

## **MUSHROOM DIVERSITY OF MAHAL FOREST RANGE OF DANG DISTRICT, GUJARAT, INDIA**

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### **ABSTRACT**

Mushrooms have diverse impacts in biology, ecology and economy. They have been a part of our daily life since time immemorial. Apart from their importance as a source of food for the regional poor and as mycorrhizal partners of host trees, some are huge sources of bioactive compounds showing medicinal importance. The floristic composition of this area has been studied by several researchers, but the macrofungus which forms an important component of the ecosystem has been largely neglected in a biodiversity studies. The present study is an attempt to give a broad spectrum of biodiversity of mushrooms and their prevalent favorable ecological relationship in Mahal Forest range. The survey was conducted in rainy season of 2013 in 3 different places which included Mountains, Grassland and Forest areas of Mahal forest. A total number of 46 species were recorded. The enormous biomass in the forest favors variety of edible and medicinal mushrooms. Dominating species belong to genera *Agaricus*, *Pleurotus*, *Termitomyces*, *Cantharellus*, *Ganoderma*, *Xylaria*, *Schizophyllum*, *Polypores*. The detailed report of the study has been presented here.

**Keywords:** Biodiversity, Mushroom, Edible, Medicinal, Mahal Forest Range

### **INTRODUCTION**

Fungi are one of the most prominent and biodiverse organisms to inhabit and influence this planet (Sarbhoy *et al.*, 1996). They are neither animal nor plant though some people consider them plants for various reasons, but they differ from plants in that they lack the green chlorophyll that plants use to manufacture their own food and energy. For this reason they are placed in a different Kingdom of their own.

Chang & Miles (1992), a mushroom is a “macrofungus with a distinct fruiting body which can be either epigeous (above ground) or hypogeous (underground) and large enough to be seen by naked eye and to be picked by hand”. Mushroom is a general term used mainly for the fruiting body of the macrofungi (Ascomycota & Basidiomycota) and represents only a short reproductive stage in their life cycle. Mushroom is a saprophytic fungus that grows on dead and decaying organic matter. Due to the absence of chlorophyll, it is unable to synthesize its own food and hence is dependent upon the organic matter/substrate for food. A number of mushrooms form mutual associations (mycorrhizal) with the roots of several forest trees. This beneficial association enhances absorption of water and nutrients amongst trees and is indispensable for the growth and development of these trees and mushrooms. Mushrooms are seasonal fungi, which occupy diverse niches in nature in the forest ecosystem. Mushroom species are the indicators of the forest life support system (Stamets, 2000).

Out of 1.5 million fungi around the globe, only 50% are characterized until now and one third of total fungal diversity of the globe exists in India (Manoharachary *et al.*, 2005). Among the total known mushrooms, approximately 850 species are recorded from India. Many of them have been used in food and folk medicine for thousands of years (Thatoi and Singdevsachan, 2014).

Gujarat has 9.69% of its geographical area declared as forest. Gujarat has a total forest cover of 14,946 sq km, of which 114 sq km is very dense forest, 6,231 sq km is moderate dense forest and 8,601 sq km is open forest. Mahal Forest range of Dangs is a gift, which is sent by nature to Gujarat, positioned at 20.91° N latitude and 73.663° E longitudes with a wide range of ecosystem. Gujarat was theoretically estimated to enshrine a considerable quantum of macrofungal diversity. According to our liberal and conservative

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estimates there may be 3000 to 440 species of macrofungi, respectively in Gujarat (Lahiri *et al.*, 2008). It was estimated that the Dang district of Gujarat enshrine almost 68.42% of the states very dense forest cover. Thus the part of the this region Mahal forest had to be the prime location of our research as it being in the Malabar-western Ghats hill zone had better forest cover and comparable diversity both of which are necessary for more number of fungi per plant.

## MATERIALS AND METHODS

### Collection Site: Mahal Forest Range of Dang District, Gujarat

Mahal forest area is located near of Bardipada range of the North forest division of Dang district of Gujarat state of India (Figure 1) and had arid climate with scanty rainfall. The longitude and latitude of the research region is 20.91°N, 73.663°E.

