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ETHNOBOTANICAL ANALYSIS OF PHYTONYMS AND PLANT-RELATED GLOSSES MENTIONED IN BUJANGGA MANIK, A PRE-ISLAMIC SUNDANESE TEXT (15TH CENTURY JAVA, INDONESIA)

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DEDE MULYANTO
Department of Anthropology, Faculty of Social and Political Science, University of Padjadjaran.
Jln. Raya Ir. Soekarno Km 21 Jatinangor, Sumedang 45363, Indonesia.
Center for Indigenous Cultures, University of Padjadjaran, Jln. Dago Utara No. 25, Bandung 40135, West Java, Indonesia.
E-mail: dede.mulyanto@unpad.ac.id *https://orcid.org/0009-0003-7939-2720*

BUDIAWATI S. ISKANDAR
Department of Anthropology, Faculty of Social and Political Science, University of Padjadjaran.
Jln. Raya Ir. Soekarno Km 21 Jatinangor, Sumedang 45363, Indonesia.
E-mail: budiawati.supangkat@unpad.ac.id

JOHAN ISKANDAR
Department of Biology, Faculty of Mathematics and Natural Sciences, University of Padjadjaran.
Jln. Raya Ir. Soekarno Km 21 Jatinangor, Sumedang 45363, Indonesia.
E-mail: johan.iskandar@unpad.ac.id

IRA INDRAWARDANA
Department of Anthropology, Faculty of Social and Political Science, University of Padjadjaran.
Jln. Raya Ir. Soekarno Km 21 Jatinangor, Sumedang 45363, Indonesia.
E-mail: ira.indrawardana@unpad.ac.id

ARI A. AUFA
Department of Islamic Education, Faculty of Islamic Education, University of Nahdlatul Ulama Sunan Giri.
Jln. Ahmad Yani No. 10, Bojonegoro 62115, Indonesia.
E-mail: ari_abiaufa@unugiri.ac.id

ABSTRACT
MULYANTO, D., ISKANDAR, B. S., ISKANDAR, J., INDRAWARDANA, I. & AUFA, A. A. 2023. Ethnobotanical analysis of phytonyms and plant-related glosses mentioned in Bujangga Manik, a pre-Islamic Sundanese text (15th century Java, Indonesia). *Reinwardtia* 22(2): 131–143. — This study aimed to identify and analyze ethnobotanical data on phytonym, utilization, and cultural value of plants mentioned in an Old Sundanese text. Since plants are mentioned with their vernacular names, identification was based on an exhaustive bibliographical search of the respective scientific name. A comprehensive investigation led to the identification of a total of 85 Old Sundanese phytonyms, which represented vernacular names for 79 distinct plant species. Furthermore, by considering the number of identified species from the plant-related glosses, 93 species belonging to 57 genera and 44 plant families were registered. Among these plant families, Arecaceae (12 species), Poaceae (nine species), and Fabaceae (six species) exhibited the highest number of identified species. In addition to the phytonyms, 36 phytotoponyms, which utilize vernacular phytonyms to designate settlements, hermitages, ports, mountains, and rivers were identified. It was worth noting that the majority of the plants associated with these phytotoponyms were indigenous. Meanwhile, only 13 species were traced back to the pre-Columbian exchange period during the Austronesian migration and the Indianization-Sinicization era in Indo-Malayan history. The result showed that the predominantly mentioned utilization included beverage production, textile manufacturing, vessel craftsmanship, betel quid preparation, perfume creation, and incense production. Among the identified species, *Areca catechu* emerges as the most frequently mentioned in the text, along with *Graptophyllum pictum* and *Cordyline fruticosa*, which were also considered as possessing profound spiritual value due to association with heavenly realms. Furthermore, the text highlighted that the production of plant-based fragrance products, also referenced in the celestial domain, held significant prominence in global trade during the 15th century.

Key words: Anthropobotanic relations, historical ethnobotany, phytonymy, Old Sundanese.

ABSTRAK
MULYANTO, D., ISKANDAR, B. S., ISKANDAR, J., INDRAWARDANA, I. & AUFA, A. A. 2023. Analisis etnobotani fitonim dan nilai budaya tumbuhan yang disebutkan dalam Bujangga Manik, teks Sunda pra-Islam (abad ke 15 Jawa, Indonesia). *Reinwardtia* 22(2): 131–143. — Tujuan artikel ini adalah mengidentifikasi data etnobotani tentang fitonim, pemanfaatan, dan nilai budaya tumbuhan yang disebutkan dalam teks Sunda pra-Islam. Mengingat tumbuhan disebutkan dengan nama lokal mereka, identifikasi didasarkan pada pencarian kepustakaan lengkap dari nama ilmiah masing-masing. Sebanyak 85 fitonim ditemukan yang teridentifikasi sebagai nama lokal untuk 79 jenis berbeda. Digabungkan dengan jumlah jenis yang teridentifikasi dari peristilahan terkait tumbuhan, total terdaftar 93 jenis dan 57 marga dari 44 suku. Suku dengan jenis terbanyak adalah Arecaceae (12), Poaceae (sembilan), dan Fabaceae (enam).

