



DIVERSITY OF MACROFUNGI IN THIRTHAHALLI TALUK OF SHIMOGA DISTRICT, KARNATAKA

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ABSTRACT

Thirthahalli taluk supports rich and diverse fungal fruitbodies with a total of 48 macrofungal species (38 genera, 28 families) found fruiting on soil and wood. In total, 10 morpho-groups were identified. The macrofungal diversity was examined based on sporocarp inventories over a year. The sporocarps encountered were collected and analyzed for their identity. The field expeditions were carried out from January to December 2019 in a 50 x 20 m transect. The families Agaricaceae, Polyporaceae and Xylariaceae. Psathyrellaceae and Tricholomataceae dominated the macrofungal communities during 2019 having the greatest number of species. The species belonged predominantly to the genera *Conocybe*, *Coprinellus*, *Coprinus*, *Daldinia*, *Hygrocybe*, *Ischnoderma*, *Lepiota*, *Phellinus*, *Polyporus* and *Xylaria*. More number of sporocarps and species were found in the month of August 2019, probably indicating rainfall to be important for the development of fruitbodies. Mulching and moisture content of substratum play very important role in the growth of macrofungi. The present work will serve as a good basis in native forest types for further studies in order to enrich the information on diversity of macro-mycobiota in India.

Keywords: Mushrooms, Sporocarps, Basidiomycete, Dominance, Abundance

INTRODUCTION

Macrofungi:

Among all living entities, fungi is an important crucial component of biodiversity which play a key role in determining the diversity of other organisms [1]. Macrofungi belong to the kingdom fungi, which constitutes the most diverse group of organisms after insects on this biosphere. They form large fruiting bodies, visible without the aid of a microscope and include fruiting bodies, such as gilled fungi, cup fungi, jelly fungi, flask fungi, entomogenous fungi, tongue fungi, coral fungi, stinkhorns, bracket fungi, puffballs and bird's nest fungi [2-3]. There are many thousands of species which are unique and each species beautiful in its own way. Since the dawn of civilizations, macrofungi have been fascinating to man due to their unusual characters like sudden appearance in isolated places in groups, rings and in different geometrical shapes. Macrofungi are found in many parts of the world as parasite and saprophyte [4-6]. They intermingle and participate or compete with other micro-organisms behaviour and predators [7].

Sporocarps:

The macrofungi are differentiated by containing spore bearing structures "Sporocarps" that are seen by naked eye, it consist of mushrooms, puffballs, bracket fungi, false-truffles and cup fungi are

common examples of macro fungi. It is usual for a particular fungus to produce a visible fruiting body only under a precise combination of conditions, including geographic location, elevation, temperature, humidity, light and surrounding flora. Sporocarps are ephemeral, may last only a few days before decomposing or being eaten. Macroscopic fungi with specific fruiting organs and size, big enough, to be visible, may either be epigeous or hypogeous [8]. Many macrofungal species are believed to fruit sporadically with no consistent pattern of occurrence from year to year. The distribution of macrofungal species is low in hot and dry seasons while they are abundant in spring and autumn due to the humid climate as well as the richness of the flora. In some species sporocarp is short-lived; in others they are persistent and may be perennial. Fruiting body of this group is extremely dependent on weather conditions and abundance of sporocarp may therefore vary by several orders of magnitude between the years. The basidiomycete sporocarps are among the first biotic groups to be affected by environmental disturbance, and as such, they can be considered as good indicators of ecosystem modification [9].

Significance:

The presence of extensive biodiversity available in tropical forests has

been identified as the treasure box for the emerging field of biotechnology [10]. Soil fungi play a central role in many ecological processes that are crucial to maintaining ecosystem stability, as influencing soil fertility, cycling of minerals and organic matter, as well as plant health and nutrition [9]. Saprotrophic macrofungi carry out the bulk of organic material decomposition and forest ecosystem has a strong effect on macrofungal diversity, species composition, and population structure [11]. The socio-economic significance of wild fungi as food, medicinal source, ecosystem conservation, plant growth promotion, etc., has long been recognized in Europe, USA, China and other developed countries and this has attracted scientists to explore the potential macrofungi and their diversity. Macrofungi studies have long been of interest to scientists as well as the public due to their important role in human welfare, in food industry, in medicinally effective products and in biodegradation. Macrofungi were considered ideal for the purpose of evaluation as biosorbents, because it has been demonstrated that many fungal species exhibit high biosorptive potentials. Work has been carried out on antimicrobial activities of lower fungi but edible mushrooms have not been adequately explored. Though the visible macroscopic fruit bodies have economic value as aesthetic components of the

natural environment and as a food crop in the case of edible species. Studies on this subject, in fact, have been carried out in different countries and new species for the world macrofungal flora have been recorded. Macrofungi are also important components of the diet of many animals including soil invertebrates and small mammals [12].

