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Diversity of Epigeous Ectomycorrhizal Fungi in the Campus of Swami Ramanand Teerth Marathwada University Nanded, Maharashtra

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Abstract: ***Present study deals with the evaluation ofdiversity of Ectomyccorhizal fungi (ECM) are themutually associated with the higher plants mainly grasses. All the fungal species were collected from S.R.T.M. University Campus. (19°06'00.3"N, 77°17'15.6"E) in Monsoon period month of June to November 2014. The fungal species samples wereisolated by the smallpileus tissue of basidiocarps and spore print method. In all 08 Ectomycorrhizal samples were identified up to species level and 03up to generic level. The genus Termitomyces heimiiand Termitomyces clypeatus are the most dominant in the collected samples.***

Keywords: Ectomycorrhiza (ECM), Fungi, Diversity

1. Introduction

The word ―Mycorrhiza'' is the combination of two Greek words '*Mykes*' means '*Fungus'* and '*Rrhiza*' means '*Root'* i.e. '*Fungal Root*'. The ―Mycorrhiza'' word firstly introduced by the German Forest Pathologist A. B. Frank in 1885. But the work on mycorrhiza was started in India by B. K. Bakshiin early sixties when practically having lack of information about mycorrhiza [7].Mycorrhiza is mutually association with roots of woody vascular plants and mycelium of nonpathogenic soil fungi.Generallymycorrhiza have classified under the two main groups on the basis of morphological and anatomical structural featuresi.e. endomycorrhiza and ectomycorrhiza. [5,11].In early days, the latest classification of mycorrhizae has seven groups i.e. *Ectomycorrhizae (ECM), Vesicular Arbuscular (VAM), Ectoendomycorrhizae, Arbutoidmycorrhizae, Ericoid mycorrhizae, Monotropoidmycorrhizae, and Orchid mycorrhizae*. [4].

Important of Ectomycorrhizae

Ectomycorrhizae is generally beneficially associatedwith temperate and boreal forest trees[2]. But it is also found in tropical region like Maharashtra during the monsoon period[1,6]. Most of the ECM fungi(about over 5,000)belonging to Ascomycetes and Basidiomycetes which are beneficial associated with about 2,000 woody perennial plants and grass. [1].The complicatednetwork of mycelium of fungus that goes in to the roots of host cell wall and hyphae entered in the root epidermal or cortical root cells known as Harting net. Ectomycorrhiza is only type of the mycorrhiza which are the absence of intracellular penetration. They only capable to produce the intercellular penetration when the nutritional balance disturbed of the associated host [4].This connection of ectomycorrhiza fungus and plants are very important for essential nutrients exchange between them. In this association both the partners are beneficial because fungi getscarbohydrates from plants and fungi provideswater, mineral, salts and metabolites to the plant [14].

Ectomycorrhizae helps in mobilization of nutrients mainly water, nitrogen, phosphorus etc. It plays dominant role inenhance the growth and development of plantand also they help tremendously in increase the productivity of soil [12,16].Ectomycorrhiza make easy provide water and nutrients from soil which are unable to absorb by the nonmycorrhizal roots of higher plants. They help in nutrient solublization and minerals cycling especially carbon and nitrogen cycling which are very important for the plant as well as for forest ecosystem [3].They are important for degrade the cellulose and hemicelluloses ex.*Termitomyces Spp.* [13].It is also play important role in stimulate uptake of phosphorus of their host plants from the soil[6].They are also reported protects the plants from the attack by the harmful root pathogens and other microorganism [2,7,15]. Ectomycorrhizae plays vital role to increase the nodulation and nitrogen fixing ability as well as they work as growth regulatorlike Indole Acetic Acid (IAA) for plants growth. [7]. Ectomycorrhiza alsohelp increase in growth of forest seedlings[10].

The present study aimed to evaluate the diversity of ECM from the selected areaof Swami Ramanand Teerth Marathwada University Campus, is located in Nanded district of Maharashtra (19°06'00.3"N 77°17'15.6"E) occupied approximately 525 acres area. Number of plants species belonging to both monocots and dicots have shown Ectomycorrhizal association.

2. Materials and Methods

Samples Collection

The fungal collection have done in the S.R.T.M. University campus (Figure 01) by hand picking method with the help of clean, sterilized polythene, basket and shovel etc.Dig out the samples safely in a matter that the ectomycorrhiza or connection in between the ectomycorrhizal hyphae with their root of host did not damaged and brought to the laboratory for further analysis and processed immediately.

Spore Print, Preparationand Isolation of Pure Culture

These collected samples were isolated from the spore print technique. For collect the spores, cut the cap from the stalk of fresh, well cleaned fungal sample place it spore side down on the whiteorblack hard paper or the clean sterilized petri plate and covered it bowl or beaker to prevent the disturbance from the air or any other things. After the couples of hours the spores fall down on the paper or petri plates which are useful to kept or inoculated on the semi synthetic media i.e. MMN media, PDA media,Czapek dox media.