Kami juga menemukan 36 toponim yang memakai nama lokal tumbuhan dan mengacu pada 33 jenis berbeda untuk menamai permukiman, pertapaan, pelabuhan, gunung, dan sungai. Sebagian besar (20) tumbuhan yang nama lokalnya dipakai dalam fitotoponimi adalah tumbuhan asli, dan hanya 13 eksotik atau diperkenalkan pada periode sebelum Pertukaran Kolumbian, mungkin selama migrasi penutur bahasa-bahasa Austronesia dan periode India-nisasi-Sinisisasi dalam sejarah Indo-Malaya. Pemanfaatan tumbuhan yang paling banyak disebutkan terkait dengan minuman, produksi tekstil, pembuatan kapal, sajian sirih-pinang, parfum, dan dupa. Melalui fitonim dan istilah terkait tumbuhannya, *Areca catechu* adalah jenis yang paling sering disebutkan dalam teks. Jenis ini, bersama *Graptophyllum pictum* dan *Cordyline fruticosa*, juga dianggap memiliki nilai spiritual tinggi karena penyebutan keberadaannya di surga. Produk wewangian nabati, juga disebutkan terdapat di surga, adalah produk-produk terpenting dalam perdagangan dunia abad ke-15.

Kata kunci: Etnobotani historis, fitonimi, hubungan antropobotanik, Sunda kuno.

INTRODUCTION

Ethnobotany is the multidisciplinary exploration of the plants within a given region and their practical applications through the traditional knowledge embedded in the local culture and its people, both historical and contemporary. An ethnobotanist diligently records the indigenous customs associated with the practical utilization of local flora across different aspects of life (Martinez *et al.*, 2019). A significant approach within the field of ethnobotany is historical ethnobotany, which focuses on examining the intricate connection between human populations in a particular geographical location and plants. This approach relies on utilizing historical documents such as manuscripts, books, iconographies, and inscriptions as valuable sources of evidence to construct comprehensive narratives and scholarly discussions (Silva *et al.*, 2014; Medeiros, 2014; 2016; 2020). Furthermore, it focuses on the repertoires of the anthropobotanic relationships which are stayed in time and space to understand the ways of society at the time under study.

Historical ethnobotany analyzes the understanding that interrelationships between humans and plants evolve and adapt over time, influenced by dynamic ecological and cultural contexts. The recognition of the ever-changing nature of these interrelationships has sparked a renewed interest among ethnobotanists in exploring the historical anthropobotanical connections. This interest has been fueled by the prospect of using historical documents as valuable resources for conducting ethnobotanical studies (Castro *et al.*, 2013; Silva *et al.*, 2014; Alves & Ming, 2015; Fatur, 2019; Svanberg *et al.*, 2019; Petran *et al.*, 2020; Coimbra & Welch, 2020; Ford, 2020; Dafni *et al.,* 2021; Liu *et al.*, 2021; Saraci & Damo, 2021). The renewal of interest is generated because exploring information within historical documents promotes a chronological perspective on the development of plant usage. This contributes significantly to the clarification of the present cultural conception of plants within specific societies (Jákl, 2015a; Dafni & Bock, 2019; Hoogervorst & Jákl, 2020; Leonti *et al.*, 2020; Wagner *et al.*, 2020).

The past anthropobotanic relationship is often recorded in literary works (Pardo-de-Santayana *et al.*, 2006; Ryan, 2018; 2020), encompassing folksongs and poems (Cardano & Herrero, 2014; Herrero & Cardano, 2015; Fernandez-Llamazares & Lepofsky, 2019; Ivanova *et al.*, 2021; Fiser, 2022). Even though literary texts from the past may not possess the same level of authority as historical sources, they can still be regarded as ethnobotanical documents. This is because such texts often serve as valuable reflections of customs, capturing the thoughts, beliefs, and traditions prevalent during that period (Sorokin, 2019).

There are studies on ethnobotanical aspect of ancient literary works from pre-Islamic Java (Jákl, 2015a; 2015b; 2016; 2017; Hoogervorst & Jákl, 2020; Mulyanto *et al.*, 2023). However, these works, similar to the majority of studies conducted on ancient Java, relied heavily on texts originating from Middle and East Java or Bali Island. For instance, Mulyanto *et al.* (2023) discovered a wealth of ethnobotanical knowledge regarding the diversity of fruits in ancient Java by examining a single text, namely Kakawin Ramayana, written in Middle Java around the 10th century.

One of the valuable remains of Old Sundanese text from the western part of Java Island is the story of Bujangga Manik. However, the academic literature on Bujangga Manik is not extensive. As a historical document, the poem has been the subject of surprisingly limited academic reviews. Noorduyn (1982) and Noorduyn & Teeuw (1999) discussed its topographical information. West (2017) worked on toponymic aspects and concluded that its deployment of listed toponyms was part of a widespread pattern or trope in Austronesian or more specifically Malayo-Polynesian literature. Several of the passages from Bujangga Manik, specifically those related to textile production in Old Sundanese texts, were also analyzed by Gunawan (2019). From a historical ethnobotanical perspective, these works provided only limited information. The encyclopedic character and presentation of daily life and material culture made them helpful sources for accounts of pre-Islamic Sunda-

nese ethnobotany. West (2021) also collected and identified some phytonyms mentioned in Bujangga Manik. However, not all phytonyms and plant-related glosses were identified and analyzed ethnobotanically. This study, then, aimed to identify all phytonyms that were directly and indirectly extracted from phytotoponyms, as well as those obtained from phytonym based glosses mentioned in Bujangga Manik. The utilization of plants and the cultural context of plant-related material cultures and activities were analyzed using historical ethnobotanical methods.

