



Morel of West Java: Description and Potential Utilization

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ABSTRACT

The genus *Morchella*, known as morels, is one of the most popular edible mushrooms worldwide. Information regarding the distribution and cultivation of this fungus is mainly from the temperate country. In Indonesia, only two reports of the distribution of this mushroom have been found at Mount Rinjani West Nusa Tenggara (2012) and Mount Klabat Minahasa Utara (2019). Since then, there has been no report of this macrofungi in Indonesia. In 2020, local people (the Indonesian mushroom hunting community) shared information about the appearance of *Morchella* at the residence area near Mount Gede Pangrango, West Java. The fruiting body was described based on the macroscopic characters. Morphological identification, which was completed by the description and macroscopic characterization, confirmed the identity of the macrofungi as *Morchella* sp. Further observation using microscopic characters and DNA data needs to be done to confirm the taxonomic position to the species level in future studies. This information adds to the recording of *Morchella* distribution and its potential use in Indonesia.

Keywords: Inventory, Macrofungi, Indonesia, *Morchella*

INTRODUCTION

The exploration and recording effort of mushroom diversity in Indonesia still needs to be done more actively. There are only 2273 species of fungi (macro- and microscopic) recorded in Indonesia, or approximately 0.15% of the total estimates worldwide (Indonesian Research Institute / LIPI, 2019). Previous research has confirmed that various species of macrofungi can occupy various ecological niches, not only in natural ecosystems but also in the areas disturbed by various anthropogenic activities (Putra *et al.*, 2017; 2018; Putra, 2020a).

Mushroom or macrofungi is the term macroscopic fungi, divided into two phyla, namely Basidiomycota and Ascomycota. *Morchella* is a wild edible mushroom of Ascomycota, which is rarely found and reported in Indonesia. This is likely due to the preference of the

mushroom to grow in temperate (non-tropical) climatic conditions in four-season countries (Mortimer *et al.*, 2012; Baroni *et al.*, 2018). In Indonesia, *Morchella* has only recently been reported from the highlands of Mount Rinjani (Rianto, 2012) and Mount Klabat (Christita *et al.*, 2019). After that, no reports have been found regarding this macrofungi in Indonesia.

Morchella is considered a unique taste and is also popular among many people worldwide (Boa, 2004). Several previous studies have reported this mushroom's nutritional content and benefits for human health (Tietel & Masaphy, 2017). Due to its rare existence, the cultivation of this mushroom in Indonesia is still rarely practised. This paper is completed with the preliminary information in the form of a description of macroscopic characters of *Morchella* in West Java and its potential uses in Indonesia.

MATERIAL AND METHOD

Mushroom observations were carried out in Cisarua Village, Sukaraja, Sukabumi, West Java (Figure 1), in November 2020 involving hobbyists in a particular area. Data collection was done by opportunistic sampling method O’Dell *et al.* (2004). The mushroom description was carried out in this study using some simple macroscopic characters referring to Putra *et al.* (2018) and Putra (2021) with modification. Ascomata were documented entirely, and the description of the information obtained was validated.

Macroscopic identification characters including habitat, how to grow, the shape of fruiting body, colour, shape, surface, and level of wetness. The results obtained were then validated to the genus level or species (if possible) by using various identification references, including Largent (1973), Arora (1986), and Rokuya *et al.* (2011). The taxonomic position and recent identity of the macrofungi followed the regulation of index fungorum. Information regarding the potential use of mushrooms was carried out through literature studies from various related references.

