

TAXONOMIC STUDY ON TEN WILD MUSHROOMS FROM HOPONE AND HSIHSEING TOWNSHIPS IN SOUTHERN SHAN STATE

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Abstract

The taxonomic studies on wild mushrooms from Hopone and Hsihseing Township, Southern Shan State have been undertaken. The study area is located between N' 20° 48' - 20° 53' and E' 97° 10' - 97° 15'. The wild mushrooms were collected from June to September, 2018. The 10 species of 8 genera belonging to 7 families and 4 order were collected, preserved, classified, identified and described. The collected species were identified as *Helvella crispa* (Scop.) Fr., *Auricularia auricular-judage* (Bull.) Wettst., *Amanita caesarea* (Scop.) Pers., *Calvaria aurea* (Fr.) Quel., *Pleurotus lignatilis* (Pers.) Rehder & Ginns., *Pleurotus pulmonarius* (Fr.) Quel., *Schizophyllum commune* (Fr.) Fr., *Lactarius determinus* Groger., *Lactarius volemus* Fr., *Russula cyanoxantha* (Schaeff.) Fr. and *Russula delica* Fr. The growing habitats of *Auricularia auricular-judage* (Bull.) Wettst. and *Schizophyllum commune* (Fr.) Fr. were on the decayed woods and the others were on the soil. An artificial key to the studied species was constructed and presented.

Keywords: Taxonomic study, wild mushrooms, Hopone and Hsihseing Township, Southern Shan State, an artificial key

Introduction

Mushrooms are fungi, generally considered to be lower forms of life, belonging to Kingdom Fungi. There are about 45,000 known species of fungi and about 2000 of them are considered edible. Of these, less than twenty five species are widely accepted as an item of food and only about a dozen of them have been commercially cultivated. The term mushroom is generally used to denote the edible fleshy fungi. The poisonous ones are called the toadstools. Both of them represent a short stage in the life cycle of fungi. To the Scientists, the word 'Mushroom' refers to both epigeous and hypogeous macroscopic fruiting bodies of fungi (Nair 1990).

Among the fungi, the common mushrooms are the puffballs, club fungi, coral fungi, hedgehog fungi, truffles, trembling fungi, morels, stinkhorns, tube-bearing fungi and lastly, the gilled fungi or agarics. All fungi, whether bacteria, yeasts or agarics, have in common an important characteristic feature that lack of chlorophyll. This remarkable substance that makes green the leaves of trees and herbs, also enables them to utilize for their nutrition, the simple elements of air, water and earth. Fungi, on the other hand, possessing no chlorophyll, must, like animals, depend for their nourishment upon living or dead organic matter. Loam, decaying wood and dead leaves support the majority of mushrooms. Gilled mushrooms, or agarics as they are called, are plants that belong to the botanical group known as fungi. Mushrooms of one kind or another are to be found at almost every season but they occur in greatest abundance after showery weather in the months of July, August, and September (Thomas 1948).

In Myanmar, mushrooms of Karen State was studied by Ku Yin Myint (1983). In 1987, Thida Saint presented by mushrooms of Taunggyi and Kalaw areas. In 2010, Kyi Kyi Win studied on the systematic studies of mushrooms in Pyay District and phytochemical investigation of *Dictyophora indusiata* (pers) Fish. In 2014, Khin Sandi Pyone Cho presented the taxonomic study on mushrooms growing in Mandalay. In 2015, Aye Aye Maw presented taxonomic studies on wild mushrooms from Monywa District. Although many researchers had done the wild mushrooms flora in Myanmar, the taxonomic

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studies on wild mushrooms have not been undertaken in Southern Shan State. Therefore, this study was carried out for this research work.

The aim and objectives of this study were to collect, classify and identify the morphological characteristics of the wild mushrooms from Hopone and Hsihseing, to study their detailed taxonomic characteristics and distribution, and to fulfill the scientific information in the compilation of the mushroom flora in Myanmar.

Materials and Methods

The naturally growing wild mushrooms were collected from Hopone and Hsihseing Townships during the month from June to October, 2015. The wild mushrooms were observed on grassland, meadows, decomposing organic matter, hollow tree stumps, rotten tree trunks and shrub forests. The specimens were collected from different localities and habitats, and locations of specimens were determined by using a Global Positioning System (GPS) device.