MATERIALS AND METHODS

Source

Data were obtained from Bujangga Manik, an Old Sundanese narrative poem about a Hindu ascetic's travels composed in West Java during the late fifteenth century. Bujangga Manik, as a *codex unicus*, was one of several surviving Old Sundanese poems written in octosyllabic meter. Its sole surviving manuscript, MS Jav. B.3. (R) was preserved in the Bodleian Library at the University of Oxford since 1627 or 1629. The unfinished text consisted of 1630 extant lines, which were inscribed scripto continua on both sides of thirty thin leaves (Noorduyn, 1982; Noorduyn & Teeuw, 1999; West, 2017; 2021). This study utilized the newest edition of Bujangga Manik which was romanized and translated into English by West (2021), with an earlier edition by Noorduyn & Teeuw (2006) as a comparison.

Data collection

All lines in Bujangga Manik were successively reviewed, and the fragment of the poem was recorded. A database was created and organized into the fields of directly and indirectly extracted phytonyms from phytotoponymy, glosses related to plant-based objects or products, plant-processing activities, the number of citations, and the uses and symbolic values attributed to the plant.

Identification of OS phytonyms and plant-related glosses

Several vernacular phytonyms were found to correspond to botanical taxa in the modern scientific sense. However, when working with Old Sundanese, the absence of any unified system of phytonyms in the era of Bujangga Manik text creation should be considered. One of the most crucial methods for disclosing the meaning of ancient phytonyms is the analysis of the context of the quotations. The frequency of encountering a specific phytonym and the diversity of contexts directly correlates to the amount of information obtained regarding the plants described. Consequently, the precise identification of botanical taxa associated with ancient phytonyms that appear only once in the corpus becomes a challenging endeavor (Sorokin, 2019). The majority of phytonyms referenced in the text are mentioned only once or twice, with virtually no botanical description accompanying them, aside from their utilization or cultural representation.

To identify the botanical identity of Old Sundanese phytonyms, sources of information outside the text were utilized. Old Sundanese was a member of Malayo-Polynesian languages, a subgroup of the Austronesian language family, spoken by people in the western part of Java Island before colonial era. Vernacular phytonyms in numerous Malayo-Polynesian languages spoken by other native Indonesians, specifically in Java Island and its vicinity, were the most important source of information. The Old Sundanese phytonym parallels in another Malayo-Polynesian plant vocabulary, such as Malay and other Sumatran, Javanese, Madurese, and Balinese, allowed this study to put forward several hypotheses. Relevant sources of information were early botanical works on Malesian plants such as Blume (1825), Hasskarl (1844), Miquel (1856), Teijsmann (1866), Van den Burg (1885), de Clercq (1909), and Heyne (1916-1927). These works not only described, and classified botanical taxa in a Linnaean way but also recorded vernacular phytonyms collected from local inhabitants, as well as information about their utilization by the native population. In addition to early Sundanese lexicographic works such as Rigg (1862), Geerdink (1875), and Coolsma (1913), Zoetmulder (1982), Old Javanese-English Dictionary was also used to find botanical vocabulary parallel to Old Sundanese phytonyms found in the text.

To verify a vernacular name into a botanical scientific nomenclature system, identification was not only carried out in consultation with these works but also cross-checking the field by taking samples of plant specimens in the form of vouchers for each specimen according to its vernacular name. Based on this collection of specimens, then, authentication be requested from plant taxonomist at Department of Biology, Faculty of Mathematics and Natural Sciences, Universitas Padjadjaran.

Finally, to determine the origin of a species and the phytogeographic zones used to determine a species is native or exotic to Java, authors consulted Plants of the World Online (https://powo.science.kew.org/).

Data analysis

After the botanical identity of all phytonyms and plant-related glosses was identified, a list of plant species was compiled alphabetically based on their current scientific names. This list was followed by information about respective plant

families, Old Sundanese phytonym, and the number of mentions.

The direct identification of plant species was limited, as a significant portion of the glosses related to plant-based products and plant-processing activities did not explicitly mention any phytonyms, thereby hindering their straightforward classification. Plant species identified from the examination of these two categories of glosses, which did not directly contain any specific phytonym, were presented in a separate table. This presentation was accompanied by a discussion associated with the sociocultural context of plant-based products and plant-processing activities.

RESULTS

Directly identified phytonyms

A total of 85 Old Sundanese phytonyms were identified, referring to 79 different plant species. These phytonyms were categorized into four groups, namely (A) phytonyms directly mentioned as a plant name, (B) phytonyms directly mentioned as part of a toponym, (C) phytonyms directly mentioned as adjectives for plant-based products, and (D) phytonyms extracted from phytonym-based verbs. Furthermore, 78 phytonyms were classified exclusively under one category, including 26 (33.33%), 29 (37.18%), 18 (23.07%), and 5 (6.41%) under category A, B, C, and D, respectively. There were 9 phytonyms mentioned in more than one category, namely 5 in A and C, 3 in B and C, 1 in A and D, and 1 in A and B, as shown in Table 1.

