BIODIVERSITY OF MEDICINAL MUSHROOMS IN THE COMMUNITY FORESTRY OF UPPER SOUTHERN PART OF THAILAND AS UTILIZATION FOR PHARMACY

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Abstract- The purpose of this research was to explore types of medicinal mushrooms at the Community Forestry of Upper Southern Part of Thailand and Pharmaceutical benefits in local people. The total of 6 locations were surveyed for 4 times during November 2013 and November 2014. The diversity of each medicinal mushrooms was found. There are 7 species at Aoe Ai Yo in Nakorn Sri Thammarat, 1 species at Khoa Wang in Nakorn Sri Thammarat, 5 species at Thung Sou in Krabi, 2 species at Mae Mok in Surat Thani, 1 species at Wang Si La in Surat Thani, and not found at Khao Phra In in Surat Thani. These can be classified for utilization into two categories as follows: 14 medicinal species for pharmacy and 2 medicinal species for other purposes. Especially, the medicinal mushrooms for pharmacy were detected by high β-glucan with HPLC method. These were extracted with distilled water and alkaline. This experiment was selectively sampled to observe the high amount of β-glucan as follows: Ganoderma dahlii (alkaline extraction) average 504.34 mg/g, Amauroderma rugosum (alkaline extraction) average 466.62 mg/g, Ganoderma dahlii (water extraction) average 454.44 mg/g, and Amauroderma rugosum (water extraction) average 391.77 mg/g. These medicinal mushrooms are bioactive compound which will be further detected. In addition, according to the condition of explored locations, all of medicinal mushrooms are well grown in brown loamy sand with the temperature condition of 24°C -29°C, and the humidity of 59.5 – 68.5% . However, local people can only take little advantage for Pharmacy production. Therefore, this research is to enrich these community forest resulting in the strength of the community in order to further conserve the environment with conservation with participation, and to maintain ecological balance.

Keywords- Biodiversity, Medicinal Mushrooms, Community Forestry, Bioactive Compound.

I. INTRODUCTION

Community Forestry is wild area or any land which is approved by Department of Forestry that under of operation of community forestry projects. This projects are cooperation and participation between local people and authorities that relate to the requirements of Forest laws. In addition, this project produce for conservation and sustainable utilization community (Community Forestry Management Office, 2011). Including thoroughly occupational, using knowledge, understanding, management and conservation (John. Helms, 2002). Especially the various of life are existence in the forest ecosystem. Moreover, it is a habitat and difference of the species, genetic and ecosystem in the world. Referred to as biodiversity (Natural Resources and Environmental Policy and Planning, 2009). Macro fungi can be classified into three groups which composed of the saprophytic mushroom, the parasitic mushroom and the my corrhizal mushroom (Anong Chandrasrikul *et al*, 2551; Stamets, 1993; Mueller *et al*., 2007). These kind of mushroom are different habitats and different functions; the habitats of wild mushroom can a growth on terrestrial, on weathered wood, on weathered timber, on alive trees and on angiosperm, but some which being eaten by wild mushroom. While the function of wild mushroom can degradation of organic compound such as; leaves, branch etc. Result in the becaming to the mineral and back to ecosystem again (steiner *et al*, 2002). Especially Bracket fungi or Shelf fungi were classified as saprophytes mushroom group. its produce for medicinal mushroom because of consistent the β-glucan main (Ooi and Liu, 1999; Schmid *et al*., 2001). According to Office of Biodiversity in Forestry about the biodiversity of mushroom at Ban Tung Heou community forestry in Trang province were found that the saprophytic mushroom 37 genera and Edible 3 genera (The National Research Council of Thailand, 2011). Although there is also less research, but more rather abundance of natural resources of Upper Southern than region other in Thailand. Particularly the community forestry is existing of natural resources in Nakornsri Thammarat province, Surat thani province and Krabi province. So the biodiversity of wild mushroom research shell the advancement of valuable biodiversity. In oder to this research is consistent with the strategy of research in Thailand. Especially to enriching and useful for local people, industry and advancement of a base data. That are the most efficiently.

II. DETAILS EXPERIMENTAL

2.1 Collecting the secondary data about the wild area in Nakhon Sri Thammarat Province, Surat Thani Province, and Krabi Province. These are study from Department of Forest Resource Management

12(Nakhon Sri Thammarat), Department of Forest Resource Management 11(Surat Thani) and inquiry from authorities.