Another general method used that cutting small tissue of basidiocarps, surface sterilized and kept on the media and maintain on it. After the 3-4 days the growth of fungal colonies started appearing on the plate observed and record it on notebook.[8, 17].

Staining and Mounting

Lactophenol cotton blue used for staining to observe the basidiospore and basidium [9]. These fungus were observed under the light microscope and micro photographed by Digi Eye Camera fitted with to OLYMPUS CX 21 bright field light microscope.

Identification of the Fungi

Identification was done by using morphological characters, thallus structure and spore characters considered as diagnostic feature for identification and these morphological structureswere identified by the standard taxonomic key given by Ainsworth and some otherbooks and various research articles.

Figure 1: Showing the Location of Study Area

Table 1: The identified ectomycorrhizal fungi associated with their host

Sr. No.	*Name of Ectomycorrhizal species*	*Host*	*Selected sites*		
			BG	*LA*	*PA*
01)	*Termitomyces heimii* Nat.	*Azadirachtaindica*	15	07	02
02)	*Termitomycesclypeatus* Heim.	*Grass/ Peltophorum ferrugineum*	07	06	01
03)	*Coprinusplicatilis*	*Cynodondactylon*	07	02	06
04)	*Galerina spp.*	*Peltophorumferrugineum*	09	-	01
05)	*Agaricusarvensis*	*Euphorbia spp.*	01	-	-
06)	*Panaelopesspp.*	Grass ssp.	-	01	03
07)	*Cordicepsspp.*	Grass ssp.	-	-	01
08)	*Volvariellabomybsiyana* (Schaeff.) Singer	*Jatropha spp.*	02	-	-
09)	*Volvariellabomybsiyanavar. flavicepsv* (Murrill) Shaffer.	*Jatropha spp.*	01	-	-
10)	*Agaricus placomyces* Peck.	Grass ssp.	-	05	-
11)	*Macrolepiota procera* (Scop.) Singer.	Grass ssp.	02	01	-
		Total	**44**	**22**	**14**

Selected Sites: BG: Botanical Garden**, LA:** Lake Area**, PA:** Pangari Area**.**

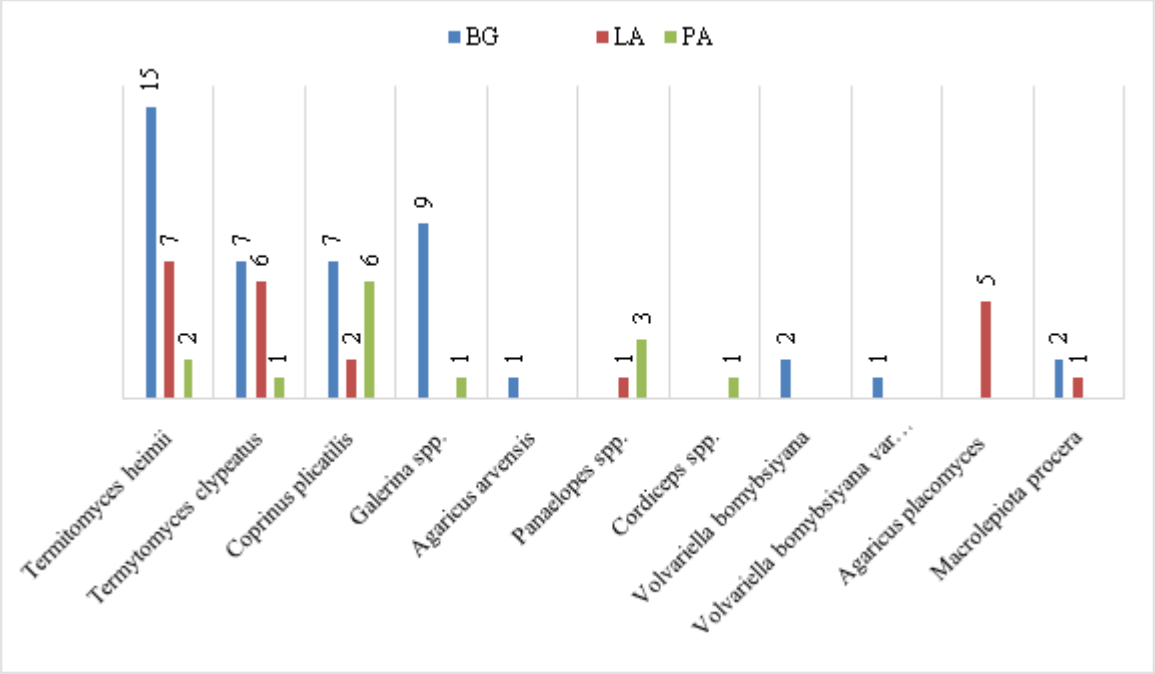

Figure 2: Graphical representation of collected ECM samples in quantity.
BG: Botanical Garden**, LA:** Lake Area**, PA:** Pangari Area**.**

3. Result

Present study deals with to explore the diversity of Ectomycorrhizal fungi. There are 11 different ectomycorrhizal fungal species are collected from selected area in which 08speciesidentifiedup to species level and 03 species up to genera level. Table 1: clearly shows that *Termytomyces ssp.*is the more dominant fugal species as compare to other species. It is observe in all the selected sites.