MATERIALS AND METHODS

Survey and sampling:

The study was conducted in Thirthahalli taluk (**Figure 1**) located in Shimoga district of Karnataka, situated between 13.7° North latitude, 75.23° East longitude and 591meters altitude. The average annual rainfall in the taluk is 1900 mm. The annual mean air temperature is 16°C to 23°C in winter and 30°C to 37°C in summer. Macrofungi exhibit pattern of diversity that are related largely to substratum and host availability. Temperature and rainfall interact with the habitat of the fungus either stimulate or retard fruiting [13]. The sporocarps encountered were collected and analyzed for their identity. Surveying was done after the rain, but some [14]. Surveys were done in 5 sampling plots of Thirthahalli taluk during January to December 2019. The study sites were plotted in 5 sampling plots of Thirthahalli taluk. A 50 × 20 m transect was measured out in each of the sampling

plot. The study sites were selected randomly and macrofungi were collected within transects and characterized for further analysis.

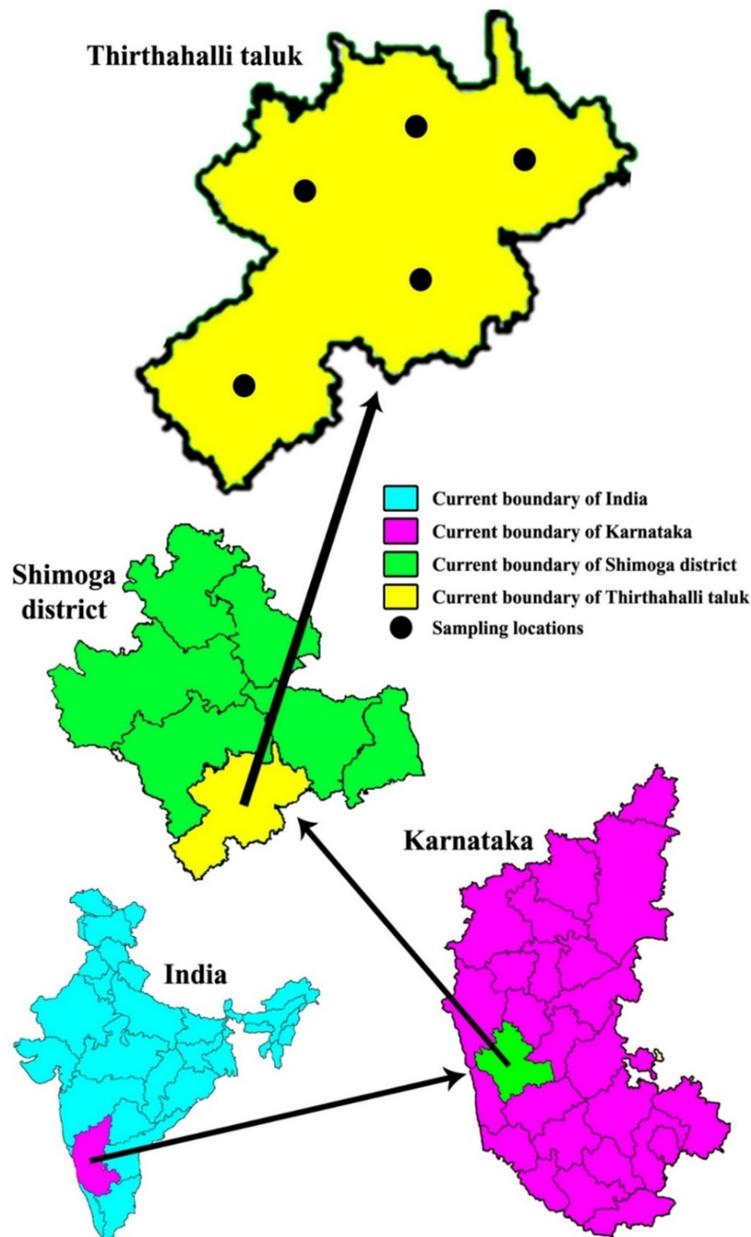


Figure 1: Map showing sampling locations of Thirthahalli taluk in Shimoga district

