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Checklist of Macro-Fungi from Baramati Area of Pune District, MS, India

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A B S T R A C T

Macro-fungi are the fungal species that produce fruiting bodies visible to naked eyes and occurs widely in the rainy season. The macro-fungi plays 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. Present investigation emphasizes on study of macro-fungi from Baramati area of Pune district of Maharashtra. During the study frequent field visits, listing of genera and their species, identification and photography has done. In the checklist total 64 fungal species belonging to 37 genera, 03 sub-divisions, 13 orders and 23 families were reported. The contribution of Basidiomycotina fungi was 90% followed by Ascomycotina (7.8%) and Zygomycotina (1.6%).

Introduction

Fungi are amongst the most important organisms in the world, not only because of their vital role in ecosystem functions (Blackwell, 2011) but also for their influence on humans and human-related activities (Mueller and Bills, 2004). They are used in the bioremediation of industrial waste and in the accumulation of heavy metals from the environment (Tuli *et al.,* 2014). According to Hawksworth (2004) there are approximately 1.5 million species of fungi found on the Earth. Sarbhoy *et al.,* (1996) reported more than 27000 fungal species throughout the India. The number of mushroom species alone, recorded in the world were 41,000 of which approximately 850 species were recorded from India (Deshmukh, 2004) mostly belonging to gilled mushrooms. The macro-fungi having large fructifications, visible to naked eyes and include large observable spore bearing structure. They have worldwide in distribution and can grow in wide range of habitats and abundant in spring and autumn due to favorable climate and low in hot and dry seasons (Pilz and Molina, 2001). Macro-fungi are rich in mineral nutrients as well as

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rich in carbohydrates (Fasidi, 1996). Chang and Buswell (1996) reported that mushroom have antitumour, anticancer, anticholesterol and antihemorrhage properties. Considering the economic aspects and the significant role of fungi several countries are working hard for their documentation and screening them for various products (Mueller *et al.,* 2004).

Baramati is one of the major agricultural tehsil in Pune district, Maharashtra state of India. It lies between 18.15^0N latitude and 74.58^0 E longitude with the wide climatic diversity. The diverse climatic conditions and ecological habitats of Baramati 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 Baramati area of Pune district of Maharashtra, India.

Materials and Methods

The survey and collection of macro-fungi was carried out from Baramati area during August, 2017 to January, 2019. While survey and collection the 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, 2015) and classified according to classification system of Ainsworth (1973).

Results and Discussion

Present investigation emphasizes on study of macro-fungi from Baramati area of Pune district of Maharashtra. In the checklist total 64 macro-fungal species belonging to 37 genera, 03 sub-divisions, 13 orders and 23 families were reported (Table 1). The Basidiomycotina fungi having highest contribution i.e. 90% followed by Ascomycotina (7.8%) and Zygomycotina (1.6%). Agaricales was found as predominant order compared to other orders. The number of species in Agaricales was - 31, followed by Polyporales (17), Auriculariales and Xylariales (3), Cantharellales and Pezizales (2), Geastrales, Boletales, Phallales, Hymenochaetales, Gomphales and Mucorales (1). *Coprinus* (8 species) and *Agaricus* (6 species) were most abundantly found genera on the contrary *Pilobolus* (1 species) was occurred rarely. Collected fungi showed lot of diversity in their habitats as 47 species was found as saprophytic followed by parasitic (8), wood rotting (06), coprophilous (02) and symbiotic (01). It is interesting to note that, among the collected fungi we have found 32 edible (wild and traditional), 17 - decomposers, 12 - medicinal and 1 - ectomycorrhizal species (Table 1).

According to Hawksworth (2004) fungi constitute the third important functional segment as decomposers, symbionts and pathogens. In forest ecosystems, macro-fungi may function as decomposers of organic matter, form mycorrhizal associations with trees, occur as parasites or pathogens and are food resources for various organisms (Crabtree *et al.,* 2010).

Fungi enhance the capability of the plants to take up and utilize nutrients, strengthen the self-defense ability, promote plant growth and improve soil quality (Zhang *et al.,* 2010). According to Dwivedi *et al.,* (2017) macrofungi having a rich nutritional value, due to their high quality proteins and out of 60,000 species of fungi, described throughout world, 10,000 species are fleshy mushrooms.

