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Edible Mushrooms in The Surroundings of Bangbayang Village, Situraja, Sumedang, West Java

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Abstract

Bangbayang is one of the villages located in the Situraja Subdistrict, Sumedang Regency, West Java. The natural conditions around the area are very cool with various types of plants, which also make it likely to find mushrooms, especially macro mushrooms that have the potential as food ingredients, but have not been reported. This study aims to inventory macro mushrooms with the potential as food ingredients in Bangbayang Village, Situraja Subdistrict, Sumedang Regency, West Java. The research method used is exploratory, and each sample of macro mushrooms obtained is observed based on the macroscopic characteristics of its fruiting body. The results of the study obtained a total of 12 species of macro mushrooms with the potential as food ingredients, namely; *Agaricus campestris, Auricularia auricula, A. cornea, Boletus edulis, Cortinarius caperatus, Filoboletus manipularis, Lentinus sajor-caju, Lepista nuda, Russula rosea, Sarcomyxa edulis, Termitomyces clypeatus,* and *Tricholoma fraticum*.

Keywords: Bangbayang Village, Exploratory, Food ingredients, Macrofungis.

INTRODUCTION

Fungi represent a highly diverse group of eukaryotic microorganisms in terms of size, shape, and complexity (Ritz, 2005; Volk, 2013; Gulis & Bärlocher, 2017; Kumar, 2021; Morton, 2021). Fungi significantly impact human life, playing crucial roles in ecosystems as decomposers of dead organic matter, alternative food sources, and some produce toxins potentially harmful to health. Therefore, understanding fungi is essential for harnessing their potential benefits in daily life.

Macrofungi have played a significant role in the cultural history of humanity for thousands of years, particularly in Europe and China. Ancient Chinese culture, for example, has long cultivated macrofungi for culinary and medicinal purposes. In Europe, macrofungi such as shiitake and ear mushrooms have become integral parts of traditional cuisine. Fungi are renowned for their intriguing culinary attributes. Currently, fungi are valued as popular food items due to their low calories, carbohydrates, fats, sodium, and cholesterol-free nature. Moreover, fungi provide essential nutrients, including selenium, potassium, riboflavin, niacin, vitamin D, protein, and fiber (Widyastiti and Tjokrokusumo, 2021).

Macrofungi exhibit varied shapes and sizes, easily observable with the naked eye. Generally, macrofungi fall under the phylum Basidiomycota, with a small portion belonging to the phylum Ascomycota (Noverita et al., 2017). The fruiting body of macrofungi consists of the cap (pileus), stalk (stipe), ring (annulus), hymenium, and gills (lamella). However, not all macrofungi species possess

the mentioned structures; some develop specific parts unique to certain fungal families. For instance, the Auriculariaceae family develops a pseudostem as a substitute for the stalk (Wahyudi, 2016).

Furthermore, according to Ukwuru et al. (2018), traditional ethnomycological knowledge of edible fungi is limited to the vi. Depending on environmental conditions, thesearts of the fruiting body, including cap color, cap shape, stalk colormorphological characteristics within a species can vary significantly, depending on environmental conditions, often leading to misidentifications.

In general, there are four classifications regarding the edibility of fungi (Li et al., 2021). These classifications are: edible (E1), edible with treatment (E2), potentially edible but unconfirmed (E3), and poisonous (P). These classifications provide characteristics of edible fungi, but they do not account for taste and texture. For example, a mushroom may be classified as edible, but it might have an unpleasant taste, rendering it practically inedible. Therefore, contemporary researchers are exploring various approaches beyond the four classifications mentioned above, such as the toxic element approach (Nowakowski et al., 2021), to determine the safety of consuming fungi.

Bangbayang Village is situated in the Situraja Subdistrict. Its location is at the southernmost end of the Situraja Subdistrict and shares direct borders with several other subdistricts, including Cisitu, Cibugel, Sumedang Selatan, and Ganeas. Topographically, Bangbayang Village features hilly terrain, characterized by the lush beauty of mountainous landscapes, creating an environment conducive to the growth of various macrofungi. Hence, this research aims to inventory the types of macrofungi, particularly those with the potential as food ingredients, in the surrounding area of Bangbayang Village, Situraja Subdistrict, Sumedang Regency, West Java.