Field Observations:

Macrofungi grow in varieties of habitats and some were attached to substratum. A pair of small hand axe, knife, scissors and forceps were used to remove or cut macrofungi with a minimum of

damage. Measuring tape was used to measure transect and hand lens for observing small features. Field observations were noted in a small field notebook with pencil that included details of structure, size, shape, colour,

consistency of the macrofungi. The field notes included date of collection, species collection number, locality, habit, habitat, latitude, longitude, altitude and substratum.

Collection and Identification:

Fresh specimens were collected with great care without any damage and soil debris were removed using a soft brush. Wood inhabiting macrofungi were collected along with the substratum. The habitat and morphological characteristics of the macrofungi were noted and photographed for further diagnosis during the collection [15]. The species were identified based on observations of morphology and microscopic structures. The sporocarps were cut into small fragments for free hand sectioning using a razor blade. The microscopic characters such as size, shape were observed for spores and basidia.

RESULTS AND DISCUSSION

In the present study, macrofungal diversity in the Thirthahalli taluk has been surveyed and documented (Table 1).

The survey was undertaken in five transects for documentation of macrofungi occurring in Thirthahalli taluk during 2019. The collected macrofungi belongs to 48 species, 38 genera, 28 families, two classes and ten morpho-groups. The collected species showed highest rate in basidiomycota with 40 species followed by eight species in Ascomycota (Figure 1).

Macrofungal studies were carried out in Thirthahalli taluk according to their respective morphology during 2019 and encountered a total of nine different types of morpho-groups. The survey recorded 23 species in fleshy gilled fungi accounting for maximum species encountered during 2019 and second highest in bracket fungi with ten species followed by four species (flask fungi), three species (cup fungi), two species (coral fungi and puffballs) and one each in bird nest fungi, jelly fungi, stinkhorns and tongue fungi (Figure 2).

Families encountered in Thirthahalli taluk during 2019 were enumerated. A total of 28 families were encountered. The dominant species were found in Agaricaceae with seven species. Families with four species were found in Polyporaceae and Xylariaceae. Three species were found in Psathyrellaceae and Tricholomataceae. Bolbitiaceae, Coprinaceae, Fomitopsid-aceae and Hymenochataceae were associated with two species and the rest of the families were encountered with only one species (Figure 3).

During the study, species were recorded highest in *Conocybe*, *Coprinellus*, *Coprinus*, *Daldinia*, *Hygrocybe*, *Ischnoderma*, *Lepiota*, *Phellinus*, *Polyporus* and *Xylaria* with two species followed by *Aleuria*, *Amanita*, *Bovista*, *Chlorophyllum*, *Clathrus*, *Clavaria*,

Clitocybe, *Cookiena*, *Coprinopsis*, *Micropus*, *Pleurotus*, *Ramaria*, *Russula*, *Crepidotus*, *Cyathus*, *Dacrymyces*, *Scleroderma*, *Termitomyces* and *Ganoderma*, *Gloeophyllum*, *Gymnopilus*, *Trichoglossum* possess only one species **(Figure 4)**.
Lachnum, *Lentinula*, *Lenzites*,
Leucocoprinus, *Macrolepiota*, *Marasmius*,

