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Original Article

Use of medicinal plants among the customary law forest communities in Jambi, Indonesia

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ABSTRACT

Indonesia has a rich history of using medicinal plants, particularly among indigenous communities. However, documentation of these practices is limited, especially for communities in customary forests. This study aimed to document the medicinal plants used by indigenous peoples in Rantau Kermas and Pulau Tengah villages, located in Jambi Province, Indonesia. The study employed an ethnobotanical method, using in-depth interviews and participatory observation with an emic approach. The Pebble Distribution Method and the local user's value index (LUVI) were applied to evaluate the uses of medicinal plants among the communities. The results indicate that the customary communities in both villages used approximately 65 plant species from 56 genera and 32 families to treat newborns, digestive system disorders, fever, and non-clinical diseases. The highest LUVI value (1.53%) recorded from the community in Rantau Kermas Village was obtained from the application of *paku resam* (*Dicranopteris linearis* (*Burm.f.*) *Underw.*), used mainly for reducing fever. In Pulau Tengah Village, the highest LUVI value (1.74%) was obtained from the consumption of *limau kapau (Citrus x aurantiifolia (Christm) Swingle)* Swingle for treating stroke and bradyphrenia. The majority of these medicinal plants used are exotic species. Therefore, further phytochemical and pharmacological investigation to enhance their utilization value while ensuring their sustainability.

Keywords: customary forest communities, ethnobotany, ethnomedicine, local wisdom, medicinal plants

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Introduction

Indonesia has a rich history in traditional medicine, which plays a significant role in healthcare provision to the community (Elfahmi *et al*., 2014; Rahayu *et al*., 2020). The practices include the use of medicinal plant products, such as Indonesian herbal medicines (Elfahmi *et al*., 2014). Indonesian herbal medicines, collectively known as *jamu*, have been used by Javanese people for centuries to maintain and improve health, prevent and treat diseases, etc. The credibility of herbal medicines has been acknowledged by communities due to their effectiveness (Riswan & Sangat-Roemantyo, 2002).

The unique cultures of Indonesia are shaped by 300 ethnic groups from over 17,000 islands (Moffatt, 2012). However, documentation of these cultures is still limited, including those of the native people in Sumatra, Java, and Bali (Nugraha & Keller, 2011). Medicinal plants have played a crucial role in the development of traditional medicine in Indonesia, resulting in a holistic approach to healthcare (Nugraha & Keller, 2011). The history of the application of traditional medicine in Indonesia can be traced back to the early days of Indonesian civilization when Hinduism spread throughout Asia (Elfahmi *et al*., 2014). Evolution in traditional medicine practices among Indonesian communities has also been driven by the availability of vast resources of medicinal plants native to Indonesia, which are not found in India (Elfahmi *et al*., 2014). Trading activities with Chinese and Arabian traders have further boosted the growth of the traditional medicine market (Pols, 2010).

Traditional herbal medicine has been used for centuries by various Indonesian ethnic groups, including customary law communities living in customary forests (Dokata & Mburu, 2023). Tropical forests of Indonesia span around 143 million hectares, which are home to more than 28,000 plant species, among which are medicinal plants that make up 80% of the global supply (Elfahmi *et al*., 2014). Forests constitute a crucial ecosystem and exert significant influence on the communities, whose livelihoods depend primarily on forest resources, including medicinal plants (Ministry of Environment and Forestry Republic of Indonesia, 2022). Customary communities are groups of people who have lived in particular geographical areas for generations because of the ties to ancestral origins, a strong connection to the environment, and the existence of a value system that determines economic, political, social, and legal institutions (Joesoef, 2020). These communities usually inhabit customary forests within their territory and are awarded private forests based on the Constitutional Court Decision of the Republic of Indonesia (Ungirwalu *et al*., 2021). Notably, the livelihoods of these communities primarily depend on forest resources, which call for their crucial role in forest management (Parera *et al*., 2022).

Rantau Kermas and Pulau Tengah are two villages inhabited by customary communities, located in Jangkat District, Merangin Regency, Jambi Province. These villages have been awarded customary forest areas that are part of the conservation area of Kerinci Seblat National Park, which directly influences the lives of the people in the communities. Keeping the balance between conservation efforts and the needs of local communities is crucial. Additionally, the healthcare practices among the communities in both villages substantially depend on forest plant resources, partly due to the long distance to public health facilities. Furthermore, reliance on traditional healers who use medicinal plants in their potions strengthens the dependence on traditional medicine among the communities in both villages. The knowledge of medicinal plant species is a form of local wisdom passed down from ancestors. However, these communities face threats to their existence due to cultural, social, and economic factors (Cordero *et al*., 2023).

The distribution of patented medicines and rural modernization have led to the neglect of traditional medicine in some areas (Srithi *et al*., 2009). Additionally, habitat destruction and overexploitation of medicinal plants in forests have rendered them vulnerable and threatened with extinction (Mbuni *et al*., 2020). Documenting medicinal plants used in traditional medicine among these communities is crucial for preserving cultural practices and sharing knowledge with other communities and countries (Miguéis *et al*., 2019). Therefore, this study aimed to 1) inventory and document the medicinal plants used by the customary law communities in Serampas, Rantau Kermas Village, and Rimbo Penghulu Depati Gento Rajo, Pulau Tengah Village; 2) evaluate the use of medicinal plants in both villages.