METHOD

1. Research Time and Location

The research was conducted in September 2022 in the vicinity of the forest and residential areas of Bangbayang Village, Situraja Subdistrict, Sumedang Regency, West Java. The sampling areas included the forested area of Bangbayang Village (blue route) and the residential area of Bangbayang Village (yellow route) (Figure 1).

Figure 1. Data Collection Routes in Bangbayang Village

2. Research Instruments

The equipment used in this research includes writing tools, data tabulation paper, road signs, labels, container boxes, luxmeter, thermometer, soil pH meter, hygrometer, GPS (Global Positioning System), digital camera, plastic bags, ruler, tweezers, bulk plastic, scissors, chloramphenicol antibiotic, 70% alcohol spray, cotton, tissue, and a book for identifying mushrooms.

3. Sample Collection:

Samples were collected using the searching method along the observation routes. This involved exploring and searching for mushrooms around the predetermined paths. Macro mushroom samples found in the research location that had the potential as food ingredients were observed based on their color, smell, and texture. Documentation was carried out using a digital camera. Furthermore, their living characteristics (grouped or solitary), cap diameter, stalk length, and other parts of the fruiting body were noted.

4. Environmental Factor Measurement:

Environmental factors such as air temperature (measured with a thermometer), soil pH (measured with a pH meter), air humidity (measured with a hygrometer), soil humidity (measured with a hygrometer), and light intensity (measured with a lux meter) were recorded. Data on these environmental factors were collected at each plot until the sample collection was complete.

5. Sample Identification:

The collected samples were identified based on the observed characteristics of the fruiting body. Identification was done with the help of macro mushroom identification books, including "Edible & Poisonous Mushrooms" and "A Guide To Common Fungi of The Hunter."

6. Data Analysis:

Data obtained from the mushroom sample collection in the research location over two days along two different routes were analyzed descriptively. Descriptive analysis was performed based on the morphological characteristics of the fruiting body, smell, texture, and the conditions around the found mushrooms, such as the presence or absence of insects. Additionally, analysis was guided by discussions with the local community.

RESULT

Environmental conditions

The environmental conditions measured during the study, including soil pH, air temperature, humidity, and light intensity, are presented in Table 1.

Table 1: Environmental Conditions in Bangbayang Village

Location	pH	Temperature (°C)	Humidity (%)	Light Intensity (lux)
Forest Area of Bangbayang Village."	5,4 - 6,6	25 – 31	26 – 60%	25 - 3050
Residential Area of Bangbayang Village	5,8 – 7,0	27 – 32	30 – 44%	1010 - 2516

Mushroom Species Found

A total of 12 mushroom species were discovered in both locations. These twelve mushroom species belong to the Phylum Basidiomycota and encompass 10 families (Table 2).

Table 2: Mushroom Species Found in Bangbayang Village

No	Familia	Genus	Spesies
1	Agaricaceae	*Agaricus*	*Agaricus campestris*
2	Auriculariaceae	*Auricularia*	*Auricularia auricula*
3	Auriculariaceae	*Auricularia*	*Auricularia cornea*
4	Boletaceae	*Boletus*	*Boletus edulis*
5	Cortinariaceae	*Cortinarius*	*Cortinarius caperatus*
6	Lyophyllaceae	*Termitomyces*	*Termitomyces clypeatus*
7	Mycenaceae	*Filoboletus*	*Filoboletus manipularis*
8	Polyporaceae	*Lentinus*	*Lentinus sajor-caju*
9	Russulaceae	*Russula*	*Russula rosea*
10	Sarcomyxaceae	*Sarcomyxa*	*Sarcomyxa edulis*
11	Tricholomataceae	*Lepista*	*Lepista nuda*
12	Tricholomataceae	*Tricholoma*	*Tricholoma fracticum*

Description of each species.

