



Suweg (*Amorphophallus paeoniifolius*) in Jawa, Indonesia: an ethnobotanical appraisal of its past and present as a traditional and functional food

Ina Erlinawati, Ni Putu Sri Asih, Yuzammi, Lulut Dwi Sulistyaningsih, Alex Sumadijaya, Himmah Rustiami, Marlina Ardiyani, I Putu Gede P. Damayanto, Joko Ridho Witono, Ary Prihardhyanto Keim, Rayhannisa, Muhammad Azli Ritonga, Tri Handayani, Julisasi T. Hadiah

Correspondence

Ina Erlinawati^{1*}, Ni Putu Sri Asih^{1,2}, Yuzammi¹, Lulut Dwi Sulistyaningsih¹, Alex Sumadijaya¹, Himmah Rustiami¹, Marlina Ardiyani¹, I Putu Gede P. Damayanto¹, Joko Ridho Witono¹, Ary Prihardhyanto Keim¹, Rayhannisa^{1,2}, Muhammad Azli Ritonga¹, Tri Handayani³, Julisasi T. Hadiah¹

¹Herbarium Bogoriense, Research Center for Biosystematics and Evolution, National Research and Innovation Agency, Jln. Raya Jakarta-Bogor Km 46, Cibinong, Bogor 16911, Indonesia

²Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Indonesia. Kampus UI Gedung E Level 2, Jln. Lingkar Kampus Raya, Pondok Cina, Beji, Depok 16424, Indonesia

³Research Center for Applied Botany, National Research and Innovation Agency, Indonesia. Jln. Raya Jakarta-Bogor Km 46, Cibinong, Bogor 16911, Indonesia

*Corresponding Author: inae001@brin.go.id

Ethnobotany Research and Applications 35:56 (2026) - <http://dx.doi.org/10.32859/era.35.56.1-17>

Manuscript received: 13/05/2026 - Revised manuscript received: 15/09/2026 - Published: 16/09/2026

Research

Abstract

Background: **Suweg** is a local common name of *Amorphophallus paeoniifolius* (Dennst.) Nicolson in Jawa, Indonesia. The species is distributed throughout Jawa and the surrounding islands and grows in moist environments and is commonly planted in home gardens or forest edges. However, it is an underutilized tuber crop that has long been embedded in tradition of Javanese culinary and is undergoing a quiet renaissance as a functional food with promising health benefits.

Methods: This study employed a multidisciplinary approach by combining literature review, ethnobotanical survey, as well as propagation practices. Ethnobotanical data were collected using a semi-structured purposive sampling method, including interviews with farmers, elementary school teachers, government officers, housewives, food artisans, and elder members of the communities of the major ethnic groups in Jawa. In addition, food processing techniques are described here.

Results: Our study traces the historical role of **suweg** in local diet and evaluates its potential for modern food innovation. A number of literature states that the tuber is edible after steaming and frying. Meanwhile, leaves have multi-purpose, such as vegetables, cattle and fish fodder, and natural disinfectant for fishponds. Our findings highlight that the tuber of **suweg** can be developed to higher economic raw material after being processed into flour, due to high concentration of

carbohydrate, which serves as a key ingredient in a wide range of processed food products. Thus, it has potential for development as a food source.

Conclusions: **Suweg** has been cultivated and consumed by the Javanese and Sundanese for centuries, mainly as a source of food. This article traces its role in local diets and evaluates its potential for modern food innovation.

Keywords: *Amorphophallus paeoniifolius*, culinary, ethnobotany, indigenous knowledge, Indonesia, Jawa, **suweg**

Background

Neglected and underutilized species (NUS) of tuber crops represent a largely untapped reservoir of dietary diversity and food-system resilience in the global tropics (Padulosi *et al.* 2013). In Indonesia, there are many species of native tubers with great nutritional potential. Their use, however, is still restricted because they need specific processing to deplete poison and itching substances, such as **gadung** (*Dioscorea hispida* Dennst.), **gembili** [*Dioscorea esculenta* (Lour.) Burkill], **uwi** (*Dioscorea alata* L.), **porang** (*Amorphophallus muelleri* Blume), **suweg** [*Amorphophallus paeoniifolius* (Dennst.) Nicolson], and **taka** [*Tacca leontopetaloides* (L.) Kuntze]. These tubers have great potential to support food security, but are less popular than the introduced species, such as sweet potato or cassava (Fatma *et al.* 2018, Erlinawati *et al.* 2023, Yonata *et al.* 2024, Putri *et al.* 2025).

The genus *Amorphophallus* is taxonomically diverse and economically significant in tropical Asia, such as *A. konjac* K.Koch (**konjak**), *A. muelleri* (**porang**), and *A. paeoniifolius* (**suweg**). **Konjak** is high in fiber and has been used to make a variety of food products, including noodles and tofu (Thanvi *et al.* 2025). **Porang**, meanwhile, has been used for generations as food and exported as raw materials for industry because it contains minerals, vitamins, lipids, proteins, carbohydrates, and dietary fiber (Hosiana *et al.* 2023). **Suweg** is one of the potential plants that has high nutrient content, such as carbohydrates, protein, vitamins, and minerals. It also possesses various health benefits, including antibacterial, antioxidant, antitumor, analgesic, and antidiarrheal due to the presence of phytochemicals (Shahbuddin *et al.* 2025).

As a member of the aroid family (Araceae), this species is widely distributed from Madagascar, eastwards via India to Malesia, southern China, Indochina, Polynesia, and northern Australia (Hettterscheid & Ittenbach 1996). In Indonesia, it is found across all main islands, from Sumatra to West Papua (Yuzammi *et al.* 2017). To date, there has been no convincing evidence to support the importance of *A. paeoniifolius* to the culture of the past. Various important plant species have been immortalized on 2,672 relief panels of the Borobudur temple in Jawa, which reflect their importance in the past life (Soekmono 1976, 2005, Fauziah *et al.* 2018, Metusala *et al.* 2020). Nonetheless, only a single member of Araceae has been found, the giant taro [*Alocasia macrorrhizos* (L.) G. Don]. Therefore, the question of the exact time when *A. paeoniifolius* was first cultivated in Jawa remains unanswered.

Prior to this study, the ethnobotany of **suweg** (*A. paeoniifolius*) in Jawa has been studied and documented well, such as by Heyne (1922), Ochse & Bakhuizen van den Brink Jr (1931), Croat (1982), Matthews (1995), Jansen *et al.* (1996), Mutaqin *et al.* (2020a, 2020b), and, quite recently, by Iskandar *et al.* (2022), who conducted research in Jawa and Kalimantan. This indicates that **suweg** has been an ethnobotanically important plant species, cultivated and harvested by traditional people.

Suweg, also known as the elephant foot yam, is notable for its large, rough, and irregularly ridged tuber. Its tall, mottled petiole supports a single umbrella-like leaf with numerous leaflets. At the same time, its inflorescence consists of a massive spadix enclosed by a purplish-brown spathe, often emitting a strong foul odor. The distinction between **suweg** and other ethnobotanical entities of the same species, one of them is **walur** (Figure 1), has long been debated and will be discussed in future study. **Suweg** remains culturally important as a traditional food source, whereas **walur** is less commonly cultivated (Widjaja & Lester 1987, Anil *et al.* 2023). Kloppenburg-Versteegh (1907) noted that while both were harvested by Javanese, Sundanese, and Balinese communities, **suweg** was regarded as a cultivated plant, whereas **walur** was considered a wild or semi-wild variant. Subsequent authors (Heyne 1922, Ochse & Bakhuizen van den Brink 1931) reinforced this view. The morphological description of **suweg** has been elaborated by Yuzammi (2000).