2.2 The researcher, Forest academic, and Village chief surveyed the wild area in Nakhon Sri Thammarat Province, Surat Thani Province, and Krabi Province. In order to determine all study areas, the total of 6 locations were surveyed for 4 times as follows; November 2013, February 2013, May 2014, and August 2014, November 2013 and November 2014. After the rain falls, these locations were explored four days and collected data by interviewing with questionnaires. The questionnaires were concluded about general information of respondents, general information of community forest, diversity information and utilization of mushrooms, and conservation information and management of ecology system in community forest.

2.3 Determining the study areas. The total of 6 locations were surveyed as follows : Aoe Ai Yo Thung song district in Nakhon Sri Thammarat, Khoa Wang Ron Phibun district in Nakhon Sri Thammarat, Thung Sou Ao Luek district in Krabi, Mae Mok Kanchanadit district in Surat Thani, Wang Si La Ban Na San district in Surat Thani, and Khao Phra In Don Sak district in Surat Thani. These were an abundance of forest.

2.4 Determining areas for plotting by walking 500 meters deep into the community forest. Converted into a rectangular area with dimensions 10x10 square meters, the areas were measured at right angles to both the left and right for 10 meters with 5 plots each of areas. The total plots are 30 plots (Modified method of Protected areas Regional Office 5, Nakhon Sri Thammarat).

2.5 Taking the samples of mushrooms from the community forests of all 3 provinces as follows: Nakhon Sri Thammarat, Krabi and Surat Thani. This sampling method was based on the abundance of forests under a different conditions that the mushrooms were selected the well mushrooms sampling by the researcher. After that, these mushrooms were put into the zipper bags; then, immersed into the ice box in order to take the mushrooms back to the laboratory for studying.

2.6 The mushroom samples were taken to study by using manual identifications of mushrooms concluding both Thai books and foreign books, such as Mushroom book in Sakaerat forest from Thailand Institute of Science and Technological Research (TISTR)(2007) and the wild mushroom book in Thailand for variety and utilization of mushrooms from Niwat Sonoamuang (2010) Sasata, R. (2008). Stamets, P., & Wu Yao , C. (1999). Christopher Hobbs, (1944), Pui-Mun Chan, *et al*.2013. M. Sepiah and A. Afni (2009). After that, these wild mushrooms were isolated to be pure mycelium mushrooms for β-glucan by HPLC method.

III. RESULTS AND DISCUSSION

3.1 General information of respondents
All 14 headman and village representatives director of community forest from 6 locations were interviewed and provided general information to the researcher with questionnaires as found: 100% of all interviewees are males, 35.71 % of them have five people in their family members, 78.57% of them have the highest education at high school level, 85.71% of them are farmers for rubber plantation, and 42.86% of them earn average monthly income than 15,000 bahts per household.

3.2 General information of community forest and characteristics of habitats in the community forest
From inquiry academics forest at Department of Forest Resource Management 12(Nakhon Sri Thammarat) and Department of Forest Resource Management 11(Surat Thani) it was found that the total of 6 locations as follow : Aoe Ai Yo at Thung song district in Nakhon Sri Thammarat, Khoa Wang at Ron Phibun district in Nakhon Sri Thammarat, Thung Sou at Ao Luek district in Krabi, Mae Mok at Kanchanadit district in Surat Thani, Wang Si La at Ban Na San district in Surat Thani, and Khao Phra In at Don Sak district in Surat Thani. These were an abundance of forest due to the tropical rain forest in the national reserve. The topography was foothill, plains, mountain, and ravines. The main soil was sandy loam. The important plants were various kinds of community forest as follow : *Baccaurea ramififlora, Barringtonia acutangula, Ficus carica, Oxalis corniculata,Carallia brachiata, Hiptage benghalensis, Syzygium siamensis, and Authocephalus chinensis.* For characteristics of habitats. The total of 6 locations were found as follow : 42.86 % of major community forest was distantly located from housing more than 500 meters, 28.57% of some habitats were outside of community forest, 21.43% of some community forest were distantly located from housing more than 1000 meters, 7.14% of some habitats were located in the community forest, 64.29 % of the community forest were not flooded, and 35.71% of the community forest were flooded for more than 1-2 weeks.

