



A STUDY ON THE DIVERSITY OF MUSHROOMS FROM CAUVERY DELTA REGION, TAMIL NADU, INDIA

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Abstract

Mushroom belongs to the group of organisms known as macrofungi under the phylum Ascomycotina and Basidiomycotina. Mushroom is the fleshy and spore - bearing organ of the fungi that called as fruiting body. Mushrooms are seasonal fungi, which occupy diverse niches in forest and territory ecosystem. They mostly occur during the rainy season, particularly in forests, where the dense canopy shade from trees provide a moist atmosphere and decomposing organic material such as leaf litter, and favors the germination and growth of mushrooms. We have studied eco- social forestry of Cauvery Delta Region of Tamilnadu. A total of 35 mushroom species belonging to 23 genera in 15 families were recorded in this study. The species richness was found more in families Agaricaceae followed by Ganodermataceae, Lycophyllaceae, Schizophyllaceae, Xylariaceae, Polyporaceae, Marasmiaceae, Psanthrellaceae, and Strophaniaceae. Auriculariaceae, Botetaceae, Fornitopsidaceae, Mycenaceae, Tremellaceae, and Tricholomataceae showed less diversity. The difference in the distribution of commonly observed mushroom fungal families over this location was compared with other locations in India.

Key word – Cauvery Delta Region- Edible - Medicinal - Poisonous mushrooms

Introduction

The fungi are heterotrophic organisms of very diverse form, size, physiology and mode of reproduction. The ancient Greeks and Romans, and surely their less civilized contemporaries, were fond of truffles, mushroom and puffballs. Mushrooms fungi have fruiting bodies large enough to be seen with the naked eye and to be picked up by hand (Chang & Miles 1987, Anon 2005). There is a great number and variations in mushroom morphology. The variation in size, colour, texture and shape of the cap and stalk are the obvious characters and important in identifying mushrooms (Chang & Miles 1987). The big difference in mushroom is that some are edible and some are poisonous (Smith & Weber 1996). Taxonomic description of macrofungi is well documented by mycologists' worldwide (Klan 1981, Ellis & Ellis, 1990). Mushrooms were included in the diet by Greeks and Romans since ancient times. Romans regarded them as food of God while Chinese termed them as elixir of life (Bashir et al. 2014). Many countries use traditionally wild edible mushrooms as delicious and nutritional foods and medicine (Saiqa et al. 2008).

Mushroom diversity

Indian mycologists have reported many species of family Agaricaceae, mostly represented by genus *Agaricus* from different states of India. Biodiversity studies have been conducted in different parts of Central India by several workers. One third of fungal diversity of globe exists in India. Out of 1.5 million of fungi, only 50% are characterized until now (Manoharachary et al. 2005). Manoharachary et al. (2005) reported different uses of medicinal mushroom viz., *Lentinus* sp., *Pleurotus* sp., *Schizophyllum* sp., *Pisolithus* sp., *Ganoderma lucidum*, *Agaricus bisporus*, *A. campestris*, *Pleurotus* sp. and *Termitomyces heimii*. A large number of agarics which includes species of *Lepiota*, *Leucocoprinus*, and *Macrolepiota* were reported (Butler & Bisby 1931) in Fungi of India. Senthilarasu & Kumaresan (2016) reported 132 species in 60 genera belonging to Agaricales, Polyporales and Russulales. *Xylaria* species grows on a variety of substrates especially on decorticated wood, dung and nests of termites/ants (Rogers 2000, Hsieh et al. 2010, Karun & Sridhar 2015). The widely distributed *Ganoderma applanatum* or shelf fungus is a unique woody Polyporaceae among all mushrooms as it is used for its pharmaceuticals value rather than food (Acharya 2010). Karwa & Rai (2010) reported total of 153 species edible and medicinal mushrooms in the study conducted in Melghat forest, which is a Tiger Reserve situated in Satpuda mountain ranges in Maharashtra. Species dominating belonged to genera *Agaricus*, *Pleurotus*, *Termitomyces*, *Cantharellus*, *Ganoderma*, *Auricularia*, *Schizophyllum*, *Morchella*, etc.