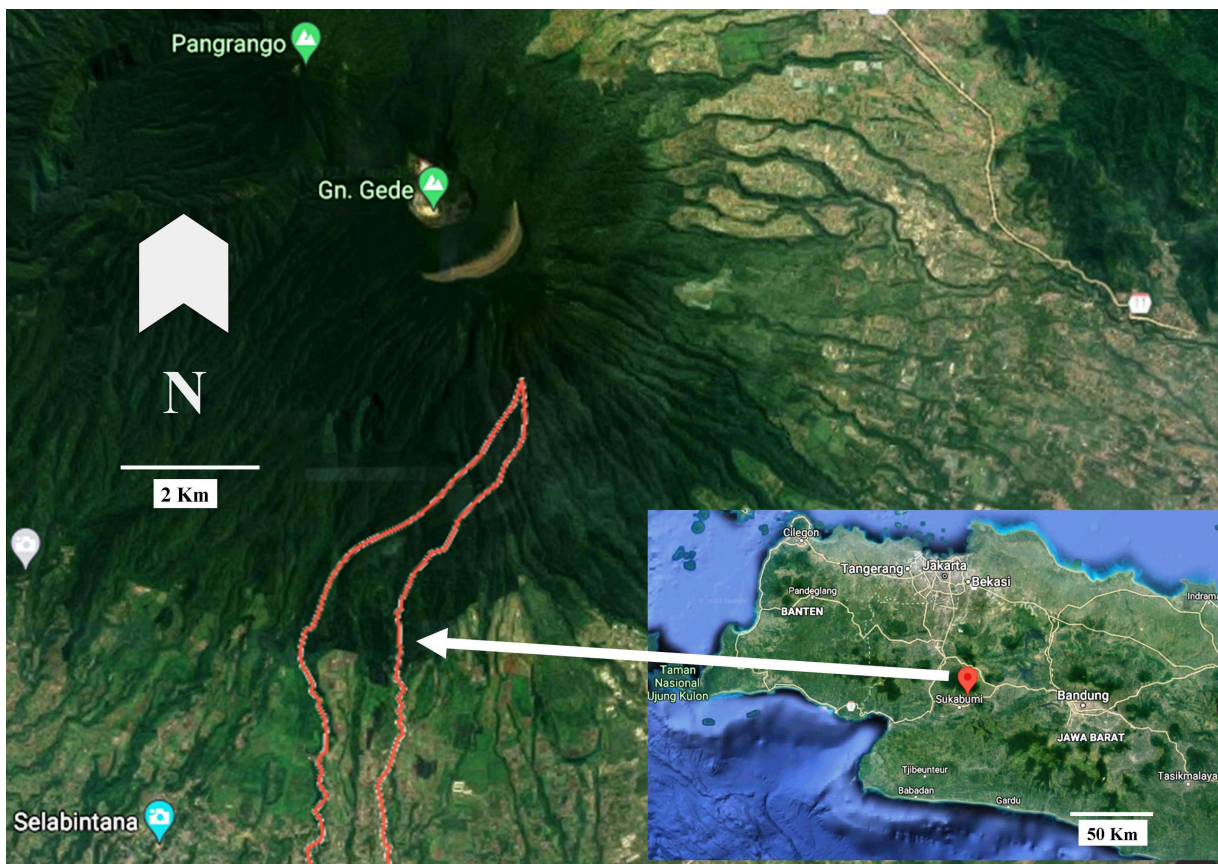


Figure 1. The occurrence of *Morchella* sp. In West Java (red arrow)

RESULT AND DISCUSSION

The morels was found in West Java in this research. The macrofungi was identified to the genus level as *Morchella* sp. Based on the indexfungorum, the taxonomical position of *Morchella* is Morchellaceae, Pezizales, Pezizomycetidae, Pezizomycetes, Pezizomycotina, Ascomycota, Fungi. To date, 350 species, subspecies and varieties of *Morchella* have been recorded worldwide (<http://www.indexfungorum.org/Names/Names.asp>, accessed on June 2020). The following is the description of *Morchella* sp. In West Java.

Description of *Morchella* sp. in West java

The macrofungi in this study grew on a 'bonsai' polybag with loose soil media (Figure 2A). The fruiting body was found in Cisarua Village, Sukaraja, Sukabumi, West Java (1500 m above sea level) at the lower part of Mount Gede Pangrango. The fruiting body of this mushroom was in the form of an elongated cone with a notched surface like a sponge (Figure 2B). The indentation of the hood was composed of a larger elongated longitudinal shape with small polygonal to irregular grooves in some parts. Ascumata was equipped with blunt, thick indentation with predominantly brown colour from base to apical with a slightly darker base.

When sliced up, the fruiting body cavity was without sinus (Figure 2C). The stipe was cylindrical, with a slightly enlarged one at the bottom. The length of the stalk was about twice as large as the diameter. In the base part of the stipe, rhizomorph structures were cream to brown and mixed with soil. The determination of identity down to the species level cannot be done in this research due to limited information. Du et al. (2019) stated that the shape, size, colour, habitat, and season in

which *Morchella* was found greatly influenced the morphological characters, and making the identification is very difficult.