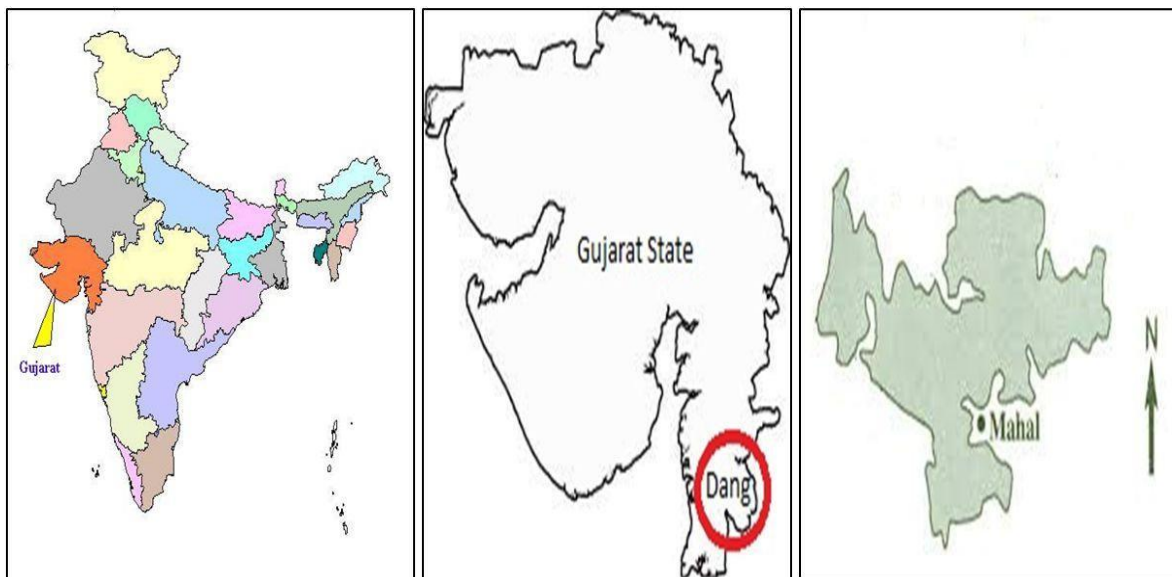


Figure 1: Collection site of Mushroom diversity

### Collection Processing

Mushroom is very fleshy and easy to collect by stepwise process. A sharp sterilized knife was used to collect the whole and parts of mushrooms growing on trees and on the ground. Mushroom samples collected were free of infection or insect attack. The earth was carefully removed from the lowest part of the stipe with knife or through dusting so as to save the fresh samples from getting too dirty. Care was also taken not to remove or damage any part of the mushroom sample. The mushrooms were collected, wrapped with tissue paper and kept inside a sterilized polythene bag. The heaviest and the lightest were placed on the bottom and top, respectively of the polythene bag in order to prevent damage of the samples (Atri *et al.*, 2003).

### Preliminary Identification of Mushrooms

The identification of macrofungi is carried out by with the help of literature (Watling and Gregory, 1980; Pushpa and Purushothama, 2012; Swapna, *et al.*, 2008; Singer, 1975; Leelavathy and Ganesh, 2000; Lincoff, 1989; Prakasam, 2012; Mushroom & other Fungi of the Midcontinental US text book by Huffman *et al.*, 2008). Help of eminent microbiologists/taxonomists were taken in identification of a species when in doubt.

## RESULTS AND DISCUSSION

Mushrooms are widespread in nature and they remain the earliest form of fungi known to mankind (Okhuoya *et al.*, 2010). Mushrooms appear to be collected and consumed during almost the entire of the

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year, but most fungi are collected during the rainy seasons, suggesting the importance of rainfall patterns in fungal phenology (Dijk *et al.*, 2003).

During the field work in rainy season, total 58 samples of the macrofungi were collected and preserved. The Mahal forest region of North forest division of dang district shows highly diverse in macrofungi. Since age's mankind has bioprospeted the biodiversity that is available in their vicinity.

The information of field work is summarized in Table 1 and figures.