Although commonly referred to as "Java" in international literature, the use of the indigenous name of the island (Jawa) reflects the cultural, historical, and geographical context where **suweg** has long been cultivated and used in this region. In Jawa, this species is most deeply woven into the cultural fabric. Historically, **suweg** was a staple in rural kitchens and a symbol of resilience during times of scarcity, despite now being overshadowed by other commercial crops. Yet today, as the world turns its attention to sustainable, nutrient-rich, and culturally rooted foods, **suweg** is poised for a revival (Mutaqin *et al.*

2020a). The cultivation and utilization of **suweg** as a food source or during times of scarcity are predominantly practiced by elders. In the past, **suweg** has been consumed as a staple food by the majority of the population in Jawa, mainly during the prolonged dry season (Mutaqin *et al.* 2020b). Indeed, in the 1940s and 1950s, **suweg** was a staple food in Jawa, Lombok, Sumatra, and several areas in Sulawesi, due to the fact that the production of cereals (rice, corn, etc.) did not meet demand in those places. However, with the increase in rice production in 1960 as a result of the "green revolution", the importance of **suweg** and several other types of local carbohydrate-producing tubers, such as **gadung** (*Dioscorea hispida* Dennst.), **garut** (*Maranta arundinacea* L.), and *Xanthosoma* sp. had declined. Today, **suweg** is still used to a limited extent in some areas of Jawa despite people's knowledge about various aspects related to this commodity is decreasing (Sugiyama & Santosa 2008).

In the natural environment, the presence of **suweg** has been observed in areas characterized by the growth of large trees or shrubs. **Suweg's** optimal growth conditions include neutral soil pH (pH 6-7) and sandy, loose, nutrient-rich clay soil. The optimal temperature for the cultivation of **suweg** ranges from 20°C to 25°C (Handayani *et al.* 2012). **Suweg** exhibits a high degree of tolerance to climatic conditions. This species is capable of thriving in tropical and subtropical regions, at altitudes of up to 800 m asl. (Backer & Bakhuizen van den Brink Jr 1968, Hetterscheid & Ittenbach 1996).

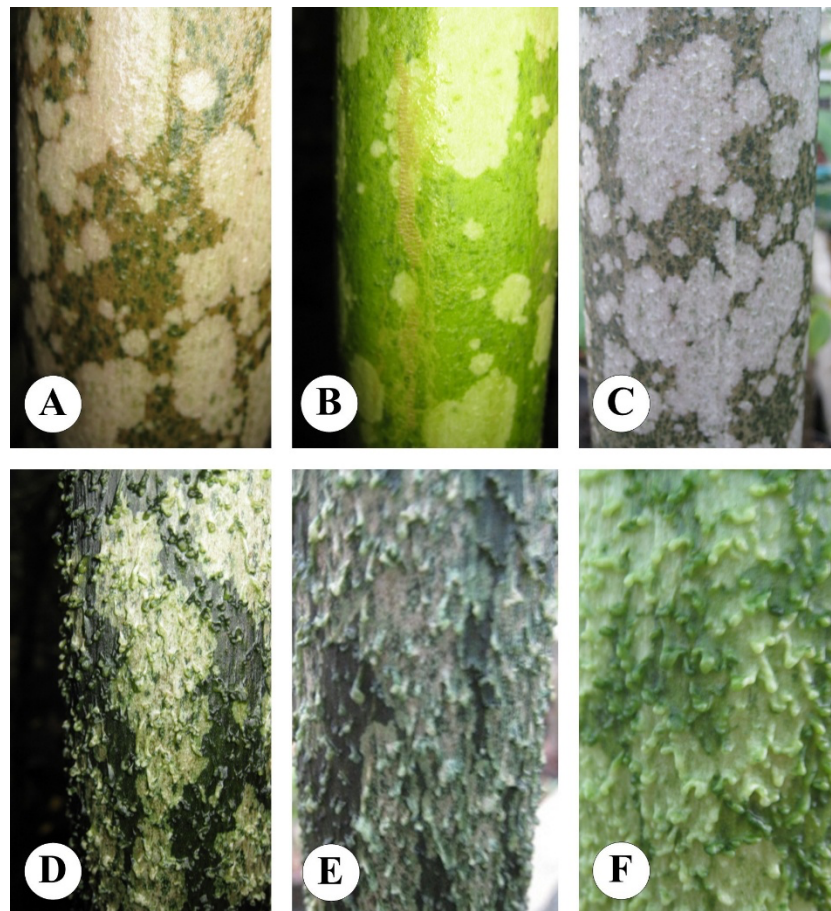


Figure 1. The morphological variation of the petiole in *Amorphophallus paeoniifolius* (A-C **suweg**, nearly smooth; D-F **walur**, rough). Photos: Yuzammi.

In Jawa, **suweg** has long been part of traditional food systems. It is boiled, steamed, or processed into flour, often serving as a substitute for rice or cassava during food scarcity in the dry season (Mutaqin *et al.* 2020a). Ethnobotanical studies emphasize its role in local food security strategies, especially in rural communities where it is grown in home gardens or agroforestry systems (Suhara & Widjaja 2000, Santosa *et al.* 2002b). Despite its availability, **suweg** is less commercially cultivated compared to **porang** (*A. muelleri*), which has strong industrial demand for glucomannan (Mutaqin *et al.* 2020b).

According to Santosa *et al.* (2003), revitalizing **suweg** cultivation could bolster Indonesia's food sources and strengthen resilience against climate change. Santosa *et al.* (2006) found that shading levels significantly affect growth and corm production of *Amorphophallus* species in Indonesia, with moderate shade providing optimal conditions. This highlights the importance of agroforestry systems and canopy management in maximizing productivity. Ethnobotanical surveys in West

Jawa highlight that while **suweg** is culturally important, its declining cultivation intensity suggests a need for policy and research support to reintroduce it into food diversification programs (Suhara & Widjaja 2000).

This article explores the journey of **suweg** across time-its long tradition in Javanese and Sundanese heritage, its emerging role as a functional food, and its untapped innovation potential, *i.e.* aim to reframe **suweg** not as a relic of the past, but as the present food. Despite being widely studied above, no comprehensive study has been conducted, particularly on the whole of Jawa. The term used in this article originated from the Indonesian word for the island, instead of the globally known Java.

Materials and Methods

Plant materials

There are two types of collection involved here; preserved herbarium specimens and living collections. Observations were conducted on preserved specimens deposited in the Herbarium Bogoriense (BO). For living collections, tubers of **suweg** were obtained from home gardens (Figure 2A) and local markets (Figure 2B) from various villages in Jawa (see ethnobotanical survey below), Indonesia. These tubers were planted as living collections at Bogor Botanical Garden. Identification was conducted by comparative assessment to descriptions in Hetterscheid & Ittenbach (1996) and Yuzammi *et al.* (2017). No herbarium specimens were generated from these living collections. Both living and preserved collections were georeferenced using GeoNames (<https://www.geonames.org/>) to generate a distribution map. All herbarium vouchers supporting ethnobotanical records are cited in the supplementary (Table S1).



Figure 2. Tuber of **suweg** had been collected from East Jawa, weighing around 20 kg (A) and **suweg** is a commodity that is rarely found in traditional markets (B). Photos: Joko Ridho Witono.

Ethnobotanical data collection

A preliminary investigation was undertaken to identify communities and markets where **suweg** remains in trade from local people. There were 34 field sites interviewed. In West Jawa, **suweg** was unavailable in the traditional markets, so no market was surveyed. This is in contrast to Central and East Jawa, where six traditional markets were surveyed after the interviews with local people. Consequently, the majority of market surveys were conducted in East Jawa (Figure 2B), covering traditional markets in Ngantang and Lawang (Malang Regency), Kandangan (Kediri Regency), and Batu (Batu City). The remaining ones are in Central Jawa, *i.e.* Beringharjo and Gamping traditional markets. In this context, we treat Yogyakarta, a distinctive administrative region as a part of Central Jawa in terms of geography. Participants represented Javanese and Sundanese ethnic groups. A purposive sampling method was used to target participants with direct experience of **suweg** cultivation, trade, or processing. Interviews with merchants, farmers, elementary school teachers, government officers, housewives, food artisans, and elder community members were conducted in Indonesian and, where appropriate, in the local language of the Javanese or Sundanese. Questions listed during the interview were as follows: 1. Is the interviewee familiar with **suweg**? 2. If so, do they use it in daily life? 3. How is **suweg** processed? 4. Is it cultivated? 5. Is it for sale? Interviews were recorded, transcribed, and analyzed thematically to document culinary uses, shifts in consumption patterns, and cultural significance (Adams 2015). All data collected during field surveys and desk study were analyzed descriptively. Free Prior

Informed Consent (FPIC) was obtained orally from all interviewees before data collection; no written record of consent was made.

