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Short communication: Diversity and ethnobotany of Araceae in Namo Suro Baru Village, North Sumatra, Indonesia

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Abstract. *Rambey R, Purba ER, Hartanto A, Prakoso BP, Peniwidiyanti, Irmayanti L, Purba MP. 2022. Short communication: Diversity and ethnobotany of Araceae in Namo Suro Baru Village, North Sumatra, Indonesia. Biodiversitas 23: 6006-6012.* For Indonesian people, the variety of Araceae species has risen to prominence as an ornamental plant and a supplemental food source. However, there is still a lack of information about some species and their cultivation in some parts of North Sumatra. This research was conducted in the village of Namo Suro Baru, Biru-Biru District, Deli Serdang, North Sumatra to identify and study the ethnobotanical use of the species of Araceae. A total of 48 plots, each measuring 2 × 2 m were constructed, and 30 respondents from the community were interviewed about the local utilization of aroids. The results of vegetation analysis recorded a total of 17 species of Araceae plants in the village of Namo Suro Baru in Biru-Biru District, Deli Serdang Regency, North Sumatra Province. *Xanthosoma sagittifolium* was the dominant species with the highest IVI, i.e. 40.44%, while *Dieffenbachia seguine* had the lowest IVI (0.86%). The parts of the plant that the locals had traditionally used were the tuber, petiole, and whole leaf. The four main purposes of using Araceae plants were classified as foods, feeds, herbal formulations or medicines, and ornamental plants. Two species of corpse flowers, *Amorphophallus titanum* and *A. prainii*, also periodically bloomed in the village, but because they are protected species, the locals did not use them for their needs.

Keywords: Araceae, ethnobotany, North Sumatra, *Xanthosoma sagittifolium*

INTRODUCTION

The Indonesian archipelago has two of the world's biodiversity hotspots (areas with a high degree of endemic species that are highly threatened by habitat loss). Subsequently, its insular nature and complex geological history have resulted in the evolution of globally diverse fauna and flora (von Rintelen 2017). Araceae (aroids) is a globally distributed plant family with 144 genera and 3,645 species (Croat et al. 2020). Aroid plants include submerged aquatic or free-floating plants, terrestrial (sometimes tuberous) plants, and epiphytes (Nugroho 2008). Araceae provide nectar, fruit, and nesting sites for a variety of arboreal species, such as birds, insects, primates, and bats (Barrancos et al. 2019).

Araceae is the most diverse family in morphology, life forms, habitat preferences, growth patterns, phenology, and adaptive modification for effective pollination (Zulhazman et al. 2021). The International Union for Conservation of Nature (IUCN) Red List includes most aroids due to their lack of protection and the continual fragmentation of their natural habitat caused by a land scarcity that includes tropical rainforests and other humid forests (Gomez-Murillo and Cuartas-Hernandez 2016).

Araceae is a large and ancient family of monocots known for its diversity in morphology and species (Ortiz et al. 2018). This family occupies a wide variety of habitats, including forest understory, river banks, open swamp areas, and even relatively dry areas. Although Araceae is highly diverse in Indonesia, the potential for their collections for conservation and economic purposes has not been fully explored (Yuzammi 2018). Subsequently, Araceae consists of many species that can be used to provide food, medicine, ornaments, and other needs for Indonesians. *Aglaonema* and *Anthurium* are exceptional Araceae species cultivated as ornamentals and are commercially valuable (Asharo et al. 2022).

According to human ecology and ethnobiology, local communities interact significantly with their environmental components. Local people utilize plants to satisfy their

daily needs (Mutaqin et al. 2018). In the village of Namo Suro Baru, people who raise livestock use taro leaves as animal feed, while other attractive species, such as *Caladium bicolor*, are planted as ornamental plants. In addition, *Amorphophallus titanum*, one of the Araceae species found in the village of Namo Suro Baru, has been included in the IUCN Red List. There are also species widely consumed by people, such as *Colocasia esculenta*, a food crop cultivated extensively and abundantly for its tubers in the humid tropics and subtropics (Ahmed 2020).