3.3 Shelf fungi information and utilization
All 14 the headman and village representatives director of community forest from 6 locations were interviewed and provided general information to the researcher with questionnaires as found : 57.14 % of major local people do not know of Shelf fungi, 21.43% of the local people known of shelf fungi and known some species of Shelf fungi, 21.43% of the local people know of shelf fungi but not know the

species of shelf fungi, 78.57% of the majority local people have not surveyed shelf fungi species to utilize for pharmacy and 21.43% some of local people have been surveyed of shelf fungi species to utilize for pharmacy, such as tonic and complementary medicine for sexual performance. In other words, shelf fungi groups were found with utilization for pharmacy, such as *Daedaleopsis confragosa*, *Ganoderma dahlii*, (Soji, *et al*., 2013) *Ganoderma applanatum*, *Trametes versicolor*, *Amauroderma rugosum*, and *Amauroderma macer*.

However, local people are little taking utilizations for pharmacy because they are not recognize of these medical mushrooms and unkown the benefits for pharmacy. So, the researcher has surveyed of medical mushrooms and will take such benefits for pharmacy in the next step. As a result, local people will know and be able to increasingly utilize for pharmacy.

3.4 Biodiversity of medicinal mushrooms in the community forestry

3.4.1 The utilizations of medicinal mushrooms in the community forestry for pharmacy (Bong *et al*., 2001; Kalaw *et al*., 2014; Soji *et al*., 2013; Subrata *et al* 2012; Chang *et al*.,(*n.d.*))

The medical mushrooms in the community forestry were surveyed in all of 6 locations and 11 species were found: *Cookeina sulcipes, Pterula verticillata, Xylaria polymorpha, Polyporus grammocephalus, Daedaleopsis confragosa, Ganoderma dahlii, Ganoderma applanatum, Trametes versicolor, Stereum hirsutum, Marasmius androsaceus, and Cymatoderma elegans.*

Some species were repeatedly found in each area as marked with a, f, i, k, and m at difference of locations and all of 14 species as shown in Table 1 and fig.1-14 As a result, this indicates that the diversity of medicinal mushrooms for pharmacy has been found more than one location and abundance in community forest. The abundance of nutrients depends on humidity and temperature. For Environmental conditions the temperature condition of 24°C-29°C, and the humidity of 59.5 – 68.5% as shown in Table 3. These major factors allow medical mushrooms to grow. However, the varieties of these medicinal mushrooms are more or less depended on geography topography.

Table1: Varieties of medicinal mushrooms in the Community Forestry utilized for pharmacy

mark	species	locations
a*	*Cookeina sulcipes*	Aoe Ai Yo
b	*Pterula verticillata*	Aoe Ai Yo
c	*Xylaria polymorpha*	Aoe Ai Yo
d	*Polyporus grammocephalus*	Aoe Ai Yo
e	*Daedaleopsis confragosa*	Aoe Ai Yo
f*	*Ganoderma dahlii*	Aoe Ai Yo
g	*Ganoderma applanatum*	Aoe Ai Yo
h	*Trametes versicolor*	Khoa Wang
i*	*Cookeina sulcipes*	Thung Sou
j	*Stereum hirsutum*	Thung Sou
k*	*Ganoderma dahlii*	Thung Sou
l	*Marasmius androsaceus*	Mae Mok
m*	*Ganoderma dahlii*	Mae Mok
n	*Cymatoderma elegans*	Wang Si La