Results and Discussion

Geographical distribution of suweg in Jawa

The distribution of **suweg** specimens across Jawa and its three satellite islands of Madura, Kangean, and Bawean is shown in Figure 3 based on herbarium collections (red circles), living collections (blue squares), as well as surveyed markets (yellow triangles) in East Jawa. The distribution of **suweg** is influenced by both ecological and anthropogenic factors. While the plant thrives in naturally moist environments, its presence is also shaped by local agricultural practices and conservation awareness. In some areas, **suweg** is planted in home gardens or forest edges, contributing to its persistence outside strictly wild habitats (Heyne 1922, Yuzammi *et al.* 2010).

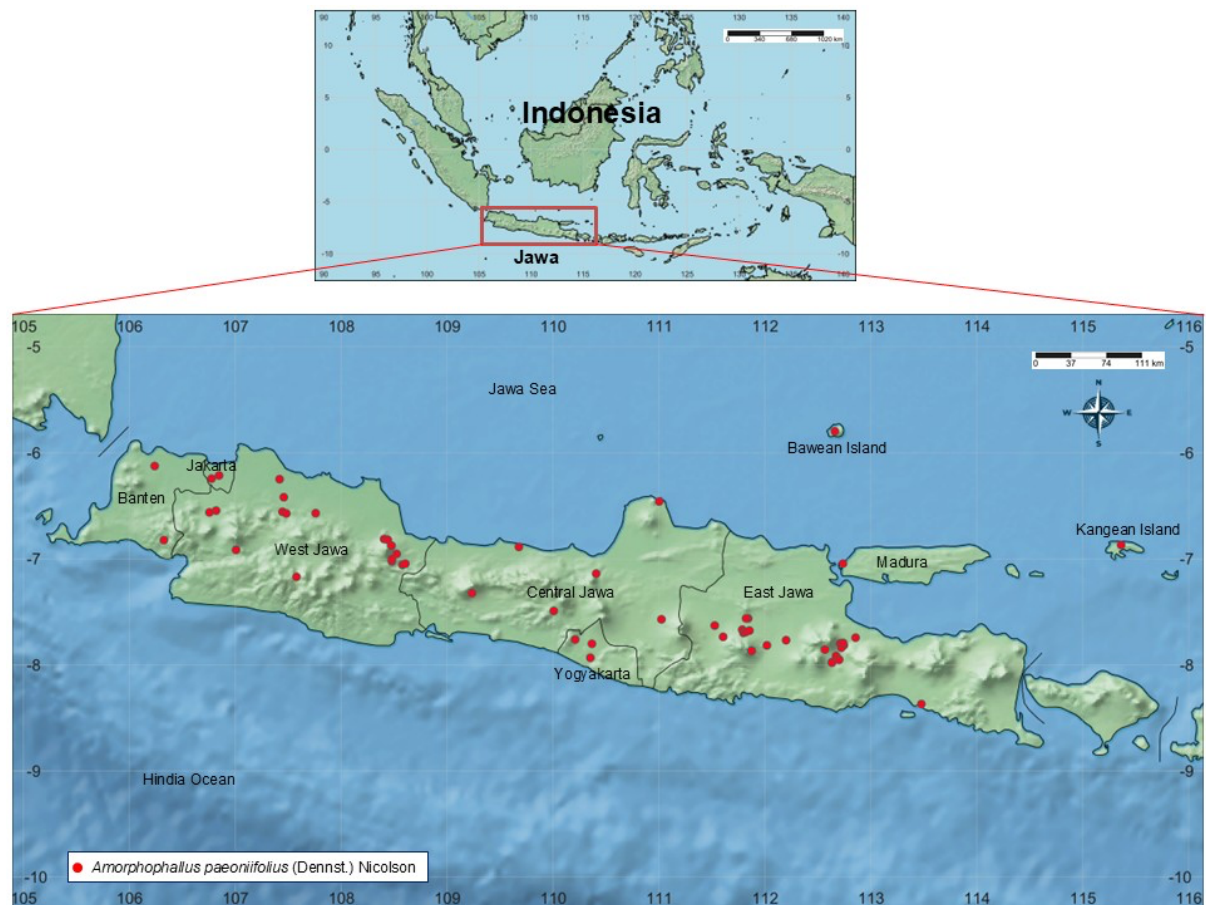


Figure 3. Distribution map of *Amorphophallus paeoniifolius* in Jawa and surrounding islands based on living (blue squares) in Bogor Botanical Garden and preserved collections (red circles) in Herbarium Bogoriense (BO), respectively. Yellow triangles show the markets surveyed for this study.

Utilisation of **suweg** across Jawa is demonstrated in Table 1, which exhibits the synthesis of available information, either from literature or new information generated from the interviews. A total of 39 interview participants (see Supplementary Table S2) were involved in this study, comprising 20 males (51.3%) and 19 females (48.7%). Participants ranged in age from 35 years to over 70 years, with the majority belonging to the 40-49-year age group (56.4%). Farmers constituted the largest occupational group (16 participants), followed by merchants (9 participants) and housewives (7 participants). The interviews were conducted across seven regions, with the highest number of participants coming from Kuningan (12 participants) and Yogyakarta (9 participants). The majority of sources of information of the utilization are literature (16) in contrast to interviews (8 records from interviews and personal communications) across four out of six provinces in Jawa. The distribution of data is skewed, with the majority of sources coming from Sundanese in West Jawa (9), whereas the rest came from Javanese that occupies Central Jawa (7), East Jawa (6), and Yogyakarta (2). The data is absent from two Provinces, Banten and Jakarta, which are assumed to be affected by heavy industrialization and urbanisation. The visual of ethnobotanical use

is exhibited on Figure 4. Rahayuningsih (2020) reported that *A. muelleri* (**porang**) has low market value and limited interest in Banten. This situation adds up and likely explains why **suweg** is not a prospective commodity in these areas.

Table 1. Utilization of **suweg** across provinces, districts, and ethnicities in Jawa from various sources.

Source	Province	Regency	Ethnicity	Plant parts used	Ethnobotanical uses	Type of evidence
Bintoro	Central Jawa	Magelang	Javanese	Tuber	Eaten after steaming	Personal communication
Martam	Central Jawa	Purworejo	Javanese	Tuber	Eaten after steaming	Personal communication
Edi Suroto	East Jawa	Pasuruan	Javanese	Tuber	Eaten after steaming	Personal communication
Matrani	East Jawa	Purwodadi	Javanese	Tuber	Eaten after steaming	Personal communication
Darman	West Jawa	Kuningan	Sundanese	Tuber	Eaten after steaming and frying	Field interview
Darman	West Jawa	Kuningan	Sundanese	Leaves	Used as fish fodder	Field interview
Eka Dewi	Yogyakarta	Kaliurang	Javanese	Tuber	Eaten after steaming and frying	Personal communication
Sudarsono	Yogyakarta	Kulonprogo	Javanese	Tuber	Eaten after steaming and frying	Personal communication
Dinalhaq <i>et al.</i> 2023	Central Jawa	Kendal	Javanese	Tuber	Eaten after frying	Literature record
Dinalhaq <i>et al.</i> 2023	Central Jawa	Kendal	Javanese	Tuber	Eaten after boiling to be kolak	Literature record
Dinalhaq <i>et al.</i> 2023	Central Jawa	Kendal	Javanese	Leaves	Eaten as vegetables (oblok-oblok)	Literature record
Dinalhaq <i>et al.</i> 2023	Central Jawa	Kendal	Javanese	Tuber	Used in traditional ceremonies known as mitoni	Literature record
Santosa <i>et al.</i> 2002b	Central Jawa	NA	Javanese	Immature leaves	Eaten as vegetables	Literature record
Santosa <i>et al.</i> 2002b	East Jawa	NA	Javanese	Immature leaves	Eaten as vegetables	Literature record
Santosa <i>et al.</i> 2002b	East Jawa	NA	Javanese	Mature leaves	Used as fish fodder	Literature record
Santosa <i>et al.</i> 2002b	East Jawa	NA	Javanese	Mature leaves	Disinfectant for fishponds	Literature record
Santosa <i>et al.</i> 2002b	East Jawa	Kediri	Javanese	Tuber	Used as cattle fodder	Literature record
Fauziyah <i>et al.</i> 2025	West Jawa	Tasikmalaya	Sundanese	Tuber	Eaten after steaming	Literature record
Mutaqin <i>et al.</i> 2021	West Jawa	Majalengka	Sundanese	Tuber	Eaten after steaming and frying	Literature record
Mutaqin <i>et al.</i> 2021	West Jawa	Majalengka	Sundanese	Leaves & petioles	Used as fish fodder	Literature record