**Table 1: Preliminary identification of mushrooms & their ecological relationship**

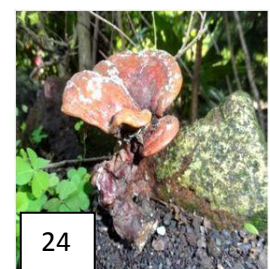
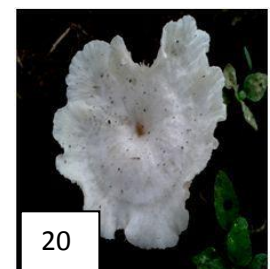
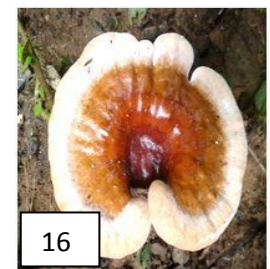
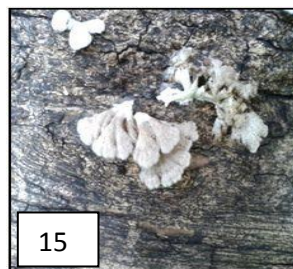
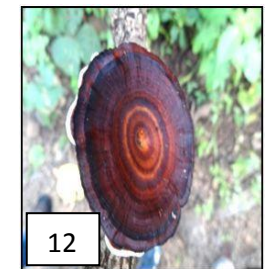
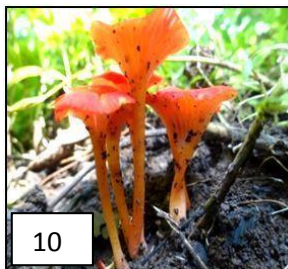
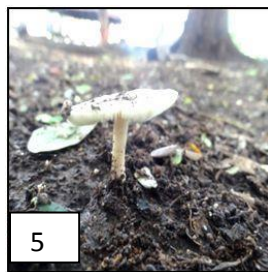
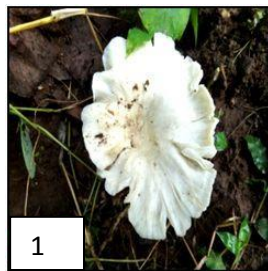
Plate No.	Mushroom Scientific name	Edible/ Poisonous	Ecological relationship	Referred sources
1	<i>Pleurotus ostreatus</i>	Edible	Dead wood	Prakasam, 2012
2	<i>Bovista spp.</i>	Poisonous	Saprophyte	Lahiri <i>et al.</i> , 2010
3	<i>Stereum spp.</i>	Poisonous	Dead wood	Pushpa & Purusothama, 2012
4	<i>Marasmius spp.</i>	Poisonous	Saprophyte, plant debris	Patil & Thite, 1978
5	<i>Amanita spp.</i>	Edible	Mycorrhizal	Trivedi, 1972
6	<i>Hypsizygus spp.</i>	Poisonous	Dead wood	Prakasam, 2012
7	<i>Phellinus spp.</i>	Poisonous	Parasitic	Lahiri <i>et al.</i> , 2010
8	<i>Lepiota spp.</i>	Poisonous	Durbis	Sathe & Deshpande, 1982
9	<i>Terametes spp.</i>	Non poisonous	Dead wood	Bankole and Adekunle, 2012
10	<i>Cantharellus spp.</i>	Poisonous	Saprophyte	Chavan & Barge, 1977
11	<i>Xylaria spp.</i>	Poisonous	Dead wood	Bankole and Adekunle, 2012
12	<i>Thelephora spp.</i>	Poisonous	Dead wood	Shauket <i>et al.</i> , 2012
13	<i>Polypores spp.</i>	Poisonous	Parasitic	Bankole and Adekunle, 2012
14	<i>Pleurotus spp</i>	Edible	Dead wood	Prakasam, 2012
15	<i>Schizophyllum commune</i>	Poisonous	Dead wood	Uppal <i>et al.</i> , 1935
16	<i>Ganoderma spp.</i>	Poisonous	Parasitic	Pushpa & Purusothama, 2012
17	<i>Phellinus spp.</i>	Poisonous	Parasitic	Lahiri <i>et al.</i> , 2010
18	<i>Ramaria spp.</i>	Edible	Saprophyte, dead wood	Pushpa & Purusothama, 2012
19	<i>Geastrum spp.</i>	Poisonous	Dead wood	Pushpa & Purusothama, 2012
20	<i>Termitomyces spp.</i>	Edible	Woody decaying	Lahiri <i>et al.</i> , 2010

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21	<i>Mycena spp.</i>	Poisonous	Dead wood	Sathe & Deshpande, 1982
22	<i>Lentinus spp.</i>	Edible	Dead wood	Senthilarasu, 2014
23	<i>Hypocrea spp.</i>	Poisonous	Dead wood stumps	Huffman, 2008
24	<i>Ganoderma spp.</i>	Poisonous	Parasitic	Bankole and Adekunle, 2012
25	<i>Clitocybe spp.</i>	Poisonous	Dead wood	Pushpa & Purusothama, 2012
26	<i>Gleophyllum spp.</i>	Poisonous	Wood decaying	Huffman, 2008
27	<i>Ganoderma spp.</i>	Poisonous	Parasitic	Pushpa & Purusothama, 2012
28	<i>Calocybe spp.</i>	Poisonous	-	Prakasam, 2012
29	<i>Schleroderma spp.</i>	Edible	Soil durbis	Huffman, 2008
30	<i>Xylaria spp</i>	Poisonous	Dead wood	Ashwani et al., 2013
31	<i>Ramaria spp.</i>	Not consume	Saprophyte, dead wood	Pushpa & Purusothama, 2012
32	<i>Cantharellus spp.</i>	Poisonous	Saprophyte	Chavan & Barge, 1977
33	<i>Neopaxillus sp.</i>	Poisonous	Durbis	Huffman, 2008
34	<i>Polypore spp.</i>	Poisonous	Saprophyte, Dead wood	Prakasam, 2012
36	<i>Ganoderma spp.</i>	Poisonous	Parasitic	Pushpa & Purusothama, 2012
37	<i>Agaricus bisporus</i>	Edible	Saprophyte	Sathe & Rahalkar, 1976
38	<i>Volvareilla spp.</i>	Edible	Saprophyte	Senthilarasu, 2014
39	<i>Coprinus spp.</i>	Edible	Saprophyte	Sathe & Deshpande, 1982
40	<i>Entoloma spp.</i>	Poisonous	Soil durbis	Sathe & Deshpande, 1982
41	<i>Marasmius spp.</i>	Poisonous	Saprophyte, plant debris	Pushpa & Purusothama, 2012
42	<i>Coprinus spp.</i>	Edible	Saprophyte	Sathe & Deshpande, 1982
43	<i>Termitomyces spp.</i>	Edible	Wood decaying	Patil et al., 1979
44	<i>Terametes spp</i>	Poisonous	Wood decaying	Bankole and Adekunle, 2012
45	<i>Parasola spp.</i>	Poisonous	Dead wood	Senthilarasu, 2014
46	<i>Phellinus spp.</i>	Poisonous	Parasitic	Lahiri et al., 2010



