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Ethnobotanical study of *sikkam* (*Bischofia javanica*) in Simalungun District, North Sumatra, Indonesia

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Abstract. *Rambey R, Panjaitan BP, Purba S, Zaitunah A, Rahmawaty, Sutomo, Saputra MH, Peniwidiyanti, Pardi F, Suratman MN, Ismail MH. 2025. Ethnobotanical study of* sikkam *(*Bischofia javanica*) in Simalungun District, North Sumatra, Indonesia. Biodiversitas 26: 2393-2401. Sikkam* or Java bishopwood (*Bischofia javanica* Blume) is a culturally significant plant traditionally utilized as both a medicinal resource and a culinary seasoning by the Simalungun community in North Sumatra, Indonesia. The ethnobotanical use of *B. javanica* was documented in this study by evaluating the utilized plant parts, associated disease treatments, methods of application and processing, traditional culinary uses, and descriptive insights into conservation knowledge and harvesting techniques of *B. javanica*. Quantitative ethnobotanical parameters, including Reported Use (RU) and Informant Consensus Factor (ICF), were also assessed based on information obtained from the Simalungun community in three villages: Pondok Buluh, Sipolha Harison, and Sirube Rube. Data were collected through semi-structured interviews with local knowledge holders, identified using a snowball sampling technique. The study recorded 14 traditional medicinal uses and 10 culinary applications for *B. javanica*. The highest ICS value for medicinal use was attributed to its role in treating diarrhea (30%), while its most significant culinary application was as a key ingredient in *Dayok Nabinatur* seasoning (50%). Processing methods were predominantly characterized by squeezing, with 75.13% of medicinal preparations and 100% of culinary uses relying on this technique. The presence of *B. javanica* in mixed agroforestry systems and community-managed landscapes, reflecting local conservation practices. These findings emphasize the cultural and practical importance of *B. javanica* in Simalungun communities, reflecting its role in sustaining traditional knowledge and supporting livelihoods. Promoting sustainable use and conservation of *B. javanica* can contribute to biodiversity preservation and the protection of intangible cultural heritage, offering pathways for its utilization beyond local communities.

Keywords: *Bischofia javanica*, ethnobiology, local knowledge, *sikkam*, Simalungun, Sumatra

INTRODUCTION

Indonesia, a tropical country, is renowned for its remarkable biodiversity, comprising a great number of flora and fauna species (Rambey and Lubis 2022). Within regions in Indonesia, Sumatra Island is particularly recognized for possessing high biodiversity and endemic species (Mambrasar et al. 2019). The mountainous tropical forests of Sumatra support diverse plant communities, often exceeding the diversity observed in many other regions of the world (Suwardi et al. 2020). Among various plant species in Sumatra, *sikkam* or Java bishopwood (*Bischofia javanica* Blume), belonging to the family Phyllanthaceae, is a popular tree species in North Sumatra Province. Previous studies have provided baseline information on the utilization of *B. javanica* among various ethnic groups and phytochemical profiles. For instance, the Karo tribe has traditionally used *B. javanica* bark for the treatment of diabetes (Nasution et al. 2018). Laboratory investigations have further explored the antidiabetic potential of *B. javanica* extracts, demonstrating their ability to lower blood glucose levels, modulate the degree of insulitis, and improve the condition of the islets of Langerhans (Rumahorbo et al. 2021a, b). In addition to its medicinal uses, *B. javanica* also serves as a source of natural dyes in rattan and bamboo weaving. Its bark produces a red dye, its fruits can be fermented into wine, and its seeds yield edible oil (Bhatnagar et al. 2023). Phytochemical analyses have identified the presence of bioactive compounds such as alkaloids, terpenoids, flavonoids, and saponins (Aththorick and Berutu 2018; Ati et al. 2021). Its leaves are valued for their antidiabetic, antimicrobial, and vitamin C content, while the bark is notably rich in tannins (Rajbongshi et al. 2014). Traditional medicinal applications also include the use of leaves and shoots to treat tonsillitis and sore throat, bark preparations for inducing abortion, and bark decoctions for managing diarrhea and dysentery, particularly among communities in the Sikkim Himalayas

(Chhetri et al. 2017).