Table 1: List of Macrofungal species in Thirthahalli taluk of Shimoga district

Sl. No.	Species Name	Family	Morpho-groups
1	<i>Aleuria aurantia</i>	Pyronemataceae	Cup fungi
2	<i>Amanita</i> sp.	Amanitaceae	Fleshy gilled fungi
3	<i>Bovista</i> sp.	Agaricaceae	Puffballs
4	<i>Chlorophyllum molybdites</i>	Agaricaceae	Fleshy gilled fungi
5	<i>Clathrus delicatus</i>	Phallaceae	Stinkhorns
6	<i>Clavaria miniata</i>	Clavariaceae	Coral fungi
7	<i>Clitocybe candicans</i>	Tricholomataceae	Fleshy gilled fungi
8	<i>Conocybe incarnata</i>	Bolbitiaceae	Fleshy gilled fungi
9	<i>Conocybe lactea</i>	Bolbitiaceae	Fleshy gilled fungi
10	<i>Cookiena tricholoma</i>	Sarcoscyphaceae	Cup fungi
11	<i>Coprinellus disseminatus</i>	Psathyrellaceae	Fleshy gilled fungi
12	<i>Coprinellus tardus</i>	Psathyrellaceae	Fleshy gilled fungi
13	<i>Coprinopsis insignis</i>	Psathyrellaceae	Fleshy gilled fungi
14	<i>Coprinus domesticus</i>	Coprinaceae	Fleshy gilled fungi
15	<i>Coprinus spelaiophilus</i>	Coprinaceae	Fleshy gilled fungi
16	<i>Crepidotus</i> sp.	Inocybaceae	Fleshy gilled fungi
17	<i>Cyathus striatus</i>	Agaricaceae	Bird nest fungi
18	<i>Dacrymyces</i> sp.	Dacrymycetaceae	Jelly fungi
19	<i>Daldinia concentrica</i>	Xylariaceae	Flask fungi
20	<i>Daldinia fissa</i>	Xylariaceae	Flask fungi
21	<i>Ganoderma lucidum</i>	Ganodermataceae	Bracket fungi
22	<i>Gloeophyllum sepiarium</i>	Gloeophyllaceae	Bracket fungi
23	<i>Gymnopilus luteofolius</i>	Strophariaceae	Fleshy gilled fungi
24	<i>Hygrocybe chlorophana</i>	Tricholomataceae	Fleshy gilled fungi
25	<i>Hygrocybe singeri</i>	Tricholomataceae	Fleshy gilled fungi
26	<i>Ischnoderma resinosum</i>	Fomitopsidaceae	Bracket fungi
27	<i>Ischnoderma</i> sp.	Fomitopsidaceae	Bracket fungi
28	<i>Lachnum virgineum</i>	Hyaloscyphaceae	Cup fungi
29	<i>Lentinula edodes</i>	Omphalotaceae	Fleshy gilled fungi
30	<i>Lenzites betulina</i>	Polyporaceae	Bracket fungi
31	<i>Lepiota acutesquamosa</i>	Agaricaceae	Fleshy gilled fungi
32	<i>Lepiota castaneidisca</i>	Agaricaceae	Fleshy gilled fungi
33	<i>Leucocoprinus cepaestipes</i>	Agaricaceae	Fleshy gilled fungi
34	<i>Macrolepiota procera</i>	Agaricaceae	Fleshy gilled fungi
35	<i>Marasmius epidryas</i>	Marasmiaceae	Fleshy gilled fungi
36	<i>Micropus xanthopus</i>	Polyporaceae	Bracket fungi
37	<i>Phellinus igniarius</i>	Hymenochaetaceae	Bracket fungi
38	<i>Phellinus robustus</i>	Hymenochaetaceae	Bracket fungi
39	<i>Pleurotus ostreatus</i>	Pleurotaceae	Fleshy gilled fungi
40	<i>Polyporus</i> sp.	Polyporaceae	Bracket fungi
41	<i>Polyporus tenuiculus</i>	Polyporaceae	Bracket fungi
42	<i>Ramaria botrytis</i>	Gomphaceae	Coral fungi
43	<i>Russula rosea</i>	Russulaceae	Fleshy gilled fungi
44	<i>Scleroderma citrinum</i>	Sclerodermataceae	Puffballs
45	<i>Termitomyces</i> sp.	Lyophyllaceae	Fleshy gilled fungi
46	<i>Trichoglossum hirsutum</i>	Geoglossaceae	Tongue fungi
47	<i>Xylaria carpophylla</i>	Xylariaceae	Flask fungi
48	<i>Xylaria</i> sp.	Xylariaceae	Flask fungi