Distribution of *Morchella*

Morels are generally distributed in temperate regions (Mortimer *et al.*, 2012; Baroni *et al.*, 2018) and generally in the highlands. In Indonesia, two species that have been reported were *M. aff. deliciosa* from Mount Rinjani (Rianto, 2012) and *Morchella* sp. from Mount Klabat Minahasa Utara (Christita *et al.*, 2019). The information in this paper is the first report regarding the existence of *Morchella* in West Java with description. *Morchella* sp., which reported in this paper, is different from *Morchella* sp. reported by Christita *et al.* (2019) from the morphology and colour of the fruiting body. *Morchella* is known to appear only for a few weeks in nature (Dhalstrom *et al.*, 2000), so it is considered rare to be found by mycologists, especially in Indonesia. The fruiting body, which was found at the sampling area only solitary. Most species of *Morchella* are saprobe fungi but also can associate with some plants (Dhalstrom *et al.*, 2000). However, it is not clear regarding the characteristics of the *Morchella* lifestyle reported in this paper.

Morchella Nutrition Content

To date, no reports have been found regarding the analysis of *Morchella* nutrition in Indonesia. Previous research in various temperate countries have confirmed the high content of protein, minerals, phenolic acids, aromatic compounds, and antioxidants from *Morchella* and consumed as food (Ozturk *et al.*, 2010; Karapinar *et al.*, 2017; Tietel & Masaphy, 2017). Due to the rarity and delicious taste, and unique shape, this mushroom has a high selling price in various countries (160 USD / Kg) (Du *et al.*, 2015). As a result, many hobbyists routinely forage this wild mushroom in nature.

