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Macrofungi from KME Society's educational campus in Bhiwandi, dist. Thane Maharashtra and their associated Myco-technologies

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ABSTRACT

Macrofungi, especially mushrooms; their wide variations in morphological characteristics have fascinated all; mycologists and laymen alike. Mushrooms, owing to their secretive life, have been associated with several animals, fictitious creatures, mysterious entities, super natural beings and happenings through the ages which are also reflected in their vernacular names. These small, apparently insignificant components of biodiversity play an important role as food, dietary supplements, therapeutics, sources of drugs, pharmaceuticals and novel compounds; in modern scientific research, biodegradation and bioremediation. In the present study, macrofungi from KME Society's G.M. Momin Women's College campus in Bhiwandi were documented by the survey method. The study recorded 17 types of macrofungi inclusive of several mushrooms; prominent among them being the genera *Auricularia*, *Daldinea*, *Trametes*, *Mycena*, and *Schizophyllum* among several others, details of which, and the current and emerging mycotechnologies associated with the types recorded, are mentioned in the paper.

Key Words: biodiversity, mushrooms, macrofungi, Bhiwandi.

INTRODUCTION

The word fungus was long ago used to denote mushrooms, following which, its colloquial usage expanded to include other related groups such as molds, polypores, puff balls and many others. The wide variations in colours, shades, sizes, shapes and other morphological characteristics exhibited by macrofungi, particularly mushrooms, accompanied with the mysterious and extremely secretive status

attached to their way of life; the mystifying appearance and disappearance of fruiting bodies, have always fascinated all; laymen and experts alike. Through the ages, in all civilizations, mushrooms have been associated with animals, superstitions and related entities, supernatural and mysterious entities, fairy tales, mythology and folk legends. Their vernacular names bear testimony to such mysterious associations, as well as their morphology, habitat and several other associative characteristics.

The dietary value of mushrooms is well documented (Bahl, 1998, Feeney *et al*., 2014). Cultivation of edible mushrooms has always attracted research attention and the trends are also visible in remote areas, as an answer to dietary deficiencies (Sharma and Thakur, 2010; Valverde *et al*., 2015). Amongst the several other uses of mushrooms and macro fungi are their utilization as sources of therapeutic and anti-cancer agents (Patel and Goyal, 2012; Sharma *et al*., 2017), neutraceuticals (Rathore *et al*., 2017), novel bioactive compounds (Chatterjee and Patel, 2017); in biotransformation and bioremediation (Raj *et al*., 2011), as dyes (Bessette and Bessette, 2001), in dye sensitized solar cells (Zalas *et al*., 2015) and several aspects of modern scientific research. In spite of their utilitarian aspects, literature on macrofungi from the mega city of Mumbai is scarce and scattered and there are practically no reports of this component of biodiversity from Bhiwandi region, adjoining Mumbai. Hence the current investigation was undertaken to study and document mushrooms and macrofungi from KME Society's campus and G.M. Momin Women's College campus in Bhiwandi city.

The area of study viz. G.M.Momin Women's College, popular amongst locals as G.M. college or Rais High School campus is a 6.5 acre campus situated in the Kaneri area of Bhiwandi city, Dist. Thane near Mumbai, the commercial capital of India. Apart from housing some of the best schools and colleges in Bhiwandi, the campus, developed since 1927 on agricultural plots which were originally paddy fields, also sports a reasonably rich biodiversity of vegetation. Various mushrooms and macrofungi appear on the educational campus, especially during the monsoon season, which prompted the present study. The study was also undertaken to spread awareness on the presence of these small but nevertheless important entities in the area of study and the current and emerging mycotechnologies associated with them.

MATERIALS AND METHODS

The study was carried out by the survey method, for collection and documentation of data during the monsoon and post-monsoon season from June to November 2017; wherein a survey of macrofungi was carried out in the area of study. The five locations of study in the campus were the gardens adjoining main building of the G.M. Momin Women's College (Location no. 1), area adjoining extension building of the college (location no. 2), area adjoining staff quarters (location no. 3), lumber and timber storage area adjoining KME Society's College of Education building (location no. 4) and area adjoining KME Society office building (location no. 5). The specimens were identified in the field and in the department of botany, G. M. Momin Women's College, using standard literature (Bakshi, 1971; Lawrence and Harniess, 1991; Keizer, 1997; Polese, 2000) and techniques suggested by Buczacki (1992) and Kaul (1999).

RESULTS AND DISCUSSION

A total of 17 types of macrofungi, comprising 15 genera, were recorded during the investigation. Amongst the fungi recorded, 2 forms comprising 2 genera belonged to Ascomycetes, while 15 forms comprising 13 genera were attributed to Basidiomycetes. The findings are presented in Table 1. Forms such as *Auricularia auricula*, *Daldinea concentrica*, *Trametes*, *Mycena*, *Schizophyllum commune* and *Schizophyllum sp.* were prominently represented, albeit at their respective site locations. The forms encountered were found to be in most of the cases, limited to their respective location and generally did not overlap with other locations of study, most probably owing to the typical and characteristic circumstantial conditions prevalent at every location. While location no. 1 showed conditions characteristic of gardens, with soil rich in organic matter, the others

were dry in comparison. Location no. 2 and 3 were characterized by few uprooted dead trees, tree stumps and logs of wood; location no. 4 was characterized by conditions typical of a dry timber depot, while location no. 5 revealed dry garden-like conditions with some dead tree stumps. The findings on biodiversity of macrofungi are in agreement with those of Todawat and Papdiwal (2012) and Kumar *et al.* (2015). Mushrooms such as *Coenocybe tenera*, *Psilocybe* sp. and *Mycena* sps. were common during rains on the garden soil freshly amended with cowdung manure; the latter, most probably being their source of origin. Many of the macrofungal forms recorded in the current investigation had remarkable abilities related to wood rotting and biodegradation of agro-industrial wastes, dietary value, production of bioactive compounds of medicinal importance (Zhang *et al*, 2016; Kinge *et al*, 2017), and are cultivated in different parts of the world for their valued products (Zervakis and Koutrotsios, 2017).