All the specimens were recorded with photographs to get their actual habit and noted the fruiting characteristics. The collection, preservation and the spores print technique were followed to Krieger & Schaffer (1967) and Pacioni (1981). To prepare the spore print, the fleshy mature specimens were selected. The stipe was removed by cutting it off as close as possible to the point of attachment of cap. It is obtained by placing a cap with the hymenium facing down on a sheet of white, black paper or a piece of glass-slide. A blow can serve as a cover. After a few hours, a layer of the spores was deposited. The real colour of the spores was determined by this way.

The collected specimens were preserved in Formalin-Acetic acid-Alcohol (FAA) by the ratio of 5:5:90. Some dried specimens were placed plastic bags and plastic bottles. The classification and identification of collected specimens were done by referring the literature such as Thomas (1948), Krieger & Schaffer (1967), Coker & Couch (1969), Pacioni (1981), Keizer (1998), Roger Phillips (2006). An artificial key to all the studied species were also constructed and presented. The herbarium specimens were numbered and deposited at the herbarium of Mandalay University for references and other scientific studies.

Results

Ten species of 8 genera belonging to 7 families and 4 orders were collected from Hopone and Hsihseing Township, Southern Shan State. The morphological and spores characters of those species were classified and identified. The list of collected species and their comparable morphological characteristics were presented in Table 1 and Table 2.

Table 1 List of collected wild mushrooms from Hopone and Hsihseing Townships

Class	Sub-Class	Order	Family	No.	Scientific Name	
Ascomycetes	Hymenoasco- mycetidae	Pezizales	Helvellaceae	1.	<i>Helvella crispa</i> (Scop.) Fr.	
Basidio- mycetes	Heterobasido- mycetidae	Auriculariales	Auriculariaceae	2.	<i>Auricularia auricular-judage</i> (Bull.) Wettst.	
	Homobasidio- mycetidae	Agaricales	Amanitaceae	3.	<i>Amanita caesarea</i> (Scop.) Per.	
			Calvariaceae	4.	<i>Calvaria aurea</i> (Fr.) Quel.	
			Pleurotaceae	5.	<i>Pleurotus lignatilis</i> (Pers.) Rehdead & Ginns	
						6.
			Schizophyllaceae	7.	<i>Schizophyllum commune</i> (Fr.) Fr.	
	Russulales	Russalaceae	8.	<i>Lactarius volemus</i> Fr.		
			9.	<i>Russula cyanoxantha</i> (Schaeff.) Fr.		
			10.	<i>Russula delica</i> Fr.		

Table 2 Comparable morphological characteristics of wild mushrooms from Hopone and Hsihseing Townships

No	Scientific Name	Growing Habitat	Edible/ Inedible	Cap		Gills / Pores	
				Colour	Shape	Umbonate	Attachment
1.	<i>Helvella crispa</i> (Scop.) Fr.	soil	edible	white	saddle-shaped	absent	-
2.	<i>Auricularia auricular-judage</i> (Bull.) Wettst.	decayed wood	edible	brown	ear-shaped	-	-
3.	<i>Amanita caesarea</i> (Scop.) Pers.	soil	edible	yellowish	convex	absent	free
4.	<i>Calvaria aurea</i> (Fr.) Quel.	soil	edible	egg yellow	cauliflower-like	-	-
5.	<i>Pleurotus lignatilis</i> (Pers.) Rehder & Ginns	soil	edible	creamy-white	depressed	absent	decurent
6.	<i>Pleurotus pulmonarius</i> (Fr.) Quel.	soil	edible	white-cream	shell-shaped	absent	decurent
7.	<i>Schizophyllum commune</i> (Fr.) Fr.	decayed wood	edible	grayish-white	fan-shaped	absent	-
8.	<i>Lactarius volemus</i> Fr.	soil	edible	brownish-orange	depressed	absent	decurent
9.	<i>Russula cyanoxantha</i> (Schaeff.) Fr.	soil	edible	wine coloured	depressed	absent	decurent
10.	<i>Russula delicata</i> Fr.	soil	edible	white-pale yellow	funnel-shaped	absent	decurent

