Biodidaktika: Jurnal Biologi dan Pembelajarannya Vol. 14 No. 1 Januari 2019
p-ISSN: 1907-087X; e-ISSN: 2527-4562

INVENTORY AND UTILIZATION OF MACROFUNGI SPECIES FOR FOOD IN CIKARTAWANA INNER BADUY BANTEN

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ABSTRACT
This research aimed to conduct inventory in macrofungi and the utilization for food in Cikartawana hamlet, Inner Baduy, Banten. The method that was used in this research was the explorative method with descriptive analysis. The result of this research showed a total 52 species of Macrofungi that belonged to 23 family have been identified and among those species about 12 species were edible and consumed by Inner Baduy people in Cikartawana hamlet. The macrofungi grew in different type of substrate: soils, on decaying organic matter, wooden stumps and living tree trunk collected from different habitat from surrounding environment. Inner Baduy people used edible macrofungi either fresh or dried in elaborated stew such as soup, steamed or stir fried. This study provides the information regarding the number of macrofungi species for harnessing the it potential and conserve the biodiversity and ecosystems.

Keywords*:* biodiversity macrofungi, inventory, Cikartawana, food.

INTRODUCTION

Indonesia is ranked at the 8th position of countries with mega-biodiversity as released by the Conservation International. This is an invaluable asset for the global population that can be utilized as much as possible for the welfare of the people. However, there are still little effort harnessing the full potential of this massive biodiversity of in Indonesia. One of the major causes is the poor documentation that, according to the Ministry of Environment and Forestry, 50% of Indonesia biodiversity remains unrecorded. Furthermore, this may lead to a bigger loss, which is the extinction of valuable species without ever being recorded. Therefore, inventory activities to record and process this information are an important component to sustain biodiversity management.

Banten Province is one of the Provinces in Indonesia, located on the western tip of Java Island which has a variety of habitat types, natural potential and high levels of biodiversity, including microorganisms, especially varieties in Macrofungi. The utilization on macrofungi by the people of Banten has long been carried out, including the Inner Baduy community who live in Cikartawana Hamlet. The local wisdom in the management and utilization of natural resources has been successfully used to preserve and conseve the nature. According to Senoaji (2010), local wisdom in the Baduy community refers to the great-grandfather of Karuhun who has been determined in the form of *Pikukuh Karuhun* (customary provisions or prohibitions). *Pikukuh* must be obeyed the community. Local wisdom in the management of species is reflected in utilization of materials sourced from the natural surroundings to support it his life for daily needs including the use of makrofungi.

Macrofungi or commonly known as mushroom is a eukaryotic organism with easily recognize fruiting body (Praborini, 2012). The vegetative part of the fungus, called the mycelium, comprises a system of branching threads and cordlike strands that branch out throughout the substrate. Macrofungi is one of the important components of the ecosystem (Deacon, 2006) which can degrade organic matter into available nutrients (Steffen *et al.*, 2002).

The purpose of this study is to provide information about Macroscopic mushroom diversity in Cikartawana hamlet, Baduy Dalam as an effort to preserve biodiversity and ecosystems and their potential use by the community

METHODS

Description of Study Site

The study was carried out in Inner Baduy, Cikartawana Hamlet, Kanekes village, sub-district of Leuwidamar, district of Lebak, Banten Province, Indonesia (Figure 1). Geographically, the village has an altitude ranging from 300-600 m above mean sea level. This region was located about 172 km in the west of Jakarta, Capital city of Indonesia. The average temperatures was 20° C with an average rainfall of 4,000 mm/year. Broadly, three types of soil available in the area were dark latosol, brown alluvial and andosol.