Source	Province	Regency	Ethnicity	Plant parts used	Ethnobotanical uses	Type of evidence
Santosa <i>et al.</i> 2002b	West Jawa	NA	Sundanese	Mature leaves	Used as fish fodder	Literature record
Santosa <i>et al.</i> 2002b	West Jawa	NA	Sundanese	Mature leaves	Disinfectant for fishponds	Literature record
Santosa <i>et al.</i> 2002b	West Jawa	Kuningan	Sundanese	Tuber	Used as pig fodder	Literature record
Santosa <i>et al.</i> 2002b	West Jawa	Kuningan	Sundanese	Leaves	Used as pig fodder	Literature record

Notes: NA = regency not specified in the source. Evidence types: field interview = direct interview conducted during this study; personal communication = information provided by informants outside a formal interview setting; literature = published or grey literature source. Interviews were conducted in Indonesian and local languages (Javanese or Sundanese).

Four texts synthesized here cover the whole island of Jawa. Santosa *et al.* (2002b) has the most extensive survey in West, Central, and East Jawa. Mutaqin *et al.* (2021) and Fauziyah *et al.* (2025) only focus on West Jawa. Meanwhile, Dinalhaq *et al.* (2023) exclusively explain Central Jawa. All information for Yogyakarta is derived from the interviews conducted.

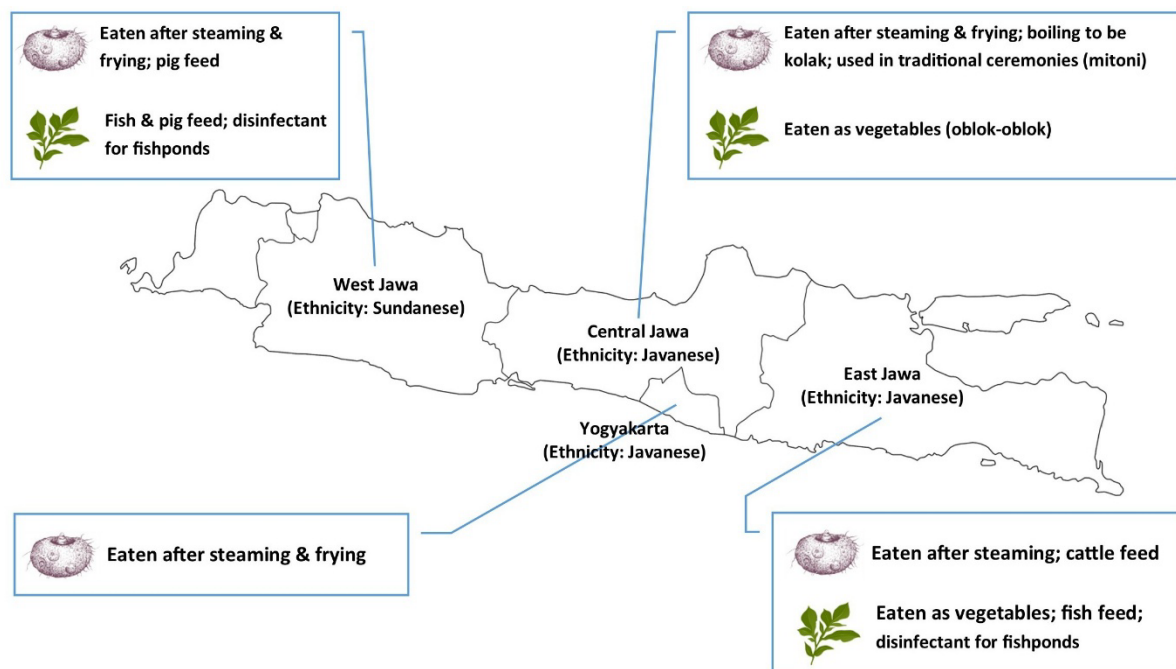


Figure 4. The map of the utilization of *suweg* across the island of Jawa according to different provinces.

In West Jawa, *suweg* has been documented in areas such as the Cimanuk Watershed and the slopes of Mount Ciremai. Ethnobotanical surveys in Majalengka Regency, particularly in villages such as Cisoka, reveal that the plant is not only cultivated for its edible tuber but also maintained as part of traditional knowledge systems (Mutaqin *et al.* 2020b). These communities often integrate *suweg* into mixed cropping systems, reflecting its adaptability and cultural significance. The use of *suweg* tubers as a snack has been reported by several researchers such as Santosa *et al.* (2002a), Kumar *et al.* (2015), Singh *et al.* (2016), and Mutaqin *et al.* (2020b). The inhabitants of Kuningan primarily utilize *suweg* tubers as a form of sustenance, predominantly as a snack, particularly during the lean season. The processing method employed in this instance is conventional, involving the use of steam to tenderize the tubers (Figure 5A). Following the completion of the cooking process, the food is consumed by pouring a mixture of salt and grated coconut. In certain instances, the tubers are utilized in the preparation of Indonesian sweet soup in coconut milk. During observation in Longkewang Village, people also used the leaves of *suweg* as fish fodder (Figure 5B). Mutaqin *et al.* (2020b) also reported that *suweg* leaves are used as fish fodder in Cisoka Village, Majalengka Regency.

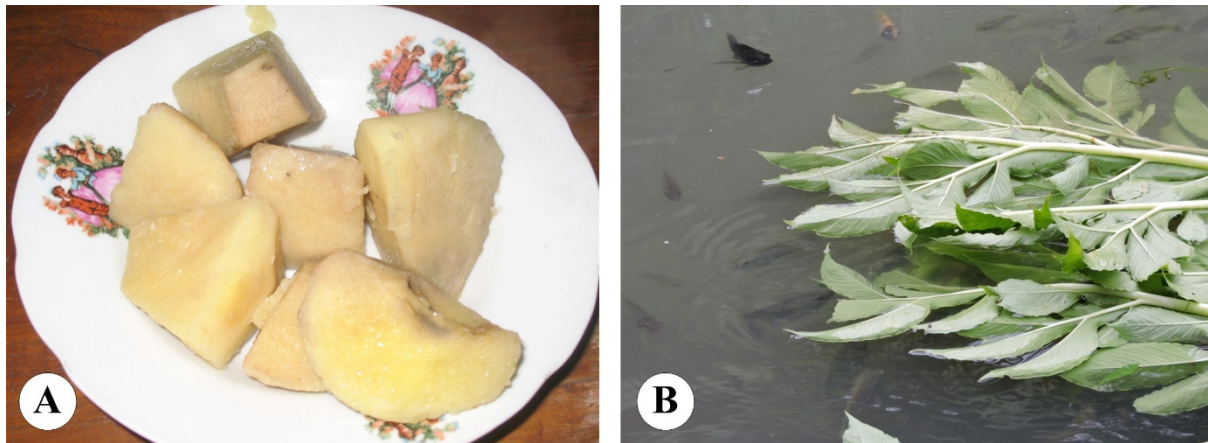


Figure 5. Boiled **suweg** tubers are commonly consumed by Javanese people particularly during food scarcity (A) and the leaf of **suweg** is used for feeding fish in Kuningan Regency (B). Photos: Joko Ridho Witono (A) and Yuzammi (B).

West Jawa shares something in common for **suweg** utilisation with Central Jawa. This species is used for personal needs and is not treated as a commodity. In Yogyakarta, local people consume it as a snack. In East Jawa, the local community uses **suweg** for domestic needs, and for some of them to leverage their livelihood. In East Jawa itself, research for **suweg** is rarely conducted because the primary focus is on porang studies. In East Jawa, the cultivation of **suweg** is conducted due to suitable climate conditions coupled with a low economic situation. A study of the ethnobotany of **suweg** in several regencies (Malang, Pasuruan, Kediri, and Nganjuk) in East Jawa revealed that the knowledge of this plant is limited to elders because younger generations have little to no interest in it.