Table 3 Comparable morphological characteristics of wild mushrooms from Hopone and Hsihseing Townships

No.	Scientific Name	Stipe			Spore				
		Shape	colour	hollow/ solid	annulus or ring	Colour	shape	texture	size
1.	<i>Helvella crispa</i> (Scop.) Fr.	calvate	white	hollow	absent	white	elliptic	smooth	16-21×10-14 μm
2.	<i>Auricularia auricular-judage</i> (Bull.) Wettst	-	-	-	absent	white	sausage- shaped	smooth	16-18×6-8μm
3.	<i>Amanita caesarea</i> (Scop.) Per	equal	yellow	solid	present	white	elliptic	smooth	10-14×6-11 μm
4.	<i>Calvaria aurea</i> (Fr.) Quel.	-	-	-	-	deep- ochraceous	oblong	roughene d	9-12×4.5-7 μm
5.	<i>Pleurotus lignatilis</i> (Pers.) Rehdead & Ginns	equal	white	solid	absent	white	elliptic	smooth	6-7.5×3-4.5μm
6	<i>Pleurotus pulmonarius</i> (Fr.) Quel.	equal	white	solid	absent	white	cylindrical	smooth	7.5-11×3-4 μm
7.	<i>Schizophyllum commune</i> (Fr.) Fr.	-	-	-	-	grayish- white	elliptic	smooth	3-4×1-1.5 μm
8.	<i>Lactarius volemus</i> Fr.	equal	brownish orange	solid	absent	white	globose	smooth	9-11 μm
9.	<i>Russula cyanoxantha</i> (Schaeff.) Fr.	equal	white	solid	absent	white	elliptic	low-wort	7-9×6-7 μm
10	<i>Russula delicata</i> Fr.	equal	whitish-cream	hollow	absent	white-pale cream	ellipsoid	reticulate	8-11×6.5-8.5 μm



Figure 1 *Helvella crispa* (Scop.)Fr.

(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)



Figure 2 *Auricularia auricular-judage* (Bull.)Wettst.

(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)



Figure 3 *Amanita caesarea* (Scop.) Per.

(A. Growing habita, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)

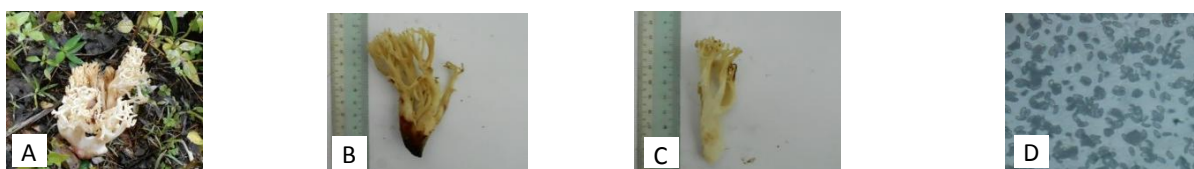


Figure 4 *Calvaria aurea* (Fr.) Quel.

(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Spores)

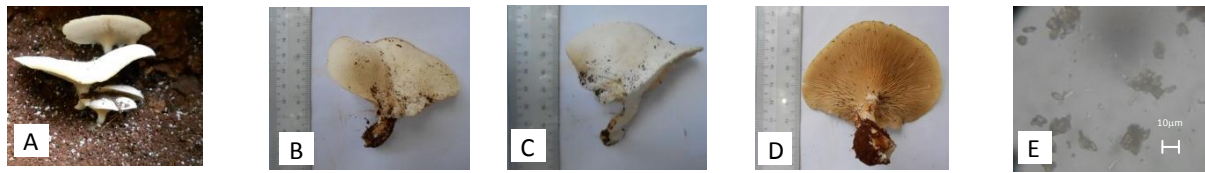


Figure 5 *Pleurotus lignatilis* (Pers.) Redhead & Ginns.
(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)



Figure 6 *Pleurotus plumonarius* (Fr.) Quel.
(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)