1. *Agaricus campestris*

The *A. campestris* mushroom lives in groups as a saprophyte in the soil. It has a fruiting body resembling an umbrella, with a cap, stalk, and ring on the stalk. The cap is convex to flat, with a diameter of 9 cm, whitish to whitish-brown. The gills (lamella) are dark brown to dark brownish. The

stalk is long, measuring 6.4 cm, pale white, with a ring (annulus) at the end of the stalk, similar in color to the stalk. The sample of *A. campestris* found was damaged due to being consumed by other organisms. The mushroom's fruiting body is soft, and in the field, it is already mature, making it easily breakable. This mushroom is reported to have the potential for consumption (Fikri, 2020) (Figure 1)."

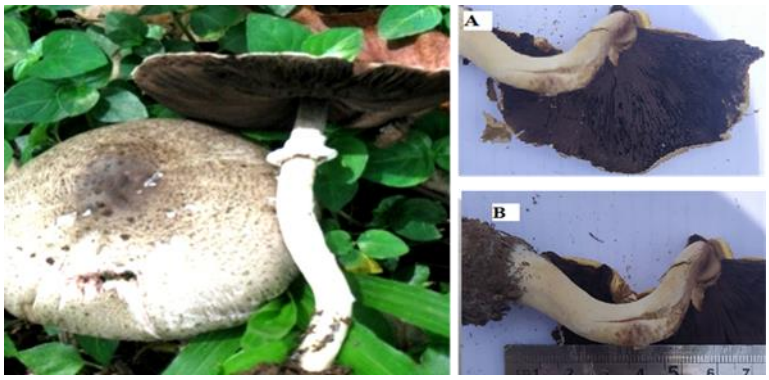

Figure 1. Fruiting Body of *Agaricus campestris*

2. *Auricularia auricula*

Auricularia auricula, known as the ear mushroom, derives its name from its ear-shaped fruiting body. This mushroom thrives as a saprophyte on wood or dead logs in forests or open areas, typically in groups. The fruiting body is ear-shaped, resembling a bowl, somewhat elastic, with a size of 2.85 cm, ranging in color from dark brown to purplish-brown, accompanied by a distinctive odor. It has a short stalk or nearly none, directly attached to the dead wood substrate. According to Rosales et al. (2015), this mushroom is widely recognized as an edible fungus (Figure 2).

Figure 2. Fruiting Body of *Auricularia auricular*

3. *Auricularia cornea*

Auricularia cornea is a saprophytic mushroom that thrives on wood or dead logs in forests or open areas, usually in groups. The fruiting body resembles an ear, like a bowl, with a somewhat elastic and slimy texture. The cap measures 3.2 cm, ranging in color from purplish-brown to yellowish-brown. The cap is sometimes adorned with white to grayish-white fuzz and lacks a distinct stalk (Figure 3). When found in the field, the mushroom's fruiting body appears slightly slimy and emits a somewhat unpleasant odor. The mushroom's resilience is low, as it tends to shrink and wilt

significantly when plucked and transported. According to Fitriani & Kristiani (2021), *Auricularia cornea* is commonly utilized by communities as a raw material for food and cultivation.

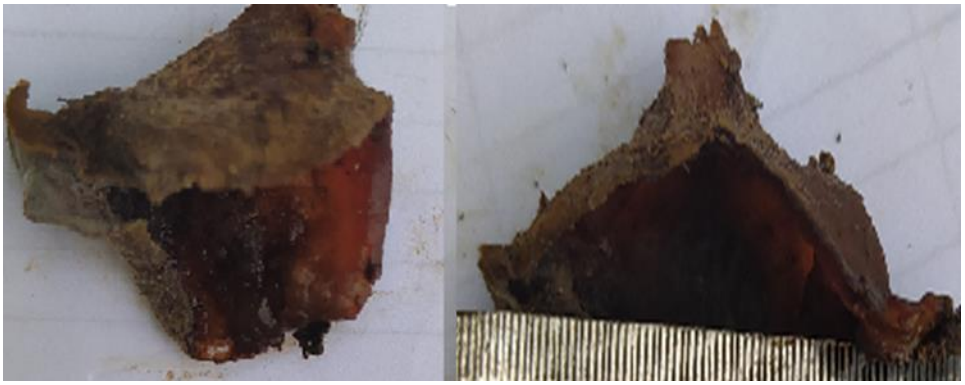

Figure 3. Fruiting Body of *Auricularia cornea*

4. *Boletus edulis*

Boletus edulis belongs to the Ectomycorrhizal group, living in symbiosis with the roots of higher plants. This mushroom is commonly found around the roots of higher plants either solitarily or in groups. The fruiting body consists of a cap and a stalk. The cap is thick, fleshy, convex, and becomes flat with age. The cap's color ranges from yellowish-brown to dark reddish-brown, with a cap diameter of 11.5 cm. The stalk is cylindrical, solid, enlarging at the base, with a stalk length of 16.5 cm. The underside of the cap is porous and has a bright yellow to yellowish color (Figure 4). According to Zheng et al. (2007), *Boletus edulis* is recognized as one of the edible mushroom species widely consumed.