Numerous local reports of the frequent blooming of the genus *Amorphophallus* in the area served as one of the catalysts for the study in the village of Namo Suro Baru. The area is surrounded by hills and rivers, which favors the growth of Araceae. Therefore, this research aimed to record and identify aroid species, followed by the diversity assessment and potential utilization by the local community, which could provide insight into the practical uses and benefits of some species.

MATERIALS AND METHODS

Study area

This research was conducted from August to September 2021 in the village of Namo Suro Baru, Sibiru-Biru District, Deli Serdang Regency, North Sumatra, Indonesia (Figure 1). The topography of the land is mostly flat with a slope of less than 5% and soil characteristic of alluvials.

Species collection and identification

Araceae species were studied in four sites, namely gardens, home gardens, rice fields, and riverbanks. Plants were sampled using purposive sampling plots where Araceae species were present. Twelve plots (2 m × 2 m) were placed at every site, totaling 48 plots. All Araceae species were documented and identified by their morphological characteristics using some guidebooks by Mayo et al. (1997) and Kurniawan and Asih (2012), while individual numbers were recorded.

Ethnobotanical aspect

The potential utilization of Araceae was studied through a series of documentation, field observation, and interviews. Snowball sampling was used to collect the interview data from 30 respondents. The data were qualitatively analyzed using local names, scientific names, utility categorization, and technical information for each species.

Data analysis

The ecological indexes of the Araceae community in the study area were generated i.e density (ind/m^2), relative density (%), frequency, and relative frequency (%). The alpha diversity of Araceae was determined using Shannon's diversity index (*H'*). The importance value index (IVI) was used to evaluate the dominant species in the area and was calculated as the sum of the relative density and relative frequency (Whittaker 1975).

