

# PROJECT COMPLETION REPORT (PCR)

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## **TITLE:- SYSTEMATIC STUDIES OF MACROMYCETES DISTRIBUTED IN AMRAVATI REGION**

### **INTRODUCTION**

India is a rich treasure of natural resources and wild macromycetes is one of them. Macromycetes, embrace a whole host of unrelated groups of fungi viz. cup fungi, morels, truffles, earth-tongues, bracket fungi, agarics, hedge-hog fungi, jelly fungi, puff-balls, stinkhorns. Studies on wild mushrooms with special reference to their edibility, utility and medicinal value with the early references on larger fungi may be beneficial for humanity. Mushrooms are recognized for distinct source of vegetable protein and have a high percentage of all the amino acids. They are free of cholesterol and richer in water-soluble vitamins and minerals than most of the vegetables. A wide range of therapeutic potential including anticancer, anticholesterolenic, antidiabetic, hepatoprotective, immunomodulative, cardiovascular and antimicrobial properties are reported in the literature of mushroom science. (Rai, et.al.,2005).

It is expected that edible mushroom industry, if properly organized, can ease the problem of food, medicine, energy and employment generation to some extent. Mushroom cultivation is eco-friendly and offers to be an excellent means for recycling of about 25 million tones of agro-forestry waste presently available in India. (Singh, 2004).

Collecting larger fungi should not be considered a haphazard pursuit. It is to emphasize that the task of identification and proper record of larger fungi is of prime importance and can only be fulfilled by extensive survey of different zones of the country. Such studies will also help in bringing up many more species not known to Indian flora so far. The study of mushrooms in the tropical region is still more difficult. First, there is an abundance of species in these regions which are imperfectly known. Second, fleshy fungi in these regions develop and decompose very quickly, which makes it impossible to process them adequately in time ( Kaul, 1999 ). It is necessary in such situations to examine them repeatedly over several seasons.

Amravati is endowed with Melghat tract rich in hilly terrain Satpuda ranges. It is surrounded by Melghat Tiger Reserve Forest and Pohara Forest. Due to suitable geographical and favourable climatic conditions, wide and rich flora and fauna are hidden in these areas.

Survey, collection, and identification form the basic building blocks of systematic studies of all living organisms. However, it acquires special importance in the study of mushrooms as most of them are highly perishable and ephemeral. Mushrooms are the fleshy-to-tough structures which are part of the reproductive phase of a certain group of fungi. They have also been referred to as larger fungi, or fleshy fungi, or macromycetes, and belong exclusively to two subdivisions of fungi-Ascomycotina and Basidiomycotina. These subdivisions are also referred to as the basidiomycetes or ascomycetes, and appear as such in most of the semi-technical and some technical literature. Watling (1973) observes that the term, larger fungus, refers to any fungus whose study does not necessarily require more than a low powered lens to see most of the important morphological features.

Larger fungi however, embrace a whole host of unrelated groups of fungi: cup-fungi, morels, truffles, earth-tongues, bracket fungi, agarics, hedge-hog fungi, jelly fungi, puffballs, stinkhorns, etc. All of these fungi are characterised by having a conspicuous reproductive structure, also called the fruiting body, carpophore, sporocarp and sometimes in ascomycetes, the ascoma or ascocarp; basidiome, or basidiocarp in basidiomycetes.

Fruiting bodies are only one part of the fungal organism. The vegetative or food-gathering phase of the organism is known as mycelium and is mostly in the substratum. The mycelium absorbs water and nutrient from the substrate which are then used in the production of fruiting bodies. The term mushroom may be applied to the entire fungal organisms, or to the fruiting bodies alone.

The function of the fruiting body is to produce and facilitate the dissemination of spores, and they are of diverse, shape, size and organisation. The majority of Ascomycotina and Basidiomycotina grow in situations where the spore-bearing structures need to be raised above the substratum for efficient liberation of spores and where developing spores need protection from desiccation. The operation of both these selective pressures results in the formation of relatively large, erect fruiting bodies for which some means of support becomes essential.