Figure 4. Fruiting Body of *Boletus edulis*

5. *Cortinarius caperatus*

Cortinarius caperatus, commonly known as the gypsy mushroom, is found growing as a saprophyte at the base of large coniferous trees in the field. This mushroom is typically solitary in its growth. The fruiting body consists of a cap and a stalk. The cap is radially convex, measuring 1.4 cm in diameter, and has colors ranging from cinnamon brown to rusty brown. Lamellae are found on the underside of the cap. The cylindrical stalk is white to cream, with a stalk length of 3.8 cm. The cap has a soft texture, is easily breakable, and does not emit a distinctive odor (Figure 5). According to Falandysz (2014), *Cortinarius caperatus* is an edible mushroom.

Figure 5. Fruiting Body of *Cortinarius caperatus*

6. Termitomyces clypeatus

Termitomyces clypeatus is a mushroom species from the *Termitomyces* genus that lives symbiotically with termites (Termid), typically in groups within leaf litter or termite mounds. The fruiting body is umbrella-shaped, consisting of a cap and a stalk, with or without a ring. The cap is randomly convex to flat, sometimes with a split cap, white to cream-colored, with brownish ornaments in the center. The cap measures 3.4 cm. The lamellae are white to pale pinkish-white. The cylindrical stalk is 8.7 cm long, white, with a ring in the middle of the stalk. According to Majumder et al. (2014), all species of this mushroom are edible.

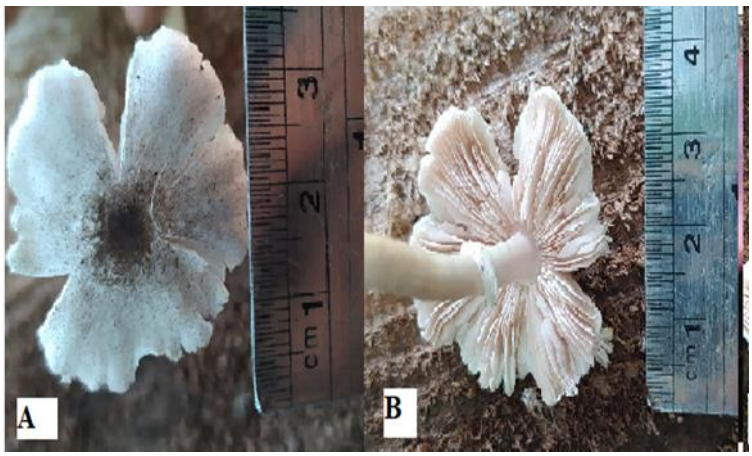

Figure 6. Fruiting Body of *Termitomyces clypeatus*

7. *Filoboletus manipularis*

Filoboletus manipularis is found growing saprophytically on dead wood, typically in groups. The fruiting body is umbrella-shaped, measuring 1.9 cm, and is white milk or bright white, up to pinkish-white, slightly shiny. The cap has a distinctive shape, with a surface ornamented with round patterns that resemble shadows from the cap's pores. The underside consists of pores, rough, and white. The stalk is white, hollow, 3.1 cm in length, odorless, and very easy to break (Figure 7). Some strains of this species are also bioluminescent, meaning the mushroom produces enzymes that glow in the dark. This mushroom falls into the edible category (Noverita et al., 2019).