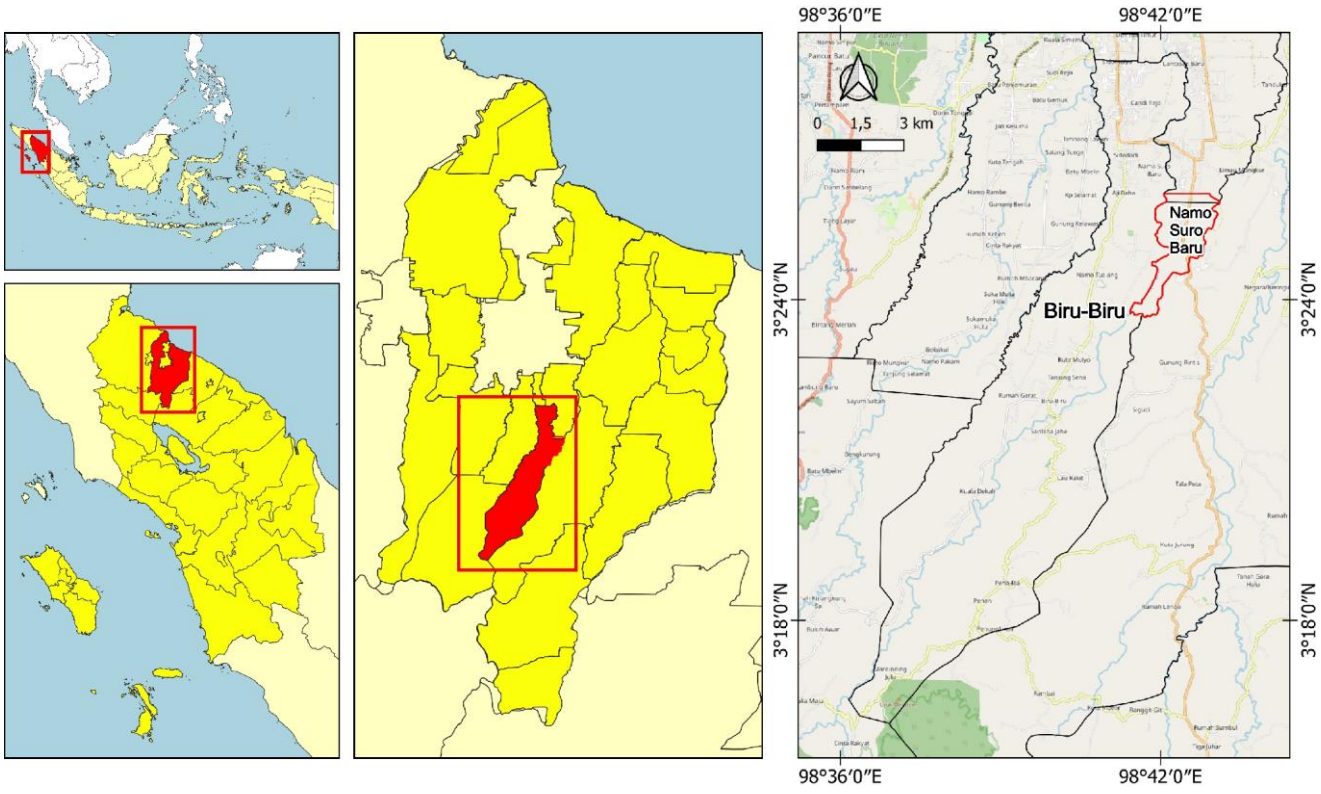

Figure 1. Map of the study area in Namo Suro Baru Village, North Sumatra, Indonesia

RESULTS AND DISCUSSION

A total of 17 species and 12 genera of Araceae were identified and documented (Figure 2). The Araceae community consists mainly of terrestrial species (*N* = 16) i.e *Alocasia odora* (G.Lodd.) Spach, *Amorphohallus prainii* Hook.f., *Amorphohallus titanum* (Becc.) Becc., *Caladium bicolor* Aiton (Vent.), *Colocasia esculenta* (L.) Schott, *Colocasia gigantea* (Blume) Hook.f., *Dieffenbachia seguine* (Jacq.) Schott, *Homalomena pendula* (Blume) Bakh.f., *Remusatia vivipara* (Roxb.) Schott, *Rhapidophora* sp., *Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi, *Schismatoglottis wongii* A.Hay, *Syngonium auritum* (L.) Schott, *Syngonium macrophyllum* (L.) Schott, *Syngonium podophyllum* Schott, and *Xanthosoma sagittifolium* (L.) Schott. The only Araceae aquatic species is *Pistia stratiotes* L, and the environmental parameters such as population density, frequency, and IVI of each species are presented in Table 1.

The Shannon's diversity index in the study area was 2.35 or classified as a moderate level of biodiversity. The dominant Araceae species based on the IVI in the village of Namo Suro Baru were *Xanthosoma sagittifolium* (40.44%), *Caladium bicolor* (28.23%), *Colocasia esculenta* (19.44%), *Amorphophallus titanum* (18.30%), *Syngonium auritum* (14.20%), *Remusatia vivipara* (10.97%), *Schismatoglottis wongii* (10.29%), and other species with IVI less than 10%. The functional value of a plant species to the area is indicated by its Importance Value Index (IVI). Plant species with the highest IVI have the greatest impact in the area. The existence of other species in the area and the changes in the local environment are mostly influenced by these species (Narayan and Anshumali 2015). The species *X. sagittifolium* is a fast-growing herbaceous plant cultivated mainly for its corms that could be vegetatively propagated into the mature plant within 14-20 weeks. The appearance of *X. sagittifolium* is almost identical to that of *C. esculenta*, except for the petiole, which is attached to the leaf margin in *X. sagittifolium* but not in *C. esculenta*. In the first 6 to 9 months, the plant can produce a large number of foliage with more than 10 corms within 10 months. In addition, *X. sagittifolium* is known for its persistence in occupying a variety of habitats, from full shade to open vegetation (Manner 2011; Randall 2012). Based on this information, it is clear that *X. sagittifolium* is very common in the village of Namo Suro Baru, and its abundance is very likely to be exploited further.