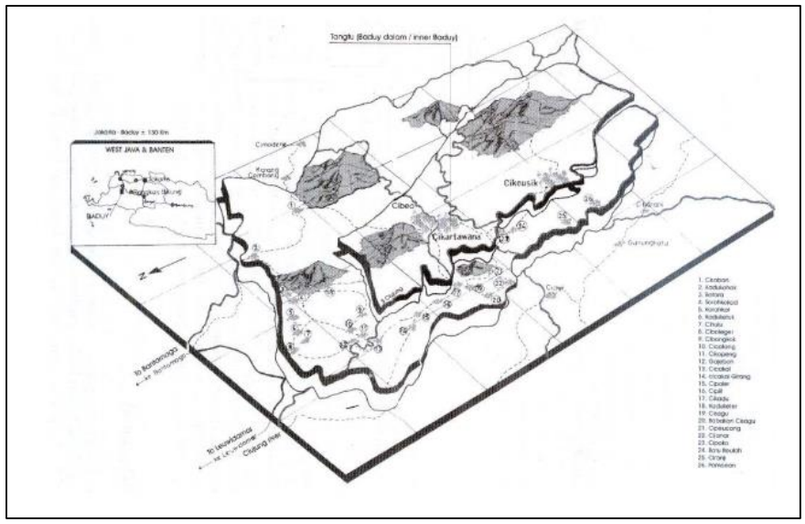

Figure 1. Study site of Baduy area in Cikartawana Hamlet, Kanekes village, Leuwidamar sub-district, Lebak district, Banten province (adapted from Iskandar & Iskandar, 2015).

Sampling Methods

The exploration was executed during Februari-April 2018. The investigation was designed to collect the macrofungi samples in the areas of Sacred forest periphery (Leuweung kolot), secondary forest (reuma), field (huma), and river bank.

At each sampling location, relative humidity, temperature, light intensity, and vegetation characteristics were recorded. Accoriding to Raghu *et al* (2004) relative humidity, temperature, light intensity is called microclimate which can affect the abundance and diversity of an organism. Documentation on utilization of macrofungi as food has been made by taking random interviews of Baduy community people , elderly men and women.

Macrofungi collection and processing

Macrofungi growing on different substrata were sampled and harvested Data on the following parameters were recorded for identification of mushrooms specimens, such as locality, habitat and substrate. Freshly harvested mushroom was washed by water for removing debris.

As the next process for spore print preparation was conducted, by placing the pileus downwards in a half white and half black paper. A drop of water was added to the upper surface of pileus then the pileus was covered to maintain the humidity. After 12 hours, the pileus was lifted and the spores were observed. Collected mushrooms were dried by using electrical air flow drier to make herbaria. Samples were stored in paper bag during research period with Silica gel at the rate of 10% of dry basis for further study (Drábková, 2014). All herbaria were stored in the Laboratory of the Department of Biology Education, Faculty of Teacher Training and Education, University of Sultan Ageng Tirtayasa, Banten Indonesia for cross-references purpose.

Morphological Observation

Information on macro fungi fruiting bodywere documented such as carpophores shape, umbo, scale, the gills, color, gills edges, stipes, length, width, color, shape, type of veil, annuls (position), volva, cap color, cap surface, cap margin, cap diameter, stipe length, gill attachment, gill spacing and spore print (Srivasta 2010) Individual spore characteristics like shape, size and color were also recorded. The final identification and classification were conducted in the Laboratory of Biology Education, University of Sultan Ageng Tirtayasa by comparing recorded characteristics of mushrooms with the help of literature (Moser & McKnight 1987, Huffman *et al.* 2008).

RESULT AND DISCUSSION

A total 52 species of Macrofungi that belonged to 23 families have been identified and among those species about 12 species were edible and consumed by Inner Baduy people in Cikartawana hamlet (Table 1).

Table 1. List of macrofungi collected from Cikartawana hamlet Inner Baduy

No	Local Name	Species	Family	Edible Macrofungi
1	*Supa cau*	*Lentinus* sp.1	Marasmiaceae	√
2	*Supa kayas bereum*	*Lentinus* sp.2		x
3	*Supa bereum*	*Pycnoporus* sp.	Polyporaceae	x
4	*Supa kayas hideng*	*Rigidoporus* sp.1		x