In East Jawa markets, **suweg** is sold in limited quantities (only a single tuber is found in each market) at a price ranging from Rp 5,000 to Rp 25,000 per tuber, depending on the size of the tuber. Based on information from residents, **suweg** can be divided into two types based on locations, namely **suweg lumpang** (the majority of the collection) and **suweg emprit**, on the other hand, which is collected from Kuncir Hamlet, Kuncir Village, Ngetos District, Nganjuk Regency, East Jawa. The difference between the two is in the size of the tubers. **Suweg lumpang** tubers can weigh more than 15 kg, while **suweg emprit** tubers weigh only about 3 kg.

Another example of a traditional Javanese dish (from Central and East Jawa) is **oblok-oblok**, consisting of vegetables cooked in coconut milk. The main ingredients typically include boiled cassava leaves, papaya leaves, or **suweg** leaves, mixed with grated young coconut. It is often supplemented with anchovies, **tempe semangit** (overripe fermented tempeh), or **lamtoro** seeds. **Suweg**, as an alternative of pumpkin, is an ingredient used with banana, sweet potato, cassava, and sugar palm fruit (**kolang-kaling**) mixed with coconut milk, palm sugar, and pandan leaves boiled together to make **kolak** (Dinalhaq *et al.* 2023). **Kolak** is a traditional Indonesian dessert or **takjil** (a snack commonly consumed early to break the fasting during Ramadhan).

Propagation techniques

Suweg propagation can be undertaken according to either of two approaches: the conventional or the modern technique. Propagation of this species is facilitated by seeds or through offshoots attached to the primary tuber. The propagation of **suweg** through conventional techniques can be achieved by employing either vegetative or generative methods. Local communities propagate **suweg** using tubers as a vegetative method. The harvested tubers are replanted in an inverted position to promote faster growth and to produce a greater number of shoots. This practice is based on the belief that reversing the tuber orientation stimulates more vigorous sprouting. This method has been successfully implemented in potatoes (Chethan *et al.* 2023). The vegetative parts of **suweg** plants that are suitable for propagation include the main tubers (Figure 6A-B), offset tubers (Figure 6C), and leaves (Figure 7A-D). Conversely, the generative components are typically derived from fruits (Figure 7E-F). This finding supports the assertion that **suweg** is a cultivated plant that has become naturalized in the wild, having initially escaped from gardens (Peter C. Boyce, pers. comm.).

In contrast, the generative method of **suweg** uses fruits. The fruits turn bright red and emit a distinctive odor that attracts animals, which play an important role as seed dispersal agents in the wild. For cultivation purposes, seeds extracted from fully ripe fruits are sown in a moist, nutrient-rich germination medium, such as sand or a mixture of soil, compost, and carbonized rice husk. Seed germination typically takes approximately two months for the development of a seedling (Figure

7F). Although this method is effective for producing large numbers of seedlings, plants grown from seeds require a longer time to reach harvestable size compared to vegetative propagation, and the characteristics of the offspring may differ from the parent plant (Yuzammi & Handayani 2019).

Processing suweg from raw material to product

In order to produce sufficient quantities of flour, the optimal time for harvesting the tubers is during dormancy after the vegetative period (3-6 months). The healthy tubers must first be thoroughly cleansed of soil by washing them with water. Subsequently, the tuber is peeled and cut into multiple smaller pieces. Subsequent to this, the sliced flesh tubers are subjected to a second rinse under running water to remove the slime. Once the tubers are slightly dry, they are grated to produce small, thin pieces, known as chips. These small, thin chips are spread over on a circular tray made of woven bamboo and are then left to dry over the course of one night. To obtain chips that are completely without moisture, it is possible to dry them under the sun or in an oven set at 60°C for approximately 40 hours. It is imperative that a regular test to break them is conducted in order to ensure that the chips are completely dry. It demonstrates that properly dry chips are easily broken, and there will be no visible moisture on the broken edges. The dried chips are then processed into flour by grinding them using a flour mill or a blender (Figure 8).



Figure 6. Conventional propagation of **suweg** using tubers (A-B) and offset tubers attached to the primary tuber (C). Photos: Tri Handayani (A) and Yuzammi (B-C).



Figure 7. Leaf cutting propagation of **suweg** using rachis sections (A-D) and generative propagation of **suweg** using fruits (E-F). Y-shaped leaf cuttings from rachis (A); cuttings planted in sterile sand medium in plastic cups covered with transparent plastic to maintain humidity (B); formation of small tubers from cuttings (C); rachis cuttings successfully developed into small plantlets (D); fruits (E); plantlets successfully raised from fruits (F). Photos: Yuzammi.

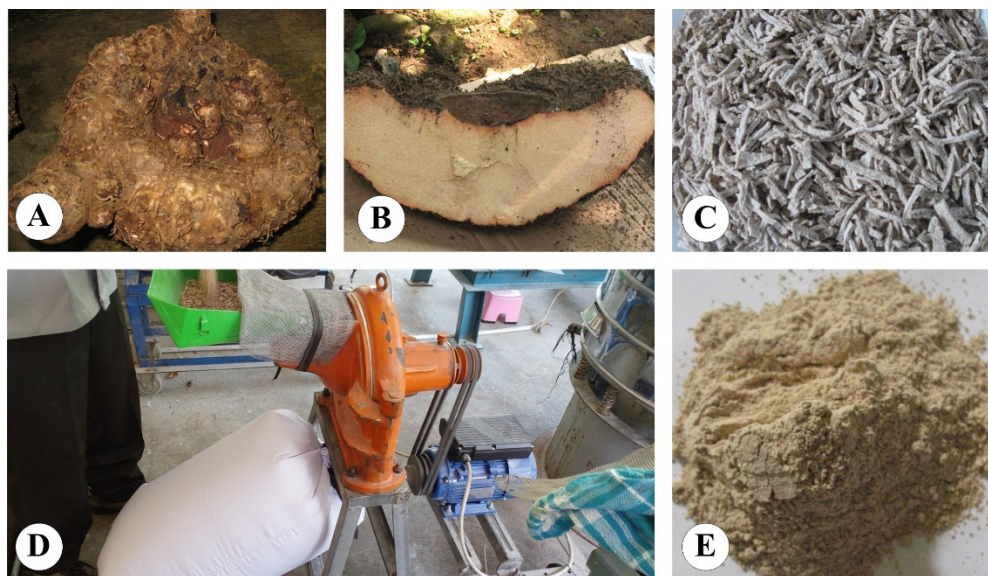


Figure 8. The tuber of **suweg** (A), a cross-section of **suweg** tuber, showing its flesh (B), dried chips (C), the flour mill machine (D), the flour of **suweg** (E). Photos: Yuzammi.

Innovative culinary applications made of suweg

Suweg tubers are a highly nutritious food source, rich in antioxidants, and can be used as functional foods. Furthermore, they can be developed to have higher economic value after being processed into **suweg** flour. The utilisation of **suweg** flour ensures enhanced longevity, ease of storage, optimised spatial efficiency, and expedited cooking times. **Suweg** flour is utilised in the production of diverse processed foods and other similar items (Yuzammi *et al.* 2014), including **onde-onde amor** (mix **suweg** and wheat flour 1: 1), brownish **amor**, cheese sticks **amor** (mix **suweg** and wheat flour 1: 2), **peyek amor** (mix **suweg** and rice flour 1: 2), **kembang goyang amor** (Figure 9) (Yuzammi *et al.* 2014). Processed foods are appealing because they are ready for the market. This will have a beneficial effect on the local community's economy, thereby gradually lifting the current perception of inferior food that is attached to **suweg**.



Figure 9. Variety of processed foodstuffs derived from **suweg** tuber: **onda-onda amor** (A); **brownish amor** (B); **cheese stick amor** (C); **peyek amor** (D); **kembang goyang amor** (E); **assorted cake amor** (F); **steamed suweg** (G). Photos: Yuzammi (A-E), Yupi Isnaini† (F), and I Gusti Made Sudirga (G).