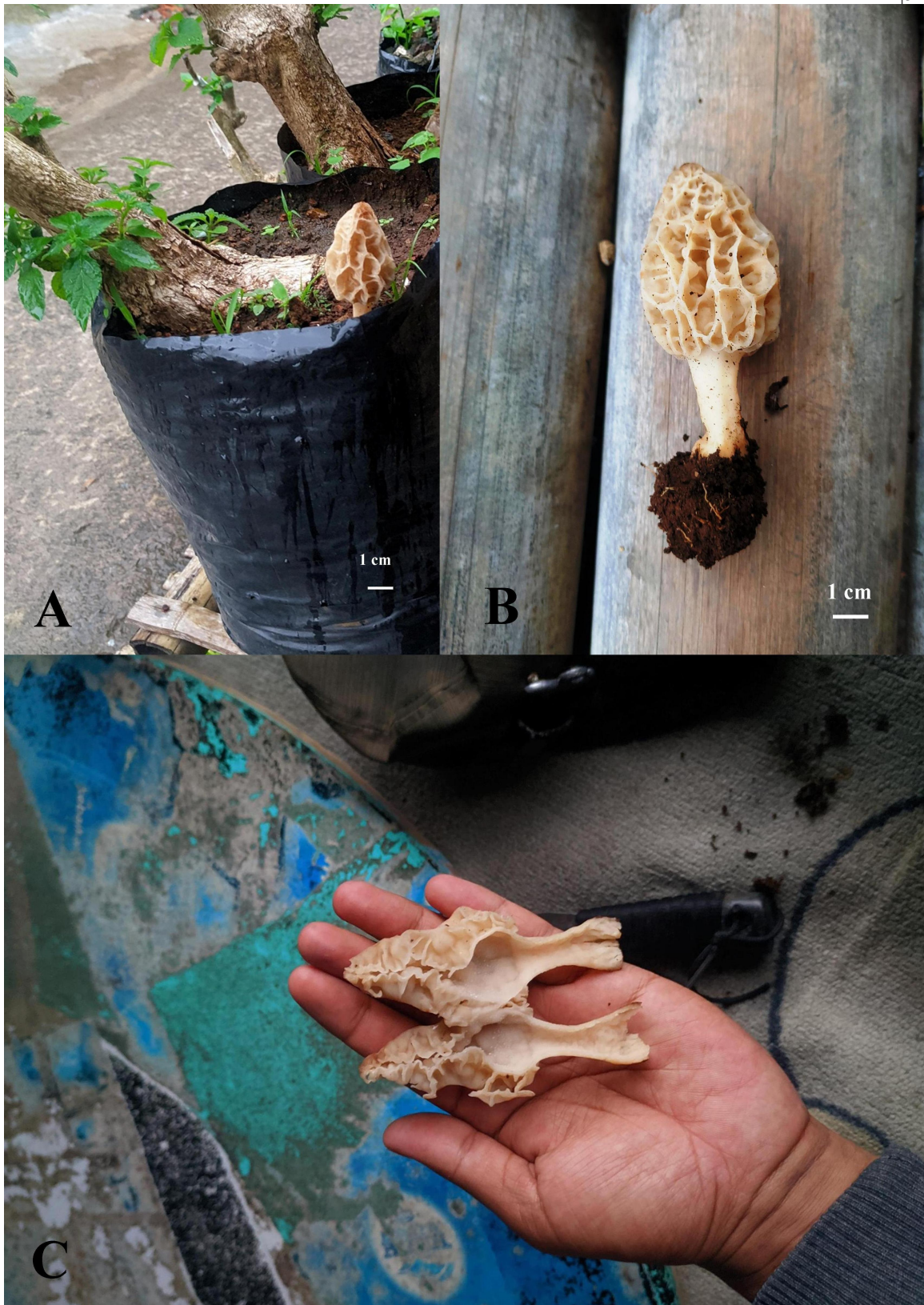


Figure 2. Macroscopic characters of *Morchella* sp. A: Fruiting body of *Morchella* grew on 'bonsai' polybag. B: Indentation of the hood of the fruiting body and rhizomorph mixed with soil. C: Fruit body without sinus when cleaved. Doc: Yos Hosni Alfian (with permission).

However, even though all types of *Morchella* are considered edible, there is a need to be careful when collecting fruiting bodies in nature. This is due to the morphology of *Morchella* is identical to *Gyromitra* (false morels), which is a poisonous mushroom.

Potential Utilization of *Morchella*

Morchella has long been a part of ethnomycology for numerous local communities worldwide (Mortimer *et al.*, 2012). Many people explore this mushroom when in a particular season, especially in China, India, Turkey, Mexico, and the United States (Mortimer *et al.*, 2012). In Indonesia, local people are not used to foraging this mushroom (Putra & Khafazallah, 2020). Due to the high demand for this mushroom is increasing every year, *Morchella* has a high economic value (Sher *et al.*, 2014; Du *et al.*, 2015). The Efforts to cultivate *Morchella* have been carried out over the past decade but mainly in Israel, the United States, and China (Masaphy, 2010). With the addition of the report on the distribution of *Morchella* around residential areas in this paper, it poses the opportunity for the cultivation in Indonesia. Good cooperation between researchers and local communities is needed to optimise and cultivate morels at the research site. In addition to its use as a food ingredient, several previous studies have confirmed that *Morchella* also has the potential as an antioxidant (Fu *et al.*, 2013), hepatoprotective (Nitha *et al.*, 2013), antitumor (Liu *et al.*, 2018), neuroprotective effects (Xiong *et al.*, 2016), and traditional medicine for stomach pain in Pakistan (Mahmood *et al.*, 2011).

Morchella exploration efforts in Indonesia

It is estimated that there are around 1.5 million species of macrofungi worldwide (Blackwell, 2011), with 2000 species

considered edible mushrooms and 700 of them used in the medical field (Lima *et al.*, 2012). In Indonesia, re-inventory of rare mushrooms has only been reported by Putra (2020b), namely *Podostroma cornu-damae*, which was last reported in 1934 in Indonesia. The efforts to explore and cultivate the beneficial wild mushrooms in Indonesia pose several challenges, including the absence of a checklist for mushroom species in Indonesia, unlike Malaysia (Lee *et al.*, 2008) and Vietnam (Kiet, 2008). In addition, the Republic of Indonesia has wide ecological ranges and geographical conditions. It is implied that the collaboration between researchers, government, mushroom hobbyists, and indigenous people in Indonesia is one solution to overcome the obstacles. *Morchella* records carried out in this paper add to the data on mushroom diversity in Indonesia. The existing description is expected to be a medium for dissemination which local communities can use as a reference in Indonesia.

CONCLUSION

Information regarding *Morchella* sp. in Cisarua Village, Sukaraja, Sukabumi, West Java needs to be followed up for further observation. Characterization with microscopic and or molecular data and its preservation needs to be done to complete the collection of information on the diversity of *Morchella* in Indonesia. In the short plan, the cultivation of *Morchella* in Indonesia might be done by pre-testing the suitable medium for isolation and breeding purpose.

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