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Identification and potential of vascular plants in the karst ecosystem of Somopuro Cave, Pacitan, East Java, Indonesia

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Abstract. *Septiasari A, Balgis M, Lathifah MN, Hanugroho PD, Setyawan AD. 2021. Identification and potential of vascular plants in the karst ecosystem of Somopuro Cave, Pacitan, East Java, Indonesia. Intl J Trop Drylands 5: 75-83.* Karst areas are composed of limestone hills or mountains formed over hundreds or even millions of years. Karst landforms vary according to the formation process. With a unique formation, karst land is a place to live for unique organisms. The karst area is like a natural laboratory that contains various phenomena of living organisms and plays an important role in the progress of science. One of the plants that live in the karst environment is a vascular plant and is rarely discussed among researchers. No one has ever investigated the vascular plants around Somopuro Cave, so this research became interesting to discuss. This paper aims to know the diversity of vascular plants in the Somopuro Karst Cave, Pacitan, East Java, Indonesia area, and the potential species. The research was conducted in November 2021, using a survey method. Based on observations around Somopuro Cave, vascular plants are grouped based on their habitus; there are 5 groups, namely trees, shrubs, herbs, vines, and epiphytes. The collection of plants in the karst area of the Somopuro Cave contains 103 species from 51 families. Results revealed that the most common vascular plants are Asteraceae, Araceae, Fabaceae, and Euphorbiaceae family. Six potentials can be utilized from vascular plants in the Somopuro Cave Area: medicinal plants, ornamental plants, foodstuffs, wood-producing plants, animal feed, and energy sources.

Keywords: Biodiversity, karst caves, Somopuro Cave, vascular plants

INTRODUCTION

Karst is a specific area consisting of relief surfaces and underground hydrographic tissue surfaces resulting from chemical and mechanical water circulation that will create cracks along with soluble rock layers, such as limestone, dolomite as well as gypsum, and salt (Kurniati and Siswanto 2020). The karst region is composed mostly of carbonate rocks, especially $CaCO_3$ limestone and CaMg dolomite $(CO_3)_2$ (Sulastoro 2013). The formation of cracks on the surface causes the water directly into the underground flow system resulting in dry conditions on the surface (Murti 2009). Karst has a unique topographic form that if there is a change in the karst, it will cause water balance, solar energy flow system, and reduction of carbon dioxide absorption (Hartono et al. 2020).

The karst ecosystem is the karst landscape's abiotic, biotic, and cultural components (Nugroho and Kristanto 2020). Karst ecosystem is a region that can capture and store rainwater as a habitat for several species of special living things and potentially mining due to hilly physiographs formed from limestone (Purnaweni 2014). Karst ecosystem is a unique landscape with a fragile or irreversible nature (Widyaningsih 2017). If the karst ecosystem is affected by a strong disturbance, there will be reverse succession, and recovery will take a long time. Biodiversity plays a role in maintaining the karst landscape and the process of restoring damaged karst ecosystems (Li et al., 2013).

Karst areas in Indonesia can be categorized based on climate and development. Karst has an important role, namely as a habitat for various flora and fauna. The biodiversity in karst is very rich and unique. So that the karst area has 3 functions: economic, ecological, and educational & cultural (Aprilia et al. 2021). Based on research by Balazs (1971), karst areas in Indonesia can be categorized into 17 locations. Not all of them developed well; from the 17 locations, 2 areas developed the best, namely the Maros karst and Gunung Sewu karst areas.

Karst landforms vary according to the formation process. With a unique formation, karst land is a place to live for unique organisms. Karst in Indonesia holds many unique potentials and is very rich in natural resources, both biological and non-biological. The phenomenon is also amazing and has never finished being researched. Therefore, this research aims to know the diversity of vascular plants in the Somopuro karst cave area and the potential species.