An additional explanation is not required for phytonyms and glosses belonging to categories A, B, and C, as they are directly referred to without any transformation. Several phytonyms under category D are positioned as the object for a verb in certain phrases. For example, from the phrase ‘ngela sepang’ (line 164), the process of boiling (a certain part) of a plant known as ‘sepang’ for dyeing purposes, the phytonym: *sepang* can be identified immediately. The name was identified as sappanwood, *Biancaea sappan* (L.)Tod. Similarly, with the phrase ‘ngangeun hayam’ (line 164), the process of stewing (certain parts) of a plant called ‘hayam’, the phytonym, namely *hayam* can be identified. The phytonym refers to *Gynochthodes umbellata* (L.) Razafim. & B. Bremer, named by Malay people as ‘akar perut ayam’ which is its root bark used to dyeing yarn with yellow colour.

Further discussion is warranted for certain phytonyms that fall under category D, as they have undergone morphological transformations. In the Sundanese language, it is common for verbs to be formed by adding a prefix to a noun. Therefore, in the context of phytonyms, several words may have been derived from plant names through this morphological process. By separating the prefix and the noun, the identity of the noun can be derived. Several verbs in Bujangga Manik are formed by adding a prefix to a noun that is the name of a particular plant. The active verb ‘nyangkuduan’, for example, is formed by adding prefix ‘nya-‘ and the noun ‘cangkudu’. The context of the verb ‘nyangkuduan’ is the activity related to dyeing, hence, it can be interpreted as “process of dyeing cotton yarn with ‘cangkudu’. The term 'cangkudu', identified as *Morinda coreia* Buch.-Ham. (syn. *Morinda tinctoria* Roxb.), refers to a specific plant species. In particular, 'cangkudu' is a mononomial used to describe this plant. The plant is known for its root bark, which, when decocted, is used to dye yarns or fabrics yellow-red. In some cases, pepper and ash may be added during the dyeing process to enhance the colour's durability (de Clercq 1909: 283).

Similarly, Old Sundanese phytonyms ‘hingul’ and ‘jerinang’ are derived from the active verbs ‘ngahingul’ and ‘ngajerinang’. The terms in question pertain to the colouration of the wood in a specific section of the vessel. This colouration is the result of a meticulous process involving particular plants. The first term, 'hurung kena ngahingul' (line 112, 150, and 910), can be understood as "[this part] is imbued with a fiery-red hue through the application of *hingul*-wood". The second term, 'siyang kena ngajerinang' (line 113, 153, and 911), can be translated as ‘[this part] is endowed with a bright-red shade through the utilization of *jerinang*-resin’. The phytonym ‘hingul’ is a synonym of ‘suren’ that refers to *Toona sureni* (syn. *Cedrela febrifuga* Blume, de Clercq 1909: 197), while ‘jerinang’ refers to *Calamus draco* (syn. *Daemonorops draco* Blume, de Clercq 1909: 217), a rattan species producing red resin commercially known as ‘dragon’s blood’.

Identified plant species from composite plant-based products

The inclusion of plant species in Table 1 is not comprehensive since it does not cover all the likely plant species found in the Bujangga Manik depiction. This discrepancy arises due to the absence of phytonyms in certain Old Sundanese glosses identified as plant-related glosses. The subsequent section examines and analyzes some of these glosses under scrutiny.

In Bujangga Manik, several glosses refer to something made from or composed of several plants. For example, the noun ‘seupaheun’ can be translated as betel quid. This particular noun, along with the related verbs 'nyeupah' and 'mucang', typically involves three vital components, namely the seed of the *Areca catechu*, the leaf of *Piper betel*, and a mixture of lime powder and water (calcium hydroxide) blended to form a paste-like consistency, making it suitable for chewing. Other ingredients may be added depending on availability and preference (Rooney, 1993; Singh *et al.*,

Table 1. List of Old Sundanese phytonyms and the botanical identity.