Fungi cannot be named from their mycelia alone, and almost all the groupings are based on the nature of the spores and organs in, or on, which they are borne. Ascomycotina and Basidiomycotina are both large groups and differ fundamentally in the way they form their perfect spores. Ascomycotina are characterised, throughout the subdivision by having an ascus (pl. asci) as a spore producing unit which is clavate, cylindrical or subglobose in shape. These asci enclose a definite number of ascospores, generally eight but the number may vary in some taxa. Ascomycotina, comprising over 28,000 species, is the largest group of fungi, but mushrooms are restricted to only a few orders. Basidiomycotina is characterised, throughout the group, in the production of perfect spore known as basidiospores on a specialised spore producing body, the basidium (pl. basidia). Each basidium usually bears four stalks called sterigmata (sing. Sterigma) each of which produce a single spore. The basidium is clavate or cylindrical in shape. Basidiomycotina is the second biggest class of fungi and includes about 16,000 species. The majority of mushrooms belong to Basidiomycotina, distributed in all the orders excepting two-Uredinales (rusts) and Ustilaginales (Smuts).

## **SIGNIFICANCE OF STUDY**

1. Exploration of many highly priced, edible, non edible, poisonous and medicinally important fungal forms, which is considered as the great wealth, hidden in the forests of nearby area of the region.
2. Enlisting of macromycetes flora which is unknown and unpublished, which is recommended by the Department of Forest (Kakodkar, 2005).
3. Edible mushroom industry if properly organized, can ease the employment generation to some extent.

(4) Few new highly proteinaceous wild mushrooms can be introduced to the society.

## **OBJECTIVES OF THE PROJECT**

1. Survey and study of larger fungi of Amravati region. This will include study of habit, habitat, distribution and field records of fungi.
2. Identification of sporophores.
3. Enlisting of edible, non-edible, poisonous and medicinally important species.
4. Preservation of collected specimens to develop herbarium (museum), and conservation for future applications.
5. To add the knowledge of fungal flora to the benefit of students and welfare of people and tribals.
6. To inculcate and popularize the mushroom science by organizing one day workshop on ‘Mushroom cultivation and mushroom recipes’.

## **MATERIALS AND METHODS**

Healthy specimens were collected from forests of Melghat and Pohra including the forest nurseries of Amravati and Tapovaneshwar. They were cleaned and brought to the laboratory. Standard techniques for collection, preservation and description have been followed (Atri and Saini 2000). Morphological observations were based on fresh specimens. The microscopic observations and spore prints were made immediately after collection (Kaul 1999). Colour terminology used is that of Kornerup and Wanscher (1967). The specimens were deposited in the Botany Museum, P.G. Department of Botany, Amravati, India.

Identification, edibility and medicinal properties were noted by referring the standard literature (Atkinson 1961; Lange and Hora 1981; Purkayastha and Chandra 1985; Patil et al 1995; Keizer 1998; Swanton 2002; Lamaison and Polese 2005; Rai et al 2005). Edibility was confirmed by interacting with the local and tribal people, who were habitual to consume the specific mushrooms of that region.

## **RESULTS AND DISCUSSION**

The surveys conducted in Amravati – Melghat region revealed the occurrence and distribution of 43 species of wild mushrooms belonging to 37 genera. Out of these 43 species, 21 mushroom species were identified as edible, 15 non-edible and 7 with medicinal potential. (Table - 1). Total 39 species belong to Basidiomycotina and 4 came under Ascomycotina. Various locations were visited, but Amravati region was found ideal for wild mushroom flora, because as the University campus, Agriculture field, Tapovan area and Forest nurseries were protected and non-grazed. Identified mushroom species showed diversity and comprises various sub-groups *viz.* gill fungi, pore fungi, cup fungi, stomach fungi, jelly fungi and bracket fungi.