MATERIALS AND METHODS

Study area

The observation is at Somopuro Cave area, Bungur Village, Tulakan, Pacitan, East Java, Indonesia (Figure 1). Somopuro Cave has located ±30 km east of the city center and is still part of the Southern Mountains karst area. Somopuro Cave's formations are stalactites and stalagmites hanging in beautiful curves. This cave is the outlet of an underground river. Around the cave, there is diverse and interesting vegetation to be investigated further. The research was conducted in November 2021.

Methods

This research was conducted using a survey method. All vascular plants that grow around the cave (*goa/gua*) will be recorded for further identification (Nasution et al., 2015). Direct observations were made in the area of the object under study as primary research data. The results were obtained to describe the conditions in the Somopuro Cave area. Then proceed with the identification of vascular plants species while collecting additional literature as supporting data. After primary data are collected, the research is focused on knowing the potential of each plant.

Procedures

Observation

Direct observations were made by exploring the Somopuro Cave area to find out the conditions around the cave and observing the diversity of the vegetation. Vascular plants were recorded and documented for further identification.

Plant identification

After the list of plants found in Somopuro Cave was compiled, the research continued with plant identification. Plants are identified based on their taxonomy and habitus. The identification data uses open web access, including plantamor.com, theplantlist.org, identify.plantnet.org, gbif.org, and powo.science.kew.org. After that, the potential of each plant was recorded based on the literature (see Table 1 for a list of references).

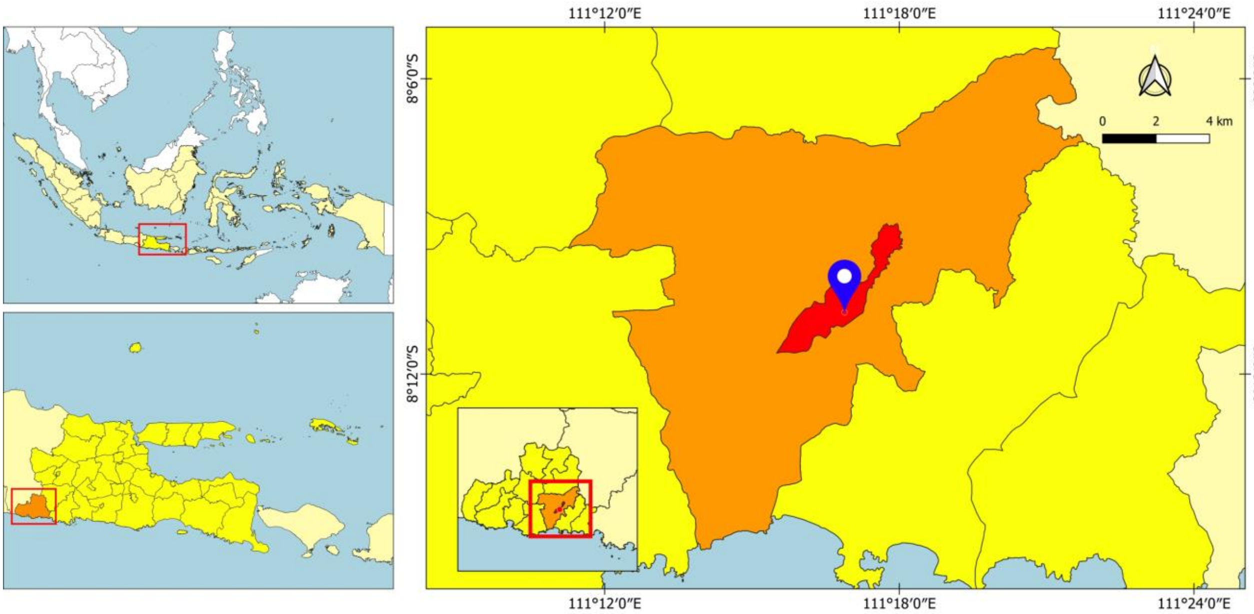

Figure 1. Location of Somopuro Cave Area, Bungur Village, Tulakan, Pacitan, East Java, Indonesia