Materials and Methods

Study area

This study was conducted between June 2022 and August 2022 in the customary law communities of Serampas in Rantau Kermas Village and Depati Penghulu Gento Rajo in Pulau Tengah Village, Jangkat District, Merangin Regency, Jambi Province (Fig. 1). Rantau Kermas Village is geographically located at S 2°33'52.52" - 2°37'17.49" and E 101°42'8.467" - 101°49'14.336" with an altitude of approximately 1000 to 1200 m.a.s.l. Pulau Tengah Village is located at S 2°33'14.162" - 2°34'56.618" and E 101°45'44.654" - 101°52'49.904" with an altitude of about 1200 to 1400 m.a.s.l. The villages experience an annual mean temperature of 26.8 °C, annual mean humidity of 85%, and annual precipitation of 2500 mm. The communities of Serampas and Depati Gento Rajo refer to the customary law communities and districts where they reside in southwestern Sumatra, Indonesia (Hariyadi & Ticktin, 2012). The geography of Rantau Kermas and Pulau Tengah villages is characterized by hilly terrain, which is part of the Bukit Barisan mountains that stretches along the western part of Sumatra Island (Hariyadi, 2021).

Conversely, Serampas communities predominantly inhabit the flat valley regions. These residential areas are typically surrounded by fields of cinnamon cultivation, secondary forests resulting from previous cultivation, and primary forests (Hariyadi, 2021). In the Rantau Kermas and Pulau Tengah communities, some individuals engage in sedentary agriculture by cultivating rice in irrigated fields. This is particularly common in areas with extensive flat terrain and ample water for irrigation (Hariyadi, 2021). In contrast, the communities in Serampas have expanded their agricultural activities to include cash crops like potatoes, cinnamon, and coffee (Hariyadi & Ticktin, 2012). Besides rice and cinnamon, the communities of Serampas and Depati Gento Rajo utilize the surrounding forests to meet various needs, including non-timber forest products.

Data collection of medicinal plants

Medicinal plants information was obtained using an emic approach through in-depth interviews and observation of participants engaging in community activities (Martin, 1995; Hoffman & Gallaher, 2007). This study involved six key informants from each village who played significant roles in the community. Informants from each village included three traditional healers, one village head, one customary forest manager, and one customary head. The interview followed a semi-structured format and used a questionnaire guide (Martin, 1995) with both close-ended and open-ended questions (Nikmatullah, 2022). Key informants were asked about medicinal plants, including their local names, uses, parts used, mode of preparation, and form of administration. Interviews were generally conducted using Bahasa (Indonesian language). Photo documentation and herbarium vouchers were prepared to identify each medicinal plant species. The specimens were deposited in the Herbarium Bogoriense (BO), Directorate of Scientific Collection Management, National Research and Innovation Agency, Republic of Indonesia. Additionally, information about the distribution of each plant species was obtained from the Plant of the World Online website (POWO, 2024) to determine whether the species is native to Sumatra or not.

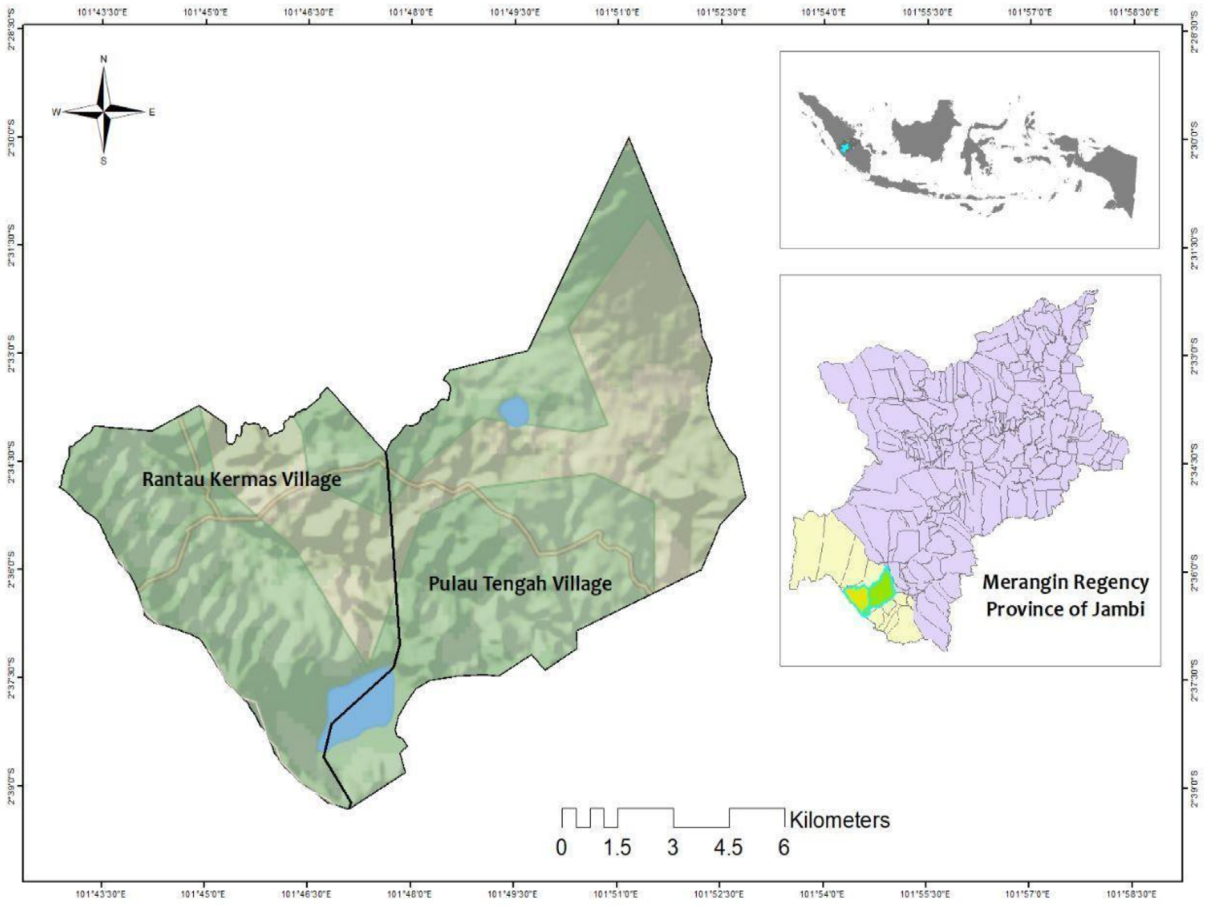

Fig. 1 Study sites in Rantau Kermas Village and Pulau Tengah Village, Jambi Province, southwestern Sumatra, Indonesia.