The interaction between humans and plants is a vital aspect of human ecology and ethnobiology, reflecting the significant role played by plants in the survival and cultural practices of traditional communities (Rambey and Onrizal 2022). Ethnobotany, the study of the relationships between humans and plants, explores how indigenous people perceive, manage, and utilize their local flora (Radhakrishnan et al. 2016). Plant biodiversity offers ecosystem services across four domains: provisioning, regulating, supporting, and cultural (Maroyi 2017). Ethnobotanical knowledge forms part of the cultural heritage passed down through generations, preserving local wisdom and sustainable practices (Najih et al. 2023). However, this knowledge is increasingly threatened by a lack of interest among younger generations in traditional practices, potentially leading to the inefficient use and abandonment of local flora (Hazarika and Pongener 2018; Rangkuti et al. 2021). Ethnobotanical studies serve as valuable tools for documenting traditional knowledge and fostering biodiversity management through community participation (Cunningham 2014; Rambey et al. 2024). Furthermore, ethnobotanical study has re-established its significance as a crucial approach in pharmaceutical research, bridging traditional knowledge of medicinal plants with drug discovery (Dean 2024). This integration has facilitated the development of novel pharmaceuticals and pharmacological tools, while also considering the ethical and cultural dimensions associated with specific plant species.

Bischofia javanica has long been utilized by local communities in Sumatra as both a medicinal resource and a culinary ingredient (Purba et al. 2018). The Batak ethnic group, indigenous to Sumatra, consists of five sub-ethnic groups: Karo, Pakpak, Simalungun, Toba, and Angkola-Mandailing (Silalahi et al. 2021). Among these, the Simalungun people, residing primarily in Simalungun District, continue to incorporate *B. javanica* into their daily practices, making the region a significant site for ethnobotanical investigation. Despite its widespread use and prior laboratory-based studies, the ethnobotanical practices and traditional knowledge related to *B. javanica* among the Simalungun people remain largely undocumented and insufficiently studied. Given the increasing threats to traditional knowledge, this study aimed to investigate the ethnobotanical uses of *B. javanica* among the Simalungun community, focusing on its utilization and processing methods. Additionally, the study examined local conservation efforts, and community-led maintenance practices of *B. javanica* in its natural habitat.

MATERIALS AND METHODS

Study area

This study was conducted in Simalungun District, North Sumatra, Indonesia, visually presented in Figure 1. Data collection was carried out in Pondok Buluh Village (Dolok Panribuan Sub-district), Sipolha Harison Village (Pematang Sidamanik Sub-district), and Sirube-Rube Village (Dolok Pardamean Sub-district).

