accordingly their labelled. Litter samples were cut into 5x5 mm^2 small pieces with a sterile parallel razor at random from the base, middle and apex. These pieces were cleaned, stained, observed under stereo-microscope and fungal colonization was recorded (Shipton and Browns 1962).

Moist chamber incubation technique:

Forty five litter samples were randomly selected and incubated in sterile moist chambers at 25±2°C. Petri plates (20 cm diam.) were sterilized (Keyworth 1951) and used as moist chambers with sterilized filter paper and periodically moistened with sterile distilled water. Sample were incubated for 48 hours and then examined under a binocular stereomicroscope for the fungal fructifications. Those fungi found sporulating were isolated, examined and identified to species level**.**

Isolation frequency and percentage occurrence were used to explain the colonization efficiency of the microfungi on the leaf litter (Table 1, Figure 2).

Leaf litter washing technique

Litter sample was cut into small pieces of 3 to 5 mm and rinsed by a sterile distil water and sterilize by using sterilization technique

Potato dextrose agar (potato 200 g, dextrose 20 g, Agar 20 g, distilled water 1 L) with streptomycin sulphate (300µg/mL) was cooled to 45°C and poured into each Petri dish. The plates were incubated at room temperature in glass chambers under aseptic conditions for 4 days and examined for fungal growth. All fungal colonies were recorded and the fungi were sub-cultured and identified.

Isolation of Fungi:

The samples were examined for associated fungi. Some of the specimens which did not show sporulating structures were subjected to moist chamber incubation so as to enable the fungi to grow and sporulate (Hawksworth, 1974). Single spores or fungal spore masses were picked up with the help of sterilized needle under a stereoscope and the fungi were cultured on pure basis (Wang and Wen, 1997). The litter samples were also subjected to particle plating method (Bills and Polishook, 1994).

Observations:

Isolation frequency (Table no.1) denotes the number of samplings in which a particular fungus was recorded as against the total number of samplings. Based on this, the fungi were categorized into 5 groups; most common(81-100%);common(61-80%); frequent(41- 60%); occasional (21-40%) and rare(1-20%).

Relative species abundance is a component of biodiversity and refers to how common or rare species is relative to other species in a defined location or community. Relative species abundance is calculated by dividing the number of species from one group by the total number of species from all groups.

Result and Discussion:

There are about 26 different genus are found on the litter of five different plant. It is high species richness found among the five different plants. Most of the fungi belongs to ascomycotina and few of them are belongs to

duteromycotina. From the above observation table of isolation frequency, it has been concluded that there is a great diversity of microfungi found on the litter of five plants. Alternaria, Torula, and the Psudotorula are the common genus of fungi which are found on various kind of litter in abundant. Some of the genuses are very rarely found in the litter decomposition activity but they are unique also.

From the above table maximum percentage of relative species abundance indicates the species is more common and occur randomly. Alternaria, Torula, Penicillium and Aspergillus are most abundantly found on the litter.

Conclusion:

Present study has revealed that the fungal diversity is very important aspect to study. There is a tremendous diversity found between the microfungi involved into the litter decomposition and the study also indicates that the group of fungi are specific to their activity to their relative host, on the basis of above result it has been concluded that Alternaria, Torula, and the Psudotorula are the common genus of fungi which are found on various kind of litter in abundant. Some of the genuses are very rarely found in the litter decomposition activity but they are unique also.

References

Bills GF and Polishook JD (1994a). Abundance and diversity of microfungi in leaf litter of lowland forest in Costa Rica. Mycologia 86: 187-198.

Molina RO, Dell T, Luoma D, Amaranthus M, Castellano and Russell K. (1993). Biology, Ecology and Social aspects of Wild Edible Mushrooms in the Forests of the Pacific Northwest: A Preface of Managing Commercial Harvest. U.S. Dept. of Agriculture Forest service, Pacific Northwest Research station, United States.

Chang ST and Miles PG (2004). Mushrooms cultivation, National Value, Medicinal Effect and Environmental Impact. 2nd ed. CRC Press, New York.

Cowan A. (2001). Fungi-Life Support for Ecosystems. Essential ARB4, West Wickham, Kent, UK.

Brown NS, Bhagwat S, Watkinson. (2006). Macrofungal diversity in fragmented and disturbed forests of the Western Ghats of India. J Appl Ecol 43 (1): 11-17.

Grigal DF, McColl JG. (1977). Litter decomposition following forest fire in northeastern Minnesota. J Appl Ecol 14: 531-538.

Hunt GA. (1999). Assessing macrofungi of special concern for conservation in forested ecosystems. In: Proc Biology and Management of Species and Habitats at Risk. Vol 2, 15-19 Feb 1999, University College of the Cariboo, Kamloops.

Keizer GJ. (1998). The Complete Encyclopedia of Mushrooms. Rebo Publishers, Netherland.

Keyworth PK. (1951). A petridish moist chamber. Trans Br Mycol Soc 34: 291-292.

Piepenbring M. (2007). Inventoring the fungi of Panama. Biodiv Conserv 16 (1): 73-84.

Shipton WA and Brown JF. 1962. A whole leaf cleaning and staining technique to demonstrate host pathogen relationship of wheat stem rust. Phytopathol 52: 1813.

Hawksworth DL. (1991). The fungal dimension of biodiversity: magnitude, significance and conservation. Mycol Res. 95:641–655.

Pan HQ, Yu JF, Wu YM, Zhang TY, and Wang HF. (2008). Diversity analysis of soil dematiaceous hyphomycetes from the Yellow River source area. J Zhejiang Univ Sci B. 6:64–69.

Gates GM, Ratkowsky DA, and Grove SJ. (2005). A Comparision of macrofungi in young Silvicultural regeneration and mature forest at the Warra LTER siet in the southern forests of Tasmania. Tasforests 16: 127.