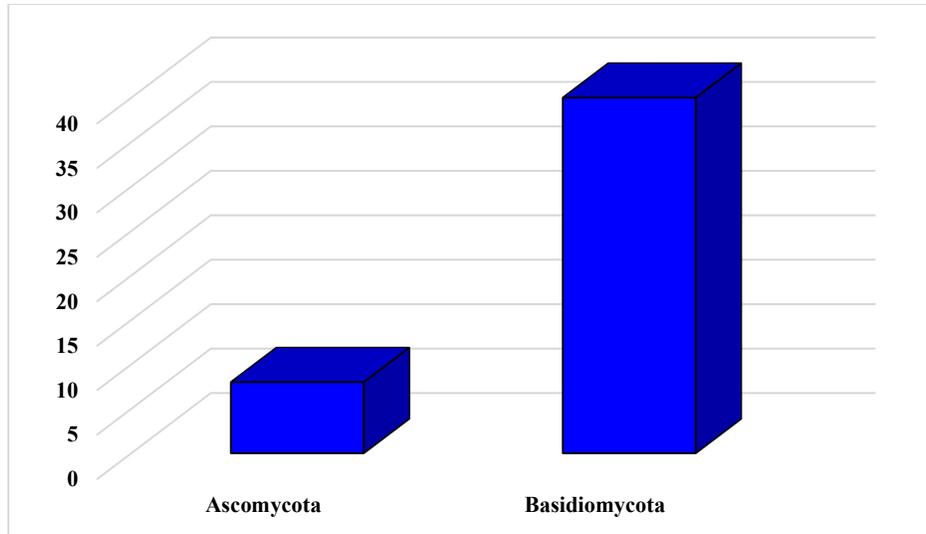


Figure 1: Total number of species occurred in Ascomycota and Basidiomycota of Thirthahalli taluk

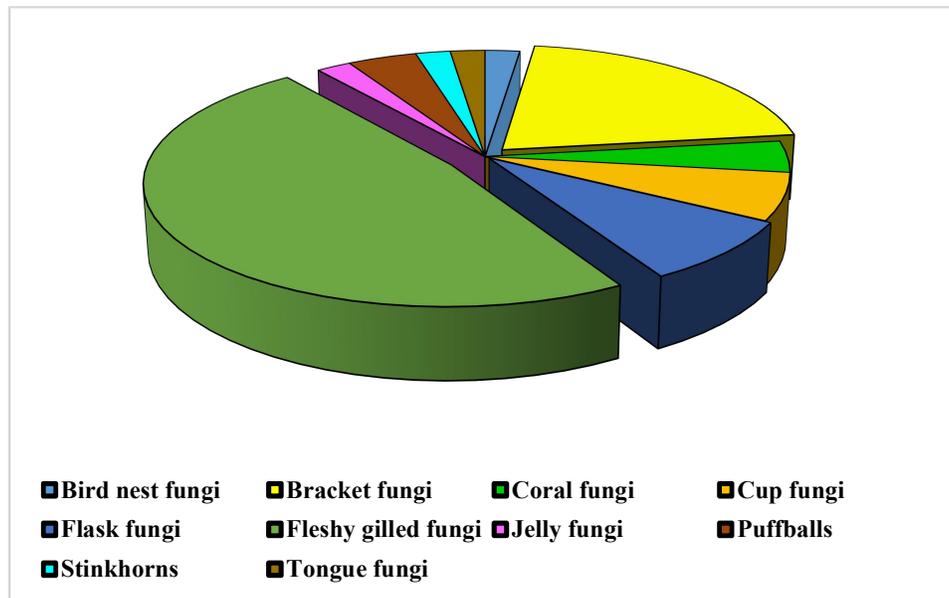


Figure 2: Total number of species occurring in different morpho-groups of Thirthahalli taluk