Scientific name, and family	Old Sundanese phytonym	Number of mentioned under category				
		A	B	C	D	Σ
Abelmoschus moschatus Medik., Malvaceae	*Kasturi*	0	1	1	0	2
Acalypha caturus Blume, Euphorbiaceae	*Lawu*	0	2	0	0	2
Aegle marmelos (L.) Corrêa, Rutaceae	*Maja*	0	1	0	0	1
Alyxia stellata (J.R.Forst. & G.Forst.) Roem. & Schult, Apocynaceae	*Palasari*	0	1	0	0	1
Alpinia malaccensis (Burm.f.) Roscoe, Zingiberaceae	*Kamisadi*	2	0	0	0	2
Amomum maximum Roxb., Zingiberaceae	*Bungarésa*	3	0	0	0	3
Areca catechu L., Arecaceae	*Pinang, pucang*	11	0	0	3	14
Arenga pinnata (Wurmb.) Merr., Arecaceae	*Kawung*	1	0	1	0	2
Artocarpus elasticus Reinw. ex Blume, Moraceae	*Teureup, koja*	0	1	1	0	2
Artocarpus heterophyllus Lam., Moraceae	*Nangka*	0	1	0	0	1
Averrhoa bilimbi L., Oxalidaceae	*Balingbing*	0	1	0	0	1
Averrhoa carambola L., Oxalidaceae	*Calingcing*	0	0	1	0	1
Bambusa vulgaris Schrad. ex J.C.Wendl., Poaceae	*Haur kuning*	1	0	0	0	1
Bambusa vulgaris Schrad. ex J.C.Wendl., Poaceae	*Haur séyah*	1	0	0	0	1
Biancaea sappan (L.) Tod., Fabaceae	*Sepang*	0	0	0	1	1
Blumea balsamifera (L.) DC., Asteraceae	*Sembung*	0	2	0	0	2
Borassus flabelifer L., Arecaceae	*Taal*	0	1	0	0	1
Calamus L., Arecaceae	*Hoé*	0	1	0	0	1
Calamus caesius Blume, Arecaceae	*Hoé walatung*	4	0	0	0	4
Calamus ciliaris Blume, Arecaceae	*Hoé muka*	2	0	0	0	2
Calamus draco Willd., Arecaceae	*Jerinang*	0	0	0	3	3
Calamus javensis Blume, Arecaceae	*Hoé omas*	2	0	0	0	2
Cananga odorata (Lam.) Hook.f. & Thomson, Annonaceae	*Wangsana*	0	0	1	0	1
Chenopodium album L., Amaranthaceae	*Diheng*	0	1	0	0	1
Chrysopogon zizanioides (L.) Roberty, Poaceae	*Narawastu*	2	0	0	0	2
Cinnamomum camphora (L.) J.Presl., Lauraceae	*Kapur*	0	0	1	0	1
Citrus x aurantium L., Rutaceae	*Jerukmanis*	0	2	0	0	2
Colocasia esculenta (L.) Schott, Araceae	*Tales, bayabon*	1	0	1	0	2
Cocos nucifera L., Arecaceae	*Kalapa*	0	2	0	0	2
Cordyline fruticosa A.Chev., Asparagaceae	*Hanjuang, handong*	2	0	0	0	2
Corypha utan Lam., Arecaceae	*Pucuk*	1	0	0	0	1
Cryptocarya massoy (Oken) Kosterm., Lauraceae	*Masui*	0	0	1	0	1
Cucumis sativus L., Cucurbitaceae	*Bonténg*	0	0	2	0	2
Curculigo latifolia Dryand, Amaryllidaceae	*Parasi*	0	2	0	0	2
Dendrocalamus asper (Schult. & Schult.f.) Backer, Poaceae	*Beutung*	1	1	0	0	2

Dioscorea hispida Dennst., Dioscoreaceae	*Gadung*	0	1	0	0	1
Dolomiaea costus (Falc.) Kasana & A.K.Pandey, Asteraceae	*Pucuk*	0	0	1	0	1
Dryobalanops aromatica C.F.Gaertn., Dipterocarpaceae	*Kapur Barus*	0	0	3	0	3
Durio zibethinus L., Malvaceae	*Kadu*	0	1	0	0	1
Embelia ribes Burm.f., Primulaceae	*Kacambang*	0	0	1	0	1
Ficus benjamina L., Moraceae	*Caringin*	0	2	0	0	2
Gigantochloa apus (Schult.f.) Kurz ex Munro, Poaceae	*Apus*	5	0	3	0	8
Gigantochloa verticillata (Willd.) Munro, Poaceae	*Awi gombong*	2	0	0	0	2
Gnetum gnemon L., Gnetaceae	*Tangkil*	0	1	0	0	1
Graptophyllum pictum (L.) Griff., Acanthaceae	*Handeuleum*	1	0	0	0	1
Gynochthodes umbellata (L.) Razafim. & B.Bremer, Rubiaceae	*Hayam*	0	0	0	1	1
Marsdenia tinctoria R.Br., Apocynaceae	*Tarum*	0	4	0	0	4
Magnolia champaca (L.) Baill. ex Pierre, Magnoliaceae	*Kembang*	0	2	0	0	2
Mimusops elengi L., Sapotaceae	*Tanjung*	0	1	0	0	1
Momordica charantia (L.) Descourt., Cucurbitaceae	*Payanggu*	0	1	0	0	1
Morinda coreia Buch.-Ham., Rubiaceae	*Cangkudu*	0	0	0	2	2
Murraya paniculata (L.) Jack, Rutaceae	*Kamuning*	2	0	0	0	2
Musa acuminata Colla, Musaceae	*Jantung*	0	0	1	0	1
Myristica fragrans Houtt., Myristicaceae	*Pala*	0	1	0	0	1
Myristica iners Blume, Myristicaceae	*Kayu laka*	2	0	0	0	2
Nypa fruticans Wurmb., Arecaceae	*Nipah*	1	0	0	0	1
Oncosperma tigillarium (Jack) Ridl., Arecaceae	*Haliwung*	0	4	0	0	4
Oroecnida integrifolia (Gaudich.) Miq., Urticaceae	*Nangsi*	0	1	0	0	3
Pandanus amaryllifolius Robx. ex Lindl., Pandanaceae	*Jaksi*	3	0	0	0	1
Pandanus tectorius Parkinson, Pandanaceae	*Pandan*	1	0	0	0	1
Papaver somniferum L., Papaveraceae	*Candu*	0	0	1	0	1
Parkia speciosa Hassk., Fabaceae	*Peuteuy*	0	1	0	0	1
Phyllanthus acidus (L.) Skeels, Phyllanthaceae	*Ceremay*	0	3	0	0	3
Phyllanthus emblica L., Phyllanthaceae	*Malaka*	0	1	0	0	1
Piper betel L., Piperaceae	*Seureuh*	2	0	2	0	4
Pogostemon cablin (Blanco) Benth., Lamiaceae	*Pupur*	0	0	2	0	2
Quercus infectoria G.Olivier, Fagaceae	*Majakané*	0	0	2	0	2
Rosa sp., Rosaceae	*Mawar*	0	0	2	0	2
Santalum album L., Santalaceae	*Candana*	3	0	2	0	5
Saraca indica L., Fabaceae	*Dédés*	3	0	0	0	3
Schizostachyum iraten Steud., Poaceae	*Tamiang*	0	1	0	0	1
Schleichera oleosa (Lour.) Oken, Sapindaceae	*Laka*	0	0	2	0	2
Sesamum indicum L., Pendaliaceae	*Lenga*	0	0	2	0	2
Sesbania sesban (L.) Merr., Fabaceae	*Janten*	0	0	2	0	2