Figure 7 *Schizophyllum commune* (Fr.) Fr.
(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)



Figure 8 *Lactarius volemus* Fr.
(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)



Figure 9 *Russula cyanoxantha* (Schaeff.) Fr.
(A. Growing habitat, B. Fruiting body in ilateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)

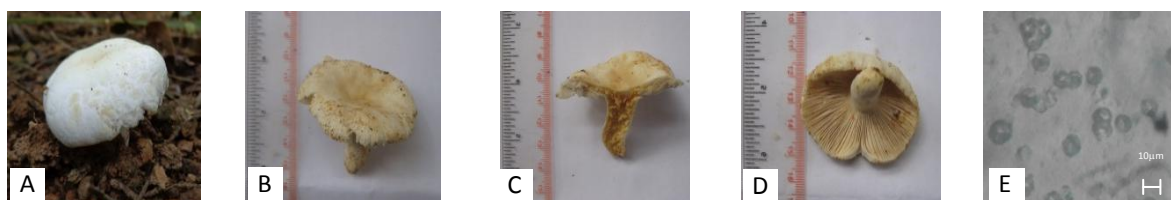


Figure 10 *Russula delica* Fr.
(A. Growing habitat, B. Fruiting body in lateral view,
C. Fruiting body in longitudinal section, D. Pileus in lower view, E. Spores)

An Artificial Key to the Studied Species

1. Stipe hollow ----- 2
1. Stipe solid ----- 3
 2. Cap saddle-shaped; Spores elliptic, smooth; Stipe calvate -----
----- 1. *Helvella crispa*
 2. Cap funnel-shaped; Spores ellipsoid, reticulate; Stipe equal -----
----- 10. *Russula delica*
3. Spores roughened or low-wort ----- 4
- 3 Spores smooth----- 5
 4. Cap egg-yellow, cauliflower; Spores oblong-----
----- 4. *Calvaria aurea*
 4. Cap wine-coloured, depressed; Spore elliptic-----
----- 9. *Russula cyanoxantha*
5. Spore sausage-shaped or cylindrical ----- 6
5. Spore elliptic or globose ----- 7
 6. Cap tan-brown, ear-shaped -----2. *Auricularia auricular-judage*
 - 6.Cap white-cream, shell-shaped-----6. *Pleurotus plumonarius*
7. Gills free or radiating ----- 8

7. Gills decurrent ----- 9
- 8 Cap yellow, convex; Spores white -----3. *Amanita caesarea*
8. Cap grayish-white, fan-shaped; Spores grayish-white -----
- 7. *Schizophyllum commune*
9. Stipe white; Spores elliptic; Gills white -----5. *Pleurotus lignatilis*
9. Stipe brownish-oranged; Spores globose; Gills pale yellow -----
- 8. *Russula virescens*

Discussion and Conclusion

In the present study, the taxonomic studies on ten species of wild mushrooms from Hopone and Hsihseing Township in Southern Shan State were undertaken. The fresh specimen of wild mushrooms from Hopone and Hsihseing Township were collected from June to October, 2015. They were included in 8 genera and 7 families.

In Hopone Township, the distributed species in Hopone Mountain were *Helvella crispa* (Scop.) Fr., *Auricularia auricular-judage* (Bull.) Wettst., *Amanita caesarea* (Scop.) Pers., *Calvaria aurea* (Fr.) Quel., *Pleurotus lignatilis* (Pers.) Rehdead & Ginns., *Schizophyllum commune* (Fr.) Fr., *Lactarius volemus* Fr., and *Russula cyanoxantha* (Schaeff.) Fr. In Hsihseing Township, *Pleurotus pulmonarius* (Fr.) Quel. and *Russula delica* Fr. were found in Lweput village.

The growing habit of fruiting bodies are very interesting. Eight species of wild mushrooms are growing in the soil. *Auricularia auricular-judae* (Bull.) Wettst. and *Schizophyllum commune* (Fr.) Fr. were growing on the decayed woods.