Figure 2. The panoramic view of Somopuro Cave, Bungur Village, Tulakan, Pacitan, East Java, Indonesia

RESULTS AND DISCUSSION

Vascular plants in Somopuro Cave

Gunung Sewu Karst area is currently being used as land to produce a source of food for the surrounding community. This is influenced by the perspective of the surrounding community towards karst conservation. According to Sunkar (2008), karst areas known to be dry can benefit the soil because they are not polluted by chemicals that can be carried by water. Therefore, the vegetation found in the Gunung Sewu karst area is dominated by plants resistant to dry conditions; this is due to the dry area of Gunung Sewu with limited water sources. Seasonal uncertainty and global warming encourage farmers to plant different crops in each growing season. This is so that they can harvest a variety of food supplies during the harvest season. Not only that, but this planting model can also indirectly maintain soil fertility.

Vascular plants often referred to as Tracheophytes, have a vascular system. Vascular system plants perform two important functions: the delivery of resources (water, essential mineral nutrients, sugars, and amino acids) to various plant organs and the provision of mechanical support (Lucas et al., 2013). The diversity of different vascular plants on each slope at all growth rates and lower plants. This can be caused by the topographic shape of the slope, the intensity of light, and land clearing. In addition, the composition of vegetation species is still dominated by pioneer types at all growth rates, while lower-level plants are generally dominated by exotic and invasive types (Widiyanti and Kusmana 2014).

The collection of vascular plants in Somopuro Cave is 103 species from 51 families (Table 1). The most common family found in the area are Asteraceae, Araceae, Fabaceae, and Euphorbiaceae. Asteraceae, commonly called the daisy family, has the largest number of species, namely 24,000-30,000 species in 1,600-1,700 genera (Funk et al. 2005; Mandel et al. 2019). Members of the Asteraceae can be found in all ecosystems and have uniquely shaped flowers and attractive colors. There are 8 species from the Asteraceae family found in Somopuro Cave. All of the plants of this family were used as medicinal plants. The Araceae has a high species diversity, with 144 genera and 3645 species recorded worldwide (Nauheimer et al. 2012). Based on Table 1, found 7 species of Araceae in Somopuro Cave. Plants from this family have the potential to be used as medicinal plants, ornamental plants, and food ingredients. According to Acebey et al. (2010), Araceae are often found in moist lowland and montane forests, but they can also be found in seasonally dry forest habitats. Araceae has a wide diversity of habitats; therefore, the species diversity is high (Croat and Ortiz, 2020). The Fabaceae family has a wide distribution in almost all parts of the world; its good adaptability makes species of the Fabaceae family grow wild, especially on the tropical island of Java (Mountara et al., 2021). The Fabaceae family has the ability to live in all soil conditions, including dry soil such as in the karst area, due to its shallow root system. Most of these plants functioned as wood-producing plants and medicinal plants. In Somopuro Cave, various species of the Fabaceae family were found, such as *Acacia* sp., *Albizia chinensis, Dalbergia latifolia, Flemingia macrophylla, Leucaena leucocephala, Mimosa pudica,* and *Zapoteca tetragona.* Many species of the Euphorbiaceae family are found; apart from being cultivated, many plant species grow wild in the tropical area. Euphorbiaceae family are the longest inhabited flora in the karst area in general (Faida et al. 2011). In Somopuro Cave, various species of the Euphorbiaceae family were found, such as *Codiaeum* sp., *Euphorbia heterophylla*, *Euphorbia hirta*, *Macaranga* sp., and *Manihot carthaginensis*. Almost all species have the potential to be used as medicine.

The collection of plants in the karst area of the Somopuro Cave contains 103 types of plants. The division of plants is based on their habitus; there are five categories. Each of the plants that are found in the karst area has a habitus consisting of epiphytes (10 species), trees (20 species), shrubs (29 species), vines (7 species), and herbs (37 species), most of these were represented by herbaceous species. Based on research, the number of understory vascular plants is more than trees. This is considered good because the understory vegetation plays an important role in most forest ecosystems, one of which is in the karst area. According to Ou et al. (2020), understory vegetation plays an important role in conserving soil, water, and biodiversity in karst areas.