Valuation of medicinal plants

Ten local people were purposefully selected as respondents in each village based on their knowledge and experience in utilizing local plants (purposive sampling) (Bano *et al*., 2014). The valuation of medicinal plant species was carried out through forum group discussions (FGDs) (Wilkinson, 1998) using the Pebble Distribution Method (PDM) (Sheil *et al*., 2002). Respondents were asked to select the ten most important medicinal plants according to their opinions. Subsequently, they were instructed to distribute 100 pebbles among the plants and rank them in order of importance. Outputs from FGD were analyzed and used for calculating the local user's value index (LUVI) of medicinal plants based on the following equation:

$$LUVI = \sum_{i=species,} \quad for\ all\ j,\ Gij \qquad \text{(Equation 1)}$$

The importance of a species (Local User's Value Index: 'LUVI') on equation 1 is the sum of all a species' *Gij* values. At the lowest level, the importance of a type of use (j) of a species (i) will be represented as an individual value *Gij*. The formula of equation 1 is solved by assigning a weight to each *Gij* in a comparison grouped via PDM. In this system, a comparison is made within each class to weigh each *Gij* as a series of exercises, and then the classes themselves are compared in one exercise. The species are ranked according to the class of value (not their total value) is important, when they have more than one use. This process allows direct estimation of the sum of all G*ij* of individual species within a given class *j* (a type of use certain) by using the formula equation 2:

$$LUVI = Gij = \sum_{kategori=j} \quad Gij = RWj \times RwijRWj \qquad \text{(Equation 2)}$$

j represents the type of uses, while *i* represents the used species $LUVI = Gij = \sum_{kategori=j} Gij = RWj \times RwijRWj$. represents the quality given to a class of utility for certain *j* that exists; *RWij* is the relative quality in category *j* of the use *i* that meets the requirements for member *j* (Sheil *et al*., 2002). This quality assessment approach can be used for assessing each species in every utilization category, limiting the list to no more than 10 species. This approach may not be effective for describing data with too many PDM types (Sheil *et al*., 2002).

Results

Medicinal plants knowledge of the customary law communities

The key informants consisted of eight males and four females in total. The age of the participants ranged from 40 to 88 years, of which 58% were elderly (≥61 years). All participants work as farmers. Their educational background varied, with 58% finishing elementary education, 33.33% obtaining junior high school education, and 8.3% receiving non-formal education. According to the participants, the knowledge of traditional medicine using plants among the customary law communities of Serampas and Depati Gento Rajo was passed down from their ancestors through generations. The transmission of knowledge typically starts within the immediate family and spreads to surrounding communities. Consequently, the use of medicinal plants has become a local tradition, which remains in practice. The "Paraji" or traditional healers in Rantau Kermas and Pulau Tengah villages possess exceptional knowledge of medicinal plants and their uses. This particular knowledge of curing diseases can only be passed down through one's family line and is inaccessible to individuals who are not related to or descended from the same lineage. This study also revealed that knowledge about medicinal plant species is prevalent among informants over 60 with only an elementary school education. The findings from the results of interviews, all informants said that the lack of interest among the younger generation in traditional medicine from both villages and their preference for patented drugs for treating diseases. This trend appears similar to that in studies by Upadhya *et al*. (2014) who revealed the perception of a lack of interest in traditional medicine practices in the younger generation) (Upadhya *et al*., 2014).

The species diversity of medicinal plants

This report presents an inventory of medicinal plants used in Rantau Kermas and Pulau Tengah villages. A total of 65 species were identified, belonging to 56 genera and 32 families (Fig. 2 and Tab. 1). Rantau Kermas Village utilized 48 species from 41 genera and 24 families. Pulau Tengah Village used 37 species from 35 genera and 23 families. Medicinal plant species from the family Lamiaceae make up the largest proportion of the species used in both villages (seven species and four genera). Rutaceae (six species and three genera) ranked second, followed by Poaceae (five species and five genera). The list of medicinal plants used in traditional medicine includes perennial herbs (29.23%), shrubs (21.54%), and trees (16.92%). A total of 43 species of medicinal plants are cultivated, including both native (16.28%) and exotic (74.42%) species. Additionally, 22 species are wild plants that grow in customary forests (24.62%), river borders (7.69%), and irrigated rice fields (4.62%).

A cross-reference with the IUCN Red List database revealed 21 species in the list, of which 18 species are categorized as least concern (IUCN, 2024). These species include *Acorus calamus* L., *Ageratum conyzoides* L., *Aleurites moluccanus* (L.) Willd., *Citrus medica* L., *Clausena harmandiana* (Pierre) Guillaumin, *Codiaeum variegatum* (L.) Rumph. ex A.Juss., *Cordyline fruticosa* (L.)A.Chev., *Dicranopteris linearis* (Burm.f.) Underw., *Enydra fluctuans* Lour., *Helianthus annuus* L., *Hellenia speciosa* (J.Koenig) S.R.Dutta, *Imperata cylindrica* (L.) P.Beauv., *Jatropha curcas* L., *Mimosa pudica* Linn, *Paspalum conjugatum* P.J. Berguis, *Persea americana* Mill., *Psidium guajava* L.,