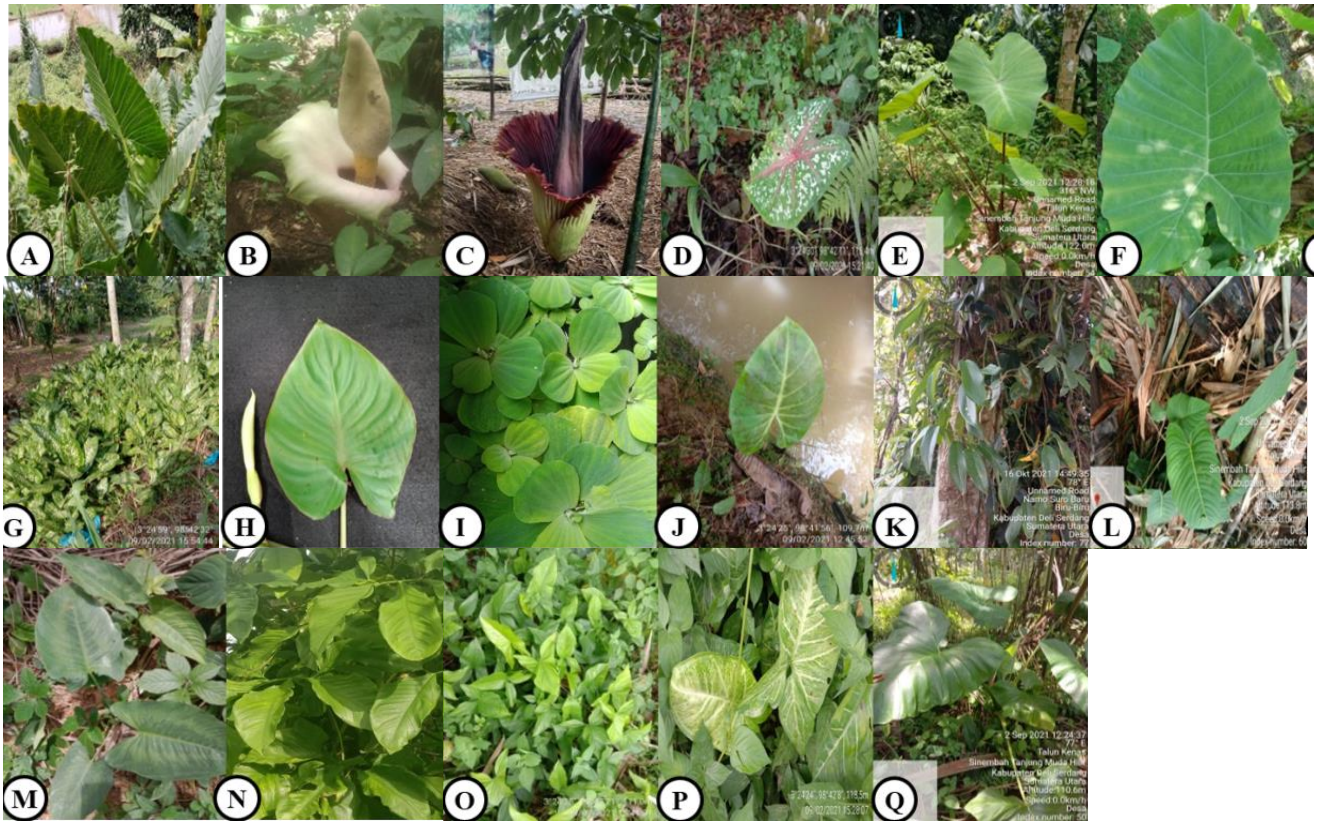

Figure 2. A. *Alocasia odora* (G.Lodd.) Spach, B. *Amorphohallus prainii* Hook.f., C. *Amorphohallus titanum* (Becc.) Becc., D. *Caladium bicolor* Aiton (Vent.), E. *Colocasia esculenta* (L.) Schott, F. *Colocasia gigantea* (Blume) Hook.f., G. *Dieffenbachia seguine* (Jacq.) Schott, H. *Homalomena pendula* (Blume) Bakh.f., I. *Pistia stratiotes* L., J. *Remusatia vivipara* (Roxb.) Schott, K. *Rhapidophora* sp., L. *Schismatoglottis calyptrata* (Roxb.) Zoll. & Moritzi, M. *Schismatoglottis wongii* A.Hay, N. *Syngonium auritum* (L.) Schott, O. *Syngonium macrophyllum* (L.) Schott, P. *Syngonium podophyllum* Schott, and Q. *Xanthosoma sagittifolium* (L.) Schott