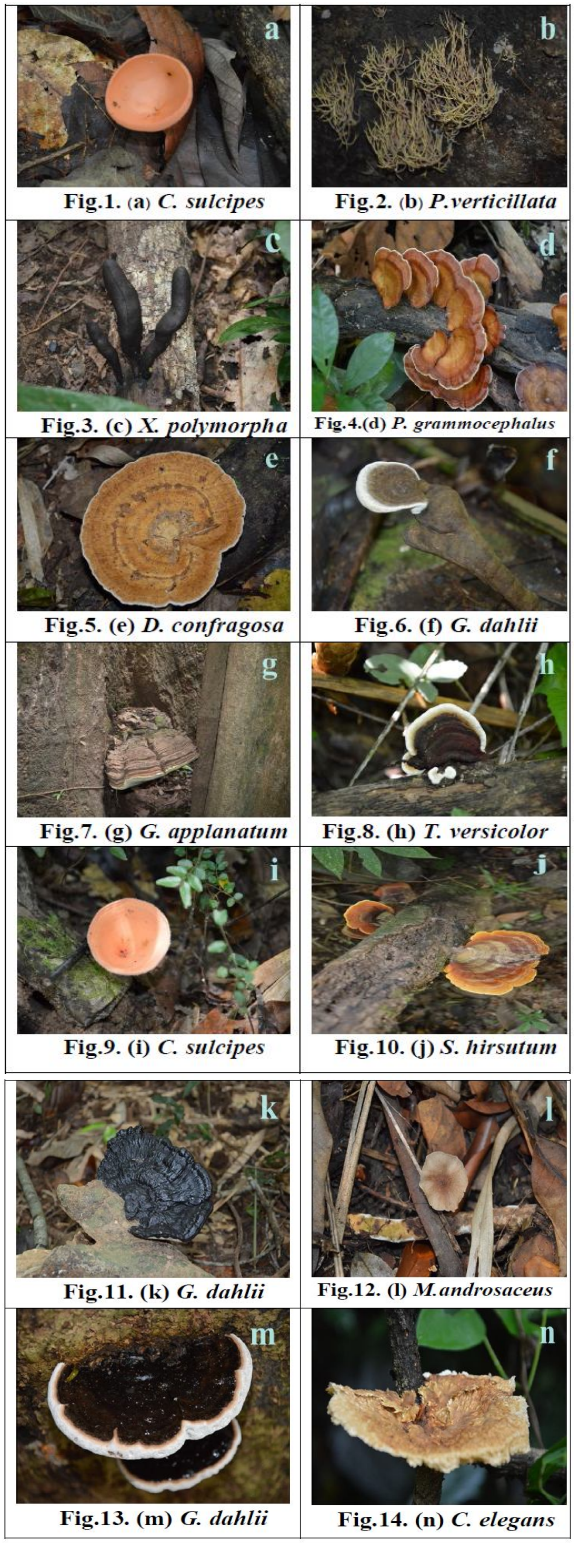


Fig.1. (a) *C. sulcipes* Fig.2. (b) *P.verticillata*

Fig.3. (c) *X. polymorpha* Fig.4.(d) *P. grammocephalus*

Fig.5. (e) *D. confragosa* Fig.6. (f) *G. dahlii*

Fig.7. (g) *G. applanatum* Fig.8. (h) *T. versicolor*

Fig.9. (i) *C. sulcipes* Fig.10. (j) *S. hirsutum*

Fig.11. (k) *G. dahlii* Fig.12. (l) *M.androsaceus*

Fig.13. (m) *G. dahlii* Fig.14. (n) *C. elegans*

Fig. 1-14 (a-n) Diversity of medicinal mushrooms in the community forestry for pharmacy

3.4.2 The utilizations of medicinal mushrooms in the community forestry for other purposes

The medical mushrooms in the community forestry were surveyed in all of 6 locations and 2 species were found: *Microporus xanthopus and Amauroderma macer*. These have been less found in 1 location as shown in Table 2 and fig.15-16 (o&p). However, these mushrooms can provide some benefits for local people and will use them for repel mosquito and nematicidal (Chang *et al*.,(n.d.); Dong *et al*., 2006). For Environmental conditions the temperature condition of 29°C, and the humidity of 64.9 – 66.9% as shown in Table 4.

Table 2: species of medicinal mushrooms in the Community Forestry utilized for other purposes

mark	species	locations
o	*Microporus xanthopus*	Thung Sou
p	*Amauroderma macer*	Thung Sou



Fig.15. (o) M. *xanthopus* **Fig.16. (p) A. *macer***

Fig. 15-16 (o&p) species of medical mushrooms in the Community Forestry to utilizations for other purposes

Table. 3 : Environmental conditions of medical mushroom and utilizations for pharmacy

Species	environmental conditions T.(°C),humidity(%)	utilizations (sample)
C. sulcipes	28, 67.6	antimalarial
P.verticillata	28, 67.9	antiinflammatory
X. polymorpha	28, 68.5	antimicrobial
P.grammocephalus	28, 66.7	antibiotics
D. confragosa	28, 67.1	antibacterial
G.dahlii	28, 68.5	antitumor
G. applanatum	28, 66.5	antitumor
T.versicolor	28.5, 65.3	antimicrobial
C. sulcipes	28, 66.9	antimalarial
S.hirsutum	26, 59.5	antioxidative
G.dahlii	29, 66.9	antitumor
M.androsaceus	24.5, 60.4	nerve tonic
G.dahlii	24, 60.8	antitumor
C.elegans	25.5, 60.8	anticarcinogenic
C. sulcipes	24, 60.3	antimalarial

Table. 4 : Environmental conditions of medical mushroom and utilizations for other purposes

Species	environmental conditions T.(°C),humidity(%)	utilizations (sample)
M. xanthopus	29, 64.9	repel mosquito
A. macer	29, 66.9	nematicidal

ACKNOWLEDGMENTS

The authors are grateful for the financial scholarship support from the graduate studies, Prince of Songkla University, Hatyai campus.

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