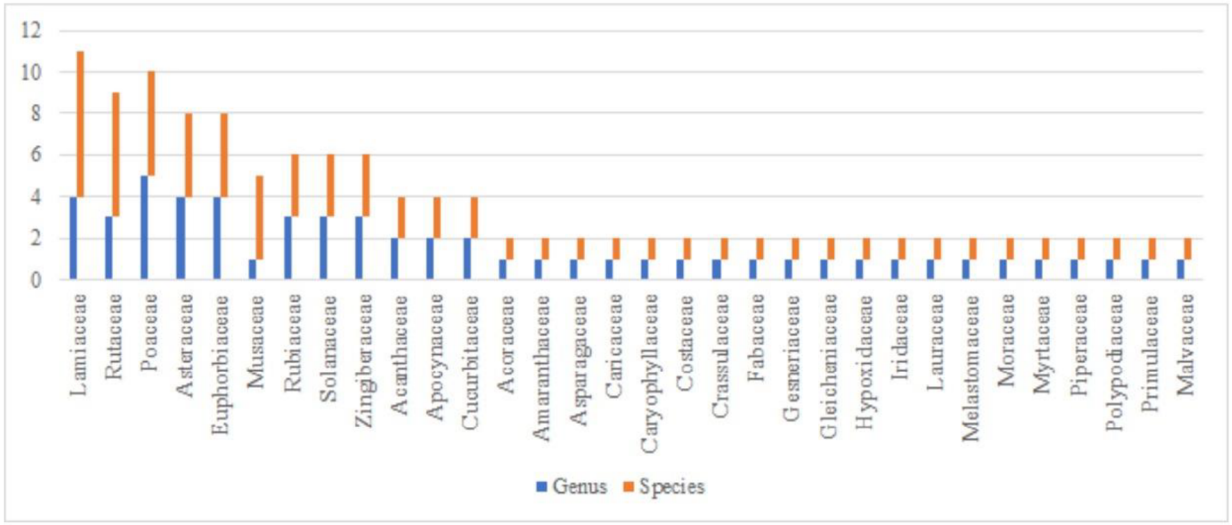

Fig. 2 Diversity of medicinal plant species in Rantau Kermas and Pulau Tengah villages, Jambi Province.

Fig. 3 The three most important medicinal plants in Rantau Kermas Village: (A) *paku resam* (*Dicranopteris linearis*), (B) *inggu* (*Ruta graveolens*), and (C) *tarum* (*Marsdenia tinctoria*).

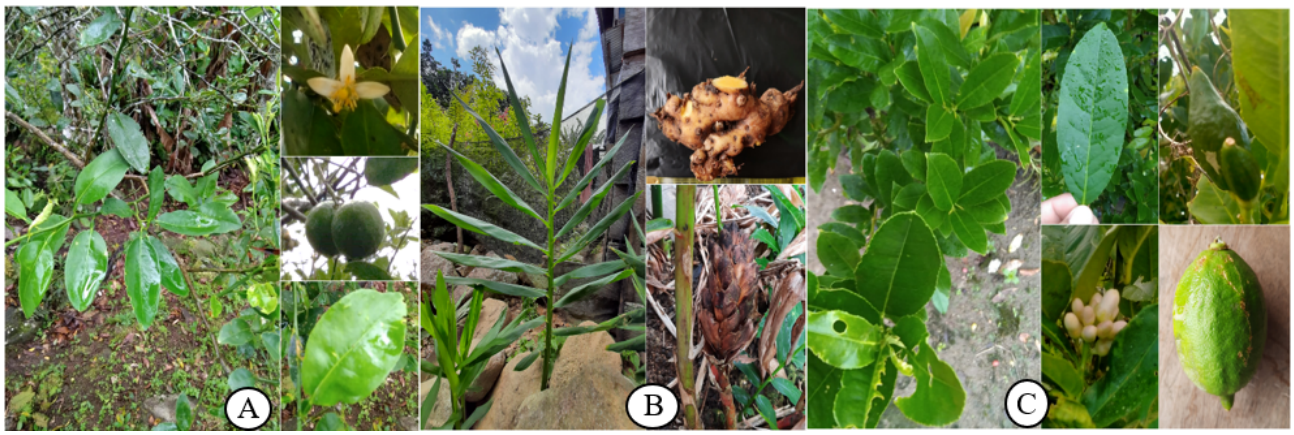

Fig. 4 The three most important medicinal plants in Pulau Tengah Village: (A) *limau kapau* (*Citrus x aurantiifolia*), (B) *kunyit melai* (*Zingiber purpureum*), and (C) *limau pagar* (*Citrus medica*).

Table 1. Medicinal plants used by communities of Rantau Kermas and Pulau Tengah villages, Jambi Province