Ecology of mushrooms

Most fungi including mushrooms grow deep down underground as a vegetative mycelium and many do indeed filter out toxins out of the soil, act as a natural sponge and as a natural recycler. They break down dead organic matter, plants, dead trees and wood, carcass, termite comb, leaf litter, and will help in the recreation of new nutrients and fertile soil. They are nature's natural recyclers where old becomes new and dead matter is broken down in order to give birth to something new. Certain bacteria and fungi thus help nature to decompose whatever is dead and old.

Mushroom emergence in natural ecosystem is a complex phenomenon. It is linked to multitude of factors such as rain fall, temperature, microclimate, soil, season, humidity, association with plants, microbes and others. Fungi produce fruit bodies in response to environmental and physiological factors, especially to adequate moisture and appropriate temperature (Pradeep et al. 2003). Many mycologists have given significant contributions in study of macrofungal diversity, Natarajan et al. 2005, Kaur et al. 2013 worked on diversity especially of agarics from Nilgiri Biosphere Reserve, Western Ghats of Tamilnadu. Senthilarasu & Kumaresan, (2016) studied morphological taxonomy of 15 agaric species belonging to order Agaricales collected from dipterocarp forests of Western Ghats of Karnataka. Biodiversity includes not only many species that exist, but also the diversity of populations that makeup a species, the genetic diversity among individual life forms, and the many different habitats and ecosystem around the globe (Ananthakrishnan, 1997). Certain species of mushroom are associated with particular kinds of trees and plants (Hawksworth, 2001). Wild mushrooms have manifold impacts on the biology, ecology and economy in forest based areas. Mushroom species are the indicators of the forest health (Stametes, 2000). The variation observed in occurrence of mushroom species in various habitats may be due to their particular mode of nutrient and the macro fungi growing on the soil are symbiotic, on rotting and dead wood are saprophytic and on trees are parasitic, cosmopolitan distribution of microfungi have also been reported (Suryanarayanan et al. 2004). *Termitomyces* grow symbiotically with termites as evaluated antioxidant activity (Puttaraju et al 2006). Basidiomycetes such as *Schizophyllum*, *Xylaria* are rarely observed from Phellophytes in Nilgiri Biosphere Reserve forest trees (Venkatesan 2004). Termite combs serve as one of the prominent

ecological niches of *Xylaria*, mostly owing to microclimatic conditions favors growth of *Xylaria* (Guedegbe et al. 2009).

Mushroom of Tropical region

In India, many random attempts on mushroom diversity documentation have been made by Natrajan & Manjula (1981). Mushrooms have been extensively studied in the western countries, while tropical countries such as India are less explored. In general, fungal diversity is greater in the tropics than that of temperate regions (Suryanarayanan et al. 2003). Mushroom diversity studies have been carried out in some specific regions of India including Sikkim (Das 2010), Jammu & Kashmir (Kumar et al. 2011), Amarkantak Biosphere Reserve (Dwivedi et al. 2012), Bangalore, Karnataka (Pushpa et al. 2012), Nagaland (Kumar et al. 2013), Meghalaya (Khaund 2013) and Western Ghats ranges (Thiribhuvanamala et al. 2014) and Western Ghats of Karnataka (Senthilarasu & Kumaresan 2016). Dutta et al. (2014) reported about traditional and ethno-medicinal knowledge of mushrooms in West Bengal. Basumatary & Gogai (2016) reported uses of wild edible mushroom fungi by Bodo community of Kokrajhar district, Assam. Lakhanpal (2014) recorded 11 species of edible mushroom from the upper hilly region of Shimla. Kumar & Manimohan (2009) recorded one new species of *Leucocoprinus* from state of Kerala.

Present study

Aim of the present study is to highlight of the mushroom diversity. To date, there are no reports on mushroom diversity of Cauvery Delta Region of Tamil Nadu. Hence, this attempt was taken in the present study.

Materials and Methods

Collection Site

Mushroom fruiting bodies were sampled from Mannai Rajagopalswami Government Arts College, campus Mannargudi and different location of Thiruvavur district, Tamil Nadu. The district receives rainfall under the influence of both southwest and northeast monsoon. A good part of the rainfall occurs as very intensive storms resulting mainly from cyclones generated in the Bay of Bengal especially during northeast monsoon. The present study was during the period from October to December 2018. This period was north east monsoon raining season. The college campus represented tropical social forest and other area was fully crop cultivated. Cauvery Delta Region is considered as "Nerkalanchiyam" (Land of Paddy cultivation). A river delta is a landform that forms at the mouth of a river, where the river flows into an ocean, sea, estuary, lake, or reservoir. Deltas form from deposition of sediment carried by a river as the flow leaves its mouth. Over long periods, this deposition builds the characteristic geographic pattern of a river delta.