Sundacarpus amarus (Blume) C.N.Page, Podocarpaceae	*Taji*		0	1	0	0	1
Styrax benzoin Dryand, Styracaceae	*Kamenyan*		0	0	1	0	1
Syzygium polycephalum (Miq.) Merr. & L.M.Perry, Myrtaceae	*Kupa*		1	0	0	0	1
Tectona grandis L.f., Lamiaceae	*Jati*		0	3	2	0	4
Toona sureni (Blume) Merr., Meliaceae	*Hingul*		0	0	0	3	3
Ziziphus mauritiana Lam., Rhamnaceae	*Darah*		0	1	0	0	1
Unidentified, Poaceae	*Awi nyowana*		2	0	0	0	2
		Σ	62	50	39	13	163
		%	38	30	24	8	100

2020). In Java, gambier, an extract derived from the leaves of *Uncaria gambir*, a climbing shrub native to tropical Southeast Asia, is usually used as an addition. Among the lower classes, it is often made from the leaves and bark of *Ficus ribes* Reinw. ex Blume (Uphof, 1959).

There are many terms related to fabric mentioned in Bujangga Manik, such as *boéh*, *bédong*, *hasiwung*, *heuyeuk*, *kaén*, *kantéh*, *kasang*, *simbut sulam*, *sinjang*, and *tapih*. However, there is no mention of their basic material. The basic material of native Indo-Malayan weaving tradition is cotton. According to Pleyte (1912: 46), there are two main species bred in Western Java to make fabric, namely ‘kapas honje’ (*Gossypium herbaceum* L.) and ‘kapas mori’ (*G. micranthum* Cav.). In recent taxonomic work, the latter is considered a subspecies of the former, *G. herbaceum* subsp. *herbaceum* L.

Identified plant species from plant-processing verbs

Some verbs related to plant-processing activities are derived from noun prefixes that represent specific plant names to directly identify the phytonym. However, there are also verbs such as 'neuleum' (line 162 and 282) and its corresponding noun 'teuleum' (line 542) that do not follow this pattern. These terms describe the process of dyeing cotton yarn with indigo dye, which involves soaking in a container filled with a mixture of warm water, certain plant parts, and other inorganic materials. According to Pleyte (1912: 74), in West Java, the indigo dye used in this process does not come from *Indigo tinctoria.* Instead, it is derived from *Marsdenia tinctoria* R.Br, which the Sundanese people of the early 20th century referred to as 'tarum areuy'.

Other verbs related to textile production, such as ‘nuar’, involve plant elements from several different species. The original noun of the verb ‘nuar’ is ‘tuar’ or ‘tuwar’ which means “kneading and oiling of white goods” (De Kat Angelino, 1930: 216). According to Pleyte (1912: 73), after being cooked, the yarn remains greasy and takes on paint poorly. The degreasing agent is found in a weak soap bath (cituar) in which the yarn is dipped and kneaded before drying in the sun. The active ingredients are oil and lye with a binder. Additionally, lye is made by charring the straw of withered rice stalks and then leaching with water. The oil used in the degreasing process is derived from various plant species. It forms a mixture that incorporates products from multiple plants when combined with lye. Pleyte (1912: 73) provides a list of plants involved in this process, along with their botanical identities (Table 2).

In the *nyangkuduan* activity (line 162 and 282), once the cloth has dried and hardened properly, it is dyed using a filtered decoction of cangkudu. However, instead of immersing the cloth in the dye, it is applied by smearing onto the cloth using a brush made of flapping peel or *pandan laut*. After the cloth is dry, the process is repeated until the desired level of redness is achieved. A post-coating can be applied using an extract of *geugeunteulan* and *gambir* (Loeber, 1914: 22) when a darker colour is preferred. *Pandan laut*, *geugeunteulan*, and *gambir* are Sundanese phytonyms that respectively refer to *Pandanus odorifer* (Forssk.) Hasskarl, *Diospyros frutescens* Blume, and *Uncaria gambir* (W.Hunter) Roxb. So, in the process of *nyangkuduan*, apart from *Morinda coreia* or *M. citrifolia*, there are three other plants whose products are involved.