During 1997-2000 foray conducted in 25 districts of Madhya Pradesh and Chhattisgarh, 150 mushroom species were recorded and only 53 were found edible (Rajak 2004). Total 73 species of wild mushroom flora belonging to 56 genera were collected from Madhya Pradesh and Chhattisgarh during 1999-2001 by Khatri et al 2009. Out of these 73 species, 31 were identified as edible, 3 mushrooms had fair edibility, 11 medicinal mushrooms, 27 non - edible and 1 poisonous. Pandey and Budhathoki (2008) published a list of 37 wild mushroom species from Sundarikal and Kathamandu region in Nepal.

In Western Maharashtra, Date (1976) collected 3 fleshy fungi. Total 17 fungal species from Southern Maharashtra were recorded by Thite et al 1976. Sathe and Deshpande (1980) collected 25 mushroom species from nearby Poona region. Though sporadic attempts have been

made in the past to collect and identified the mushroom flora in various region of the country (Kaul 1999). But there are few references available on mushroom flora of Vidarbha region. Ghurde and Wakode (1981) recorded 3 Morchells from Central India. Pusadkar et al 2004, during manson surveys, recorded 10 wild edible mushroom species from Vidarbha region. Recently, Hedawoo and Mohite 2008, have been reported 15 wild edible mushroom species from Melghat and Amravati region viz.- *Agaricus campestris*, *Auricularia mesenterica*, *Calocybe indica*, *Calvatia cyathiformis*, *Coprinus comatus*, *Leucocoprinus capaestipes*, *Lycoperdon pusillum*, *Macrolepiota procera*, *M. rhacodes*, *Morchella conica*, *Podaxis pistillaris*, *Russula claroflava*, *Sparassis crispa*, *Termitomyces heimii* and *T. mammiformis*.

In the present investigation, out of 43 wild mushroom species, 15 were previously recorded by Hedawoo and Mohite, 2008. Remaining 29 including medicinal mushrooms are the new additions to the wild mushroom flora from Amravati region. During surveys the genera like- *Agaricus*, *Coprinus*, *Cyathus*, *Lycoperdon*, *Macrolepiota*, *Phallus*, *Schizophyllum*, *Termitomyces*, *Daldinia*, *Polyporus* and *Ganoderma* were found in dominating form every year.

## CONCLUSION:

Amravati-Melghat region is found to be one of the important biodiversity rich-area for varied wild fleshy fungi. This biodiversity must be protected and conserved. If edible mushroom industry is properly organized, it can ease the problem of malnutrition prevalent in Melghat and Bhamragarh and also provide medicine and employment.

**Table-1 Reported mushroom species, their common names, locations, edibility and references on edibility**

<i>Agaricus campestris</i> (L. ex Fr.)	Field mushroom	Amravati	E	Watling (1973)
<i>Agaricus placomyces</i> (Peck)	Flat capped Psalliota	Amravati	E	Krieger (1967)
<i>Auricularia mesenterica</i> (Persoon)	Jews Ear	Wadali and Melghat forest, Amravati	E	Cheng and Tu (1978)
<i>Calocera cornea</i> (Fr.) Fr.	Jelly fungi	Wadali and Amravati	NE	-
<i>Calocybe indica</i> (P. & C.)	Milky mushroom	Amravati	E	Purkayastha and Chandra (1980)
<i>Calvatia cyathiformis</i> (Bosc) Morg.	Cup shaped puff-ball	Amravati	E	Jong (1978)
<i>Chlorophyllum molybdites</i> (Meyer ex Fr.) Mass.	Scaly mushroom	Rahatgaon and Amravati	E	Zoberi (1972)
<i>Coprinus comatus</i> (Muell ex Fr.) S.F. Gray	Shaggy ink caps	Wadali and Amravati	M	Rai et al (2005)
<i>Cyathus striatus</i> (Haller ex Pers.)	Bird's nest fungi	Amravati	NE	-
<i>Daldinia concentrica</i> (Bolt.ex Fr.) Ces.	Wood rotting fungi	Amravati and Melghat	M	Khatri et al (2009)
<i>Favolus brasiliensis</i> (Fr.) Fr.	Pore fungi	Amravati	NE	-
<i>Ganoderma applanatum</i> (Pers. ex Waller.) Pat.	Bracket fungi	Amravati and Wadali	M	Rai et al (2005)
<i>Ganoderma lucidum</i> (Leyss.) Karst	Reishi mushroom	Amravati and Melghat forest	M	Wasser (2005)
<i>Geastrum fimbriatum</i> (Fries) Fischer	Earth star	Amravati	NE	-