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Species diversity of macrofungi is related to their particular habitats. Nine species were found edible, out of which some have medicinal properties. For local populations, mushrooms are usually considered as substitutes for animal protein, and are known as meal for the poor.

Most common edible macrofungi found in Assam are the species of *Agaricus*, *Lactarius*, *Lycoperdon*, *Russula*, *Scleroderma*, *Cantharellus*, *Pleurotus*, *Lentinus*, *Schizophyllum* etc. In India, mushrooms are a non wood forest produce and popular as food among the ethnic people of North east India (Tapwal *et al.*, 2013).

In addition to these Kumar *et al.*, 2013, described 15 edible fungi along with their macronutrient content collected from different forest areas of Nagaland. Only three species viz. *Ganoderma spp.*, *Polypores spp.* and *Phellinus spp.* recorded in Mahal forest range were parasitic in nature. The pathogenic fungi directly kill or weaken the forest plants and decline the forest health and productivity. But fungal diseases also have positive influences on ecosystem productivity and biodiversity (Trappe and Luoma, 1992). Although the species of *Ganoderma* and *Phellinus* were recorded in some tree species but their population was very less. Beside their pathogenic nature, they are being used for the manufacture of various drugs by pharmaceutical companies.

Gogoi and Sarma (2012) documented 12 macrofungal species from Dhemaji district of Assam with their ethnomycological utilization. Kumar *et al.*, (2013) described four medicinal mushrooms from Nagaland along with their nutrient contents. The Subphylum Basidiomycotina, class Hymenomycetes, and order Agaricales, were found the most represented taxa recorded during the study as previous literature work have done by Pushpa and Purushothama (2012).

When compared with the biodiversity of macrofungi in semi evergreen and moist deciduous forests of Shimoga region, Karnataka (Swapna *et al.*, 2008) and Mushrooms in and Around Bangalore (Karnataka), India (Pushpa and Puroshothama, 2012) the diversity of Mahal Forest Range is quite low. Thus 9% of fungal biodiversity is India's contribution to the world (Lahiri *et al.*, 2010).

The ecological preference of the species revealed that maximum number of species were saprophyte and associated with higher dead wood trees. The mycorrhizal fungi basically serves as an extension of the plant root system, exploring soil far beyond the roots and transporting water and nutrients to the roots. The fungus grows from the colonized roots into the surrounding soil. The distribution of macrofungi throughout the world is closely related to the distribution of green plants. These fungi in combination with bacteria play an active part in the natural decomposition of organic matter. In addition, soil fungi store carbon dioxide and cause various chemical reactions and water fungi help purify polluted waters (Kumaresan and Satyanarayanan, 2001; Maria and Sridhar, 2002).

## Conclusion

Preliminary comfortable field visits at Mahal and interaction with local tribe delivered the impression that there may be a considerable diverse of macrofungal diversity with valuable traditional practices. The higher upper limit came to around 3000 species and the lower conservative estimate stood around 1100 to 440 species of macrofungi.

Out of these species possibly 80 to 160 species could be unique to Gujarat. The Mahal Forest Range, Dangs were found to possess rich in mushrooms. This was in line with the hypothesis of greater diversity. Out of the 46 species collection, 12 species of mushrooms found to be edible and 34 species not consumed by tribes. The ecological preference of the species revealed that maximum number of species were saprophyte and associated with higher dead wood trees.

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