The potency of plant

Plants found in the Somopuro Cave area have potential that the surrounding community can utilize. The research results show that plants are classified into 6 potentials: medicinal plants, ornamental plants, foodstuffs, wood-producing plants, animal feed, and energy sources.

Medicinal plants

Plants in the study area showed that most have potential as medicinal plants. In identifying vascular plants in Somopuro Cave, we found 41 species from 23 families that have the potential to be used in medicine. Medicinal plants contain ingredients that can help in the healing process of a disease. Many people have taken advantage of the plants around them. Knowledge of this medicinal plant will be passed on to the next generation. There is a lot of information about the utilization of medicinal plants. So, a lot of research has been done to find out the content of plants. The plant parts commonly used for medicine are leaves, fruit, flowers, roots, rhizomes, and tubers. *Iresine herbstii, Ageratum conyzoides, Piper betle,* and *Colocasia esculenta* are medicinal plants that have the same use as wound medicine. The plant part used is the leaf (Dipankar et al. 2011; Dwivedi and Tripathi 2014; Asih and Kurniawan 2019; Herlina 2019). *Iresine herbstii*, *Solanum stramoniifolium* and *Swietenia mahagoni* contain antioxidants helpful in protecting cells in the body from the effects of free radicals (Dipankar et al., 2011; Svobodova et al., 2017; Herlina, 2019). Based on Widodo et al.'s 2019) research, the Fabaceae family, like *M. pudica* and *L. leucocephala*, can be used for liver disease treatment (Figure 3A&B). At the same time,e the research of Asih and Kurniawan (2019) shows that the plant Amorphophallus sp. (Figure 3C) from the Araceae family contains glucomannan and low glucose levels from its tubes. Hence it is good for people with diabetes.

Tabel 1. List of record species on Somopuro Cave Area, Pacitan, East Java, Indonesia

