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STUDY OF MACRO-FUNGAL DIVERSITY FROM KARJAT AREA OF AHMEDNAGAR DISTRICT, MS, INDIA

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ABSTRACT:
Fungi are having separate kingdom among living organisms among them macro-fungi are the fungal *species* that produce fruiting bodies visible to naked eyes and occurs widely in the rainy season. The macro-fungi play an important role in nutrient dynamics, soil health, as pollution indicator, *species* mutualism and its interaction and even has its economic role in carbon cycling and the mobilization of nitrogen and phosphorous. During extensive field survey macrofungal samples were collected and identified which belonging to 36 *Species* 7 Orders and 17 Families (Xylariaceae, Tremellaceae, Auriculariaceae, Dacrymycetaceae, Fomitopsidaceae, Meruliaceae, Polyporaceae, Ganodermataceae, Agaricaceae, Lyophyllaceae, Marasmiaceae, Psathyrellaceae, Strophariaceae, Schizophyllaceae, Bolbitiaceae, Tricholomataceae and Hymenochaetaceae) from different parts of Karjat area. Out of which order Agaricales are most dominant among others. This is first time reported from Karjat area.
KEYWORDS: Basidiomycetes; Diversity; Macrofungal; Survey.

INTRODUCTION:

Fungi are a group of heterotrophic organisms that consist of a thallus, an assemblage of vegetative cells not forming tissue in the functional sense, and therefore not having differentiated organs. They are one of the most diverse groups of organisms on the earth, and constitute a significant part of terrestrial ecosystems. They form a large share of the *species* richness and are key-players in ecosystem processes (Keizer, 1998; Seen-Irlet *et al.*, 2007).

These fungi mostly belong to Ascomycota, Basidiomycota and Zygomycota. The peculiar diagnostic morphological (external morphology and internal morphology) characters of fructification (ascomata in case of ascomycota and basidioma in case of basidiomycota) play an important role in their identification. These fructifications are visible and have different types of shapes, size and colour. On the basis of shape and size of fructification, the macrofungi can be categorized into fleshy fungi, mushrooms, polyporoid fungi, cup fungi, jelly fungi and puffballs etc. Most of the macrofungi are considered as important non-timber forest product as these are both edible and medicinal too (Vane, 2003; Boa, 2004; Bishop *et al*., 2015). Biodiversity of naturally occurring macrofungi on deteriorated waste woods and dead tree logs were studied and reported. *Ganoderma lucidum, Ganoderma curtisiil, Ganoderma applanatum, Ganoderma carnosum and Schizophyllum commune* shows diverse occurrence of habitats on wood deteriorating and tree logs (Kumar, 2017). The detailed review of published records of macrofungi revealed that only twenty two *species* of macrofungi (*Auricularia auricula-judae, Echinodontium taxodii, E. himalayana, Fomitopsis dochmia, Ganoderma applanatum, G. lucidum, Hymenochaete mougeotii, Scytinostroma cystidiatum, Flavodon flavus, Steccherinum oreophilum, Dichomitus leucoplacus, Hexagonia sulcata, Polyporus hirsutus, Trametes hirsute, T. Gibbosa, T. Versicolour, Tyromyces gollanii, Coronicium gemmiferum, Schizophyllum commune, Hyphodontia arguta, Stereum sanguinolentum* and *Daldinia concentric*) have been reported by researchers from Hamirpur region (Chander *et al.*, 2017a, 2017b). During extensive field survey thirty macrofungal

samples were collected and identified which belonging to twenty-three genera and sixteen families (Ganodermataceae, Hygrophoraceae, Hyphodermataceae, Hymenochaetaceae, Fomitopsidaceae, Polyporaceae, Tricholomataceae, Pezizaceae, Meruliaceae, Strophariaceae, Sparassidiaceae, Xylariaceae, Albaratrellaceae, Cantharellacea, Pyronemataceae and Cordycipitaceae) from different parts of Gorakhpur district. Out of these *species*, seven *species* were found to be edible; twenty-two were nonedible while *Hygrocybe miniata* was deadly poisonous (Singh *et al.*, 2019).