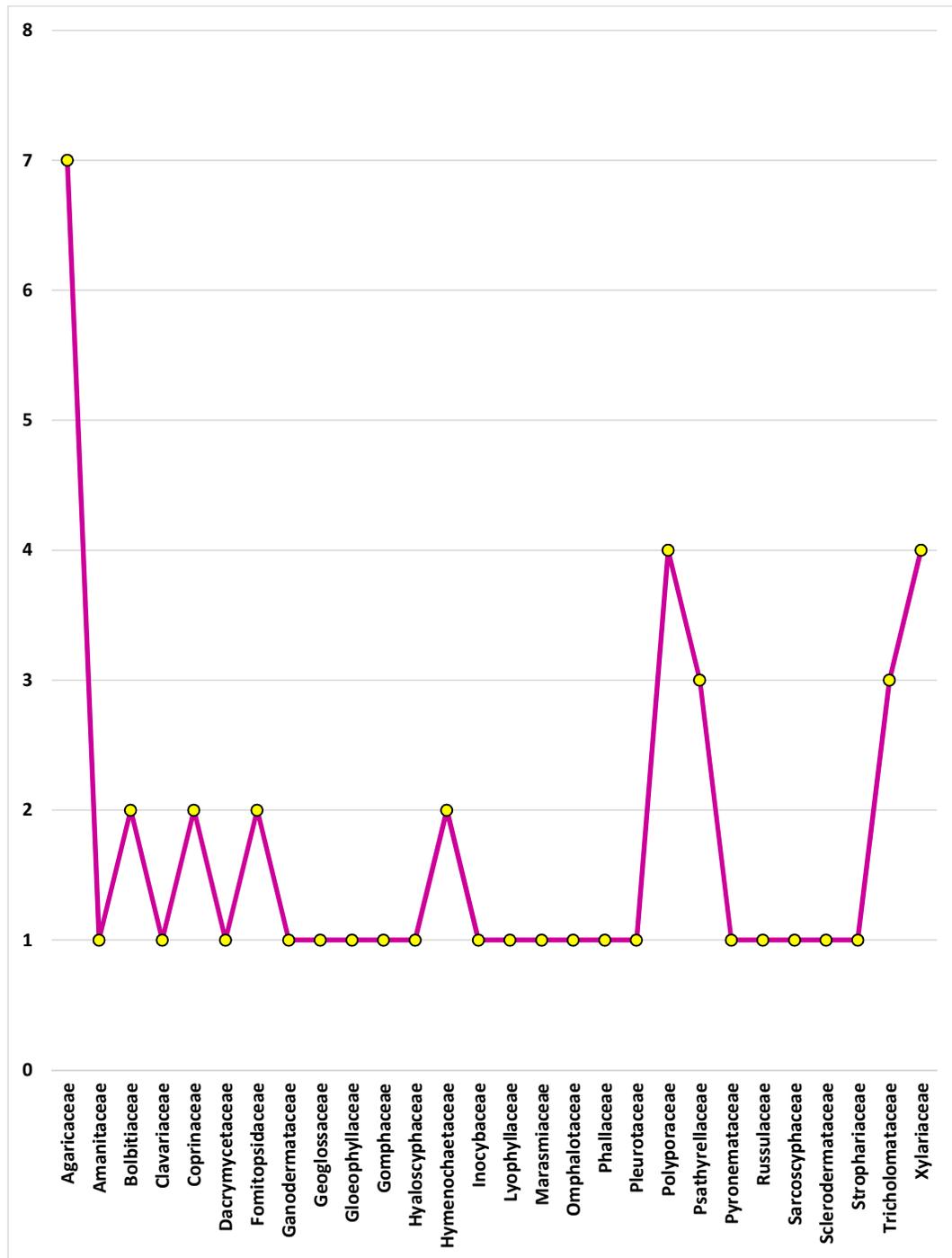


Figure 3: Total number of species occurring in different families of Thirthahalli taluk

