Nepal Journal of Science and Technology Vol. 14, No. 1 (2013) 75-80

Mycodiversity at Sankarnagar Community Forest, Rupandehi District

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Abstract

This investigation explored the diversity of higher fungi with their identification, documentation and utilization. The study area covered 549 ha, which lies within a narrow limit of altitude between 165 and 200 masl, in tropical deciduous riverine forest. *Amanita chepangiana, A. pantherina, Macrolepiota fuliginosa, M. rhacodes, Russula emetica, R. foetens, R. nigricans, Scleroderma citrinum, S, bovista, Termitomyces clypeatus* and *T. eurhizeus* were found to be dominant. The collected samples represented 29 species of Basidiomycetes belonging to 7 orders, 18 families and 25 genera. The dried specimens housed at Tribhuvan University Central Herbarium (TUCH), Kirtipur, Kathmandu. The mycoelements prevailing in this area need sustainable conservation and utilization.

Kew words: basidiomycetes, macrofungi**,** mushroom diversity

Introduction

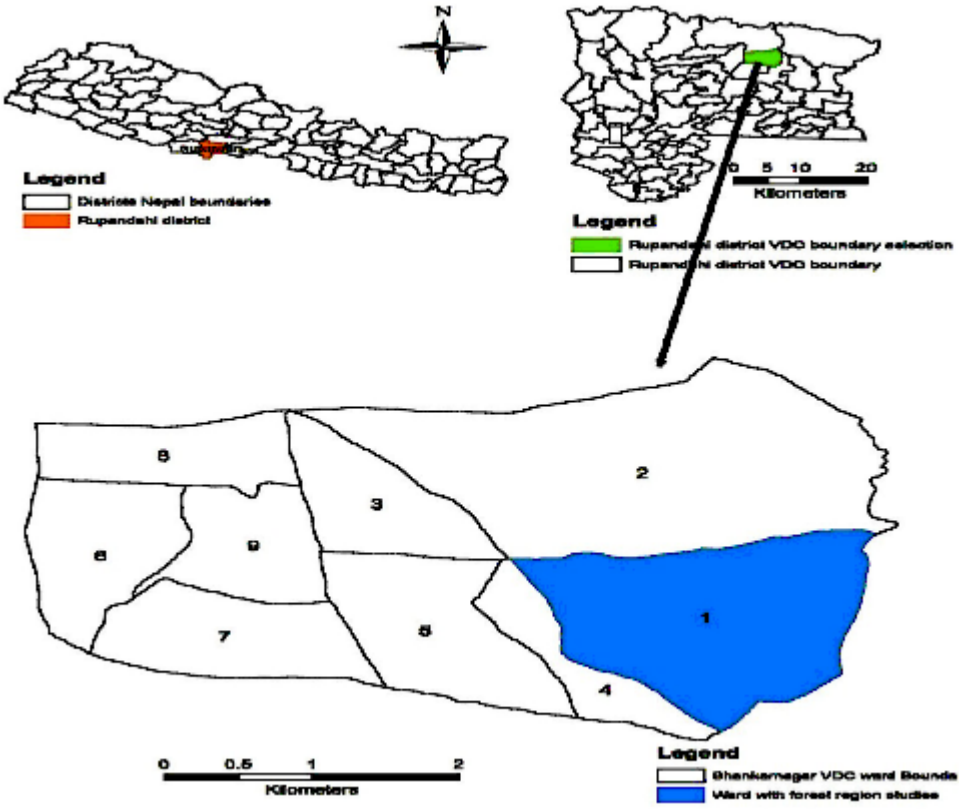
Higher fungi generally contain two main groups, the Ascomycota and Basidiomycota. Although most of the Ascomycota are microscopic species, they also contains some larger fungi such as cup-fungi, morels and truffles. Around 14000 to 16000 species of Basidiomycota are known in the world (Hawksworth *et al*. 1995, Watkinson *et al*. 2000). Fungi in the order Agaricales are commonly called mushrooms, toadstools, gill fungi, or agarics. They are also referred to as being terrestrial, lignicolous, saprobic or mycorrhizal. Mushrooms form large fruiting bodies visible without the aid of a microscope. The distribution of macro-fungal species is low in hot and dry seasons while they are abundant in spring and autumn due to humid climate as well as the richness of the flora at this time (Sibounnavong 2008). Macro-fungal studies have long been of interest to scientists in the world for their significant roles in forest ecosystem, human life, their use in the pharmaceutical industry, and the mass production of cultivated fungi in the food industry, as well as their vital role in biodegradation (De Boer *et al*. 2005). Many studies have reported that the Basidiomycota account for most of the lignocelluloses decomposition in leaf litter (Miyamoto *et al*. 2000).