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Table.1 Checklist of macro-fungi from Baramati area

Sr No.	Name of Fungi	Family	Order	Class	Sub Division
1	*Pilobolus crystallinus*	Pilobolaceae	Mucorales	Mucoromycetes	Zygomycotina
2	*Daldinia concentric*	Xylariaceae	Xylariales	Sordariomycetes	Ascomycotina
3	*Xylaria hypoxylon*	Xylariaceae	Xylariales	Sordariomycetes	Ascomycotina
4	*Hypoxylon coccineum*	Xylariaceae	Xylariales	Sordariomycetes	Ascomycotina
5	*Peziza imnaea*	Pezizaceae	Pezizaceales	Pezizomycetes	Ascomycotina
6	*Ascobolus scatigenus*	Ascobolaceae	Pezizaceales	Pezizomycetes	Ascomycotina
7	*Ganoderma lucidum*	Ganodermataceae	Polyporales	Agaricomycete	Basidiomycotina
8	*Ganoderma sessile*	Ganodermataceae	Polyporales	Agaricomycete	Basidiomycotina
9	*Ganoderma resinaceum*	Ganodermataceae	Polyporales	Agaricomycete	Basidiomycotina
10	*Pleurotus ostreatus*	Pleurotaceae	Agaricales	Agaricomycete	Basidiomycotina
11	*Volvariella argentina*	Pluteaceae	Agaricales	Agaricomycete	Basidiomycotina
12	*Leucocoprinus badhamii*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
13	*Lepiota aspera*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
14	*Lepiota brunneoincarnata*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
15	*Lepiota magnispora*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
16	*Lepiota procera*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
17	*Lycoperdon umbrinum*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
18	*Lycoperdon utriforme*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
19	*Lycoperdon perlatum*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
20	*Lycoperdon pyriforme*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
21	*Agaricus augustus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
22	*Agaricus californicus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
23	*Agaricus subrutilescens*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
24	*Agaricus porphyrocephalus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
25	*Agaricus diminutivus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
26	*Agaricus lutosus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
27	*Coprinus comatus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
28	*Coprinus logapus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
29	*Coprinus hiascens*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
30	*Coprinus fimetarius*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
31	*Coprinus calyptratus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
32	*Coprinus stercoreus*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
33	*Coprinus patouilardii*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
34	*Coprinus plicatilis*	Agaricaceae	Agaricales	Agaricomycete	Basidiomycotina
35	*Marasmius bulliardii*	Marasmiaceae	Agaricales	Agaricomycete	Basidiomycotina
36	*Cyathus striatus*	Nidulariaceae	Agaricales	Agaricomycete	Basidiomycotina
37	*Clavaria amoena*	Clavariaceae	Agaricales	Agaricomycete	Basidiomycotina
38	*Clavaria pyxidate*	Clavariaceae	Agaricales	Agaricomycete	Basidiomycotina
39	*Armillaria tabescens*	Physalacriaceae	Agaricales	Agaricomycete	Basidiomycotina
40	*Termitomyces microcarpus*	Lyophyllaceae	Agaricales	Agaricomycete	Basidiomycotina
41	*Polyporus arcularius*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
42	*Polyporus squamosus*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
43	*Polyporus umbellatus*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
44	*Trametes hirsute*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
45	*Trametes versicolor*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
46	*Lenzites betulina*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
47	*Fomes fomentarius*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
48	*Hexagonia tenuis*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
49	*Lentinus tigrinus*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
50	*Tyromyces stipticus*	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
51	*Loweporus* sp.	Polyporaceae	Polyporales	Agaricomycete	Basidiomycotina
52	*Daedalea quercina*	Fomitopsidaceae	Polyporales	Agaricomycete	Basidiomycotina
53	*Fomitopsis pinicola*	Fomitopsidaceae	Polyporales	Agaricomycete	Basidiomycotina
54	*Fomitopsis feei*	Fomitopsidaceae	Polyporales	Agaricomycete	Basidiomycotina
55	*Geastrum saccatum*	Geastraceae	Geastrales	Agaricomycete	Basidiomycotina
56	*Auricularia auricula*	Auriculariaceae	Auriculariales	Agaricomycete	Basidiomycotina
57	*Auricularia americana*	Auriculariaceae	Auriculariales	Agaricomycete	Basidiomycotina
58	*Auricularia polytricha*	Auriculariaceae	Auriculariales	Agaricomycete	Basidiomycotina
59	*Ramaria formosa*	Gomphaceae	Gomphales	Agaricomycete	Basidiomycotina
60	*Boletus edulis*	Boletaceae	Boletales	Agaricomycete	Basidiomycotina
61	*Cantharellus cibarius*	Cantharellaceae	Cantharellales	Agaricomycete	Basidiomycotina
62	*Hydnum repandum*	Hydnaceae	Cantharellales	Agaricomycete	Basidiomycotina
63	*Phallus* sp.	Phallaceae	Phallales	Agaricomycete	Basidiomycotina
64	*Phellinus rimosus*	Hymenochaetaceae	Hymenochaetales	Agaricomycete	Basidiomycotina