Scientific name	Family	Native/ Exotic	Life forms	IUCN	Location	Local name	Habitat	Diseases/ uses	Parts used	How to use	Plant sources
Acorus calamus L.	Acoraceae	Exotic	G	LC	Rantau Kermas	*Jerangau*	Y	Stomachache	Rhizome	Chewed and then sprayed on the sore	C
					Pulau Tengah			Possessed		Sliced and then chewed	
Aeschynanthus albidus (Blume) Steud.	Gesneriaceae	Native	Ep	-	Rantau Kermas	*Kanalu/ kayu ingap*	Cf	Cancer	All parts of plant	Boiled and then drink the water	W
Ageratum conyzoides L.	Asteraceae	Exotic	H	LC	Rantau Kermas	*Rumput angit*	Cf	Scratch wound	Leaves	Rubbed and then applied on the wound	W
Aleurites moluccanus (L.) Willd.	Euphorbiaceae	Exotic	T	LC	Pulau Tengah	*Kemiri*	Cfi	Impotence	Sweet fruit and stems	-	W
Alstonia scholaris (L.) R.Br.	Apocynaceae	Native	T	-	Rantau Kermas	*Pulai*	Cf	Malaria	Leaves	Boiled and then drink the water	W
Austroeupatorium inulifolium (Kunth) R.M.King & H.Rob.	Asteraceae	Exotic	P	-	Rantau Kermas	*Rumput bungo*	Cf	Malaria, Scratch wound	Young leaves	Boiled then squeezed water and drink as much as 3 times	W
					Pulau Tengah	*Nimput bunga*	Y	Scratch wound	Leaves	Squeezed until the water comes out, then applied to the wound	C
Capsicum annuum L.	Solanaceae	Exotic	P	-	Pulau Tengah	*Cabe*	Cfi	Fever	Roots	Mixed with other plants then added water and recited a spell	C
Carica papaya L.	Caricaceae	Exotic	T	-	Pulau Tengah	*Kates/ Pepaya*	Cfi	Fever	Roots	Mixed with other plants then added water and recited a spell	C
Celosia argentea L.	Amaranthaceae	Exotic	F	-	Rantau Kermas	*Bungo ramo kuning*	Y	Postportum potions	Leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
						Bungo ramo merah				Mixed with *bungo ramo kuning*, *padang fatir*, and *camay* leaves, put in a funnel made of banana leaves and then dripped into the eyes	
					Pulau Tengah	*Rambu kuning*		Headache		Pounded then applied on the head	
Citrus hystrix DC.	Rutaceae	Native	T	-	Rantau Kermas	*Limau purut/ miyao purut*	Y	Convulsion	Fruit and leaves	Mixed with water, then used to bathe the baby	C

Table 1. Cont.

Scientific name	Family	Native/ Exotic	Life forms	IUCN	Location	Local name	Habitat	Diseases/ uses	Parts used	How to use	Plant sources
Citrus medica L.	Rutaceae	Exotic	T	LC	Rantau Kermas	*Limau susu/ limau sou/ miyau sou*	Y	Newborn baby potions	Leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
					Pulau Tengah	Limau pagar		Possessed	Fruit	Sliced, crumpled, and recited a spell	
Citrus x aurantiifolia (Christm) Swingle	Rutaceae	Exotic	T	-	Pulau Tengah	*Limau nipis/ kapau/ limau sundai*	Y	Stroke	Fruit	Mixed with roasted pepper and Kampong chicken eggs, then drunk, the rest is applied on the body	C
								Bradyphrenia		Drink or used for bathing	
Citrus x microcarpa Bunge	Rutaceae	Exotic	St	-	Pulau Tengah	*Limau kunci*	Y	Bradyphrenia	Fruit	Drink or used for bathing	C
Clausena harmandiana (Pierre) Guillaumin	Rutaceae	Exotic	T	LC	Rantau Kermas	*Marimun*	Cf	Fever	Leaves	Rubbed/squeezed with water and applied on the body	W
Codiaeum variegatum (L.) Rumph. ex A.Juss.	Euphorbiaceae	Exotic	Sh	LC	Rantau Kermas	*Puding emas*	Y & R	Newborn baby potions	Leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
Coffea arabica L.	Rubiaceae	Exotic	St	EN	Rantau Kermas	*Kopi*	Y	Newborn baby potions	Young leaves	Sliced and mixed with other plants then applied on the body for 7 days	C
Coleus amboinicus Lour.	Lamiaceae	Exotic	P	-	Rantau Kermas	*Peladang angit*	Cf	Newborn baby potions	Leaves and stems	Boiled, the water is used to bathe the baby for 3 days	W
Coleus scutellarioides (L.) Benth.	Lamiaceae	Native	H	-	Rantau Kermas	*Padang fatir*	Y	Newborn baby potions	Leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
Cordyline fruticosa (L.) A.Chev.	Asparagaceae	Exotic	Sh	-	Pulau Tengah	*Jaluang merah/ putih/ Junjung*	Y	Fever	Leaves	Pounded and apllied on the head	C
								Fertility	Shoots/inner leaves	Blended and then applied on the left side of the stomach, but there are restrictions on eating foods that contain gas (such as *tape* or fermented cassava etc.)	
Cucumis sativus L.	Cucurbitaceae	Exotic	Cl	-	Pulau Tengah	*Mentimun*	Cfi	Fever	Roots	Mixed with other plants then added water and recited a spell	C

Table 1. Cont.

Scientific name	Family	Native/ Exotic	Life forms	IUCN	Location	Local name	Habitat	Diseases/ uses	Parts used	How to use	Plant sources
Cucurbita moschata Duchesne	Cucurbitaceae	Exotic	Cl	-	Pulau Tengah	*Perenggi*	Cfi	Fever	Roots	Mixed with other plants then added water and recited a spell	C
Curculigo latifolia Dryand. ex W.T.Aiton	Hypoxidaceae	Native	P	-	Rantau Kermas	*Gunting tari*	Cfi	Childbirth potions	Young stems	Mixed with other plants in bamboo filled with water and then drink the water	W
Curcuma zedoaria (Christm.) Roscoe	Zingiberaceae	Exotic	P	DD	Rantau Kermas	*Kunyit temu*	Y	Tonic	Rhizome	Brewed and then drink the water	C
					Pulau Tengah	*Kunci temu*	Cfi				
Datura metel L.	Solanaceae	Exotic	Sh	-	Pulau Tengah	*Kecubung*	R	Conjunctivitis	Flower buds	Rubbed with regular coconut oil, then dripped with flower water	C
Davallia solida (G. Forst.) Sw.	Polypodiaceae	Native	Ep	-	Pulau Tengah	*Kunyal mengkarung*	Cf	Oligomenorea	Stems	Eat with betel leaves with cold rice in the morning	W
Dicranopteris linearis (Burm.f.) Underw.	Gleicheniaceae	Native	Cl	LC	Rantau Kermas	*Paku sam/paku resam/pakis asam*	Cf	Fever	Leaves	Squeezed and recited a spell, then applied on the body	W
					Pulau Tengah		Cfi			Squeezed in water, then applied on the body	
Drymaria cordata (L.) Willd. ex Schult.	Caryophyllaceae	Exotic	Cr	-	Rantau Kermas	*Rumput rantai*	Y	Diarrhea in babies	Leaves	Squeezed, added whiting and recited a spell, then applied on the navel	C
Enydra fluctuans Lour.	Asteraceae	Exotic	H	LC	Rantau Kermas	*Sekrau*	Irf	Anorexia, jaundice	Leaves	All the mixed plants are put into a bamboo filled with water, then boiled and use the water for bathing	W
					Pulau Tengah			Amnesia		Sliced, brewed, and drink the water	
Ficus ribes Reinw.ex Blume	Moraceae	Native	T	-	Pulau Tengah	*Aro*	R	Diarrhea	Latex	Boiled and then drink the water	W
Graptophyllum pictum (L.) Griff.	Acanthaceae	Exotic	Sh	-	Rantau Kermas	*Puding hitam, puding telur*	Y	Newborn baby potions	Leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
					Pulau Tengah	*Puding hitam*	Cfi	Sprain		Heated leaves, added vegetable oil, and applied on the sore	
Hedychium coronarium J.Koenig	Zingiberaceae	Exotic	P	-	Pulau Tengah	*Suli*	Y	Heatiness	Roots, stems, and leaves	Boiled and then drink the water	C