Collection of Mushroom

The biodiversity documentation is a continuing process and efforts in this line should be systematic and need more determined dedication. The variation observed in occurrence of mushroom species in various habitats may be due to their particular mode of nutrition; the macro fungi growing on the soil are symbiotic, on rotting and dead wood are saprophytic and on trees are parasitic. The collection of mushrooms have been made from different plain regions, CDR of Tamilnadu during

2018. They may be fleshy or leathery or sometimes woody and bear their spore producing structures on lamellae or within the tubes, opening out through pores. The lamellate members are called agarics and the tube bearing members as boletes and polypores. The mushroom spores – bearing fruiting body of a fungus, typically produced above ground on soil or on its food source. The production of fruiting bodies by different mushroom species was collected during raining period. Many mushroom species were collected with the aid of hunting knife, scissor, digging tools and polythene bags. During survey of the morphological characters of observed specimens were properly noted. Photographs of specimen from different angles were also taken for future studies. For this study the opportunistic sampling of mushroom protocol, was followed (Mueller et al. 2004).

Morphological characterization

Morphological Characterization of the mushroom were carried out based on the , cap size, structure, colour of the fruiting body, gills shape and colour as described earlier (Kumar et al. 2015).. Morphological characters of the mushroom samples studied and data sheet prepared. Mushrooms were identified using the standard manual Hard (2013). The terms for morphological characteristics have been adopted from Largent & Stuntz (1977), Singer (1986) and Lodge et al. (2004).

Results and Discussion

A total of 35 mushroom species in 23 genera and 15 families were recorded with Ascomycota, Basidiomycota, and Pezizomycotina constituting the species respectively (Table1). Out of 35 mushrooms 23 were identified to genus level. The highest species diversity was found in the family Agaricaceae belonging to 7 species were recorded, followed by Ganodermataceae (6 species), followed by Schizophyllaceae, Xylariaceae 3 species each (Fig 1). Lycophyllaceae, Polyporaceae, Marasmiaceae, Psathyrellaceae and Strophariaceae families were represented by two species each. Least diversity was found in the families Auriculariaceae, Botetaceae, Fornitopsidaceae, Mycenaceae, Tremellaceae, and Tricholomataceae. Some of the genera recorded were *Boletus*, *Ganoderma*, *Leucoagaricus*, *Myceneae*, *Schizophyllum*, *Xylaria*, etc. Overall, 35 mushroom species are identified in 9 are edible, 7 species are edible and medicinal, 6 species are only medicinal, 6 species are inedible although medicinal, 3 species are generally considered Edible or Slightly Poisonous. In addition one species is industrial used and another one unknown species were recorded. Basidiomycota contains about 30,000 described species, which is 37% of the described species of true fungi reported by Kirk et al. (2001). On the other hand, still more to be described. Thus, exploring newer areas for fungi will result in identifying species new to science. Fungal species are especially important components of biodiversity in tropical forests where they are major contributors to the maintenance of the earth's ecosystem, biosphere and biogeochemical cycle. Fungi have beneficial roles in nutrient cycling, agriculture, biofertilizers, antibiotics, food and biotechnological industries. Fungi play a significant role in industry, agriculture, medicine, food industry, textiles, and bioremediation (Danielson et al.1989).

Everyone knows that some plants and animals have a very wide geographical distribution, while others have extremely limited ranges. Macro and micro fungi are found throughout the world. Many species of micro fungi are found on land and in water, the macro fungi are basically forest, terrestrial. Wood is host to numerous fungal species and offers numerous habitats. For example, some fungi will grow only on dead wood, while others are found only on live plants. Not even all dead wood is same. There are also differences between the environments offered by recently dead wood, partly rotted wood and well- rotted wood, leaf litter, soil etc. Fungi are important organisms that serve many vital functions in forest ecosystems including decomposition, nutrient cycling, symbiotic relationships

with trees and other plants, biological control of other fungi, and as the causal agents of diseases in plants and animals further, mushrooms are sources of food for humans and wildlife.

Table 1. Distribution of mushroom species at Cauvery Delta Region of Tamilnadu.