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Ranadive *et al.,* (2011) is pioneer worker in Aphyllophorales of Maharashtra as well as India, emphasizes on majority all aspects of Aphyllophorales and concluded that i) Aphyllophorales are the major source of biologically active natural products among the species of the diverse fungal phylum Basidiomycota ii) many species like *Trametes versicolor*, *Laetiporus sulphureus* and *Ganoderma* having rich variety of active secondary metabolites and polysaccharides and iii) several new chemical compounds isolated from polypores are proved to have significant antimicrobial activities. Devkota (2006) described the value of *Cordyceps sinensis* and regarded internationally as Himalayan Viagra. This Himalayan treasure species used by indigenous people for the treatment of different diseases like diarrhea, headache, cough, rheumatism, liver disease and also as an aphrodisiac and tonic. Muraleedharan *et al.,* (1995) reported that macrofungi were considered ideal for the purpose of evaluation as biosorbents as it has exhibit high biosorptive potentials.

Monsoon and winter climates are the ideal conditions for the growth the development of macro-fungi (Yemul *et al.,* 2019). Walting and Abraham (1992) found that, Jammu and Kashmir possess a prime place in the variety and galaxy of macro-fungi due to wide agro-climatic variations, diverse physiography and undulating topography. Study of Aphyllophorales fungi from Western Ghats of Maharashtra was carried out by Ranadive *et al.,* (2011). During their work they concluded that, the heavy rainfall and high humidity favours the growth of aphyllophoraceous fungi. They published checklist of the 256 species of aphyllophoraceous fungi including 170 species from 10 poroid families and 86 species from 20 non-poroid families. Gogoi and Parkash (2015) 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), Polyporales (5), Cantharellales (4) and Boletales (2). Diversity of gasteroid fungi (Basidiomycota) from Hollongapar Gibbon Wildlife Sanctuary, Jorhat, Assam, India was studied by Gogoi and Vipin (2015) 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 Agaricaceae (8 sp.) was highly dominant from the study site followed by Phallaceae (7 sp.), Geastraceae (4 sp.), and Sclerodermataceae (3 sp.).

Natarajan *et al.,* (2005) documented 25 species of ectomycorrhizal fungi in Kadamakkal Reserve Forest of Kodagu, Karnataka. Swapna *et al.,* (2008) enumerated 778 species of macro-fungi from Shimoga District of Karnataka. Mohanan (2011) reported 550 species of macro-fungi from Kerala. Farook *et al.,* (2013) compiled a literature-based checklist of agarics with 616 species occurring in Kerala State. Verma *et al.,* (2008) described forest fungi of central India in details and furthermore Verma (2014) again reported 282 species of Basidiomycetes from central India.

The present attempt has been concluded that, Baramati area of Pune district of Maharashtra having tremendous diversity of macro-fungi. The Basidiomycotina group showed highest contribution compared to Ascomycotina. Agaricales and Polyporales were found as dominant orders. They can luxuriantly available in rainy and cold climatic conditions. These situations are ideal for their growth, development and sporulation. These fungi having very important potential applications like edibles, medicinal, symbionts and decomposers.

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