Figure 7. Fruiting Body of *Filoboletus manipularis*

8. *Lentinus sajo-caju*

Lentinus sajor-caju, known as kipadali or padali mushroom by some Sundanese people, can be found growing in clusters on the dead trunks of padali wood. The fruiting body of L. sajor-caju is funnel-shaped, with the rim of the funnel curving when young and becoming flat as it ages. The cap has a diameter of 1.45 cm, white to cream-colored, turning brownish with age. The underside of the cap has thin, decurrent lamellae. The stalk is central, short, cylindrical, and the same color as the cap (Figure 8). When young, the mushroom has a soft cap texture, while in maturity, it becomes firm and does not emit a distinctive odor. Sharma et al. (2012) explained in their research that L. sajor-caju is consumable, as well as other species like *L. connatus, L. torulosus, L. cladopus,* and *L. squarrosulus.*

Figure 8. Fruiting Body of . *Lentinus sajo-caju*

9. *Russula rosea*

Russula rosea, known as the rosy mushroom due to its distinctive color, thrives in the soil around plant roots as an ectomycorrhizal fungus. The fruiting body is umbrella-shaped, consisting of a cap and a stalk. The cap starts as convex, later becoming flat with age, fleshy, and has a pinkish-red color with a diameter of 5.8 cm. The underside of the cap bears closely arranged lamellae, ranging in color from reddish to brown. The stalk is long, cylindrical, with a consistent diameter from base to apex, dense and fleshy, displaying the same pinkish-red hue as the cap. The mushroom does not emit a distinct odor (Figure 9). According to Yu and Liang (2022), *Russula rosea* is considered one of the

edible wild mushrooms due to its high protein content, low fat, and various other nutrients. Additionally, it has the potential for medicinal use as an antioxidant and anti-tumor agent.

Figure 9. Fruiting Body of . *Russula rosea*

10. *Sarcomyxa edulis*

Sarcomyxa edulis, discovered in the field as a saprophyte on dead wood in groups, consists of a cap with a very short or nearly absent stalk. The cap is shaped like an oyster, closely resembling the fruiting body of the oyster mushroom (Pleurotus). It has a cap diameter of 3.3 cm, a golden-brown color, fine velvety fuzz, a soft texture, and fleshy consistency, emitting a distinct aroma. The underside of the cap features crowded lamellae, appearing yellow. According to Tian et al. (2021), Sarcomyxa edulis is considered one of the mushroom species that can be consumed both as food and medicine due to its high nutritional content.

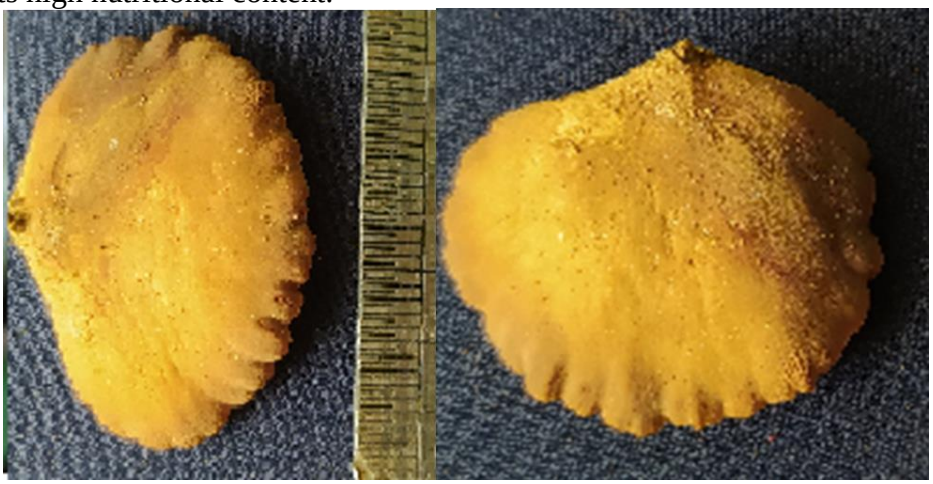

Figure 10. Fruiting Body of . *Sarcomyxa edulis*

11. *Lepista nuda*

Lepista nuda, commonly known as the blewit mushroom, thrives as a saprophyte on the dead trunks of trees. The fruiting body takes the shape of a parasol, comprising a cap and a stalk. The cap exhibits a distinctive semi-circular shape curving inward towards the center on one side facing the stalk, with a cap diameter of 3.1 cm. The cap's color varies influenced by environmental conditions, ranging from grayish-brown, grayish-purple, to purple. The underside of the cap features brownish lamellae. The stalk is quite thick and sturdy, measuring about 1 cm in length (Figure 11). The

mushroom does not emit a specific aroma. According to Singer (1986), this mushroom is considered edible and is valued for its taste, aroma, and high nutritional quality.