The present study was carried out in Karjat tahsil located as south region of Ahmednagar district at 18019'86" N to 18049'86" N latitude and 74043' 20" E to 75013'20" E longitude having a total area of 1,440 km^2. The Karjat tahsil is drought prone with less average rainfall. The diverse climatic conditions and ecological habitats of Karjat make this area a natural habitat for the growth and development of large number of macro-fungi. Considering these things, the present investigation is trying to focus on the diversity of macro-fungi in and around Karjat area of Ahmednagar district of Maharashtra, India.

STATEMENT OF RESEARCH PROBLEM:

Karjat is a drought prone area due to some rains the fungal diversity was observed in the area and no study was carried out earlier, related to this area. So, an attempt was made to study biodiversity of fungi Karjat region.

OBJECTIVES OF THE STUDY:

To study biodiversity of macrofungi from Karjat region with the help of morphological and anatomical studies.

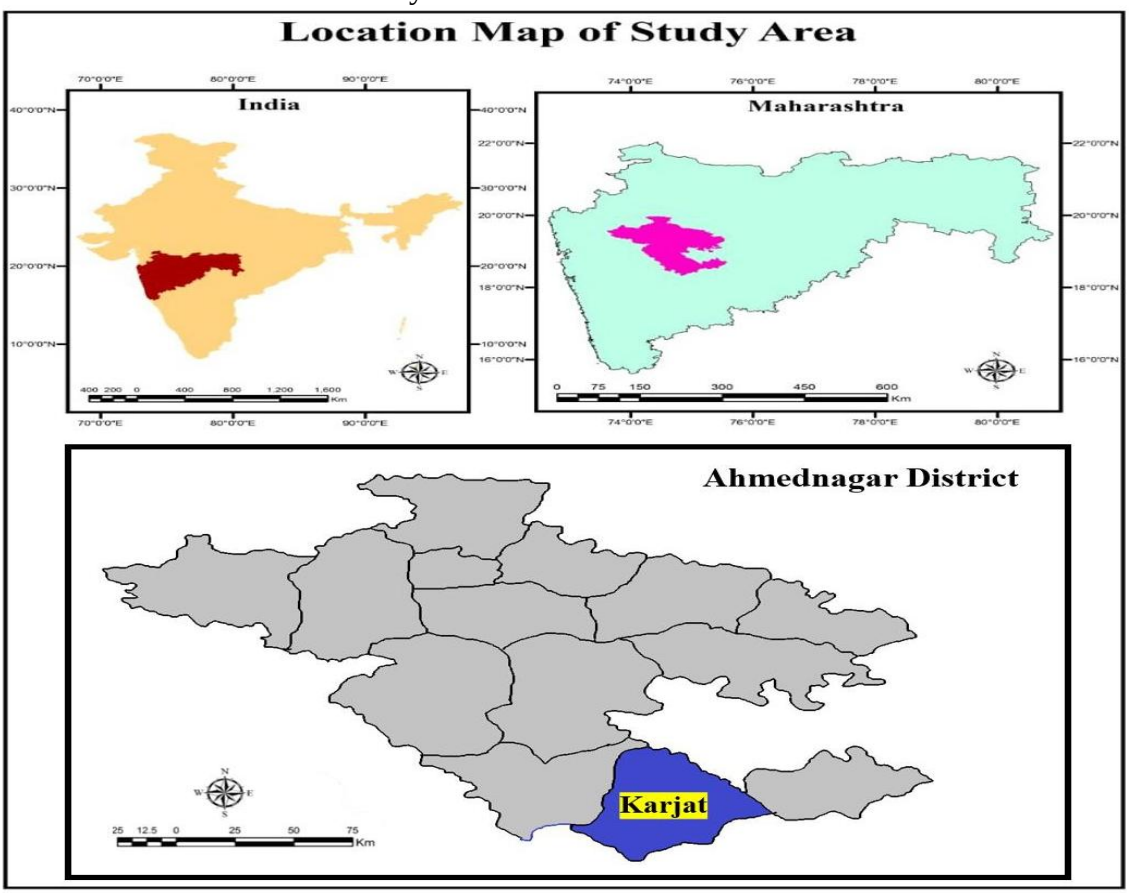
SIGNIFICANCE OF THE STUDY:

Majority of fungi are growing in rainy season and that is the suitable climate for the growth and development of Fungi. In Karjat, we found most dominant macrofungi in around area. From the literature survey we found that macrofungi from Basidiomycotina are the best sources of minerals and vitamins and also referred as edible fungi. Fungi having very important potential applications like medicinal, symbionts and decomposers. This study will enrich the study of Macrofungi and adds knowledge about its biodiversity from Karjat Tehsil.