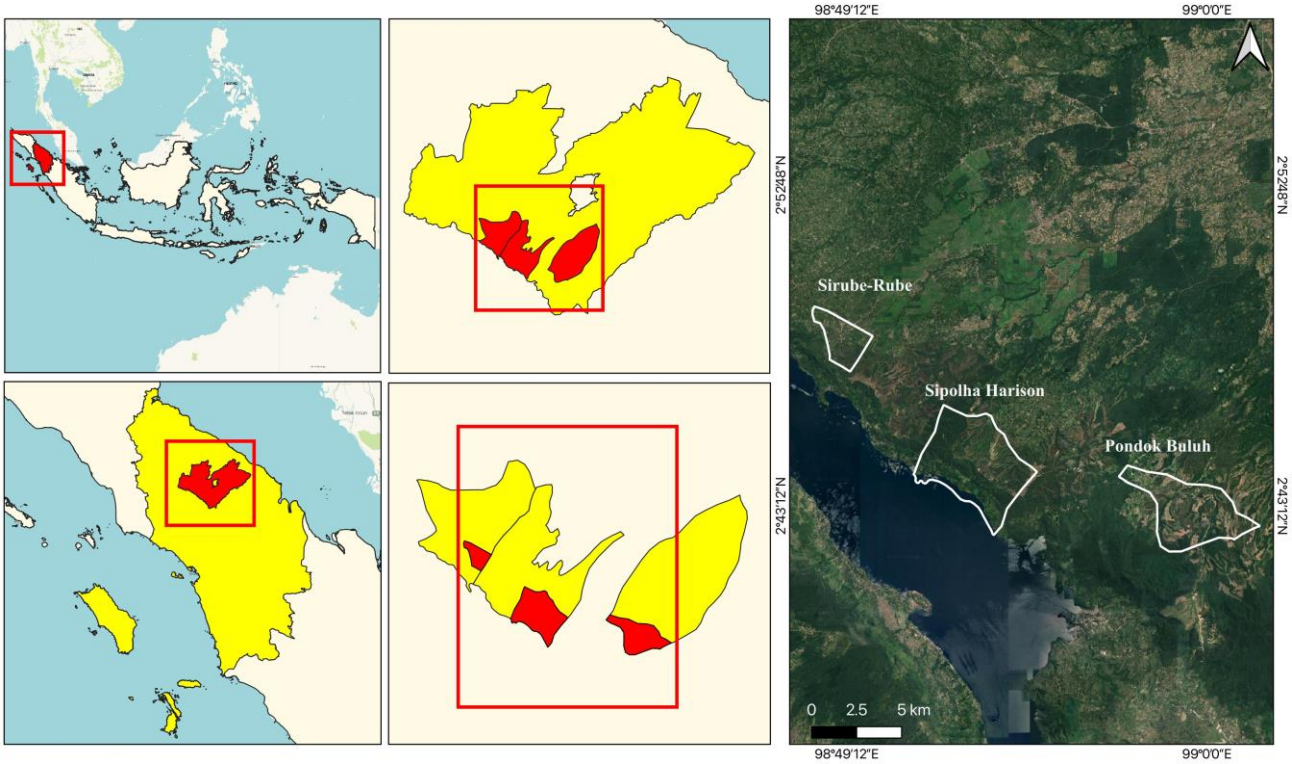

Figure 1. Map showing study area in Simalungun District, North Sumatra, Indonesia

Data collection

Data collection for this study was conducted between August and December 2023, incorporating both primary and secondary data sources. Primary data focused on the utilization of *B. javanica* plants in Simalungun District, obtained through interviews with 33 respondents and field surveys. Secondary data encompassed socio-cultural and general information about Simalungun District, sourced from the Forest Management Unit (KPH) Region II Simalungun. Data were primarily collected through semi-structured interviews, during which information was systematically recorded and documented. The data included details on the plant parts utilized, associated disease treatments, methods of application and processing, traditional culinary uses, and ingredients, as well as descriptive insights into conservation knowledge and harvesting techniques related to *B. javanica*. The respondents were selected using the snowball sampling technique, where initial informants recommended subsequent respondent based on their knowledge and relevance to the study.

Data analysis

The Plant Part Value (PPV) was calculated to determine the percentage of specific plant parts used (e.g., roots, stems, leaves, fruits, seeds, flowers, bark, and wood) for medicinal purposes. The PPV was determined using the following formula:

$$PPV\ (\%) = \frac{\sum RU\ (plant\ part)}{\sum RU} \times 100 \quad (1)$$

Where:
PPV : Percentage utilization of plant parts
RU : Total number of reported uses for each plant part

This equation allows for a quantitative assessment of the relative importance of different plant parts in traditional uses, helping to identify the most utilized components. Higher PPV values indicate plant parts with greater ethnobotanical significance. The Index of Cultural Significance (ICS) was used to quantify the cultural importance of *B. javanica* within the Simalungun community. The ICS was calculated using a weighted scoring system based on three key variables: quality of use, intensity of use, and exclusivity of use. Quality of use refers to the perceived value of *B. javanica* in traditional practices, with higher scores assigned to uses related to essential health treatments or cultural rituals. Intensity of use considers the frequency and extent of *B. javanica* utilization within the community, where higher scores reflect frequent or widespread applications. Exclusivity of use accounts for whether *B. javanica* has unique applications that are not easily substituted by other plants, with higher scores given to culturally or medicinally irreplaceable uses. The formula is as presented as follows:

$$ICS = \sum_{i=1}^{n} (q \times i \times e) \quad (2)$$

Where:
q : Quality value
e : Exclusivity value
i : Intensity of use value
n : Number of benefits

Quality value (*q*) reflects the functional significance of the plant, with a score of 5 assigned to main food ingredients, 4 to supplementary food and primary ingredients, 3 to secondary ingredients or traditional medicine, 2 to ritualistic, mythological, or recreational uses, and 1 to rarely known or used applications. Intensity of use (*i*) measures the frequency or extent of utilization, with a scale ranging from 5 for very high intensity to 1 for minimal use. Exclusivity value (*e*) denotes the preference and uniqueness of the plant's use, with a score of 2 for preferred, primary, and unrivaled applications, 1 for one among several choices, and 0.5 for alternative or secondary materials. These criteria collectively enabled a systematic assessment of *B. javanica*, providing insights into its role in traditional practices and its significance within the cultural framework of the Simalungun community.