<i>Hygrophoropsis aurantiacus</i> (Wulf.) Fr.	False Chanterella	Amravati	NE	-
<i>Laccaria amethystine</i> (Bolt.) Pk.	Amethyst Laccaria	Amravati	E	Krieger (1967)
<i>Leucocoprinus capaestipes</i> (Sow. ex Fr.)	Onion Stemmed Lepiota	Tapovaneshwar and Amravati	E	Krieger (1967)
<i>Lycoperdon pusillum</i> (Persoon)	Puff-ball	Wadali, Pohra forest and Amravati	E	Cunningham (1979)
<i>Macrolepiota procera</i> (Scop. ex Fr.) Sing	Parasol mushroom	Pohra forest and Amravati	E	Jong (1978)
<i>Macrolepiota rhacodes</i> (Vitt.) Singer	Shaggy Parasol mushroom	Amravati	E	Krieger (1967)
<i>Marasmius rotula</i> (Scop.) Fr.	Wheel mushroom	Amravati	NE	-
<i>Morchella conica</i> (Persoon)	Conic morel	Melghat forest	E	Atkinson (1961)
<i>Mutinus caninus</i> (Hudes. ex Pers.) Fr.	Carrion fungi	Amravati	NE	-
<i>Peziza rutilans</i> (Dill.) L.	Cup fungi	Amravati	NE	-
<i>Phallus impudicus</i> (L. ex Pers.)	Stink horn	Amravati and Melghat, Pohra forest	NE	-
<i>Pleurotus dryinus</i> (Pers. ex Fr.) Kummer	Oyster mushroom	Wadali forest	E	Atkinson (1961)
<i>Pleurotus ostreatus</i> (Jacquin ex Fr.) Kummer	Oyster mushroom	Amravati	E	Phillips (1981)
<i>Pleurotus petaloides</i> (Bull. ex Fr.) Quel.	Petal-like Agaric	Tapovaneshwar	E	Atkinson (1961)
<i>Podaxis pistillaris</i> (L. ex Pers.) Morse	Khumbi mushroom	Amravati and Wadali	E	Kannaiyan and Ramasamy (1980)
<i>Polyporus varius</i> Fries	Wood polypore	Amravati and Wadali	NE	-
<i>Pterula mulifida</i> (Fr.) Fr.	Fairy clubs	Melghat forest	NE	-
<i>Russula claroflava</i> (Persoon)	Yellow Russula	Amravati	E	Lange and Hora (1981)
<i>Schizophyllum commune</i> (Fries)	Split-gill fungus	Amravati and Badnera	M	Mizuno et al (1990)
<i>Scleroderma verrucosum</i> (Bull.) Pers.	Warted devil's snuff box	Rajura and Amravati	NE	-
<i>Sphaerobolus stellatus</i> (Tode ex Pers.)	Dung star	Amravati and Melghat forest	NE	-
<i>Termitomyces heimii</i> (Natarajan)	Dumbersathi mushroom	Amravati and Rahatgaon	E	Sathe and Kulkarni (1980)
<i>Termitomyces mammiformis</i> (Heim)	Dumbersathi mushroom	Amravati	E	Zoberi (1972)
<i>Trametes versicolor</i> L. ex. Fries	Bracket fungi	Pohra and Melghat forest	M	Tsang et al (2003)
<i>Tremella mesenterica</i> (Persoon)	Jelly fungi	Melghat forest and Amravati	NE	-
<i>Tricholoma album</i> (Fr.) Quel.	White Tricholoma	Amravati	E	Sinha and Padhi (1978)
<i>Tulostoma albicans</i> (White)	Stalked puff-ball	Amravati	NE	-
<i>Volvariella media</i> (Schum. ex Fr.) Singer	Straw mushroom	Amravati	E	Jong (1978)
<i>Xylaria polymorpha</i> (Pers.) Grev.	Wood club fungus	Amravati and Pohra forest	M	Khatri et al (2009)