Nepal is considered as the homeland for the mushroom floral diversity (Aryal & Budhathoki 2012). So far 812 mushroom species have been identified (Adhikari 2009). Of them, 228 edible (Christensen *et al*. 2008), 66 poisonous (Pandey 2008, Adhikari 2009) and 75 medicinal species (Adhikari 2009) have been reported. The investigation on mushrooms of Nepal started since the contribution of (Lloyd 1808, Berkeley 1838), since then several papers have been published and several botanical investigations have been done. Among these, very few reveal the studies and investigation on wild mushrooms from western Nepal. This area has not been investigated so far. This is a preliminary report on mycodiversity investigation carried out at Sankarnagar community forest, Rupandehi district. The paper highlights the study on collection, identification and documentation of wild edible mushrooms in this district.

The study site is rich in mushroom diversity and offers immense scope for macrofungi studies. The useful wild mushrooms and their ethno-information are being eroded as a result of degradation of appropriate habitat of the species, unsustainable land use activities and over-exploitation of natural resources.

Study area

The study area lies in Lumbini zone, Rupandehi district, Sankarnagar V. D. C., ward No. 9, in the western Terai belt of Nepal ((fig. 1). The forest vegetation is dominated by the species of Dipterocarpaceae, Combretaceae and Leguminosae families. The study site is situated between 27.66703°- 27.68745° N latitudes and 83.25137°- 83.32187° E longitudes and an area of 549 ha of forest. The altitude range varies between 165 metre and 200 metre mean above sea level and average annual rainfall is 1391mm (DHM 2010).



The area lies in the tropical zone embracing different types of vegetation and soil composition. The tropical riverine belt consists of mostly the following vascular flora: *Acacia cateachu, Adina cordifolia, Anogeissus latifolius, Bombax ceiba, Dalbergia latifolia, Dalbergia sissoo, Eugeina jambolana, Mallotus philippensis, Phoenix sylvestris, Shorea robusta, Schleihera oleosa, Syzygium cumini, Tectona grandis, Terminalia alata T. tomentosa,* and *T. belerica* etc. The northern belt of this area has loamy sand, while the southern belt consists of sandy loam to loamy soil.

Methodology

The survey was conducted from 15th to 31st May and 29 mushroom samples were collected from 1st June to 31st Oct in 2011 and 2012. A participatory rural appraisal (PRA) survey was conducted with local people aimed at getting information largely on mycodiversity aspects. Data were obtained by combined semi-structured questionnaire, participatory discussions and field observations.

Mushroom samples were photographed in their natural habitat and their morphological characters were noted.

The samples were well dried and packed in wax paper bags with proper tag numbers. The habitat including ecological parameters *viz*. altitude, vegetation composition, soil type, soil pH, soil moisture, humidity, and temperature were recorded. The paper bags were brought to the Central Department of Botany, Ttribhuvan University, for further microscopic examination.

The identification was done with the help of relevant literature (Bakshi 1971, Dickinson & Lucas 1979, Singer 1986 and Kumar *et al.* 1990) and Website (biodiversity library.org; Index fungorum; Jstor.org; Mycobank.org; Scircus; tropicos.org; Agaricus in the Pacific Northwest; Boletes in the Pacific Northwest). The voucher specimens were deposited at Ttribhuvan University Central Herbarium.

Results and Discussion

In the survey, 29 species of Basidiomycetes from 7 orders belonging to 18 families and 25 genera were recorded with their brief descriptions (Table 1).

Table 1.Mushroom species collected from Sankarnagar community forest, Rupandehi district

S.No.		Scientific name	Local name	Order	Family	Host/Substratum	Ecology	Application
1	100772	*Amanita chepangiana* Tulloss & Bhandary	Salleu, Kukhura Phule Chyau	Agaricales	Plutaceae	Soil	Mycorrhizal	Used as vegetable
2	100773	*Amanita pantharina* (DC.) Kromb	Bhut Chyau	Agaricales	Amanitaceae	Soil	Mycorrhizal	Deadly poisonous
3	1010524	*Agaricus sylvicola* (Vittad.) Peck	Sal Chyau	Agaricales	Plutaceae	Soil	Saprophytic	not edible
4	100716	*Auricularia auricular-judae* (Bull.) Quel.	Kane Chyau	Auriculariales	Auriculariaceae	Log (*Shorea robusta*)	Saprophytic	Edible, used to prepared soup
5	10071 20	*Bjerkandera adusta* (Willd.) P. Karst.	Kane Chyau	Polyporales	Hapilopilaceae	Log(*Terminalia alata*)	Saprophytic	Not edible, used as a razor strop
6	10083 29	*Buchwaldoboletus lignicola* (Kallenb.) Pilat	Dhyabre Chyau	Bolatales	Bolataceae	Log (*Shorea robusta*)	Saprophytic	Not edible
7	100703	*Trametes hirsuta* (Wulfen) Lloyd	Kathe Chyau	Polyporales	Polyporaceae	Log (*Shorea robusta*)	Saprophytic	
8	10071 07	*Ganoderma lucidium* P. Karst.	Dadhu Chyau	Polyporales	Ganodermataceae	Trunk (*Bombax ceiba*)	Parasitic	To remove evil spirit, for used in decorative purpose.
9	10071 28	*Grifola frondosa* (Dicks.) Gray	Giddha Chyau	Polyporales	Meripilaceae	Stump (*Mallotus philippinensis*)	Parasitic	Used to relief for muscular pain.
10	100715	*Dacryopinax spathularia* (Schwein.) G.W. Martin	Putali Chyau	Tramellales	Dacrymycetaceae	rotten wood (*Shorea robusta*)	Saprophytic	Not edible