Concerning glosses that pertain to plant-based products, it is common to be made using various types of plants. For instance, the noun 'tuak' (line 632) denotes a lightly alcoholic beverage produced through the fermentation of sap obtained from certain palm trees. In Java, this beverage can be prepared using the sap from either the palmyra palm (*Borassus flabelifer*) or the sugar palm (*Arenga pinnata*). Based on personal observations, in western Java, particularly among the Sundanese people, 'tuak' is typically made using sugar palm.

Table 2. List of plant in plant-processing activity 'nuar'.

Sundanese name	Scientific name	Family	Part used
Cabe-areuy	*Piper betel* L.	Piperaceae	Leaf
Dadap	*Erythrina subumbrans* (Hassk.) Merr.	Fabaceae	Leaf
Jahe	*Zingiber officinale* Rosc.	Zingiberaceae	Rhizome
Jeruk nipis	*Citrus x aurantiifolia* (Christm.) Swingle	Rutaceae	Fruit
Kaliki	*Ricinus communis* L.	Euphorbiaceae	Seed
Kapas	*Gossypium herbaceum* L.	Malvaceae	Seed
Pare	*Oryza sativa* L.	Poaceae	Stalk
Pedes	*Piper nigrum* L.	Piperaceae	Fruit
Picung	*Pangium edule* Reinw.	Achariaceae	Fruit
Suuk	*Arachis hypogaea* L.	Fabaceae	Seed
Wijen	*Sesamum indicum* L.	Pedaliaceae	Seed

On phytotoponyms

A total of 36 phytotoponyms were documented (Table 1), with 26 referring to places, six to mountains, and four to rivers, respectively. Furthermore, 33 different plant species were identified from the phytonyms of the phytotoponyms. Among them, 20 plant species were native to the region, while 13 were exotic or introduced during pre-Columbian exchange, possibly during Austronesian migration. Examples of these introduced species included coconut (*kalapa*, *Cocos nucifera*), wild rhea (*nangsi*, *Oroecnida integrifolia*), and durian (*kadu*, *Durio zibethinus*). Some plants were introduced during the Indianization-Sinicization period of western Java's history, such as jujube (*darah*, *Ziziphus mauritiana*), teak (*jati*, *Tectona grandis*), pummelo (*jeruk manis*, *Citrus x aurantium*), and bael (*maja*, *Aegle marmelos*). Several of phytotoponyms mentioned in Bujangga Manik were still used in some parts of western Java without any morphological transformation such as Citarum, Citeureup, Gunung Ceremai, Palasari, Gunung Sembung, or with transformation such as Cihaliwung (now Ciliwung, a river). However, almost all phytonyms used to form phytotoponym mentioned in Bujangga Manik were utilized in many parts of western Java.

Utilization and cultural value of plant

From the description above, several forms of plant utilization were identified related to beverage, textile production, vessel craft, and betel quid. Betel chewing was firmly embedded in the traditions of Southeast Asia. In ancient times it was seen as a sign of lavish luxury and enjoyed amongst royalty (Clarence-Smith, 2018). In Bujangga Manik, glosses related to betel quid such as 'seupaheun', 'nyeupah', 'seupah', 'mucang', and 'pasileman', were the terms that appear most often. This was related to the social background of individuals from the nobility circle. The phytonym 'pinang' (refer to *Areca catechu*) was also the most often referred to in Bujangga Manik, as shown in Table 1. The areca palm tree held high cultural value as an essential ingredient of the betel quid, which served multiple social functions in Old Sundanese society. It was not only given as an offering to special guests but also presented during proposal ceremonies. The cultural significance was vividly depicted in the presence of this tree in the portrayals of the places that the main character, Bujangga Manik, traversed on his journey to heaven (lines 1457–1469). This highlighted the deep historical and symbolic importance attributed to the areca palm tree in Old Sundanese culture. In addition to the areca palm, there are other plants mentioned in this study. These include *handeuleum* (*Graptophyllum pictum*), *hanjuang* or *handong* (*Cordyline fruticosa*), and *parasi* (*Curculigo latifolia*). These plants are referenced alongside the areca palm, highlighting their presence and significance within the narrative.

Plant-based fragrance products, such as *candana* (sandalwood, *Santalum album*) and *kulit masui* (massoy bark, *Cryptocarya massoy*), held significant cultural value as they were depicted as a parable for the fragrant soul of a saint ascending to heaven (lines 1640–1643). These fragrances, along with other scents such as *kapur Barus* (Barus camphor, *Dryobalanops aromatica*), *dédés* (flower-based musk, *Saraca indica*), *lenga* (sesame oil, *Sesamum indicum*), *wangsana* (cananga oil, *Cana-*