5	*Supa lumar catang*	*Rigidoporus* sp.2		x
6	*Supa padali bodas*	*Cellulariella* sp		x
7	*Supa kayas putih*	*Trametes* sp.1		x
8	*Supa padali coklat*	*Daedaleopsis* sp		x
9	*Supa cau leutik*	*Trametes* sp.2		x
10	*Supa kayu putih*	*Trametes* sp.3		x
11	*Supa kayu hejo*	*Trametes* sp.4		x
12	*Supa arey*	*Microporus* sp.		x
14	*Supa nyiruan*	*Laetiporu*s sp.		√
15	*Supa lumar catang*	*Mycena* sp.1	Mycenaceae	x
16	*Supa payung*	*Mycena* sp.2		√
17	*Suum cau orange*	*Mycena* sp.3		x
18	*Supa kayas bodas*	*Daedalea* sp.1	Fomitopsidaceae	x
19	*Supa tutung*	*Fomitopsis* sp.1		x
20	*Supa awi*	*Fomitopsis* sp.2		x
21	*Supa kayang*	*Daedalea* sp.2		x
22	*Supa kincir coklat*	*Hymenopellis* sp	Physalacriaceae	x
23	*Supa tikukur*	*Oudemansiella* sp.		√
24	*Supa taneh leutik*	*Coprinus* sp.1	Psathyrellaceae	*x*
25	*Supa amis*	*Coprinus* sp.2		√
26	*Supa jarami*	*Coprinus* sp.3		√
27	*Supa cau hideng*	*Psathyrella* sp.1		x
28	*Supa taneh bodas*	*Coprinus* sp.4		x
29	*Supa kiray*	*Psathyrella* sp.2		√
30	*Supa lember lutung*	*Auricularia*sp.1	Auriculariaceae	√
31	*Supa lember sangu*	*Auricularia*sp.2		√
32	*Supa tutung bodas*	*Ganoderma* sp.1	Ganodermataceae	x
33	*Supa tutung hideng*	*Ganoderma* sp.2		x
34	*Ganoderma* sp.3	*Ganoderma* sp.3		x
35	*Supa kayas coklat*	*Supa kayas coklat*		x
36	*Ganoderma* sp.4	*Ganoderma* sp.4		x
37	*Supa kamanden*	*Amauroderma* sp.		x
38	*Supa akar*	*Pleurotus* sp.1	Tricholomataceae	x
39	*Supa akar kayu*	*Pleurotus* sp.2		x

40	*Supa baseuh*	*Agaricus* sp.	Cantharellaceaae	√
41	*Supa mireg*	Schizophyllum sp.	Schizophyllaceae	√
42	*Suum cau hideng*	*Volvariella* sp.	Pluteaceae	√
43	*Supa koneng*	*Calocera* sp.	Dacrymycetaceae	x
44	*Supa akar hideng*	*Laccaria* sp.	Hydnangiaceae	x
45	*Supa batok*	*Cyathus* sp.	Nidulariaceae	x
46	*Supa tai kotok*	*Lepiota* sp.	Lepiotaceae	x
47	*Supa kasongket*	*Hygrocybe* sp.	Hygrophoraceae	x
48	*Supa jangkar*	*Clavariadelphus* sp.	Gomphaceae	x
49	*Supa taneh lojor*	*Conocybe* sp	Bolbitiaceae.	x
50	*Supa catang*	*Gymnopus* sp.	Omphalotaceae	x
51	*Supa koja*	*Clavariaa* sp.	Clavariaceae	x
52	*Supa kasungka*	*Cortianrius* sp.	Cortinariace	x
53	*Supa kincir bereum*	*Sarcoscypha* sp	Sarcoscyphaceae.	x

The reported macrofungi families were Polyporaceae (eleven species), Psathyrellaceae, Ganodermataceae (six species), Fomitopsidaceae (four species), Mycenaceae (three species), Marasmiaceae, Physalacriaceae, Auriculariaceae, Tricholomataceae (two species), Cantharellaceaae, Schizophyllaceae, Pluteaceae, Dacrymycetaceae, Hydnangiaceae, Nidulariaceae, Lepiotaceae, Hygrophoraceae, Gomphaceae, Bolbitiaceae. Omphalotaceae, Clavariaceae, Cortinariace and Sarcoscyphaceae (one species each).

Inner Baduy community identified by distinguish and named the parts of macrofungi species in the local language–Sundanese based on traditional knowledge passed through genetarion. The knowledge related to macrofungi among Baduy people and others traditional people in the world (Santiago *et al.*, 2016; Teke *et al.*, 2018) is limited to its fruit bodies, which represent the sexual stage of their life cycle. People only recognize the bracket fungi through the sporocarp shape by their local name. Local names had very precise meanings, usually corresponding to a mycological genus, and no cases of names extending beyond a genus (e.g., to name the whole family). The names designating species of bracket fungi are made up of two words, the first word *supa* means "mushroom" followed by a modifier that can be an adjective or noun. These modifiers indicate the morphology of the bracket fungi sporocarp such as color, structure or substrate used by the fungi.

In this research family of Polyporaceae has the highest species number among another family. Previous studies also showed the same condition. Tambaru *et al.* (2016) has been collected eighteen species of Polyporaceae. Polyporaceae member has large fruit body and hard woody structure so that therefore the species have good adaptability in various substrate in different habitat (McKnight dan McKnight 1987)

Many mushrooms have a cosmopolitan distribution (Suryanarayanan and Hawksworth 2004). The collected macrofungi grew in different type of substrate: soils, on decaying organic matter, wooden stumps and living tree trunk (Figure 2) from their local forest e.g. *Reuma* (immature forest) and *Leuweung kolot* (mature forest) surrounding their environment. There is about 48% land area in Baduy covered with forest which contains a high biodiversity as the source of medicinal component and still be protected under their native customary rights. The abundance of macrofungi on different substrate greatly depends up on the organic and nitrogenous content of the soil and also on the other nutrients factors which plays key role in the growth of fungi (Kumar et al. 2013).