11	1007127	*Laetiporus sulphareus* Murrill	Kath-phule Chyau	Polyporales	Polyporaceae	tree on forest (*Tectona grandis*)	Parasitic	Young ones are used for culinary purpose
12	100704	*Leucopaxillus giganteus* Boursier	Pyaje Chyau	Agaricales	Tricholomataceae	open grassland	Saprophytic	Edible, used as vegetable
13	100740	*Marasmius oreade* (Bolt.) Fr.	Noune Chyau	Agaricales	Marasmiaceae	soil	Saprophytic	Edible, but not commonly use
14	10081 18	*Macrolepiota fuliginos* (Baila) Bon	Gobbre Chyau	Agaricales	Agaricaceae	soil	Saprophytic	Used as vegetable
15	10083 30	*Macrolepiota rhacodes (Vittad.) Sing.*	Gobbre Chyau	Agaricales	Agaricaceae	soil	Saprophytic	Used as vegetable
16	100711	*Pycnoporus cinnabarinus* (Jacq.) P. Karst.	Sindur e Chyau	Polyporales	Polyporaceae	Stump (*Syzygium cumini)*	Saprophytic	Medicine, for relief ear pain, Mumps, cut wound.
17	100804	*Psathyrella candolleana* (Fr.) Quel.	Todke Chyau	Agaricales	Coprinaceae	Log (*Dalbergia latifolia*)	Saprophytic	Inedible
18	10083 16	*Ramariopsis kunzei* (Donk) Corner	Panje Chyau	Phallales	Gomphaceae	Stump(*Mallotus philippinensis*)	Saprophytic	Inedible
19	100717 1	*Russula emetica* (Schaeff.) Pers.	Ratteu o Chyau	Russulales	Russulaceae	litter	Mycorrhiza e	Poisonous, Medicine that cause vomiting
20	10083 50	*Russula foetens* Pers.	Gandh e Chyau	Russulales	Russulaceae	Soil	Mycorrhiza e	Poisonous
21	100751	*Russula nigricans* Fr.	Handi Chyau	Russulales	Russulaceae	Soil	Mycorrhizal	Edible, pickle
22	101002	*Schizophyllum commune* Fr.	Pankha Chyau	Agaricales	Schizophyllaceae	Decayed wood (*Shorea robusta*)	Saprophytic	Edible,Religious,cult-ural,Culinary purpose
23	1009152	*Scleroderma bovista* Fr.	Alu Chyau	Bolatales	Sclerodermataceae	Soil	Mycorrhizal	Vegetable, /Medicinal
24	100731 7	*Scleroderma citrinum* Pers.	Dalle Chyau	Bolatales	Sclerodermataceae	Soil	Mycorrhizal	Inedible/Medicinal Causes gastric disorders or acute indigestion
25	100748	*Sparassis crispa* (Wulfen.) Fr.	Cauli Chyau	Polyporales	Sparadiaceae	Log (*Tectona grandis)*	Parasitic	Used as vegetable
26	101053	*Termitomyces clypeatus* R. Heim.	Dhame re Chyau	Agaricales	Tricholomataceae	Termites nest	Obligate sumbiont	Edible, Medicinal, Feaver. Miseales
27	100711 9	*Termitomyces eurhizeus* (Berk.) Heim.	Dhame re Chyau	Agaricales	Tricholomataceae	Termites nest	Obligate sumbiont	Edible, Medicinal, Feaver. Miseales. It is used as a mixture with some herbs as a lotion for skin diseases

Note: S.No. =Serial number, CN= Collection number.

A notable frequency of *Amanita chepangiana, A. pantherina, Macrolepiota fuliginosa, M. rhacodes, Russula emetica, R. foetens, R. nigricans, Scleroderma bovista, S. citrinum, Termitomyces clypeatus,* and *T. eurhizeus*, were observed. Out of the total collection, 41% mushrooms fall under Agaricales followed by, Polyporales, Russulales, Boletales, Auriculariales, Phallales and Tremellales (fig. 2.)