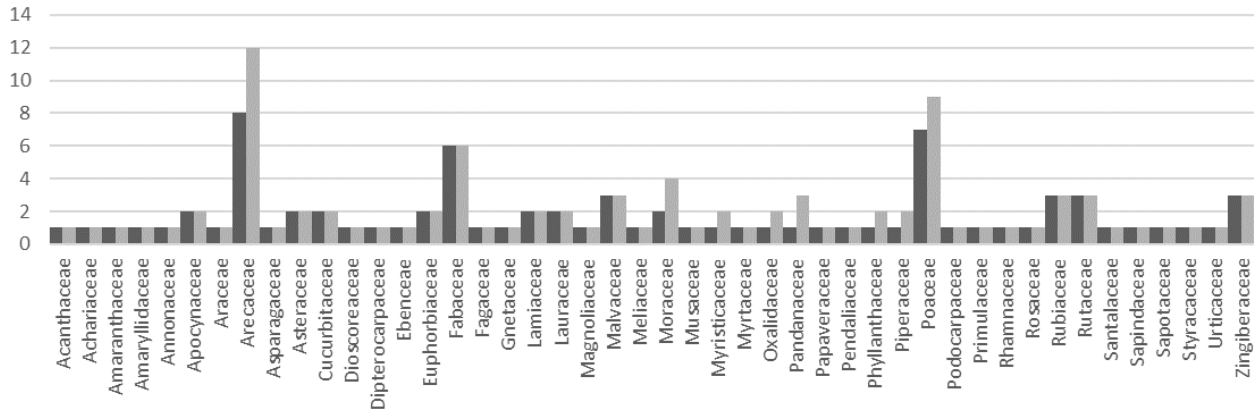

Fig. 1. Distribution of species and genera of plant families.

nga odorata), and *pucuk* (puchuk, *Saussurea costus*), were believed to exist in heaven together with precious goods made of gold and silver, as well as imported merchandise from Java, China, and India (lines 1692–1697). This highlighted the cultural significance attributed to these plant-based fragrances and their association with heavenly realms.

By considering both the plant species explicitly mentioned in the text and those indirectly included in plant-related glosses, a comprehensive tally showed a total of 93 distinct species and 57 genera from 44 different plant families (Fig. 1). Among these families, Arecaceae, Poaceae, and Fabaceae contained 12, nine, and six species, respectively. This indicated a remarkable botanical diversity associated with the topic, showcasing the significant presence and importance of various plant families and their species.

DISCUSSION

In this study, several Old Sundanese glosses were interpreted differently compared to previous authors' interpretations. The meaning of term 'ngahingul' mentioned in Bujangga Manik line 112 and line 910, for example, was interpreted by Gunawan (2019) and West (2021) as "a pattern resembling a writhing fish" based on Sasmita's interpretation of the term 'hihinggulan', believed to be strongly linked to the Old Javanese word 'igul'. However, this interpretation appears imprecise for three reasons. First, in Sundanese grammatical patterns, morphological transformation from the noun 'igul' should be 'hihigulan' not 'hihinggulan'. Second, syntactic context of the verb 'ngahingul' in sentence "hurung beunang ngahingul" of line 112 is a specific colour of certain part of vessel interior because the term 'hurung' means 'fiery-red'. Thirdly, the term 'hingul' is a phytonym in several Sumatran languages, synonymous with 'suren' in Sundanese language, that refers to *Toona sureni* and/or *T. sinensis* (de Clercq, 1909; Heyne III, 1917; Endert, 1924; den Berger, 1926). These two species, like other members of mahogany family, are valuable timber trees. They are a source of high quality hardwoods used for highend furniture work, interior finishing, decorative paneling, and other wood crafts. The difference between two species is that the sapwood of *T. sureni* is white to pinkish or pale red, and the heartwood is light red or brown in colour. The sapwood of *T. sinensis* is cream-coloured to red, the heartwood is light brick -red when exposed, and becomes reddish brown when aging (Orwa *et al.*, 2009; Peng *et al.*, 2012).

Other authors (Noorduyn & Teeuw, 2006; West, 2021) interpret the term 'bayabon' as "a particular kind of cloth". In this study, the term refers to *Collocasia esculenta* based on information from old botanical works on Java (Teijsmann, 1866; Seed & Plants, 1909) as well as other sources (Pleyte, 1911; van Dapperen, 1934). In traditional textile production in Southeast Asia, the corm of this plant used to create a vibrant purple dye for fabrics (Mongkholrattanasit *et al.,* 2021).

Even though previous authors reviewed in depth toponyms mentioned in Bujangga Manik (Noorduyn, 1982; Noorduyn & Teeuw, 1999; Noorduyn & Teeuw, 2006; West, 2017; West 2021), the phytotoponyms were not specifically discussed. Phytotoponymy is a linguistic expression that highlights the significant role of plants, constituting crucial remnants of ancient languages. It forms an essential lexical domain within toponymy, providing relatively reliable evidence regarding the botanical landscape of the past (Sindik & Caric, 2016; Pinna *et al.*, 2017; Camarda, 2019;

Fagundez & Izco, 2016; Vidal-Luengo *et al.*, 2019; Al-Okashi, 2021; Khisamitdinova *et al.*, 2022). The use of society's vernacular phytonym in Bujangga Manik for naming geographical features such as mountains, rivers, and important places is evident. With other historical texts from pre-Columbian exchange period, it serve as a significant source for reconstructing the past distribution of plant communities and plant uses in western Java.

Most Old Sundanese phytonyms identified in this study are monolexemic and barefaced names (Berlin, 1992; Franco *et al.*, 2022; Hidayati *et al.*, 2022) that have no meaning other than their own. Some of them, such as 'jerinang' and 'hingul' for example, are clearly loanwords unknown in the modern Sundanese botanical vocabulary. There are only seven names are bilexemic in which their secondary name has another meaning and need another study to decode them and unclose the meaning.

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