Table 1. Cont.

Scientific name	Family	Native/ Exotic	Life forms	IUCN	Location	Local name	Habitat	Diseases/ uses	Parts used	How to use	Plant sources
Helianthus annuus L.	Asteraceae	Exotic	F	-	Pulau Tengah	*Bunga matahari*	Y	Fertility	Flower buds	Blended and then applied on the left side of the stomach, but there are restrictions on eating foods that contain gas (such as *tape* etc.)	C
Hellenia speciosa (J.Koenig) S.R.Dutta	Costaceae	Native	P	LC	Rantau Kermas	*Fatawa/ putawa*	Y	Newborn baby potions	Young leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
					Pulau Tengah	*Setawa/ Fatawa/ putawa*	Y, R, & Cf				
Hibiscus rosa-sinensis L.	Malvaceae	Exotic	Sh	-	Rantau Kermas	*Bungo rayo*	Y & R	Cough	Leaves and flower	Soaked in hot water, added salt, then drink the water, and the rest is applied on the neck	C
Hymenachne amplexicaulis (Rudge) Nees	Poaceae	Exotic	G	-	Rantau Kermas	*Serumpai/ sumpai*	Irf	Anorexia, jaundice	Leaves	All the mixed plants are put into a bamboo filled with water, then boiled, used for bathing	W
					Pulau Tengah			Amnesia		Sliced, brewed, and drink the water	
Imperata cylindrica (L.) P.Beauv.	Poaceae	Exotic	G	LC	Rantau Kermas	*Gunting lalang*	Cf	Childbirth potions	Young stems	Mixed with other plants in bamboo filled with water, and then drunk	W
Iris domestica (L.) Goldblatt & Mabb.	Iridaceae	Exotic	P	-	Rantau Kermas	*Papet*	Y	Newborn baby potions	Leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
Jatropha curcas L.	Euphorbiaceae	Exotic	Sh	LC	Rantau Kermas	*Daun jarak*	Y	Cheilitis/ stomatitis	Sap in leaves and fruit	Sap applied on the sore	C
Justicia gendarussa Burm.f.	Acanthaceae	Native	Sh	-	Rantau Kermas	*Ranyau rusuh/ rumput rusuh/ Talasih hutan*	Y, Cf	Newborn baby potions, fever	Leaves	Squeezed and then rubbed, and some mixed with water and then drunk	W
								Convulsion		Mixed with other plants and then applied on the body as much as three times a day	
Kalanchoe pinnata (Lam.) Pers.	Crassulaceae	Exotic	Sc	-	Rantau Kermas	*Saringin/ sedingin*	Y	Newborn baby potions	Leaves	Sliced and then mixed with other plants, then applied on the body for 7 days	C
					Pulau Tengah						
Labisia pumila (Blume) Fern.Vill.	Primulaceae	Native	H	-	Pulau Tengah	*Rumput fatimah*	Y	Childbirth potions	Leaves	Brewed with hot water	C

Table 1. Cont.