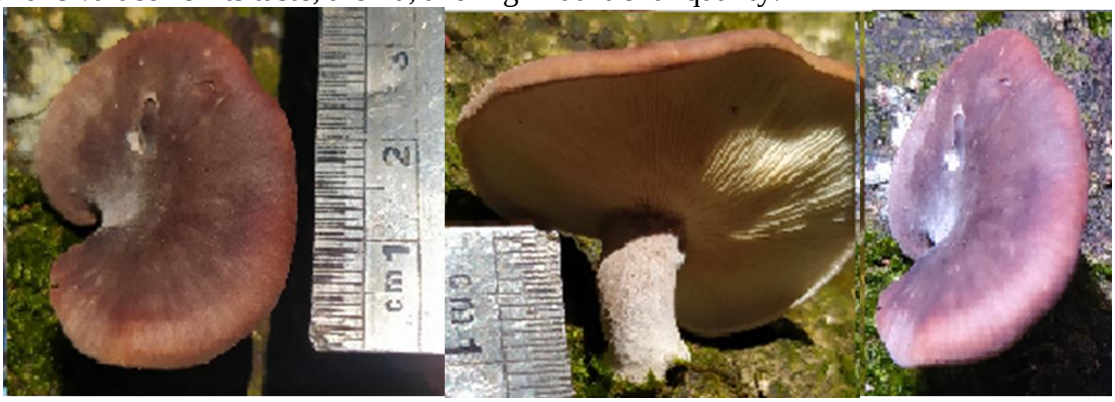

Figure 11. Fruiting Body of . *Lepista nuda*

12. *Tricholoma fracticum*

Tricholoma fracticum belongs to the group of ectomycorrhizal fungi, forming a symbiotic relationship with higher plants. The mushroom's structure consists of a cap and a stalk without a ring. The cap is initially convex, becoming flat as it matures, with the edges curling downward, displaying a reddish-brown color and a cap diameter of 2.05 cm. The underside of the cap features lamellae. The stalk is whitish-brown, thick, and fleshy, measuring 1.05 cm. The aroma it emits is generally faint, lacking any distinct odor. According to Tel et al. (2012), *Tricholoma fractium* is an edible mushroom that can be used for both food and medicinal purposes, although it is noted for having a somewhat bitter and tough taste.