Conclusion

Suweg is a promising but underutilized food resource in Jawa. A combination of literature study, interviews, and market surveys supports that it is a valuable candidate for strengthening local food security and reducing reliance on a limited number of staple crops. **Suweg** offers multiple functional benefits beyond human consumption. Propagation-wise, its tubers, leaves, and other plant parts can be used as food, livestock, and fish fodder. Processing **suweg** into flour increases its economic and practical value. Flour production improves shelf life, storage efficiency, transportability, and cooking convenience while creating opportunities for its incorporation into both traditional and modern food products. This can help transform **suweg** from a neglected crop into a culturally meaningful, economically valuable, and sustainable alternative food source in rural livelihoods of developing countries for the future.

Declarations

List of abbreviations: BO - Herbarium Bogoriense, BRIN - Badan Riset dan Inovasi Nasional (National Agency for Research and Innovation), NUS - Neglected and Underutilized Species, FPIC - Free Prior Informed Consent, GBIF - Global Biodiversity Information Facility.

Ethics approval and consent to participate: Ethical approval was not required under the institutional guidelines applicable to this study; nonetheless, the research followed the ethical and legal guidelines for research on traditional knowledge and the ethical principles of ethnobiological research. Free Prior Informed Consent (FPIC) was obtained orally from all participants before data collection. The study also adhered to the Nagoya Protocol on Access and Benefit Sharing, ensuring respect for indigenous knowledge and community rights.

Consent for publication: All the participants and their practices shown in images gave their direct consent to have the image in the paper and being published.

Availability of data and materials: The data supporting this article are provided in Supplementary Tables S1 and S2. Herbarium vouchers are deposited in Herbarium Bogoriense (BO) and the living collections are maintained at Bogor Botanical Garden, where they may be consulted on request.

Competing interests: The authors declare that they have no competing interests.

Funding: The authors received no specific funding for this work.

Author contributions: IE, NPSA, Y, LDS, AS, HR, MA, IPGPD, JRW, APK, R collected the data, analyzed, and wrote the text. TH provided the data; MAR & JTH wrote the text. All authors wrote the final version of the text.

Acknowledgements

We gratefully acknowledge the Director of Scientific Collection Management, Herbarium Bogoriense, National Research and Innovation Agency of Indonesia (BRIN), for granting access to herbarium specimens. We also thank Herbarium Naturalis Biodiversity Center (L), the Global Biodiversity Information Facility (GBIF), and JSTOR Global Plants for providing invaluable specimen and data resources. We acknowledge Peter C. Boyce, Martam, Matrani, Edi Suroto, Bintoro, Darman, Eka Dewi, and Sudarsono for the information provided; Yupi Isnaini†, Sri Wahyuni, and Herawati for the data provided; and I Gusti Made Sudirga for the image provided.

Literature cited

- Adams WC. 2015. Conducting semi-structured interviews. In: Newcomer KE, Hatry HP, Wholey JS (eds.) Handbook of Practical Program Evaluation, fourth edition. Jossey-Bass, A Wiley Imprint.
- Anil SR, Devi AA, Asha KI, Beevy SS, Siril EA. 2023. Intraspecific inflorescence and palynological variations in the morphotypes of *Amorphophallus paeoniifolius*. Genetic Resources and Crop Evolution 70: 1915-1927.
- Backer CA, Bakhuizen van den Brink Jr RC. 1968. Flora of Java 3:111-113. Wolters-Noordhoff NV, Groningen.
- Chethan CR, Tewari VK, Shrivastava AK, Nare B, Kumar SP, Dubey RP, Singh PK, Ghosh D, Chander S, Sreekanth D. 2023. Optimization of potato sprout orientation angle and effective weed management practice to produce higher economical tuber yield from cut tuber planting. Potato Research 66: 195-213.
- Croat TB. 1982. A study of Old World Aroids. Aroideana 5: 13-25.
- Dinalhaq PC, Wahidah BF, Miswari. 2023. Ethnobotany of suweg (*Amorphophallus paeoniifolius* (Dennst.) Nicolson) in Darupono Village, Kendal District. Al-Hayat: Journal of Biology and Applied Biology 6(2): 191-203.
- Erlinawati I, Rustiami H, Sinay H, Hastilestari R, Megawati. 2023. The diversity and distribution of tuber crops as alternative food in North Maluku: A preliminary report. AIP Conference Proceedings 2972: 030007.
- Fatma LY, Jumari, Utami S. 2018. Keanekaragaman *Dioscorea* spp dan habitatnya di Kabupaten Kudus, Jawa Tengah. Bioma: Berkala Ilmiah Biologi 20(1): 17-24.
- Fauziah, Yulistyarini MP, Lestari DA, Ariyanti EE, Metusala D, Damaiyani J, Patmiati, Matrani. 2018. Buku panduan wisata edukasi: Relief flora Candi Borobudur. Balai Konservasi Tumbuhan Kebun Raya Purwodadi Lembaga Ilmu Pengetahuan Indonesia, Purwodadi.
- Fauziyah NN, Hernawati D, Putra RR. 2025. Studi etnobotani tumbuhan famili Araceae di Desa Mertajaya, Kecamatan Bojongasih, Tasikmalaya. Bioma: Jurnal Biologi dan Pembelajaran Biologi 10(2): 143-157.
- Handayani T, Yuzammi, Isnaini Y, Siregar M, Witono JR, Sudarsono, Sutini. 2012. Modul pelatihan budidaya suweg. Pusat Konservasi Tumbuhan Kebun Raya Bogor, Lembaga Ilmu Pengetahuan Indonesia. (Unpublished Manuscript).
- Hettterscheid W, Ittenbach S. 1996. Everything you always wanted to know about *Amorphophallus*, but were afraid to stick your nose into!!!!. Aroideana 19: 7-131.
- Heyne K. 1922. De nuttige planten van Nederlandsch-Indië tevens synthetische catalogus der verzamelingen van het Museum voor Economische Botanie te Buitenzorg Vol. 1. Ruygrok, Batavia, Indonesia.
- Hosiana AM, Pinatih GNI, Laksemi DAAS. 2023. Beneficial health effects of porang (*Amorphophallus muelleri*): A review. Indonesia Journal of Biomedical Science 17(1): 235-238.
- Iskandar BS, Iskandar J, Suroso, Alfian RL, Mulyanto D. 2022. Non-edible plants traded in traditional markets of Beringharjo, Yogyakarta and Pasar Baru, East Kalimantan, Indonesia: The role of biocultural system. Biodiversitas Journal of Biological Diversity 23(9): 4657-4669.
- Jansen PCM, van der Wilk C, Hettterscheid WLA. 1996. *Amorphophallus* Blume ex Decaisne. In: Flach M, Rumawas F. (eds). Plant resources of South-East Asia no. 9: Plants yielding non-seed carbohydrates. Backhuys Publisher, Leiden, Netherlands, pp. 45-50.