Family	Name	Local name	Habitus	Potency
Acanthaceae	*Hemigraphis reptans* (G.Forst.) T.Anderson ex Hemsl.	-	H	-
	Ruellia tuberosa L.	Pletekan	H	Medicine (1)
Adiantaceae	*Adiantum* sp.	Suplir	E	Ornamental plant (6)
Amaranthaceae	*Iresine herbstii* Hook.	-	H	Ornamental plant, Medicine (18)
Apiaceae	*Centella asiatica* (L.) Urb.	Pegagan	H	Medicine (10)
Apocynaceae	*Cerbera manghas* L.	Bintaro	T	Energy (11)
	Dischidia major (Vahl) Merr.	-	E	Ornamental plant
	Tabernaemontana sp.	-	S	-
Araceae	*Amorphophallus paeoniifolius* (Dennst.) Nicolson	Suweg	H	Medicine (9)
	Colocasia gigantea (Blume) Hook.f.	Talas (besar)	H	Foodstuffs (9)
	Colocasia sp.	Talas (kecil)	H	Foodstuffs
	Syngonium sp.	-	V	Ornamental plant
	Colocasia esculenta (L.) Schott	Talas (ungu)	H	Foodstuffs, Medicine (9)
	Caladium bicolor (Aiton) Vent.	Keladi	H	Ornamental plant (9)
	Philodendron sp.	-	H	Ornamental plant
Arecaceae	*Adonidia merrillii* (Becc.) Becc.	-	T	Ornamental plant
	Arenga pinnata (Wurmb) Merr.	Aren	T	Foodstuffs
	Cocos nucifera L.	Kelapa	T	Wood, Foodstuffs (6)
	Burretiokentia dumasii Pintaud & Hodel	Palem	T	Ornamental plant (4)
Asparagaceae	*Cordyline fruticosa* (L.) A.Chev.	Andong	S	Ornamental plant (4)
Asteraceae	*Ageratum conyzoides* L.	Bandotan	S	Medicine (2,6,10)
	Tridax procumbens L.	Gletang	H	Medicine (6)
	Wedelia chinensis (Osbeck) Merr.	-	H	Medicine (13)
	Crassocephalum crepidioides (Benth.) S.Moore	Sintrong	S	Medicine (12)
	Chromolaena odorata (L.) R.M.King & H.Rob.	Rumput Minjangan	S	Medicine (6)
	Ayapana sp.	Prasman	S	-
	Ageratina riparia (Regel) R.M.King & H.Rob.	-	S	Medicine (19)
Balsaminaceae	*Impatiens* sp.	Pacar air	H	Ornamental plant
Begoniaceae	*Begonia* sp.	Begonia	H	Ornamental plant (5)
	Begonia sp. 2	Begonia	H	Ornamental plant (5)
Bromeliaceae	*Ananas comosus* (L.) Merr.	Nanas	H	Foodstuffs
Campanulaceae	*Hippobroma longiflora* (L.) G.Don	Ki Tolod	H	Medicine (2)
Cucurbitaceae	*Momordica* sp.	-	V	-
Cystopteridaceae	*Gymnocarpium dryopteris* (L.) Newman	Pakis	H	Ornamental plant
	Gymnocarpium robertianum (Hoffm.) Newman	Pakis	H	Ornamental plant
Dioscoreaceae	*Tacca palmata* Blume	-	H	Ornamental plant
Euphorbiaceae	*Codiaeum variegatum* (L.) Rumph. ex A.Juss.	Puring	S	Medicine (12)
	Euphorbia heterophylla L.	Patikan emas	H	Medicine (21)
	Euphorbia hirta L.	Patikan kebo	H	Medicine (12)
	Macaranga sp.	-	T	-
	Manihot carthaginensis (Jacq.) Müll.Arg.	Singkong	S	Foodstuffs
Fabaceae	*Dalbergia latifolia* Roxb.	Sono	T	Wood
	Acacia sp.	Akasia	T	Wood (6)
	Albizia chinensis (Osbeck) Merr.	Sengon	T	Wood (6)
	Leucaena leucocephala (Lam.) de Wit	Lamtoro	T	Foodstuffs, Medicine (17)
	Mimosa pudica L.	Putri Malu	H	Medicine (2,10)
	Zapoteca tetragona (Willd.) H.M.Hern.	Kaliandra putih	S	Ornamental plant
	Flemingia macrophylla (Willd.) Kuntze ex Merr.	-	S	Medicine (22)
Gnetaceae	*Gnetum gnemon* L.	Melinjo	T	Foodstuffs
Lamiaceae	*Orthosiphon aristatus* (Blume) Miq.	Kumis kucing	S	Medicine (10)
	Plectranthus monostachyus (P.Beauv.) A.J.Paton	-	H	Medicine (3)
	Tectona grandis L.f.	Jati	T	Wood (6)
Linderniaceae	*Lindernia crustacea* (L.) F.Muell.	-	S	Ornamental plant
Lygodiaceae	*Lygodium circinatum* (Burm.) Sw.	Paku Hata	E	Ornamental plant (4)
Malvaceae	*Hibiscus tiliaceus* L.	Waru	T	Medicine (6)
	Hibiscus rosa-sinensis L.	Bunga Sepatu	S	Ornamental plant
	Urena lobata L.	Pulutan	S	Medicine (6)
Melastomataceae	*Clidemia hirta* (L.) D.Don	Senduduk Bulu	S	Medicine (2)
Meliaceae	*Swietenia mahagoni* (L.) Jacq.	Mahoni	T	Wood (6), Medicine (10)
Menispermaceae	*Tinospora* sp.	-	V	-
Moraceae	*Artocarpus heterophyllus* Lam.	Nangka	T	Medicine (10)
	Ficus septica Burm.f.	Awar-awar	T	Medicine (10)
	Ficus retusa L.	Ara	T	Medicine (10)