Figure 3: Fruiting bodies of ectomycorrhiza fungia) *Termitomyces clypeatus* **b)***Termitomyces heimmi***c)** *Galerina spp.***d)** *Coprinus plicatilis***e)***Agaricus arvensis***f)** *Macrolepiota procera* **g)***Agaricus placomyces***h)***Cordiceps spp.* **i)***Panaelopes spp.* **j)***Volvariella bomybsiyana var. flaviceps***k)** *Volvariella bomybsiyana*

4. Conclusion

The result of this research experiments showed thatexplore the diversity of epigeous ectomycorrhiza in S.R.T.M. University campus.Ectomycorrhiza is the most important factor for plant as well as the ecosystem. It channelize nutrients and biomass which are important for the nature. They are associated both the monocots and dicots plants.

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References

[1] Agarwal, P., and Sah, P. (2009) Ecological Importance of Ectomycorrhizae in World Forest Ecosystems. ***Nature and Science.*** 7(2), ISSN 1545-0740.
[2] Amadou, M. B., Duponnois, R., Moyersoen, B.,Diédhiou, A. G., (2012)Ectomycorrhizal symbiosis of tropical African trees.***Mycorrhiza.*** 22:1–29 DOI 10.1007/s00572-011-0415x
[3] Deckmyn, G., Meyer, A., Smits, M.M., Ekbald, A., Grebenc, T., Komarov, A., and Kraigher, H. (2014) Simulating ectomycorrhizal fungi and their role in carbon and nitrogen cycling in forest ecosystems. ***Canadian Journal of Forest Res***.44: 535-553.
[4] Harley, J.L. and Smith, S.E. (1983)***Mycorrhizal symbiosis,*** Academic Press, London. pp.05, 191,334.
[5] Imhof, S. (2009)Arbuscular, ecto-related, orchid mycorrhizas—three independent structural lineages

towards mycoheterotrophy: implications for classification? ***Mycorrhiza***.19:357–363

[6] Kamble, V. and Mulani, R.M. (2012)Mutation Studies in ECM Fungus *Tricholoma lascivum* (Fr.) Gilletfrom Maharashtra. ISSN: 2278-1072, ***Biosciences International***, 1(3): 66-73.

[7] Mehrotra, M.D. (1991) ***Mycorrhizae of Indian Forest Trees***. Published by the Editor, Editorial Board, Forest Research Institutes on behalf of ICFRE, Dehra Dun. PP. 1, 7,131-137.

[8] Metzler, S., Metzler, V., Miller, O.K. (1992) ***Texas Mushroom: A field Guide,*** University of Texas Press, Austin. PP. 15.

[9] Mitchell, A.D., Walter, M., Gaunt, R.E. (1997) Image analysis of Agaricus basidiospores for use in systematics. Biotechnology techniques. Vol. 11, No. 11, pp. 801-804. ***Mycologia***. 61: 410-411.

[10] Nair, M.C., Balkrishnan, S. (1984). ***Beneficial fungi and their utilization.*** Scientific Publishers. ISBN: 81-85046-31-x. pp 59-72.

[11] Payronel, B., Fassi, B., Fontana, A. and Trappe, J.M. (1969)***Terminology of Mycorrhizae***.61:410-411.

[12] Plamboeck, A.H., Dowson, T.E., Warburton, L.M.E., North, M., Bruns, T.D., Ouerejeta, J.I. (2007) Water transfer via ectomycorrhizal fungal hyphae to conifer seedlings. ***Mycorrhiza***. 17:439-447.

[13] Sawhasan, P., Worapong, J., Flegel, T.W., Vinijsanun, T. (2012) Fungal partnerships stimulate growth of *Termitomyces clypeatus* stalk mycelium in vitro. ***World Journal of Microbiology and biotechnology.*** 28:2311-2318.

[14] Schirkonyer, U., Bauer, C., Rothe, G.M. (2013) Ectomycorrhizal diversity of at five different tree species in forests of the Taunus Mountains in Central Germany. ***Open Journal of Ecology.*** Vol.3 No. 1, 66-81.

[15] Sim, M.Y. and Eom, A.H. **(2006)** Effect of Ectomycorrhizal Fungi on growth of seedlings of *Pinus densiflora*.***Mycobiology.***34(4): 191-195.

[16] Smith, S.E., and Read, D.J. (2008) ***Mycorrhial Symbiosis***. Academic Press, ISBN: 978-012-370526-6. PP. 4-5.

[17] Stamets, P. and Chilton, J. S. (1983)***The Mushroom Cultivator, A Practical Guide to Growing Mushrooms at Home.*** ISBN: 0-96 1 0798-0-0, Published by Agarikon Press Box 2233, Olympia, Washington, 98507.PP.23-31.

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