The utilization of Araceae by the local people can be summarized into four categories, i.e., feed, food, medicine, and ornamental plants (Table 2). In Table 3, some information on the medicinal aspects of reported Araceae was collected prior to this research. The results showed that the practical use of documented Araceae by the local community in the village of Namo Suro Baru is still limited, including information on health benefits. Additionally, only one species, *Colocasia gigantea*, has been identified for its ability to treat diabetics. *Colocasia gigantea* has been reported to have antidiabetic activity in addition to antidiarrheal, antimicrobial, and antioxidant properties based on its phytochemical content (Alam et al. 2021). Aththorick and Berutu (2018) mentioned other health benefits of *C. gigantea* as a treatment for skin sensitivity after drug therapy by the Karonese people, in North Sumatra. In contrast, a study by Liu et al. (2017) concluded that the tubers of *C. gigantea* are toxic and should not be consumed by humans. Based on the knowledge of species use, the majority of Araceae plants were mainly recognized as ornamental plants (12 out of 19) by the local community. The ornamental species are simply planted as decorative plants in the gardens, regardless if they are obtained from the wild or cultivated for that purpose.

Table 1. Importance value index (IVI) of 17 aroid species in Namo Suro Baru Village, North Sumatra, Indonesia

Species	Density (ind/m^2)	Relative Density (%)	Frequency (N = 48)	Relative Frequency (%)	IVI (%)
Alocasia odora (G.Lodd.) Spach	613	2.96	9	5.73	8.69
Amorphohallus prainii Hook.f.	142	0.69	3	1.91	2.60
Amorphohallus titanum (Becc.) Becc.	1415	6.83	18	11.46	18.30
Caladium bicolor Aiton (Vent.)	3207	15.49	20	12.74	28.23
Colocasia esculenta (L.) Schott	1651	7.97	18	11.46	19.44
Colocasia gigantea (Blume) Hook.f.	613	2.96	9	5.73	8.69
Dieffenbachia seguine (Jacq.) Schott	47	0.23	1	0.64	0.86
Homalomena pendula (Blume) Bakh.f.	707	3.41	5	3.18	6.60
Pistia stratiotes L.	1179	5.69	1	0.64	6.33
Remusatia vivipara (Roxb.) Schott	1084	5.24	9	5.73	10.97
Rhapidophora sp.	1179	5.69	1	0.64	6.33
Schismatoglottis calyptrata (Roxb.) Zoll. & Moritzi	189	0.91	9	5.73	6.65
Schismatoglottis wongii A.Hay	943	4.55	9	5.73	10.29
Syngonium auritum (L.) Schott	1226	5.92	13	8.28	14.20
Syngonium macrophyllum (L.) Schott	471	2.28	3	1.91	4.19
Syngonium podophyllum Schott	566	2.73	7	4.46	7.19
Xanthosoma sagittifolium (L.) Schott	5471	26.43	22	14.01	40.44
Total	20,703	100.00	157	100	200.00

Table 2. List of Araceae species used by the local community in Namo Baru Suro Village, North Sumatra, Indonesia. N/A = Not available

Scientific name	Local names	Usage categorization	Technical usage/ Information
Alocasia odora	*Bira*	Feed	Whole leaves are chopped and boiled for pig feed
Amorphophallus prainii	*Bunga bangkai putih*	N/A	It is a protected species
Amorphophallus titanum	*Bunga bangkai*	N/A	It is s a protected species
Caladium bicolor	*Bunga keladi bintik putih*	Ornamental plant	It is planted as an ornamental plant in housing
Colocasia esculenta	*Bira*	Feed	Whole leaves are chopped and boiled for animal feed
Colocasia gigantea	*Sukat bewan*	Feed, food, medicine	Tubers are chopped and boiled for human consumption and to treat diabetes Whole leaves are chopped and boiled for animal feed
Dieffenbachia seguine	*Bunga keladi putih*	Ornamental plant	It is planted as an ornamental plant in housing
Homalomena pendula	*Bunga keladi*	Ornamental plant	It is planted as an ornamental plant in housing
Pistia stratiotes	*Kiambang*	Ornamental plant	It is planted on the surface of fish pond
Remusatia vivipara	*Sukat air*	Feed, food	Tubers are chopped and boiled for animal feed and human consumptiosn
Rhapidophora sp.	*Bunga keladi*	Ornamental plant	It is planted as an ornamental plant in housing
Schismatoglottis calyptrata	*Bunga keladi*	Ornamental plant	It is planted as an ornamental plant in housing
Schismatoglottis wongii	*Keladi ekor lele*	Ornamental plant	It is planted as an ornamental plant in housing
Syngonium auritum	*Bunga syngonium*	Ornamental plant	It is planted as an ornamental plant in housing
Syngonium macrophyllum	*Bunga syngonium*	Ornamental plant	It is planted as an ornamental plant in housing
Syngonium podophyllum	*Bunga syngonium putih*	Ornamental plant	It is planted as an ornamental plant in housing
Xanthosoma sagittifolium	*Sukat*	Food	Tubers are chopped and boiled for human consumption