Muntingiaceae	*Muntingia calabura* L.	Talok	T	Foodstuffs
Musaceae	*Musa paradisiaca* L.	Pisang	H	Foodstuffs
Myrtaceae	*Psidium* sp.	Jambu	T	Foodstuffs
Orchidaceae	*Aerides* sp.	Anggrek	E	Ornamental plant (5)
	Dendrobium sp.	Anggrek	E	Ornamental plant (5)
	Geodorum densiflorum (Lam.) Schltr.	Anggrek tanah	H	Ornamental plant (5)
Oxalidaceae	*Oxalis barrelieri* L.	Belimbing tanah	H	Medicine (23)
Phyllanthaceae	*Phyllanthus buxifolius* (Blume) Müll.Arg.	Seligi	S	Medicine (16)
	Phyllanthus urinaria L.	Meniran	S	Medicine (2)
Piperaceae	*Peperomia pellucida* (L.) Kunth	Sirih Cina	H	Medicine (6)
	Piper betle L.	Sirih	V	Medicine (20)
Poaceae	*Bambusa* sp.	Bambu	T	Wood
	Brachiaria mutica (Forssk.) T.Q.Nguyen	Kolonjono	H	Animal feed
	Oplismenus hirtellus (L.) P.Beauv.	-	S	Animal feed
	Ancistrachne numaeensis (Balansa) S.T.Blake	-	H	Animal feed
Polygalaceae	*Polygala paniculata* L.	Akar tuju angin	S	Medicine (14)
Polygonaceae	*Polygonum aviculare* L.	-	V	Medicine (8)
Polypodiaceae	*Lepisorus excavatus* (Bory ex Willd.) Ching	Paku	E	Ornamental plant
	Pyrrosia sp.	Paku	E	-
Primulaceae	*Maesa* sp.	-	S	-
Pteridaceae	*Pityrogramma calomelanos* (L.) Link	Paku perak	E	Ornamental plant
	Pteris vittata L.	Pakis rem china	V	Ornamental plant
	Pteris ensiformis Burm.f.	Paku	H	Medicine (25)
Rosaceae	*Rubus* sp.	-	S	-
Rubiaceae	*Gardenia jasminoides* J.Ellis	Kacapiring	S	Ornamental plant
	Canthium sp.	-	S	-
Selaginellaceae	*Selaginella plana* (Desv.) Hieron.	Rane	E	Ornamental plant
	Selaginella repanda (Desv.) Spring	-	E	Ornamental plant
Solanaceae	*Solanum torvum* Sw.	Takokak	S	Foodstuffs
	Solanum stramoniifolium Benth.	-	S	Medicine (24)
Tectariaceae	*Tectaria* sp.	-	H	-
Thelypteridaceae	*Phegopteris connectilis* (Michx.) Watt	Pakis beech	S	-
	Christella dentata (Forssk.) Brownsey & Jermy	-	H	-
Thymelaeaceae	*Phaleria macrocarpa* (Scheff.) Boerl.	Mahkota Dewa	S	Medicine (7)
Urticaceae	*Pilea microphylla* (L.) Liebm.	-	H	Medicine (10)
Violaceae	*Viola rubella* Cav.	-	S	Ornamental plant
Vitaceae	*Cissus javana* DC.	Irah-Irahan	V	Ornamental plant
Zingiberaceae	*Curcuma longa* L.	Kunyit	H	Foodstuffs, Medicine (15)
	Globba sp.	-	H	Foodstuffs, Medicine (4)
	Zingiber officinale Roscoe	Jahe	H	Foodstuffs, Medicine (15)