RESULTS AND DISCUSSION

Age structure of local respondents in Simalungun District, North Sumatra, Indonesia

A total of 33 respondents participated in the ethnobotanical study of *B. javanica* in Simalungun District (Figure 2). The gender distribution was evenly balanced, with an equal number of male and female participants. The community' ages ranged from 22 to 67 years, and they were categorized into five age groups. Among the participants, 12.12% were aged between 21 and 30 years, 21.21% were between 31 and 40 years, 30.30% were within the 41-50 age group, and 33.33% fell into the 51-60 age group. The remaining 3.03% of community were aged 61 years or older. Ethnobotanical knowledge, which falls under the umbrella of Traditional Ecological Knowledge (TEK), is a crucial aspect of natural resource management and plays an important role in the protection of ecosystems and species (Sinthumule 2023). This knowledge is culminated by local communities through their adaptive experiences with natural resources (Magni 2017).

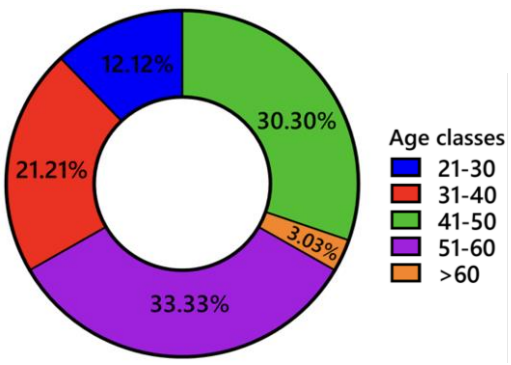

Figure 2. Age classes of interviewed Simalungun community (n: 33 respondents) regarding *Bischofia javanica*'s ethnobotanical knowledges

In the case of the Simalungun community, older individuals tend to possess a deeper understanding of the medicinal uses of *B. javanica*, which remains relatively common across communities (Aparicio et al. 2021; Lu et al. 2022; Ndavaro et al. 2024). The abundance of *B. javanica* in natural habitats may suggest ineffective transmission of the associated ethnobotanical practices to younger generations or limited interest of the youths in preserving this knowledge, potentially contributing to cultural erosion. The following discussion explored the potential utilization of *B. javanica* as a traditional medicine and a culinary ingredient in traditional cuisine, showing ethnobotanical significance and the need for conservation efforts.

Utilization of *Bischofia javanica* as traditional medicine by Simalungun community

Based on interviews, the Simalungun community widely used *B. javanica* for daily uses and traditional remedies (Table 1). The plant has been cited 14 times for medicinal uses. The people of Simalungun utilize *B. javanica* to treat a range of ailments as presented in Table 1. This finding is in line with the result of other studies. For example, Lee et al. (2021) reported that *B. javanica* was used to treat various conditions, including wounds, tonsillitis, and ulcers. Ilyas et al. (2022) summarized the use of *B. javanica* in the treatment of diabetes, particularly among the Pakpak sub-ethnic of Batak people, North Sumatra. Silalahi et al. (2015) also documented the use of *B. javanica* bark and roots for treating diabetes and cholesterol by the Karo sub-ethnic of Batak people. The traditional uses of *B. javanica* as a medicinal plant have been reported among ethnically affiliated communities. This may also be influenced by its natural abundance, which facilitates its widespread utilization among indigenous communities inhabiting the same region, particularly in North Sumatra and its surrounding areas.

Processing method of *Bischofia javanica* into medicines by Simalungun community

The ethnobotanical survey revealed that the most prevalent method of processing *B. javanica* into herbal medicines among the Simalungun people is squeezing, accounting for 75.13% of responses (Figure 3). This method is favored due to its simplicity and effectiveness, as noted by Febryano et al. (2023), who observed that squeezing is considered the easiest processing method to the majority of medicinal plants, including *limau mipes* (*Citrus* × *aurantifolia*), a signature medicine by the Lintang people, South Sumatra, Indonesia. In Bantul District, Yogyakarta, traditional healers utilize medicinal plants from the Zingiberaceae family, the most widely used plant group, for joint pain therapy (Widyowati et al. 2023). The plants are typically processed by squeezing to extract their healing compounds before being administered orally or applied topically as a compress. Figure 3 also shows various methods of applying *B. javanica*. The most common method of using *B. javanica* as medicine is through consumption or oral ingestion, with 81.35% of community utilizing this approach. Oral consumption is believed to provide a faster healing response compared to other traditional methods in a local community (Najem et al. 2020). Ethnobotanical studies reveal the widespread use of medicinal plants for oral and digestive health care across various cultures, with oral ingestion being the most common method of application. In India and Brazil, traditional healers and dental service users utilize a diverse range of plants to treat oral ailments, primarily through ingestion (Kumar 2014; Tribess et al. 2015). While other administration routes, such as dermal application and direct application to affected areas, are also reported, oral ingestion remains predominant by the local community in Wonchi District, Central Ethiopia (Melkamu 2019). This method is particularly preferred for treating internal ailments, such as gastrointestinal disorders.