From among the macrofungal forms reported herein, *Daldinia concentrica* is well documented as a wood decay fungus (Hiscox and Boddy, 2017); has applications in traditional medicines and ethnomycology (Akpaja *et al*., 2005), yields secondary metabolites with anti-HIV (Qin *et al*., 2006), nematicidal (Anke *et al*., 1995), phytotoxic (Lee *et al*., 2006), antimicrobial (Shen *et al*., 2017) activities and is known for its health benefits (Karun *et al*., 2017). *Hypoxylon* has been successfully exploited for metabolites exhibiting anti-bacterial and anti-fungal activity (Yuyama *et al*., 2017). Widely believed to be the earliest cultivated fungus for food (Royse, 2014), *Auricularia auricula* has been in the lime light for its antioxidant and antimicrobial activities (Yu and Oh, 2016), hypoglycemic (Yuan *et al*, 1998) and therapeutic properties (Lu *et al*., 2018), dietary aspects (Misaki and Kakuta, 1995; Vallee *et al*, 2017), novel cultivation practices (Onyango *et al*., 2011), molecular aspects (Du *et al*., 2016), commercial food value (Zou, *et al*., 2017) and mycoremediation potential (Song *et al*., 2017).

Table 1: Macrofungi recorded on KME Society's Educational Campus, Bhiwandi

S. No.	Botanical Name	Common Name	Location site				
			1	2	3	4	5
Ascomycetes							
1	*Daldinia concentrica* (Bolton) Cesati & de Notaris	King Alfred's cakes, carbon balls		*	*		
2	*Hypoxylon sp.*	hypoxylon		*	*		
Basidiomycetes							
3	*Auricularia auricula* (Bull.) J. Schrot	Jelly ear, Jew's ear, Tree ear			*		
4	*Auricularia polytricha* (Mont.) Sacc.	Cloud ear fungus			*		
5	*Schizophyllum commune* Fries	Split-gill, Common Schizophyllum		*	*	*	
6	*Pleurotus ostreatus* (Jacq ex Fr.) P. Kumm.	Oyster mushroom	*				
7	*Polyporus sp.*	Bracket fungus				*	
8	*Poria sp.*	Poria				*	
9	*Trametes sp.*	Many zoned polypore					*
10	*Daedalea sp.*	Maze gill				*	
11	*Coenocybe tenera* (Schaeff.) Fayod	Cone cap mushroom, brown dunce cap	*				
12	*Laccaria laccata* (Scop.) Cooke	Deceiver	*				
13	*Marasmius sp.*		*				
14	*Psilocybe sp.*		*				
15	*Mycena sp.*(1)	Common mycena	*				
16	*Mycena sp.*(2)	Common mycena	*				
17	*Psathyrella sp.*	Cone capped agaric	*				

A. polytricha is known for its antimicrobial (Gbolagade and Fasidi, 2005) and antidiabetic (Wu *et al*., 2014) properties as well as culinary and medicinal importance (Afiukwa *et al*., 2013). *Schizophyllum commune* was reported as a respiratory allergen (Singh *et al*., 2013) but also produces commercially valuable biopolymers (Mohammadi *et al*., 2017) and has been attributed with anti-inflammatory property (Du *et al*., 2017).

The popular edible oyster mushroom, *Pleurotus ostreatus*, is reported to have nutritive, medicinal and antimicrobial attributes, neutraceutical potential (Kunjadia *et al*., 2014) along with biodegradation capabilities, mycoremediation potential (Purnomo *et al*., 2017), apart from being source of novel compounds and enzymes (Piscitelli *et al*., 2017). *Polyporus*, *Poria* and *Trametes,* well known for their wood rotting activity, also have great therapeutic value (Stamets 2012) and applications in alternative medicine. Genus *Trametes* is reported as an excellent source of enzyme laccase (Bucic-Kojic *et al*., 2017) and for its mycoremediation potential (Wolfand *et al*., 2016). Apart from production of laccase and potent role in biodegradation, *Daedalea* and *Marasmius* have also been attributed with biotransformation abilities (Rizqi and Purnomo, 2017; Vantamuri and Kaliwal, 2017). The small agaric *Mycena* was reported as source of several novel volatile compounds (Palazzolo *et al*., 2017) and as symbiont enhancing germination and growth in rare orchid species (Lee *et al*., 2017). Similarly, *Psathyrella* sps. are reported endowed with compounds of nutritional and therapeutic value (Atchibri *et al*., 2017). Various species of *Psilocybe* are known for their psychedelic effects and applications in medicine (Nichols *et al*., 2016). The current study revealed a moderately rich biodiversity of macrofungi on KME Society's Educational Campus, which is however significant considering the poor macro mycoflora of Bhiwandi and its surrounding areas.

A survey of mushrooms and macrofungi was conducted during monsoon and immediate post monsoon months in the current year 2017 in Bhiwandi, Dist. Thane, Maharashtra, India. A total of 17 types of mushrooms and macrofungi, belonging to 15 genera, were recorded from the area of study. Amongst the fungi recorded, 2 forms belonged to Ascomycetes, while 15 forms comprising 13 genera were members of Basidiomycetes. All the macrofungi found growing in the area of study were economically and environmentally important. Most of the forms documented, were reported to exhibit exceptional wood rotting capabilities.

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