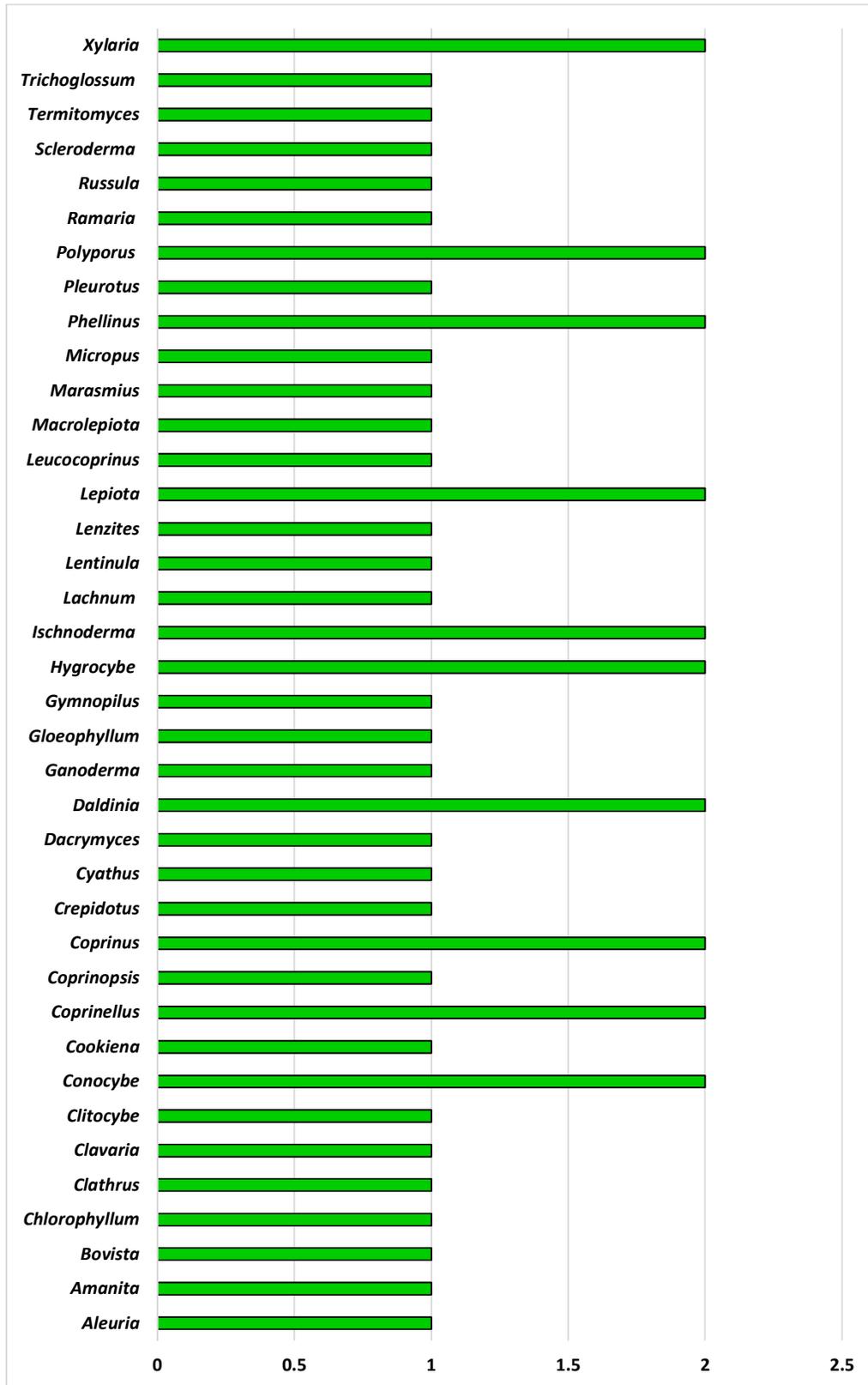


Figure 4: Total number of species in different genera of Thirthahalli taluk

CONCLUSION

The study on macrofungal diversity in Thirthahalli taluk of Shimoga district, Karnataka showed abundance and diversity is more in rainy season than winter and summer. Mulching and moisture content of substratum play very important role in the growth of macrofungi. The work usually needs more time because every time we wouldn't get the macrofungi in the study sites. The wood decaying fungi were usually present in all the seasons.

More number of sporocarps and species were found in the month of August 2019, probably for the highest rainfall and percolation was more in the soil and high moisture in the substratum, which produced more number of fruiting bodies and different macrofungal species. In our study more number of species belong to fleshy gilled fungi as the same species may need less rain or moisture content for its development and they found in all the substratum. Some species were edible (*Termitomyces* sp.) and many species found to be non-edible.

The same work has been dealt by researchers in the past, but our working duration is very short. However, the species collected were more in the short span of time. The research on macrofungi should be more in the future days and utilization of these for mankind should be traced out. More encouragement and preference should

be given to the “diversity of macrofungi” and the nature’s miracle i.e., Macrofungi should be conserved for the welfare of present and future human generations.

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