Table 2 presents the detailed usage methods of *B. javanica* among the Simalungun people. Furthermore, the most common medicinal uses of *B. javanica* are for treating diarrhea (14.51%) and ulcers (13.47%), or gastrointestinal disorders in general. These results correspond with the report by Panda et al. (2018) that the bark decoction of *B. javanica* is used to treat various gastrointestinal conditions, including diarrhea and dysentery by local community in Chirang Reserve Forest, Northeast India. Similarly, Aththorick and Berutu (2018) reported that the bark of *B. javanica* or *cingkam* was traditionally used for the treatment of gastritis by Karonese people in Karo and Langkat District, North Sumatra, Indonesia.

Table 1. Number of Simalungun people (n) citing *Bischofia javanica* as medicine and its utilized part

Ailments	Utilized parts	Pondok Buluh (n)	Sipolha Harison (n)	Sirube Rube (n)
Hemorrhoids	Trunk bark and root bark	(5)	(10)	(1)
Ulcer	Trunk bark and root bark	(11)	(10)	(5)
Dysentery	Trunk bark and root bark	(2)	(11)	(11)
Gastric	Trunk bark and root bark	(9)	(5)	(7)
Lever	Trunk bark and root bark	(1)	-	-
Measles/Pox	Leaves	(10)	(9)	(5)
Diabetes	Trunk bark and root bark	(5)	(5)	(4)
Appendicitis	Trunk bark and root bark	(2)	(1)	(3)
Skin sores	Leaves	(10)	(2)	-
Stomachache	Trunk bark and root bark	(1)	(1)	-
Vomiting	Trunk bark and root bark	(4)	-	-
Hypertension	Trunk bark and root bark	(1)	(5)	(1)
Hyperlipidemia	Trunk bark and root bark	-	(6)	(2)
Diarrhea	Trunk bark and root bark	(10)	(8)	(10)

The stem bark of *B. javanica* has been reported to contain various classes of bioactive phytochemicals, some of which play a role in alleviating digestive disorders. Tannins possess antibacterial properties and aid in intestinal wall contraction, while flavonoids and terpenoids have been recognized for antidiarrheal effects (Pangondian et al. 2020). The profiling of *B. javanica* stem bark extract with LC-MS/MS identified four secondary metabolites, including Ambronal (terpenoid), Asperulosidic acid (terpenoid), Epigallocatechin(4β,8)-gallocatechin (polyphenol), and Stigmastan-3,6-dione (steroid), which may contribute to the therapeutic potential in treating digestive disorders (Susanto et al. 2022).

Culinary aspect of *Bischofia javanica* in Simalungun community

The use of *B. javanica* as a spice is an important aspect of the culinary practices by the Simalungun people in North Sumatra, Indonesia. The frequency of use across different villages is displayed in Table 3. The *B. javanica* tree, particularly the stem bark, is extensively used in the preparation of traditional dishes, reflecting its cultural importance. The Simalungun people utilize the stem and root bark of the tree for various culinary purposes, including seasoning for meats such as chicken and pork, as well as for making spice blends used in soups and stews. Moreover, *B. javanica* bark is an integral part in the preparation of *Dayok nabinatur*, a ceremonial dish that symbolizes order and harmony in life (Panjaitan 2023).

The processing of *B. javanica* bark is quite straightforward, primarily by squeezing it. All respondents (100%) informed the squeezing method as the method to process the bark. Getaneh and Girma (2014) also reported that squeezing is the most common and accessible method for preparing plant materials as spices. Once processed, the bark is primarily used as a seasoning in traditional dishes. Majority of respondents (95.67%) consumed *B. javanica* bark directly as a condiment, while only a small portion of them (4.32%) used it in mixed preparations. The predominant use of the bark for flavoring was again documented in various traditional dishes, particularly in *Dayok nabinatur* (14.29%) with other details presented in Table 4. The bark specifically carries deep cultural significance in terms of the use as a seasoning for *Dayok nabinatur*. During joyful and sorrowful occasions, *Dayok nabinatur* dish is often served in the form of a culinary delight as well as a symbol of harmony and order. According to local traditions, the dish is presented with an expectation for people consuming it to find balance in life and experience healing and well-being.