Table 3. List of other ethnobotanical reports mentioning the aroid species found in Namo Suro Baru Village, North Sumatra, Indonesia. N/A = Not available

Scientific name	Region	Country	Technical usage/ Information	References
Alocasia odora	Asia	China	Rhizomes are processed to treat abdominal pain, cholera, and hernia; It is commonly planted as an ornamental plant indoors and outdoors	Liu et al. (2014)
Amorphophallus prainii	N/A	N/A	N/A	N/A
Amorphophallus titanum	N/A	N/A	N/A	N/A
Caladium bicolor	Africa	Cameroon	Leaves and tubers are boiled then the decoction is consumed to treat vaginal inflammation	Jiofack et al. (2009)
		Nigeria	Leaves with fresh tubers of *Dioscorea dumetorum*, *Xanthosoma sagittifolium*, and Nigerian black soap (*Pterocarpus Osun*) are milled together and used for bathing in a flowing river. The formulation is believed to conquer enemies	Sonibare and Abegunde (2012)
	South America	Guyana	Tubers are pounded with hunted animals and rubbed on a hunter's body as a ritual or hunting charm	van Andel et al. (2015)
		Peru	Dewdrops are used to treat face dermatosis. Leaves are infused for steam baths to relieve fatigue. Tubers are grafted into a poultice to heal snakebite	Odonne et al. (2013)
Colocasia esculenta	Asia	India	Whole plant is cooked to release mucilage for the nervine tonic. Leaves are crushed into juice and consumed as appetizers, astringents, expectorants, and stimulants. The decoction is used to treat diarrhea, etc	Prajapati et al. (2011)
		Indonesia	Whole plant is boiled in water and consumed by the Dayak community in West Kalimantan to treat high blood pressure	Supiandi et al. (2019)
Colocasia gigantea	Asia	China	Fresh leaves are given as pig feeds to deter intestinal parasites	Liu et al. (2014)
			Tubers are inedible due to their toxicity to humans and potential as insecticides	Liu et al. (2017)
		Indonesia	Tubers are consumed to relieve drug itching	Aththorick and Berutu (2018)
		Thailand	Petioles are edible and consumed by people	Pholhiamhan et al. (2017)
Dieffenbachia seguine	Africa	Nigeria	Planted as an ornamental to ward off mystical things, for example, evil eye	Castro et al. (2016)
	Asia	Myanmar	Leaves are processed as an ointment to treat skin ulcers	Kyaw et al. (2021)
	South America	Suriname	Leaves are inedible and poisonous, sometimes mistaken for the edible *Colocasia esculenta*	van Andel et al. (2018)
Homalomena pendula	Asia	Bangladesh	Leaves are juiced and consumed to treat hemorrhoids	Uddin et al. (2014)
Pistia stratiotes	Africa	Nigeria	Leaves and roots are boiled together with *Nymphaea lotus* in corn water and applied topically to treat breast and skin cancer	Afolayan et al. (2020)
		Togo	Whole parts are prepared into decoction and orally administered to treat malaria	Koudouvo et al. (2011)
	Asia	Pakistan	Leaves are crushed and used as an ointment for injured areas, for example, arthritis, inflammation, and skin diseases.	Ikram et al. (2014)
Remusatia vivipara	Asia	India	Tubers along with *Curcuma longa* fruits are crushed and boiled in coconut oil then poured into the ears to cure the infection.	Bhat et al. (2012)
			Tubers are made into a paste and then applied to the joint to cure pain	Kambe et al. (2014)
			Tubers are made in various forms (paste and boiled) and then applied to the skin to cure various diseases etc. breast tumors, itching, and physical injuries	Shanavaskhan et al. (2012)
Schismatoglottis calyptrata	Asia	Indonesia	Sap is used to treat physical injuries	Royyani and Efendy (2015)
	Oceania	New Guinea	Leaves are heated and applied topically to treat various skin diseases	Koch et al. (2015)
Schismatoglottis wongii	N/A	N/A	N/A	N/A
Syngonium auritum	Caribbean Sea	Jamaica	It is claimed as an ethnomedicinal plant but no further information is provided	Picking et al. (2015)
Syngonium macrophyllum				