- Kloppenburger-Versteegh J. 1907. Indische planten en haar geneeskracht. Masman & Stroink, Semarang.
- Kumar RPK, Kolli SK, Suneetha J, Hemanth G. 2015. Cultivation on *Amorphophallus paeoniifolius* (Dennst.) Nicolson (elephant foot yam) in Kuvvur Mandal of West Godavari District, Andhra Pradesh, India. International Journal of Current Research 7(5): 15549-15553.
- Matthews PJ. 1995. Aroids and the Austronesians. Tropics 4(2): 105-126.
- Metusala D, Fauziah, Lestari DA, Damaiyani J, Mas'udah S, Setyawan H. 2020. The identification of plant reliefs in the Lalitavistara story of Borobudur temple, Central Java, Indonesia. Biodiversitas Journal of Biological Diversity 21(5): 2206-2215.
- Mutaqin AZ, Kurniadie D, Iskandar J, Nurzaman M, Husodo T. 2021. Utilization and cultivation of Suweg (*Amorphophallus paeoniifolius* (Dennst.) Nicolson) in areas around Ciremai Mount, Cimanuk Watershed Region. E3S Web of Conferences 249: 03003.
- Mutaqin AZ, Kurniadie D, Iskandar J, Nurzaman M, Partasasmita R. 2020a. Ethnobotany of *Amorphophallus paeoniifolius*: Morphology, folk classification, and habitat in area around Mt. Ciremai, Cimanuk Watershed Region, West Java, Indonesia. Biodiversitas Journal of Biological Diversity 21(8): 3898-3909.
- Mutaqin AZ, Kurniadie D, Iskandar J, Nurzaman M, Partasasmita R. 2020b. Ethnobotany of suweg, *Amorphophallus paeoniifolius*: Utilization and cultivation in West Java, Indonesia. Biodiversitas Journal of Biological Diversity 21(4): 1635-1644.
- Ochse JJ, Bakhuizen van den Brink Jr RC. 1931. Vegetables of the Dutch East Indies (edible tubers, bulbs, rhizomes, and spices included). Department van Landbouw, Nijverheid en Handel, Archipel Drukkerij, Buitenzorg.
- Padulosi S, Thompson J, Rudebjer P. 2013. Fighting poverty, hunger and malnutrition with neglected and underutilized species. Bioversity International, Rome.
- Putri WE, Johannes E, Sjafaraenan. 2025. Tuber diversity of *Dioscorea hispida* from Muna Island, Indonesia, for potential microencapsulated bioherbicide agents. Asian Journal of Agriculture 9(1): 174-184.
- Rahayuningsih Y. 2020. Various internal and external factors and development strategy of porang (*Amorphophallus muelleri* Blume) in Banten Province. Jurnal Kebijakan Pembangunan Daerah 4(2): 77-92.
- Santosa E, Sugiyama N, Chozini MA, Lontoh AP, Sudiarto S, Kawabata S, Hikosaka S, Sutoro, Hidayat A. 2002a. Morphological and nutritional characterization of elephant foot yam in Indonesia. Japanese Journal of Tropical Agriculture 46(4): 265-271.
- Santosa E, Sugiyama N, Lontoh AP, Sutoro, Hikosaka S, Kawabat S. 2002b. Cultivation of *Amorphophallus paeoniifolius* (Dennst.) Nicolson in home gardens in Java. Japanese Journal of Tropical Agriculture 46(2): 94-99.
- Santosa E, Sugiyama N, Mine Y. 2003. Growth and corm production of *Amorphophallus muelleri* Blume and *A. paeoniifolius* (Dennst.) Nicolson in Indonesia. Japanese Journal of Tropical Agriculture 47(2): 102-109.
- Santosa E, Sugiyama N, Nakata M, Lee ON. 2006. Growth and corm production of *Amorphophallus* at different shading levels in Indonesia. Japanese Journal of Tropical Agriculture 50(2): 87-91.
- Shahbuddin D, Reddy M, Ridzuan R, Sjahril R. 2025. Botanical aspects, nutritional benefits and cultivation of elephant foot yam (*Amorphophallus paeoniifolius*). Malaysian Journal of Fundamental and Applied Sciences 21: 2423-2446.
- Singh A, Chaurasiya A, Mitra S. 2016. Assessment of nutritional composition in elephant foot yam (*Amorphophallus paeoniifolius* (Dennst.) Nicolson) cultivars. International Journal of Food Studies 5(2): 146-157.
- Soekmono R. 1976. Chandi Borobudur: A monument of mankind. UNESCO Press, Paris.
- Soekmono R. 2005. The restoration of Borobudur. The UNESCO Publication, Paris.
- Sugiyama N, Santosa E. 2008. Edible *Amorphophallus* in Indonesia: Potential crops in agroforestry. Gajah Mada University Press, Yogyakarta.
- Suhara L, Widjaja EA. 2000. Ethnobotany of *Amorphophallus* in West Jawa. Biodiversitas Journal of Biological Diversity 1(2): 65-72.
- Thanvi HA, Majhi S, Sunita K, Sharma BP, Rote K, Rout S, Das K. 2025. Food and medicinal aspects of *Amorphophallus* species. Journal of Biodiversity and Conservation 9(2): 244-252.
- Widjaja EA, Lester RN. 1987. Morphological, anatomical and chemical analyses of *Amorphophallus paeoniifolius* and related taxa. Reinwardtia 10(3): 327-340.
- Yonata D, Pranata B, Nurhidajah. 2024. Potential of neglected and underutilized tacca tuber (*Tacca leontopetaloides*) for sustainable food system in Indonesia. Journal of Global Innovations in Agricultural Sciences 12(3): 770-778.

- Yuzammi. 2000. A taxonomic revision of the terrestrial and aquatic aroids (Araceae) in Java. MSc thesis, University of New South Wales.
- Yuzammi, Handayani T. 2019. Stimulasi perakaran setek rakis suweg (*Amorphophallus paeoniifolius* (Dennst.) Nicolson) menggunakan Naphthalene Acetic Acid. Buletin Kebun Raya 22(2): 117-124.
- Yuzammi, Isnaini Y, Handayani T. 2014. Pengembangan dan pemanfaatan suweg berbasis kearifan lokal dalam upaya mendukung ketahanan pangan nasional. Prosiding Widyakarya Nasional Pangan dan Gizi X. Biro Kerjasama dan Pemasyarakatan Ilmu Pengetahuan dan Teknologi-LIPI, Jakarta, Indonesia.
- Yuzammi, Kurniawan A, Asih NPS, Erlinawati I, Hetterscheid W. 2017. The *Amorphophallus* of Indonesia. Center for Plant Conservation Botanic Gardens - LIPI, Bogor, Indonesia.
- Yuzammi, Siregar M, Witono JR, Sahromi. 2010. Nutrition properties and the prospect of six *Amorphophallus* species of tubers in Java. Proceeding of International Seminar Current Issues and Challenges in Food Safety: Science-Based Approach for Food Safety Management. SEAFast Centre, IPB, Bogor, Indonesia.

Supplementary Material

Table S1. Herbarium specimens (all deposited in Herbarium Bogoriense) for distribution record and living collections (all cultivated in Bogor Botanical Garden) for ethnobotanical record of *Amorphophallus paeoniifolius* examined in this study.

Collector(s) and collection number	Locality	Collection date
Herbarium for distribution record		
C. A. Backer 18223	East Jawa, Jember, Poeger [Puger]	28 December 1914
C. A. Backer 18374	East Jawa, Pasuruan, Kepuh	02 January 1915
C. A. Backer 19310	East Jawa, Bangkalan, Madoera [Madura]	26 February 1915
C. A. Backer 23280	Central Jawa, Pekalongan, Lebak Barang	12 January 1918
C. A. Backer 27237	East Jawa, Mamboerit [Mamburit], Kangean Islands	19 March 1919
C. A. Backer s.n.	Jakarta, Batavia, Kebajoran [Kebayoran]	NA
C. R. W. K. v. Alderwerelt van Rosenburgh vavr 326	Jawa (without specific location)	01 September 1920
C. R. W. K. v. Alderwerelt van Rosenburgh vavr 327	Jawa (without specific location)	01 September 1920
C. R. W. K. v. Alderwerelt van Rosenburgh vavr 328	Jawa (without specific location)	01 September 1920
C. R. W. K. v. Alderwerelt van Rosenburgh vavr s.n.	East Jawa, Kediri	NA
C. van Dillewijn 119	West Jawa, Purwakarta	20 December 1927
D. de Visser Smits s.n.	Djogja [Yogyakarta]	01 October 1917
E. A. Widjaja EAW 48	Central Jawa, Klaten, Mojogedang	07 March 1976
H. J. Coster s.n.	West Jawa, Tjibadak [Cibadak], Plaboean [Plabuan]	08 April 1905
J. G. B. Beumee 4573	West Jawa, Krawang [Karawang]	13 November 1919
J. G. B. Beumee s.n.	East Jawa, Madiun	23 April 1918
J. H. Coert s.n.	East Jawa, Kediri, Pare	01 December 1919
Leg. ign. s.n.	East Jawa, Bawean, Lango Sawah	NA
S. H. Koorders Kds 41662β	East Jawa, Pare, Gadoengan [Gadungan]	NA
S. H. Koorders Kds 41685β	West Jawa, Soebang [Subang]	NA
S. H. Koorders Kds 42450β	East Jawa, Pare, Gadoengan [Gadungan]	NA
S. H. Koorders Kds 42455β	West Jawa, Bogor, Citerep	15 December 1915
S. H. Koorders Kds 42723β	Jawa (without specific location)	NA
S. H. Koorders Kds 42855β	East Jawa, Pare, Gadoengan [Gadungan]	NA
S. H. Koorders Kds 43171β	East Jawa, Pare, Gadoengan [Gadungan]	NA
Living collection for distribution and ethnobotanical records		
J. R. Witono JW 377	Central Jawa, Banyumas Regency, Baturraden District, Kemutug Lor Village	27 July 2009
J. R. Witono JW 378	Yogyakarta Special Region, Kulon Progo Regency, Nanggulan District, Jatisarono Village	27 July 2009
J. R. Witono JW 383	East Jawa, Kediri Regency, Mojo District, Ampel Gading Village	01 August 2009
J. R. Witono JW 386	East Jawa, Madiun Regency, Dagangan District, Padas Village	03 August 2009
J. R. Witono JW 389	East Jawa, Madiun Regency, Dagangan District, Padas Village	03 August 2009
J. R. Witono JW 394	Yogyakarta Special Region, Kulon Progo Regency, Pengasih District, Karangsari Village	03 October 2010
J. R. Witono JW 395	East Jawa, Kediri Regency, Banyakan District, Parang Village	04 October 2010
J. R. Witono JW 397	East Jawa, Kediri Regency, Banyakan District, Parang Village	05 October 2010
J. R. Witono JW 402	East Jawa, Ponorogo Regency, Ngebel District, Wagir Lor Village	07 October 2010
S. Wahyuni YN 97	East Jawa, Pasuruan Regency, Purwodadi District, Lebakrejo Village	10 June 2011
S. Wahyuni YN 98	East Jawa, Pasuruan Regency, Purwodadi District, Cowek Village	10 June 2011
S. Wahyuni YN 99	East Jawa, Pasuruan Regency, Purwodadi District, Gajah Rejo Village	10 June 2011