Note: E: Epiphytes, T: Trees, S: Shrubs, V: Vines, and H: Herbs; 1. Xu et al. (2020), 2. Kartika (2017), 3. Astuti et al. (2021), 4. Ilhamullah et al. (2015), 5. Surya and Astuti (2017), 6. Priyanti et al. (2011), 7. Faried et al. (2007), 8. Park et al. (2018), 9. Asih and Kurniawan (2019), 10. Herlina (2019), 11. Handayani et al. (2015), 12. Karyati and Adhi (2017), 13. Hossen et al. (2020), 14. Pizzolatti et al. (2009), 15. Hadi et al. (2016), 16. Rahmahani (2017), 17. Zayed and Samling (2016), 18. Dipankar et al. (2011), 19. Hynniewta and Kumar (2010), (20. Dwivedi and Tripathi (2014), 21. Ughachukwu et al. (2014), 22. Ho et al. (2011), 23. Tagne et al. (2015), 24. Svobodova et al. (2017), 25. Shi et al. (2017).

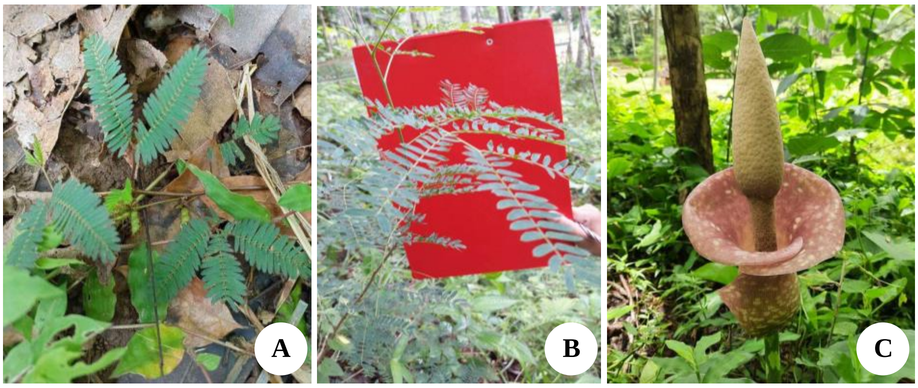

Figure 3. A. *Mimosa pudica*, B. *Leucaena leucocephala,* and C. *Amorphophallus* sp.

Figure 4. A. *Hibiscus rosa-sinensis,* B. *Syngonium* sp., and C. *Cordyline fruticosa*

Ornamental plants

Based on Table 1, 30 species from 21 families have potential as ornamental plants as an addition for view and visual therapy. Ornamental plants can include plants from vines, shrubs, and even trees. All plants that fall into the ornamental plant category are unique in color, shape, or smell. Plants that have beautiful flowers will be used as ornamental plants. According to Shibata (2008), plants are referred to as ornamental plants because of their ornamental purpose and value. These plants can be used for unique, floricultural crops, such as flowers with new and beautiful shapes or colors. These ornamental plants consist of *Adiantum* sp., *I. herbstii, Dischidia major, Syngonium* sp.*, Caladium bicolor, Philodendron* sp., *Adonidia merrillii, Burretiokentia dumasii, Cordyline fruticosa, Impatiens* sp., *Begonia* sp., *Begonia* sp. 2, *Gymnocarpium dryopteris, Gymnocarpium robertianum, Tacca palmata, Z. tetragona, Lindernia crustacea, Lygodium circinatum, Hibiscus rosa-sinensis, Aerides* sp., *Dendrobium* sp., *Geodorum densiflorum, Lepisorus excavatus, Pityrogramma calomelanos, Pteris vittata, Gardenia jasminoides, Selaginella plana, Selaginella repanda, Viola rubella,* and *Cissus javana*. Besides that, some ornamental plants can be used to analyze biomass and carbon absorption, like *H. rosa-sinensis* (Figure 4A) (Haruna 2020). Ornamental plants like *Syngonium* sp. can be used as environmental indicators for vertical garden and green wall systems (Figure 4B) (Jozay et al. 2021). In addition, *C. fruticosa* ornamental plants have many leaf variations, making them very popular and used as ornamental plants (Figure 4C) (Tobondo et al. 2021). However, if there is an increase in the number of ornamental plant lovers, it will threaten these plants in the future. Therefore, cultivation efforts need to be carried out to preserve ornamental plants. So that the needs of this plant remain abundant and there is no need to take it from nature.