Scientific name	Family	Native/ Exotic	Life forms	IUCN	Location	Local name	Habitat	Diseases/ uses	Parts used	How to use	Plant sources
Marsdenia tinctoria R.Br.	Apocynaceae	Exotic	Sh	-	Rantau Kermas	*Tarum*	Y	Convulsion	Leaves and twigs	Pick up the plant with a black cloth, then squeezed, pricked and applied to the body	C
Melastoma malabathricum L.	Melastomaceae	Native	Sh	-	Rantau Kermas	*Kenuruk*	Cf	Diarrhea	Leaves and roots	Boiled then drink a little water, the rest is applied on the body	W
Mimosa pudica Linn	Fabaceae	Exotic	P	LC	Rantau Kermas	*Sekejut*	Cf	Convulsion	Roots	Soaked in warm water, then applied on the body	W
Morinda citrifolia L.	Rubiaceae	Native	T	-	Rantau Kermas	*Mengkudu*	Y	Hypertention	Fruit	Blended, filtered, and then drink the water	C
Musa sp.	Musaceae	-	P	-	Rantau Kermas	*Pisang adago*	Cfi	Newborn baby potions	Inner pseudostem	Sliced, mixed with water, used for bathing	C
Musa sp.	Musaceae	-	P	-	Rantau Kermas	*Pisang dingin*	Cfi	Newborn baby potions	Inner pseudostem	Sliced, mixed with water, used for bathing	C
Musa sp.	Musaceae	-	P	-	Rantau Kermas	*Pisang layu*	Cfi	Newborn baby potions	Inner pseudostem	Sliced, mixed with water, used for bathing	C
Musa sp.	Musaceae	-	P	-	Rantau Kermas	*Pisang rajo*	Cf	Newborn baby potions	Inner pseudostem	Sliced, mixed with water, used for bathing	C
					Pulau Tengah		Cfi	Fever	Roots	Mixed with other plants then added water and recited a spell	W
Ocimum sp.	Lamiaceae	-	Sh	-	Rantau Kermas	*Talasih hitam*	Y	Reject reinforcements	Leaves	Pounded in water, then applied all over the body, especially for baby baths mixed with *inggu* leaves	C
					Pulau Tengah						
Ocimum tenuiflorum L.	Lamiaceae	Native	Sh	-	Rantau Kermas	*Bungo uko itam*	Y	Newborn baby potions	Young leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
Orthosiphon aristatus (Blume) Miq.	Lamiaceae	Native	P	-	Rantau Kermas	*Kumis kucing*	Y	Low back pain, myalgia	Top root	Boiled and then drink the water	C
					Pulau Tengah						
Paspalum conjugatum P.J. Berguis	Poaceae	Exotic	G	LC	Rantau Kermas	*Gunting padi*	Irf	Childbirth potions	Young stems	Mixed with other plants in bamboo filled with water and then drunk	W
Persea americana Mill.	Lauraceae	Exotic	T	-	Pulau Tengah	*Alpukat*	Cfi	Hypertention	Leaves	Boiled and then drink the water	C

Table 1. Cont.

Scientific name	Family	Native/ Exotic	Life forms	IUCN	Location	Local name	Habitat	Diseases/ uses	Parts used	How to use	Plant sources
Piper betle L.	Piperaceae	Exotic	Cl	-	Rantau Kermas	*Sirih*	Cfi	Conjunctivitis	Leaves	Squeezed out the water, then dripped into the eye	C
					Pulau Tengah		Y & Cfi	Headache		Heated, then applied and massaged on the head	
Pogostemon menthoides Blume	Lamiaceae	Exotic	P	-	Rantau Kermas	*Paladang abang*	Y	Postportum potions	Young leaves	Sliced and mixed with other plants, then applied on the body for 7 days	C
Pogostemon villosus (Roxb.) Benth.	Lamiaceae	Native	Sh	-	Rantau Kermas	*Paladang hutan*	Cf	Convulsion	Leaves	Mixed with other plants and then applied on the body as much as three times a day	W
Psidium guajava L.	Myrtaceae	Exotic	T	LC	Rantau Kermas and Pulau Tengah	*Jambu batu/ jambu biji/ jambu putih*	Y	Stomachache	Leaves	Boiled and then drink the water	C
Ricinus communis L.	Euphorbiaceae	Exotic	Sh	-	Pulau Tengah	*Kaliki merah*	Cfi	Otalgia	Petiole	Blow one ear that doesn't hurt	W
Ruta graveolens L.	Rutaceae	Exotic	Sh	LC	Rantau Kermas	*Inggu*	Y	Reject reinforcements	Leaves	Mixed with *talasih hitam*, then rubbed in water	C
					Pulau Tengah			Detect kidney disease		Attached to a part of the body, if it feels cold then there is interference with the kidneys	
Saccharum officinarum L.	Poaceae	Exotic	P	-	Rantau Kermas	*Tebu hitam*	Cfi	Oligohydramnios	Sugarcane water	Chewed	C
					Pulau Tengah		Y				
Schizostachyum brachycladum (Kurz ex Munro) Kurz	Poaceae	Exotic	P	-	Rantau Kermas	*Bambu telang*	Cf	Anorexia	Water in stems	All mixed plant ingredients are boiled in watery bamboo, used for bathing	W
Solanum melongena L.	Solanaceae	Exotic	P	-	Pulau Tengah	*Terong*	Y	Fever	Roots	Mixed with other plants then added water, and recited a spell	C
Uncaria gambir (W.Hunter) Roxb.	Rubiaceae	Native	L	-	Rantau Kermas	*Akar lundang*	Cf	Stomachache	Water in stems	Drink directly	W
					Pulau Tengah	*Rundang*		Anemia	Roots	Boiled and then drink the water	
Zingiber purpureum Roscoe	Zingiberaceae	Exotic	P	DD	Rantau Kermas	*Kunyit melai*	Y	Stomachache	Leaves	Chewed and then sprayed on the sore	C
					Pulau Tengah			Possessed	Rhizome	Sliced and then chewed	

and *Ruta graveolens* L. Two species, *Curcuma zedoaria* (Christm.) Roscoe and *Zingiber purpureum* Roscoe are classified as data deficient (DD). Only one species, *Coffea arabica* L., is currently categorized as endangered (EN). This coffee species is cultivated by the local community and becomes one of their sources of livelihood. The local communities process the beans of *Coffea arabica* and sell them as a superior local product known as "Kopi Jangkat".