Sl. No.	Scientific Name	Family	Order	Remark
1.	<i>Macrolepiota procera</i>	Agaricaceae	Agaricales	E
2.	<i>Macrolepiota</i> Sp.1	Agaricaceae	Agaricales	E
3.	<i>Podaxis pistillaris</i>	Agaricaceae	Agaricales	E
4.	<i>Leucoagaricus leucothites</i>	Agaricaceae	Agaricales	E/P
5.	<i>Xanthagaricus</i> Sp. 1	Agaricaceae	Agaricales	UN
6.	<i>Leucocoprinus brinbaumii</i>	Agaricaceae	Agaricales	E
7.	<i>Lycoperdon</i> Sp. 1	Agaricaceae.	Agaricales	E
8.	<i>Auricularia auricular-judae</i>	Auriculariaceae	Auriculariales	E/M
9.	<i>Boletus edulis</i>	Boletaceae	Boletales	E/P
10.	<i>Fibroporia radiculosa</i>	Fomitopsidaceae	Polyporales	ID
11.	<i>Ganoderma lipsiense</i>	Ganodermataceae	Polyporales	M
12.	<i>Ganoderma</i> Sp. 1	Ganodermataceae	Polyporales	M
13.	<i>Ganoderma</i> Sp. 2	Ganodermataceae	Polyporales	M
14.	<i>Ganoderma lucidum</i>	Ganodermataceae	Polyporales	M
15.	<i>Ganoderma</i> Sp. 3	Ganodermataceae	Polyporales	M
16.	<i>Ganoderma applanatum</i>	Ganodermataceae	Polyporales	M
17.	<i>Termitomyces</i> Sp. 1	Lyophyllaceae	Agaricales	E/M
18.	<i>Termitomyces</i> Sp. 2	Lyophyllaceae	Agaricales	E/M
19.	<i>Marasmius</i> Sp. 1	Marasmiaceae	Agaricales	E
20.	<i>Marasmius cladophyllus</i>	Marasmiaceae	Agaricales	E
21.	<i>Mycena</i> Sp. 1	Mycenaceae	Agaricales	E
22.	<i>Polyporus alreolaris</i>	Polyporaceae	Polyporales	E/M
23.	<i>Cerioporus squamosus</i>	Polyporaceae	Polyporales	E/M
24.	<i>Coprinellus</i> sp. 1	Psathyrellaceae	Agaricales	E
25.	<i>Cystoagaricus trisulphuratus</i>	Psathyrellaceae	Agaricales	E/P
26.	<i>Schizophyllum</i> Sp. 1	Schizophyllaceae	Agaricales	IE/M
27.	<i>Schizophyllum commune</i>	Schizophyllaceae	Agaricales	IE/M
28.	<i>Schizophyllum</i> Sp. 2	Schizophyllaceae	Agaricales	IE/M
29.	<i>Hypholoma fascialare</i>	Strophaniaceae	Agaricales	P
30.	<i>Hypholoma sublateritium</i>	Strophaniaceae	Agaricales	P
31.	<i>Tremella mesenterica</i>	Tremellaceae	Tremellales	E/M
32.	<i>Lepista</i> Sp. 1	Tricholomataceae	Agaricales	E/M
33.	<i>Daldinia concentrica</i>	Xylariaceae.	Sordaricmycetes	IE/M
34.	<i>Xylaria hypoxylon</i>	Xylariaceae.	Xylariales	IE/M
35.	<i>Xylaria</i> Sp. 1	Xylariaceae.	Xylariales	IE/M

Notes: E – Edible, E/P – These Mushrooms are generally considered Edible or Slightly Poisonous, UN – Unknown, E/M – Edible and Medicinal, ID – Industrial use, M – Medicinal, IE/M – Inedible and Medicinal, P – Poison.

Figure 1. Family wise occurrence of mushroom at Cauvery Delta Region of Tamilnadu.





Conclusion

Human environments are not free from fungi. Some people look on fungi as slimy, awful things with no redeeming features. People both love and fear mushrooms, but we may be more afraid of picking them ourselves than is warranted. So, fungi are inherently neither good nor bad. “Of those, less than a dozen are seriously poisonous. Of those, less than a half – dozen are truly deadly.” Now, that doesn’t mean everyone should run out and just start foraging mushrooms. But beginners can learn to identify a few good edibles and some of feature of poisonous species. They are also being affected by human intervention in ways we are just beginning understand.

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