Collector(s) and collection number	Locality	Collection date
S. Wahyuni YN 100	East Jawa, Pasuruan Regency, Purwodadi District, Gajah Rejo Village	10 June 2011
S. Wahyuni YN 101	East Jawa, Pasuruan Regency, Purwodadi District, Gajah Rejo Village	10 June 2011
S. Wahyuni YN 102	East Jawa, Malang Regency, Singosari District, Banjararum Village	11 June 2011
S. Wahyuni YN 103	East Jawa, Malang Regency, Pakis District, Asri Katon Village	11 June 2011
S. Wahyuni YN 104	East Jawa, Malang Regency, Pakis District, Asri Katon Village	11 June 2011
S. Wahyuni YN 105	East Jawa, Malang Regency, Lawang District, Sumberngepoh Village	11 June 2011
S. Wahyuni YN 106	East Jawa, Pasuruan Regency, Purwodadi District, Capang Village	11 June 2011
S. Wahyuni YN 107	East Jawa, Pasuruan Regency, Purwodadi District, Capang Village	11 June 2011
S. Wahyuni YN 108	East Jawa, Malang Regency, Batu Market	12 June 2011
S. Wahyuni YN 109	East Jawa, Malang Regency, Ngatang Market	12 June 2011
S. Wahyuni YN 110	East Jawa, Kediri Regency, Kandangan Market	12 June 2011
S. Wahyuni YN 111	East Jawa, Nganjuk Regency, Wilangan District, Mancon Village	13 June 2011
S. Wahyuni YN 112	East Jawa, Nganjuk Regency, Wilangan District, Sudimoro Harjo Village	13 June 2011
S. Wahyuni YN 113	East Jawa, Nganjuk Regency, Sawahan District, Siwalan Village	13 June 2011
S. Wahyuni YN 114	East Jawa, Nganjuk Regency, Sawahan District, Kebun Agung Village	13 June 2011
S. Wahyuni YN 115	East Jawa, Nganjuk Regency, Sawahan District, Kebun Agung Village	13 June 2011
S. Wahyuni YN 116	East Jawa, Nganjuk Regency, Ngetos District, Kuncir Village	13 June 2011
Yuzammi YI 1601	West Jawa, Kuningan Regency, Ciniru District, Longkewang Village	16 April 2016
Yuzammi YI 1625	West Jawa, Kuningan Regency, Maleber District, Maleber Village	17 April 2016
Yuzammi YI 1628	West Jawa, Kuningan Regency, Maleber District, Cicurug Village	17 April 2016
Yuzammi YI 1631	West Jawa, Kuningan Regency, Pesawahan District, Lebak Wangi Village	17 April 2016
Yuzammi YI 1634	West Jawa, Kuningan Regency, Pesawahan District, Padabeunghar Village	18 April 2016
Yuzammi YI 1637	West Jawa, Kuningan Regency, Pesawahan District, Singkup Village	18 April 2016
Yuzammi YI 1640	West Jawa, Kuningan Regency, Cigugur District, Ciparigi Village	18 April 2016
Yuzammi YI 1644	West Jawa, Kuningan Regency, Cilimus District, Bendorasa Village	19 April 2016
Yuzammi YI 1647	West Jawa, Kuningan Regency, Kuningan District, Cikubangsari Village	19 April 2016
Yuzammi YI 1650	West Jawa, Kuningan Regency, Kuningan District, Bubulak Village	19 April 2016
Yuzammi YI 1652	West Jawa, Kuningan Regency, Kuningan District, Cibinuang Village	19 April 2016

Notes: NA = Date not specified.

Table S2. Data of interviewed participants.

Gender	Age (years old)	Occupation	Location
Female	40	Merchant	Yogyakarta: Gamping Traditional Market, Sleman Regency
Female	45	Merchant	Yogyakarta: Gamping Traditional Market, Sleman Regency
Female	37	Merchant	Yogyakarta: Beringharjo Traditional Market
Female	40	Merchant	Yogyakarta: Beringharjo Traditional Market
Male	35	Village office staff	Yogyakarta: Pajangan District, Sendang Sari Village
Male	48	Head of the village	Yogyakarta: Pajangan District, Sendang Sari Village
Female	36	Elementary school teacher	Yogyakarta: Pajangan District, Sendang Sari Village
Female	42	Merchant	Yogyakarta: Candi Boko
Female	40	Merchant	Yogyakarta: Candi Borobudur
Male	45	Leader of farmer group	Kuningan: Ciniru District, Longkewang Village
Male	40	Farmer	Kuningan: Ciniru District, Longkewang Village
Male	50	Farmer	Kuningan: Maleber District, Maleber Village
Male	55	Farmer	Kuningan: Maleber District, Cicurug Village
Male	42	Farmer	Kuningan: Pesawahan District, Lebak Wangi Village
Female	48	Farmer	Kuningan: Pesawahan District, Padabeunghar Village
Male	50	Farmer	Kuningan: Pesawahan District, Singkup Village
Male	Over 50	Farmer	Kuningan: Cigugur District, Ciparigi Village
Male	43	Farmer	Kuningan: Cilimus District, Bandorasa Village
Female	50	Farmer	Kuningan: Kuningan District, Cikubangsari Village
Male	35	Farmer	Kuningan: Kuningan District, Bubulak Village
Male	38	Farmer	Kuningan: Kuningan District, Cibuuang Village
Female	40	Merchant	Kediri: Kandangan Traditional Market
Female	Over 60	Housewife	Nganjuk: Wilangan District, Ngudikan Village
Male	45	Farmer	Nganjuk: Wilangan District, Mancon Village
Female	Over 60	Housewife	Nganjuk: Wilangan District, Sudimoro Harjo Village
Male	Over 50	Farmer	Nganjuk: Sawahan District, Siwalan Village
Male	45	Farmer	Malang: Singosari District, Banjararum Village
Female	45	Housewife	Malang: Pakis District, Asri Katon Village
Female	35	Housewife	Malang: Lawang District, Sumberngepoh Village
Female	45	Merchant	Malang: Batu Traditional Market
Female	45	Merchant	Malang: Ngantang Traditional Market
Female	40	Housewife	Pasuruan: Purwodadi District, Lebak Rejo Village
Male	40	Government officer	Pasuruan: Purwodadi District, Cowek Village
Male	43	Government officer	Pasuruan: Purwodadi District, Gajarejo Village
Male	40	Government officer	Pasuruan: Purwodadi District, Capang Village
Male	Over 70	Farmer	Kulon Progo: Nanggulan District, Jatisarono Village
Female	60	Housewife	Kulon Progo: Nanggulan District, Jatisarono Village
Female	38	Housewife	Kulon Progo: Nanggulan District, Jatisarono Village
Male	40	Farmer	Kulon Progo: Nanggulan District, Jatisarono Village