Syngonium podophyllum	Asia	Bangladesh	Leaves juice is orally administered to cure influenza and pneumonia	Tsannun et al. (2015)
		Indonesia	Leaves are prepared for decoction and used as an antidote	Gailea et al. (2016)
	South America	Ecuador	Latex is prepared into an ointment to relieve physical injuries	Doyle et al. (2016)
Xanthosoma sagittifolium	Africa	Cameroon	Leaves are chopped and macerated then the liquid is applied to the skin as body care	Fongnzossie et al. (2017)
		Nigeria	Tubers mixed with *Dioscorea dumetorum*, *Caladium bicolor* (leaves), and Nigerian black soap (*Pterocarpus osun*) are milled together and used for bathing in a flowing river. The formulation is believed to conquer enemies	Sonibare and Abegunde (2012)
	Asia	Bangladesh	Rhizomes and leaves are applied to the itchy skin, rheumatic pain, and wounds	Alam et al. (2022)
			Cooked leaves are consumed to treat diabetes	Uddin et al. (2019)
		Indonesia	Tubers are boiled and consumed to treat hypertension	Supiandi et al. (2021)
	South America	Peru	Tubers are minced into a poultice to relieve inflammation	Odonne et al. (2013)
			Leaves are prepared into a decoction and used for wound healing	Roumy et al. (2020)

Similar prospects were also acknowledged by Yuzammi (2018), who documented some Araceae in Bogor Botanic Gardens, Indonesia, for example, *Alocasia*, *Aglaodorum*, *Aglaonema*, etc. Mutaqin et al. (2018) also reported the dominant utilization of aroids as ornamental plants in Cisoka Village, West Java, Indonesia, with the genera of *Aglaonema*, *Anthurium*, *Caladium*, *Dieffenbachia*, *Philodendron*, *Spatiphyllum*, and *Syngonium*. In a more recent study, Ramli et al. (2021) reported some ornamental aroids in Masjid Ijok Village, Malaysia, such as *Alocasia macrorrhiza*, *A. sanderiana*, *Caladium bicolor*, *C. humboldtii*, *C. lindenii*, and *Dieffenbachia maculate*.

Meanwhile, the dominant species of the site, *X. sagittifolium*, is consumed as an additional food due to its palatable tuber. According to the Food and Agriculture Organization (FAO), *Xanthosoma sagittifolium* is one of the six most important root and tuber crops, and it is primarily cultivated as a staple crop by most communities in Africa, Asia, and Oceania (Obakye et al. 2018). The utilization is also reported by Mutaqin et al. (2018) for *talas Padang* (*X. sagittifolium*) that was consumed by the local community through a series of traditional processing such as boiled, fried, salted, steamed, and sweetened. Subsequently, each community has its method of processing Araceae tubers, which are rarely eaten raw due to the presence of raphides (calcium oxalate crystals) that can cause irritation and itching (Chairiyah et al. 2016). The local community has recognized two species, *Amorphophallus prainii*, and *Amorphophallus titanum*, as endangered and in need of conservation, even though they only bloom during certain times of the year and without any information on their utilization. Information on the diversity of wild Araceae collected during this research may lead to the cultivation of certain species, which may be economically and socially beneficial. Furthermore, the information summarized in this research about the traditional use of Araceae from other regions is expected to be shared with local communities to increase knowledge about other aspects of their use.

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