**List of newly added mushroom species**

<i>Agaricus</i> sp.				
<i>Pleurotus</i> sp.				

<i>Lepiota sp.</i>				
<i>Volvariella sp.</i>				
<i>Tricholoma sp.</i>				
<i>Phellinus sp.</i>				
<i>Coprinus sp.</i>				
<i>Omphalina sp.</i>				
<i>Panellus sp.</i>				
<i>Marasmius sp.</i>				
<i>Mycena sp.</i>				
<i>Inonotus sp.</i>				
<i>Dictyophora sp.</i>				
<i>Clathrus sp.</i>				
<i>Clavaria sp.</i>				
<i>Pisolithus sp.</i>				
<i>Fomes sp.</i>				



*Lycoperdon pusillum* Persoon.



*Calvatia cyathiformis* (Bosc) Morg.



*Podaxis pistillaris* (L. ex Pers.) Morse.





*Coprinus comatus* (Muell) S. F. Gray.



*Termitomyces heimii* Natarajan.



*Termitomyces mammiformis* Heim.





*Macrolepiota procera* (Scop. ex Fr.) Sing.



*Macrolepiota rhacodes* (Vitt.) Singer.







*Pleurotus dryinus* (Pers. ex Fr.) Kummer.



*Pleurotus ulmarius* (Bull.) Quel.



*Pleurotus ostreatus* (Jacquin ex Fr.)

Kummer





*Calocybe indica* P. & C.



*Auricularia mesenterica* Pers.

### Report on

#### **“One Day workshop on Mushroom Cultivation Technology and Mushroom Recipes”**

One Day workshop on **“Importance of Mushroom Cultivation Technology and Mushroom Recipes”** was organized on 05.01.2010 at Yaoli (Shahid). The workshop was organized in associative with NSS unit of college. For the workshop total 60 participants were present including villagers, students and teachers.

#### **The programme schedule was as follows –**

Following subject experts have given their contributions on various topics:-

1. Introduction of experts – **Dr. Shrikant Wadhal**
2. Importance of Mushrooms – **Dr. Dilip Hande**
3. Medicinal aspects of Mushrooms- **Dr. Prakash Deotale**
4. Nutraceutical values of Mushrooms - **Dr. Dinesh Khedkar**
5. Cultivation Technology of *Pleurotus sajor-kaju* and Demonstration –  
**Dr. Ganesh Hedawoo**
6. Mushroom Recipes – **Prof. Bhupendra Dorkar**

After the completion of technical session, “Mushroom pakodas” were served. The programme was ended with certificate distributions and vote of thanks.

### **ACKNOWLEDGEMENTS**

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## **RESEARCH PUBLICATIONS BASED ON RESEARCH PROJECT:**

**Hedawoo, G. B. and Mohite, P. U. 2008** Some wild edible mushrooms from Melghat Tiger Reserve Forest and Amravati region. *Biosci. Biotech. Res. Comm.* Vol (1) No.(2): 163-167.

**Hedawoo, G. B. 2010** Wild Mushroom Flora from Amravati Region, Maharashtra, India. *J. Mycol. Pl. Pathol.* 40(3): 441-444.

**Hedawoo, G. B.; Pilley, H. H.; Atre, N. M. and Nagmote S. R. 2012.** Wild Mushroom Database: A repository for wild mushrooms from Melghat and Amravati region. *Jour. of Sci. Infor.* 3:107 - 109.

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