RESEARCH METHODOLOGY:

The survey and collection (Photo Plate 1.) of macro-fungi was carried out from Karjat area during rainy season from 2020 to 2021. While survey and collection, habitat, habit, type of substratum, colour, size and odour of macro-fungi were recorded. Field photography of fungi was also done. Fungal material was brought to the laboratory using clean polythene bags and stored properly for their further analysis. Macroscopic and microscopic characters of their fruiting bodies were studied by using laboratory lenses and light microscope. The fungi were identified by using standard literature (Ranadive *et al.*, 2011, Gogoi and Parkash, 2015a) and classified according to classification system of Ainsworth (1973).

Photo Plate 1: Location of Study Area



RESULTS AND DISCUSSION

Present investigation emphasizes on study of macro-fungi from Karjat area of Ahmednagar district of Maharashtra. In the observation total 36 macro-fungal *species* belonging to 02 sub-divisions, 7 orders and 17 families were reported (Table 1. & Photo Plate 2.). The Basidiomycotina fungi having highest contribution i. e. 97% followed by Ascomycotina (3%). Agaricales was found as predominant order compared to other orders. The number of *species* in Agaricales was - 21, followed by Polyporales (8 *sp*.), Hymenochaetales (3 *sp*.) Xylariales, Tremellales, Auriculariales and Dacrymycetales (1 *sp*.) respectively.

Coprinus, Agaricus and Ganoderma were most abundantly found genera on the contrary *Tremella and Dacryopinax* was occurred rarely. Present study was shown interesting due to its economical values as edible, medicinal but rarely some *species* are found poisonous too (Table 2). Ranadive *et al.* (2011) reported that Aphyllophorales of Maharashtra as well as India, emphasizes on majority all aspects of Aphyllophorales and concluded that Aphyllophorales are the major source of biologically active natural products among the *species* of the diverse fungal phylum Basidiomycota.They further reported many *species* like *Trametes versicolor, Laetiporus sulphureus* and *Ganoderma* are richest source of secondary metabolites and polysaccharides and The majority of chemical compounds isolated from polypores are screened to have significant antimicrobial activities.

Gogoi and Parkash (2015a) published a checklist of gilled mushrooms from Hollongapar Gibbon Wildlife Sanctuary, Assam, India and reported 138 *species* of gilled mushrooms belonging to 48 genera, 23 families. They found that the order Agaricales was the highest number of *species* i.e. 113, followed by Russulales (14 *sp*.), Polyporales (5 *sp*.), Cantharellales (4 *sp*.) and Boletales (2 *sp*.). Diversity of gasteroid fungi (Basidiomycota) from Hollongapar Gibbon Wildlife Sanctuary, Jorhat, Assam, India was

studied by Gogoi and Parkash (2015b) and reported 22 gasteroid fungal *species* belongs to 9 genera, 4 families, 4 orders, 2 sub-classes and 1 class. Furthermore, they concluded that the family 8 *species* from Agaricaceae was highly dominant from the study site followed by Phallaceae (7 *sp.*), Geastraceae (4 *sp.*), and Sclerodermataceae (3 *sp.*). Shimoga District of Karnataka. Our reports are also similarly observed.

Verma *et al.* (2018) Observed that thirty macrofungal samples were collected and identified which belonging to twenty-three genera and sixteen families (Ganodermataceae, Hygrophoraceae, Hyphodermataceae, Hymenochaetaceae, Fomitopsidaceae, Polyporaceae, Tricholomataceae, Pezizaceae, Meruliaceae, Strophariaceae, Sparassidiaceae, Xylariaceae, Albaratrellaceae, Cantharellacea, Pyronemataceae and Cordycipitaceae) from different parts of Gorakhpur district. Bhosale *et al.* (2019) published a checklist of Macro-Fungi from Baramati Area of Pune District and reported 64 fungal *species* belonging to 37 genera, 03 sub-divisions, 13 orders and 23 families.