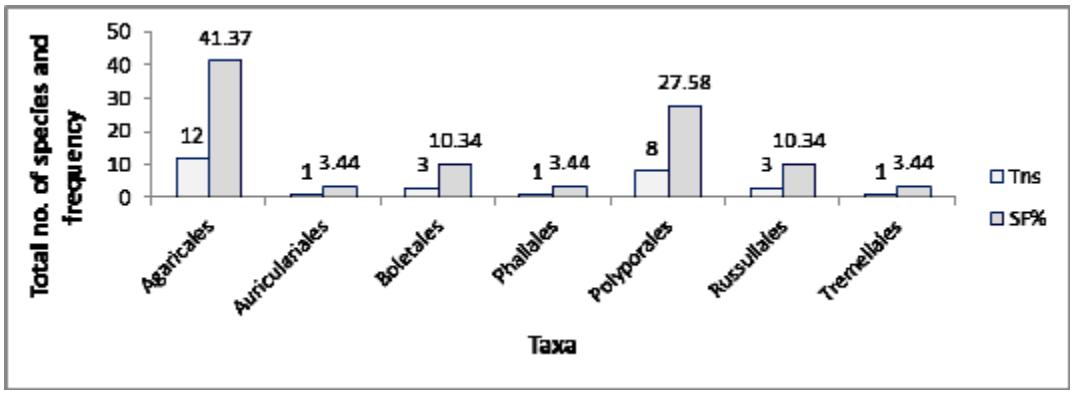


Fig. 2. Total no. of species and % of frequency of Basidiomycotina (29 spp.)

On the basis of information collected, 91% of the collected mushrooms are used as food, 6.5% as medicine, 1.5% as taste and flavor and 1% as tonic. The food values of wild edible mushrooms are more significant in the study sites. People use these mushrooms for the remedy of different types of diseases and ailments. Their medicinal uses for the treatment of different types of diseases make them more significant for the people of the area.

The phytodiversity and ecological conditions provide a good homeland for the growth of tremendous parasitic, saprophytic and mycorrhizal fungi (Aryal *et al*. 2012). Wild edible mushrooms are not only an important source of food for local people but also are used as medicines. This study revealed that there were plenty of edible species of fungi in the study site. The most common among edible species were collected, sacked in bags and carried to market for selling (e.g. *Macrolepiota fuliginosa, Scleroderma bovista, Termitomyces clypeatus, Termitomyces eurhizeus, Volvorella bombaycina etc*).

Among 29 species, 14 are edible, 7 inedible, 3 poisonous, 4 medicinal and 1 species has religious value. Some of the the edible species viz. *S. bovista, T.clypeatus* and *T. eurrhizus* are also used for medicinal purpose. The medicinally important tropical polypore like *P.cinnabarinus*is is used for the remedy of infectious disease (mump), ear pain etc. Similarly, *G.lucidium*, a species of medicinal importance is also used as a decorative item, *S.citrinum* a medicinal species is also used as food. One of the exceptional case of medicinal important species *G. frondasa* was also found in the study site, though this is a temperate species. The cosmopolitan inedible species *S. commune* is sometimes used for culinary purposes in food deficit condition. This species also has religious value and is used as Sagun for better happenings in marriage ceremonies in Newar community.

During the surveys, it was found that the population of *M. fuliginosa, R. nigricans, T. clypeatus, T. eurhizeus* and *V. bombycina* were declining since the last two decades due to the deterioration of forest. The above mentioned notable frequencies of species were found in abundance during sample collection period. Being saprophytic, obligatory symbionts as well as part of the mycorrhizal association, these macrofungi play an important role in increasing the soil fertility in the forest by biodegradation as well as decomposition of the lignocelluloses compounds of leaf litter. The litter debris of vascular flora favors the regulation and maintenance of temperature and moisture in the soil for their macrofungi. The toxic species listed are *A. pantherina, R. emetica* and *R. foetens.*

The reported mushrooms are widely spread throughout the country in tropical to temperate belts. It needs extensive investigation to find out their morphological characters, species richness, distribution pattern and species diversity index. Some of the important macrofungi such as *Macrolepiota,*

Scleroderma, Termitomyces, Volvorella spp., need special attention to be conserved against the threat to avoid their unmanaged and unscientific exploitation. Besides these harvesting should be done more scientifically rather than using traditional methods. The mycoelements prevailing in this area need sustainable conservation and utilization.

Acknowledgements

The author acknowledges Nepal Academy of Science and Technology for providing a Ph.D. research grant. He also acknowledges the Central Department of Botany, Tribhuvan University for providing laboratory facilities. The Institute of Agriculture and Animal Science is thanked for granting him study leave. The authors are grateful to Prof. R.D. Tiwari for his help to complete this work. Sincere thanks are extended to the local people of the study area for providing various information.

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