Various cap shapes were also observed in this study areas. In *Pleurotus lignatilis* (Pers.) Rehdead & Ginns., *Lactarius volemus* Fr. and *Russula cyanoxantha* (Schaeff.) Fr., the shaped of the cap were depressed. *Russula delica* Fr. was found in funnel shaped. *Schizophyllum commune* (Fr.) Fr. was possess the fan-shaped. The convex shaped of the cap can be found in *Amanita caesarea* (Scop.) Pers. The shell-shaped of the cap can be found in *Pleurotus pulmonarius* (Fr.) Quel. The ear-shaped of cap can be found in *Auricularia auricular-judage* (Bull.) Wettst. Saddle - shaped of the cap can be found in *Helvella crispa* (Scop.) Fr. *Calvaria aurea* (Fr.) Quel. possess the cauliflower-like of the cap.

The stipe shapes of 6 species were equal in *Amanita caesarea* (Scop.) Pers., *Pleurotus lignatilis* (Pers.) Rehdead & Ginns., *Pleurotus pulmonarius* (Fr.) Quel., *Lactarius volemus* Fr., *Russula cyanoxantha* (Schaeff.) Fr. and *Russula delica* Fr. *Helvella crispa* (Scop.) Fr. was calvate. The stipe were absent in *Auricularia auricular-judage* (Bull.) Wettst., *Calvaria aurea* (Fr.) Quel. and *Schizophyllum commune* (Fr.) Fr. The stipe of 2 species were hollow in *Helvella crispa* (Scop.) Fr. and *Russula delica* Fr. The other 5 species were solid. *Amanita caesarea* (Scop.) Pers. possess the ring on the stipe. In the other species, the ring is absent.

In the colour of spores, *Calvaria aurea* (Fr.) Quel. possess deep ochraceous colour. The spores of grayish-white can be found in *Schizophyllum commune* (Fr.) Fr. The spores of *Russula delica* Fr. was white to pale-cream. The other 7 species were white. The real colour of spores was determined by the spores print. These findings were agreed with Moore (2014). All of the studied species were edible. These findings were agreed with Groves (1979).

Some wild mushroom species from these Hopone and Hsihseing Township areas were also found in Karen State,, Mon State, Taungyi and Kalaw areas, Pyay District and Monywa District. These are *Amanita caesarea* (Scop.) Pers., *Auricularia auricular-judage* (Bull.) Wettst., *Schizophyllum commune* (Fr.) Fr., *Lactarius volemus* Fr., *Russula cyanoxantha* (Schaeff.) Fr. and *Russula delica* Fr. in Karen State (Ku Yin Myint 1983); *Schizophyllum commune* (Fr.) Fr., in Thaton District, Mon State (Thandar Soe 2013); *Helvella crispa* (Scop.) Fr., *Auricularia auricular-judage* (Bull.) Wettst., *Amanita caesarea* (Scop.) Pers., *Schizophyllum commune* (Fr.) Fr., *Lactarius volemus* Fr., *Russula cyanoxantha* (Schaeff.) Fr. and *Russula delica* Fr. in Taungyi and Kalaw areas (Thida Saint 1987); *Auricularia auricular-judage* (Bull.) Wettst., *Amanita caesarea* (Scop.) Pers., *Schizophyllum commune* (Fr.) Fr., and *Russula delica* Fr. in Pyay District (Kyi Kyi Win 2010) and *Auricularia auricular-judage* (Bull.) Wettst., *Amanita caesarea* (Scop.) Pers., *Schizophyllum commune* (Fr.) Fr., *Lactarius volemus* Fr. and *Russula delica* Fr. in Monywa District (Aye Aye Maw 2015).

Therefore, it would be concluded that the present study was one of the systematic records of wild mushrooms to be used by researchers in various fields of studies. This study will be provided the partial fulfillment of the information on the wild mushrooms distribution in Hopone and Hsihseing Township, in Southern Shan State and will be beneficial to accomplish the mushroom flora in Myanmar.

Acknowledgements

I would like to express my gratitude to Dr Nu Nu Yee, Professor and Head, Department of Botany, University of Mandalay, for her permission, invaluable advice and providing all the department facilities to do this research. I am grateful to Dr Soe Myint Aye, Pro-rector, Department of Botany, Myitkyina University, for his good suggestion and invaluable advice in this research.

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