Photo Plate 2: Macro-fungal Diversity from Karjat Area


Cystoagaricus trisulphuratus


Coprinopsis cinere


Coprinopsis lagopus


Termitomyces clypeatus


Ganoderma lingzhi


Trametes hirsuta


Schizophyllum commune


Omphalotus olearius


Daldinia concentrica


Dacryopinax spathularia


Macrolepiota procera


Agaricus rotalis

Table 1: *Species* Diversity of Macrofungi in Karjat Area of Ahmednagar District.

Sr. No.	*Species*	Family	Order	Class	Sub Division
1.	*Daldinia concentrica*	Xylariaceae	Xylariales	Sordariomycetes	Ascomycotina
2.	*Tremella mesenterica*	Tremellaceae	Tremellales	Tremellomycete	Basidiomycotina
3.	*Dacryopinax spathularia*	Dacrymycetaceae	Dacrymycetales	Dacrymycetes	Basidiomycotina
4.	*Auricularia auricula*	Auriculariaceae	Auriculariales	Agaricomycete	Basidiomycotina
5.	*Fomitopsis pinicola*	Fomitopsidaceae	Polyporales	Agaricomycete	Basidiomycotina
6.	*Irpex lacteus*	Meruliaceae	Polyporales	Agaricomycete	Basidiomycotina
7.	*Abortiporous biennis*	Meruliaceae	Polyporales	Agaricomycete	Basidiomycotina
8.	*Hexagonia tenuis*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
9.	*Trametes hirsuta*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
10.	*Ganoderma applanatum*	Ganodermataceae	Polyporales	Agaricomycete	Basidiomycotina
11.	*Ganoderma lingzhi*	Ganodermataceae	Polyporales	Agaricomycete	Basidiomycotina
12.	*Ganoderma lucidum*	Ganodermataceae	Polyporales	Agaricomycete	Basidiomycotina
13.	*Agaricus arvensis*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
14.	*Agaricus campestris L.*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
15.	*Agaricus rotalis*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
16.	*Coprinus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycoti

	cinerea				na
17.	*Coprinus comatus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
18.	*Coprinus lagopus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
19.	*Coprinus hiascens*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
20.	*Lepiota cristata*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
21.	*Lycoperdon umbrinum*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
22.	*Macrolepiota procera*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
23.	*Podaxis pistillaris*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
24.	*Termitomyces clypeatus*	Lyophyllaceae	Agaricales	Agaricomycete	Basidiomycotina
25.	*Marasmius oreades*	Marasmiaceae	Agaricales	Agaricomycete	Basidiomycotina
26.	*Marasmius siccus*	Marasmiaceae	Agaricales	Agaricomycete	Basidiomycotina
27.	*Omphalotus olearius*	Marasmiaceae	Agaricales	Agaricomycete	Basidiomycotina
28.	*Cystoagaricus trisulphuratus*	Psathyrellaceae	Agaricales	Agaricomycete	Basidiomycotina
29.	*Agrocybe pediades*	Strophariaceae	Agaricales	Agaricomycete	Basidiomycotina
30.	*Schizophyllum commune*	Schizophyllaceae	Agaricales	Agaricomycete	Basidiomycotina
31.	*Panaeolus cyanescens*	Bolbitiaceae	Agaricales	Agaricomycete	Basidiomycotina
32.	*panaeolus papilionaceus*	Bolbitiaceae	Agaricales	Agaricomycete	Basidiomycotina
33.	*Cantharellula umbonata*	Tricholomataceae	Agaricales	Agaricomycete	Basidiomycotina
34.	*Coltricia perennis*	Hymenochaetaceae	Hymenochaetales	Agaricomycete	Basidiomycotina
35.	*Phellinus everhartii*	Hymenochaetaceae	Hymenochaetales	Agaricomycete	Basidiomycotina
36.	*Phellinus ferreus*	Hymenochaetaceae	Hymenochaetales	Agaricomycete	Basidiomycotina

CONCLUSION:

The present study has been concluded that, Karjat area of Ahmednagar district of Maharashtra having tremendous diversity among macro-fungi. The Basidiomycotina group showed highest contribution as compared to Ascomycotina. Agaricales and Polyporales were found most dominant

orders and luxuriantly grow in rainy season and cold climatic conditions. Only these fungi having very important potential applications like edibles, medicinal, symbionts and decomposers.

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