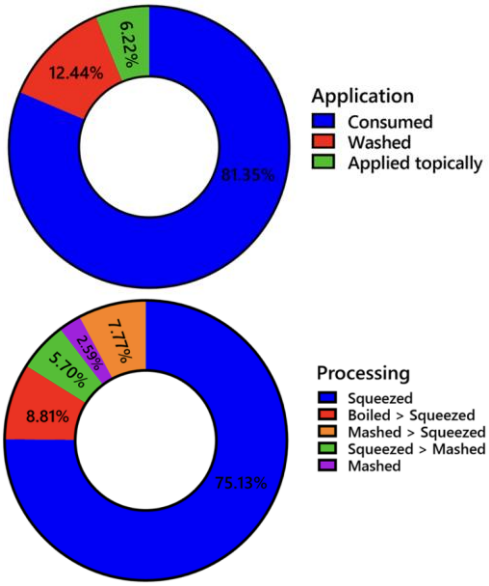

Figure 3. Application and processing of *Bischofia javanica* by Simalungun community in percentage

Table 2. Efficacy of *Bischofia javanica* as medicine to treat various ailments by Simalungun community

Benefits	Σ	%
Diarrhea	28	14.51
Ulcer	26	13.47
Measles/Pox	24	12.44
Dysentery	24	12.44
Gastric	21	10.88
Hemorrhoids	16	8.29
Diabetes	14	7.25
Skin sores	12	6.22
Hyperlipidemia	8	4.15
Hypertension	7	3.63
Appendicitis	6	3.11
Gastroenteritis	4	2.07
Stomachache	2	1.04
Liver disease	1	0.52

Table 3. Number of Simalugun people (*n*) citing *Bischofia javanica* in culinary dish and its utilized part

Dish(es)	Part utilized	Pondok Buluh (*n*)	Sipolha Harison (*n*)	Sirube Rube (*n*)
Hinasumba	Stem bark and root bark	(11)	(10)	(11)
Dayok nabinatur	Stem bark and root bark	(11)	(11)	(11)
Naniura	Stem bark and root bark	(10)	(8)	(10)
Sambel giling	Stem bark and root bark	(10)	(5)	(5)
Roasted chicken	Stem and root bark	(10)	(10)	(10)
Roasted pork	Trunk bark and root bark	(10)	(11)	(11)
Kerang holat	Trunk bark and root bark	(5)	(1)	(1)
Gulai	Trunk bark and root bark	(10)	(11)	-
Namata	Trunk bark and root bark	(2)	(8)	(11)
Natural food dyes	Trunk bark and root bark	(2)	(5)	-

The phrase "*Sai andohar ma songon paratur ni dayok nabinatur on,*" which follows the offering, translates to a prayer for life to become orderly as the well-arranged chicken dish. This practice reflects the symbolic importance of food in the Simalungun culture, where the preparation and sharing of food are intertwined with spiritual and social well-being (Damanik and Sinaga 2020). Tables 4 and 5 comprehensively present the use of *B. javanica* in traditional cooking and the importance as a spice. These summarize how the bark is used in a variety of dishes, ranging from roasted meats such as chicken and pork to stews and traditional condiments. The wide variety of dishes reflects the versatility of *B. javanica* as a seasoning and the inherent role in the Simalungun culinary tradition.

Table 4. Number of Simalungun people citing the use of *Bischofia javanica* as spices in various dishes

Processing	**Σ**	**%**
Dayok nabinatur seasoning	33	14.29
Hinasumba seasoning	32	13.85
Roast pork seasoning	32	13.85
Roast chicken seasoning	30	12.99
Naniura cuisine seasoning	28	12.12
Namatah cuisine seasoning	21	9.09
Gulai seasoning	21	9.09
Sambel giling	20	8.66
Kerang holat seasoning	7	3.03
Natural food dyes	7	3.03
Σ	231	100

Table 5. Brief description of traditional dishes utilizing *Bischofia javanica* as spices in the Simalungun community

Documentation(s)	**Dish(es)**	**Description**
	*Dayok nabinatur*	*Dayok nabinatur* is a traditional dish made from chicken meat, enhanced with spices extracted from the trunk (*holat*) of the *B. javanica* tree. This dish is regularly served during various occasions.
	*Namatah*	*Namatah* consists of chopped chicken meat mixed with *B. javanica* juice, traditionally wrapped in banana leaves for serving. It is often served alongside *Dayok nabinatur* in ceremonial meals.
	*Hinasumba*	*Hinasumba* is a traditional dish prepared with raw or minimally processed chicken or pork meat without cooking. It is commonly served during traditional ceremonies, such as weddings and thanksgiving events.
	*Naniura*	*Naniura* is a dish made with fresh carp, typically uncooked to preserve its natural flavor. The fish is soaked in *B. javanica* juice, tamarind, and various spices for several hours (approximately 3-5 hours), allowing the flavors to infuse.
	*Kerang holat*	*Kerang holat* is a dish made by boiling mussels and mixing them with *B. javanica* juice. The addition of *B. javanica* juice helps to cook the mussels while enhancing their flavor, making them savories and more delicious.