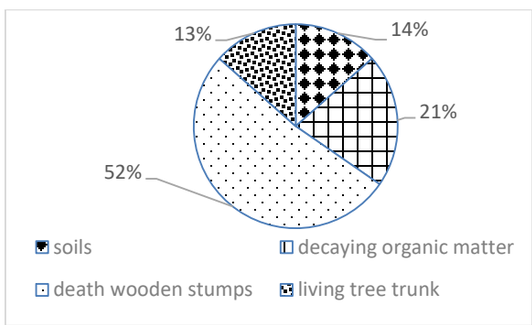

Figure 2. The abundance of macrofungi on different substrate

Environmental factor such as such as, pH, temperature, relative humidity, and light intensity (Kadiri and Kehinde, 1999) also have highly influenced on the growth of macrofungi. by several factors. Based on observation in research

study, the temperature is in the range of 21-29ºC, relative humidity is 80-98%, pH is 5.5-6 and light intensity 212-1585,5 lux. Previously, Zharare *et al*. (2010) reported that maximum growth of *Pleurotus* sp., one of member Tricholomataceae was at 25ºC. Thus, it appears that 20-25ºC was universal temperature range for the mycelial growth of mushrooms. Each mushroom has its optimal pH range for development, and it is variable; for example, pH between 4.0 and 7.0 for the mycelium and 3.5 to 5.0 for fruiting body formation (Urben, 2004). The optimum pH for mycelial growth and subsequent fruiting body development is obtained at between 6.5 and 7.0 (Kalmis et al., 2008). For most fungi, the wide humidity range is 20–70% (Pandey et al., 2001).

High humidity is favorable for macrofungi pining and fruiting. The combination of the best environmental factor such as air temperature, humidity, as well as other variables, provides a synergistic effect optimizing the production of macrofungi fruiting body.

According to Keizer (1998), edible macrofungi has fruit body, not poisonous, and has nutritional value. It is in agreement with Gbolagade et al. (2006) that macrofungi considered as highly nutritious food which contains protein (Crisan & Sand 1978), amino acids (Ingram 2002, Kalac 2009)), vitamins B, C and D (Heleno et al 2010, Panjikkaran &Mathew, 2013), crude fiber, lipids, sugars, glycogen and important mineral contents (Ca, P, K) (Abolfazi & Janardhana 2012)., which are essential for normal functioning of the human body.

About 23% from total collected macrofungi were edible and used as food (Figure 3). The method of preparing the edible macrofungi is related tothe collected amount and the species. Inner Baduy people used edible macrofungi either fresh or dried in elaborated stew such as soup, steamed or stir fried.

Figure 3. The Edible Macrofungi fruiting body. a) *Supa cau* (*Lentinus*sp.1); b) *Supa payung* (*Mycena* sp.2); c) *supa amis* (*Coprinus* sp.2); d-e) *supa lember lutung dan supa lember sangu* (*Auricularia* sp.); f) *supa baseh* (*Agaricus* sp.); g) *Supa mireg* (*Schizophyllum* sp.) h) supa jarami (*Coprinus* sp.3); i) *suum cau hideng* (*Volvariella* sp.); j) *supa tikukur* (*Oudemansiella* sp.); k) *supa jangkar* (*Clavariadelphus* sp.); l) *supa kiray* (*Psathyrella* sp.2); dan *supa nyiruan* (*Laetiporu*s sp.)

CONCLUSION

Based on the study above, it is concluded that 52 species of Macrofungi that belonged to 23 family have been identified and among those species about 12 species were edible and consumed by Inner Baduy people in Cikartawana hamlet. This result should be a reference for further exploration and increased the information about diversity of edible macrofungi especially in Baduy community and in Banten generally.

ACKNOWLEDGEMENT

The study was carried out with the financial support from Islamic Development Bank through University of Sultan Ageng Tirtayasa Indonesia (No. 356/UN43.9/PL/2017). The authors would like to express our gratitude to the community of Baduy for their participation in this study in sharing their indigenous knowledge and for their hospitality.

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