Foodstuffs

Plants that have the potential as foodstuffs are 16 species from 12 families. The plant parts used for food are leaves, flowers, fruit, rhizomes, and tubers. The utilization of plants can be processed first or eaten directly. This includes foodstuffs plants consisting of *Colocasia gigantea*, *Colocasia* sp., *C. esculenta, Arenga pinnata, Cocos nucifera, Ananas comosus, M. carthaginensis, L. leucocephala, Gnetum gnemon, Muntingia calabura, Musa paradisiaca, Psidium* sp., *Solanum torvum, Curcuma longa, Globba* sp., and *Zingiber officinale*. The tubers of *C. esculenta* can be made into various processed foods, such as fried, steamed, boiled, sweetened, or salted. Meanwhile, the young leaves of *C. esculenta* can be used as vegetables for cooking (Figure 5) (Mutaqin et al. 2018).

Wood-producing plants

Based on Table 1 found 7 species from 5 families that have the potential for wood production. Wood-producing plants have a strong stem texture to be used as building materials. This wood can be used for industrial products like buildings, handcraft, and furniture. Wood-producing plants have high economic value, depending on the type of plant and quality. But to get a good quality takes a long time to harvest. Wood production plants consist of *C. nucifera, D. latifolia, Acacia* sp., *A. chinensis, Tectona grandis, S. mahagoni,* and *Bambusa* sp. These plants are composed of chemicals that can make their stems strong, tough, and suitable for wood-producing materials. In general, wood consists of chemicals such as carbohydrates, cellulose, lignin, and extractives. One of the substances that determine the durability of wood is the extractive substance (Wibisono et al., 2018).

Figure 5. *Colocasia esculenta*

Figure 6. *Brachiaria mutica* (source: https://www.feedipedia.org/)

Figure 7. *Cerbera manghas*

Animal feed

There are 3 species of plants that have the potential as animal feed, and all of them are from the Poaceae family. The plants used were *Ancistrachne numaeensis*, *Brachiaria mutica*, and *Oplismenus hirtellus*. Kalanjana grass, or *B. mutica*, is an economically important plant (Figure 6). This plant is used as cut grass for animal feed, hay, or livestock grazing (Reksohadiprojo 1985; Dwari and Mondal 2011). The part of the plant used for animal feed is from the base to the tip of the leaf.

Energy source

Meanwhile, species that have the potential as an energy source, only one species was found is *Cerbera manghas* (Figure 7). *Cerbera manghas* are commonly grown as roadside urban plants. This plant has a lot of fruit but is not used because it is poisonous. Based on research from Handayani et al. (2015), *C. manghas* has a toxic fruit, so it doesn't have much potential besides seed oil extraction for biodiesel. Bintaro seeds or *C. manghas* have a fairly high oil content of around 40-65% but cannot be consumed because they contain toxins, so their use as an energy source will not compete with food needs (Herwanda 2011).

From the research that has been done, it can be concluded that there are 103 species from 51 families that grow in the Somopuro Cave area, Tulakan, Pacitan, East Java, Indonesia. Results revealed that the most common vascular plants are Asteraceae, Araceae, Fabaceae, and Euphorbiaceae family. Based on their habitus, they are divided into 5 categories, namely epiphytes (10 species), trees (20 species), shrubs (29 species), vines (7 species), and herbs (37 species). Six potentials can be utilized from vascular plants in the Somopuro Cave Area, namely medicinal plants (41 species), ornamental plants (30 species), foodstuffs (16 species), wood-producing plants (7 species), animal feed (3 species) and energy sources (1 species).

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