Knowledge and methods to conserve *Bischofia javanica* trees in Simalungun

Bischofia javanica is a woody species that provides numerous benefits and has a variety of uses within the local communities of Simalungun. It is common to find *B. javanica* trees in the yards of nearly every household in the region, explaining its importance to the community. *In situ* conservation refers to the practice of preserving and utilizing plants within their natural habitat, maintaining their natural growth without the need for external inputs such as fertilizers or other treatments. In the Simalungun community, *B. javanica* tree is typically allowed to grow for at least 10 years before being utilized. To prevent damage to the tree, the bark is harvested in a sustainable manner, typically by scraping it from a single section of the trunk or roots in preference to remove bark from the entire tree. This practice allows the bark to regenerate, typically within 12 months to a year, ensuring the tree remains viable for future use. In 2018, *B. javanica* was included in the IUCN Red List of Threatened Species, where it was classified as "Least Concern" with stable wild population in the global assessment. Despite its stable status, conservation practices remain crucial for the continued sustainability of this species. Each part of the tree offers distinct benefits. As illustrated in Figure 4, the leaves are particularly abundant and are commonly used, as they naturally regenerate each season. Their use does not negatively affect the sustainability of the plant, thus contributing to its conservation (Holger and Joan 2020). Conversely, the stems and roots are more frequently utilized for medicinal purposes. Interview responses indicate that the roots are often used in decoctions, a practice that has been traditionally applied for its therapeutic properties while stems, as previously discussed, have been used in culinary practices.

Quantitative ethnobotanical parameters of *Bischofia javanica* in the Simalungun community

Cumulative data show that Simalungun community in the three villages mentioned that they primarily used root bark (30%), stem bark (30%), leaves (20%), and other parts of *B. javanica* for both medicinal and culinary purposes (Table 6). According to Rambey et al. (2021), various plant parts such as flowers, fruits, bark, stems, and seeds can be processed into spices. Each part of the *B. javanica* tree has a distinct function, contributing to its broad utility. The cultural significance of *B. javanica* trees is an essential aspect of their utilization within the Simalungun community. The Index of Cultural Significance (ICS) for useful plants in the Simalungun District varies between 0.5 and 50, reflecting the diversity in plant uses and their cultural importance. The highest ICS value for *B. javanica* is associated with its medicinal use for diarrhea, with a value of 30% based on 28 documented uses (Table 7). Conversely, the lowest ICS value is observed in its application as a remedy for liver diseases, with a value of only 1% based on a single use. According to Turner (1988), the ICS value of a plant reflects its cultural importance, with greater values indicating more frequent and diverse use. However, the significance and benefits of plants can vary widely between ethnic groups and cultures. For its use as a spice, the highest ICS value for spices is recorded for *Dayok nabinatur* seasoning, with an ICS value of 50% based on 33 uses. This is followed using *B. javanica* in *Hinasumba* seasoning, which holds an ICS value of 32% with 32 uses (Table 8).

Bischofia javanica plays a central role in traditional Simalungun cuisine, contributing distinctive flavors to ceremonial dishes. Conversely, the lowest ICS values are attributed to the use of *B. javanica* as a natural food dye and *kerang holat* seasoning, both with ICS values of 4%, indicating their less frequent use in comparison to culinary applications. According to Purba et al. (2018), spices derived from plants like *B. javanica* are aromatic and serve multiple purposes in food preparation, such as enhancing flavor, adding aroma, and preserving food.