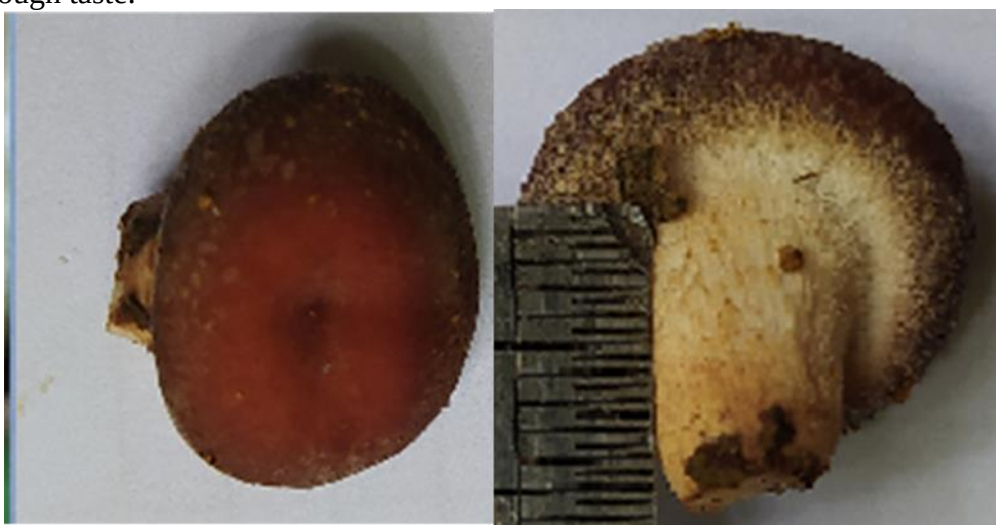

Figure 12. Fruiting Body of . *Tricholoma fractium*

DISCUSSION

A total of 12 mushroom species were found in the Bangbayang Village, Situraja, Sumedang, West Java, and are declared to have the potential as food sources. These species include *Agaricus campestris, Auricularia auricula, Auricularia cornea, Boletus edulis, Cortinarius caperatus, Termitomyces clypeatus, Filoboletus manipularis, Lentinus sajor-caju, Russula rosea, Sarcomyxa edulis, Lepista nuda,* and *Tricholoma fracticum*. These twelve species were observed to grow well in two locations, with seven species in the Bangbayang Village Forest area and five species in the

residential area of Bangbayang Village. This indicates that both areas are highly conducive to mushroom growth, supported by environmental factor observations, including soil pH ranging from 5.4 to 7.0, temperatures of 25-32°C, humidity of 26-60%, and light intensity of 25-3050 lux.

Generally, macrofungi thrive in a neutral to slightly acidic pH range, typically between 5 to 7 (Mohamed et al., 2015). The optimal temperature for macrofungi growth is within the range of 20-30°C. However, some species can grow at lower or higher temperatures (Trappe and Castellano, 2000). Most macrofungi grow in shaded or semi-shaded habitats, showing better growth in low to moderate light intensity (Lugo and Dighton, 2009). The required humidity for macrofungi growth generally falls within the optimal range of 70-90% (Shaw and Trappe J. M., 1981).

Three of these species, namely *Agaricus campestris*, *Auricularia auricula*, and *Auricularia cornea*, are already extensively cultivated and sold in markets or supermarkets in Indonesia. Other species, including *Termitomyces clypeatus, Filoboletus manipularis*, and *Lentinus sajor-caju*, have also been utilized as food sources by rural communities in Indonesia living around forests, harvested during rainy seasons, but they have not been cultivated yet.

In Indonesia, several types of mushrooms have been successfully cultivated commercially. Some commonly cultivated mushroom species include Oyster Mushrooms (*Pleurotus* spp.), Straw Mushrooms (*Volvariella volvacea*) (Chang and Miles, 2004), Ear Mushrooms (*Auricularia* spp.) (Eko Setiawan, 2006), Shiitake Mushrooms (*Lentinula edodes*) (Przybylowicz and John Donoghue, 1988), Enoki Mushrooms (*Flammulina velutipes*) (Guohua Xia and Mingjie Chen, 2016), and Reishi Mushrooms (*Ganoderma lucidum*) (Khoo, et al., 2013). Reference: "Budidaya Jamur Kuping dan Tiram" (Cultivation of Ear and Oyster Mushrooms) by Eko Setiawan (2006).

Mushrooms have the potential to be a food source due to the nutritional content they provide. The nutritional content in macrofungi that has the potential as a food source includes Protein (Stamets, 2005; Chandra, et al., 2019), Fiber (Oyetayo and Oyetayo, 2009), B-Complex Vitamins (B2, B3, B5, B6) (Shaw and Trappe, 1981), Minerals (Iron, Zinc, Magnesium) (Lugo and Dighton, 2009), Antioxidants (Polysaccharides, Beta-Glucans) (Wasser, 2017), and Essential Amino Acids (Jong and Birmingham, 1990).

CONCLUSION

A total of 12 edible mushroom species have been identified and morphologically described. Ten mushroom families have been identified, all of which belong to the Basidiomycota phylum. In Desa Bangbayang, a total of 12 mushroom species were identified, with 7 species found in the Desa Bangbayang Forest area and 5 species from the residential areas of Desa Bangbayang. The mushroom species identified in the Desa Bangbayang Forest area include *Lentinus sajor-caju, Cortinarius caperatus, Filoboletus manipularis, Sarcomyxa edulis, Russula rosea, Lepista nuda*, and *Tricholoma fracticum.* Meanwhile, in the residential areas of Desa Bangbayang, the identified species include *Auricularia auricula, Termitomyces clypeatus, Auricularia cornea, Boletus edulis*, and *Agaricus campestris.*

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