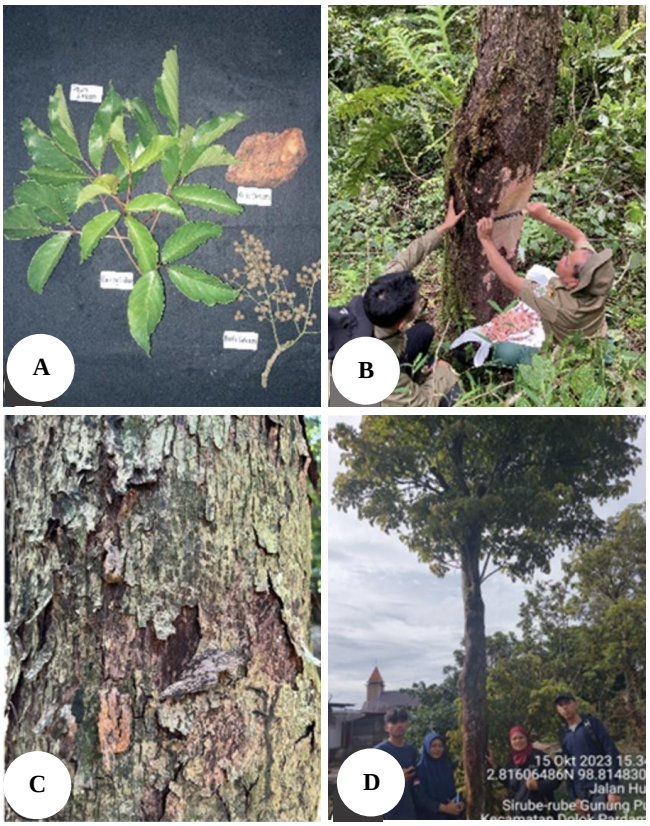

Figure 4. A. Leaf, bark, and fruit specimens of *Bischofia javanica* from study site; B. Process of scraping bark for daily utilization by Simalungun people; C. Appearance of *B. javanica* bark; D. Field documentation in the study area with a *B. javanica* tree

Table 6. Reported Use (RU) and Plant Part Value (PPV, %) of *Bischofia javanica* by Simalungun people

Plant part(s)	Σ RU	PPV (%)
Root (Bark)	3	30
Stem (Bark)	3	30
Leaves	2	20
Fruits	1	10
Timber	1	10
Total	10	100

Note: RU: Amount of use quoted for each plant part

Table 7. ICS value on the utilization of *Bischofia javanica* plant as medicines

Benefits	Σ	*q*	*i*	*e*	ICS
Diarrhea	28	3	5	2	30
Ulcer	26	3	5	2	30
Measles, Smallpox	24	3	4	2	24
Dysentery	24	3	4	2	24
Acid reflux (GERD)	21	3	4	2	24
Hemorrhoids	16	3	4	2	24
Diabetes	14	3	3	2	18
Skin sores	12	3	3	2	18
Hyperlipidemia	8	3	3	1	9
Hypertension	7	3	3	1	9
Appendicitis	6	3	2	1	6
Acute gastroenteritis	4	3	2	1	6
Stomachache	2	1	2	1	2
Liver disease	1	1	1	1	1
Σ					225

Note: *q*: Quality score; *i*: Intensity score; *e*: Exclusivity score; GERD: Gastroesophageal Reflux Disease

Table 8. ICS value on the utilization of *Bischofia javanica* plant as spices

Benefits	Σ	*q*	*I*	*e*	ICS
Dayok nabinatur seasoning	33	5	5	2	50
Hinasumba seasoning	32	4	4	2	32
Roast pork seasoning	32	4	4	2	32
Roast chicken seasoning	30	4	4	2	32
Naniura cuisine seasoning	28	4	3	2	24
Namatah seasoning	21	4	3	2	24
Sambel giling	20	4	3	1	12
Gulai seasoning	21	4	3	1	12
Kerang holat seasoning	7	2	2	1	4
Natural food dyes	7	2	2	1	4
Σ					226

Note: *q*: Quality score; *i*: Intensity score; *e*: Exclusivity score

This study highlighted the important ethnobotanical role of *B. javanica* within the Simalungun community, particularly in traditional medicine, culinary practices, and cultural applications. The results show that *B. javanica* remains an important plant resource, with its bark, leaves, and other plant parts being widely utilized for medicinal and practical purposes. Based on previous investigations, the presence of bioactive compounds such as tannins, flavonoids, and terpenoids promote the pharmacological potential of *B. javanica*, supporting its traditional use for treating digestive disorders and other ailments. From a practical perspective, these findings emphasize the need for promoting traditional dishes which utilized *B. javanica* as seasonings or condiments to younger generations. This study is limited by focusing on a specific ethnic group, requiring broader investigations into the use of *B. javanica* among other indigenous communities, possibly in regions outside of Sumatra where the species have been found. Further phytochemical and pharmacological explorations are needed to validate the medicinal properties of *B. javanica* through laboratory and clinical study. Future investigations should explore the impact of cultural erosion on ethnobotanical knowledge transmission, as well as the potential for integrating *B. javanica*-based remedies into modern healthcare systems.

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