Rules for the collection and use of medicinal plants

The data on types of medicinal plants was primarily sourced from Rantau Kermas Village, considering the relatively high frequency of medicinal plant utilization among its people. Despite the localization of these plants in different villages, around 17 plant species are equally used as medicinal plants by the communities of Rantau Kermas and Pulau Tengah villages (Tab. 1), namely *Acorus calamus*, *Austroeupatorium inulifolium* R.M.King & H.Rob, *Citrus medica*, *Curcuma zedoaria*, *Dicranopteris linearis*, *Enydra fluctuans*, *Graptophyllum pictum* (L.) Griff., *Hellenia speciosa*, *Hymenachne amplexicaulis* (Rudge) Nees, *Kalanchoe pinnata* (Lam.) Pers., *Orthosiphon aristatus* (Blume) Miq., *Piper betle* L., *Psidium guajava*, *Ruta graveolens*, *Saccharum officinarum* L., *Uncaria gambir* (W.Hunter) Roxb., and *Zingiber purpureum*. Additionally, 17 species of these medicinal plants are native to Sumatra, namely *Aeschyanthus albidus* (Blume) Steud., *Alstonia scholaris* (L.) R.Br., *Citrus hystrix* DC., *Coleus scutellaroides* (L.) Benth., *Curculigo latifolia* Dryand. ex W.T.Aiton, *Davallia solida* (G.Forst) Sw, *Dicranopteris linearis*, *Ficus ribes*, *Hellenia speciosa*, *Justicia gendarussa* Burm.f., *Labisia pumila* (Blume) Fern.Vill., *Melastoma malabathricum* L., *Morinda citrifolia* L., *Ocimum tenuiflorum* L., *Orthosiphon aristatus*, *Pogostemon villosus* (Roxb.) Benth., and *Uncaria gambir*.

Medicinal plants are typically obtained from areas, such as cultivation fields, customary forests, irrigated rice fields, river borders, and home gardens (Tab. 1). About 44% of medicinal plants are retrieved from home gardens. Initially, people harvested medicinal plants from the customary forest area. However, most medicinal plant species have been cultivated in home gardens to limit access to customary forests, except for certain species that are still undomesticated, such as *Dicranopteris linearis* and *Uncaria gambir*. Furthermore, there are several rules that the communities in both villages must adhere to, such as only harvesting medicinal plants in the form of herbs or shrubs; in the case of trees, they are only allowed to take part in the plant rather than cutting it down. *Marimun* (*Clausena harmandiana*), *paku resam* (*Dicranopteris linearis*), and *ranyau rusuh* (*Justicia gendarussa*) are among the species used as fever remedies that are available exclusively in the customary forest. These rules also explain the vast majority of the available medicinal plants in the form of herbs and shrubs.

The key informants reported that restrictions on the use of medicinal plants are implemented to protect the livelihoods of the communities, particularly water sources. Violations of these restrictions result in fines, such as 200 kg of rice or a goat. These conservation efforts strengthen the link between resource conservation and sustainable use (Long *et al.*, 2003; Hashim *et al.*, 2019) and also have focused on establishing protected areas that are ecosystem-oriented (Ma *et al.*, 2013). Consequently, people have started to grow medicinal plants from the customary forest in their home gardens. Based on observations in this study, almost every household owns a garden cultivated with medicinal plants, which are also used as hedges or ornamental plants, such as *junjung* (*Cordyline fruticosa*). The necessary parts of the plants are extracted and taken to a "Paraji", who will formulate a medicine and recite a spell for anyone in the communities who falls sick.

Special rules and cultural norms may apply when local communities use certain medicinal plants. For instance, in Rantau Kermas Village, the leave of *tarum* (*Marsdenia tinctoria R.Br.*) must be taken using a black cloth, lest the benefits may be lost. Meanwhile, in Pulau Tengah Village, there is a prohibition on consuming gaseous foods, such as *tape* (fermented cassava), when using sunflower (*Helianthus annuus*) buds and *junjung* (*Cordyline fruticosa*) leaf shoots for fertility drugs. Traditional healers from both villages mutually believe that the effectiveness of the plants is reduced when consumed with gaseous foods because they are typically applied topically to the stomach. Nevertheless, it is important to maintain objectivity and avoid subjective evaluations.

Ways of using medicinal plants

The study revealed that the communities in Rantau Kermas and Pulau Tengah villages frequently used plants to treat various conditions. The list includes, 16 species used for treating newborns, 12 species for digestive disorders, 11 species for fever, and 10 species for non-clinical diseases, such as convulsions, possession, and rejection of reinforcements (Tab. 1). The plant parts commonly used in the traditional medicine preparation include leaves (36 species), stems (10 species), roots (9 species), fruit (6 species), rhizome (3 species), and others, such as flowers, sap, twigs, etc (10 species). Medicinal potions are typically made using one or several plant species. For instance, in Rantau Kermas Village, the "Paraji" prepares a potion for newborns using a mixture of *Citrus medica, Coffea arabica, Codiaeum variegatum, Coleus scutellaroides, Graptophyllum pictum, Hellenia speciosa, Iris domestica* (L.) G oldblatt & Mabb., *Kalanchoe pinnata,* and *Ocimum tenuiflorum*; a mixture of *Celosia argentea* and *Pogostemon menthoides* Blume has been used to prepare a concoction for postpartum mothers.

In Rantau Kermas Village, the three most important medicinal plants are *paku resam* (*Dicranopteris linearis*), *inggu* (*Ruta graveolens*), and *tarum* (*Marsdenia tinctoria*) with LUVI

Tab. 2 LUVI scores of medicinal plants in Rantau Kermas and Pulau Tengah villages, Jambi Province

Rantau Kermas Village				Pulau Tengah Village			
Local Name	**Scientific Name**	**Value of PDM**	**LUVI**	**Local Name**	**Scientific Name**	**Value of PDM**	**LUVI**
Paku Resam	*Dicranopteris linearis* (Burm.f.) Underw.	17	1,53	*Limau kapau/ nipis*	*Citrus x aurantiifolia* (Christm) Swingle	15	1,74
Inggu	*Ruta graveolens* L.	15	1,35	*Kunyit melai*	*Zingiber purpureum* Roscoe	14	1,62
Tarum	*Marsdenia tinctoria* R.Br.	14	1,26	*Limau pagar*	*Citrus medica*	13	1,51
Talasih hitam	*Ocimum* sp.	12	1,08	*Limau kunci*	*Cirus x microcarpa* Bunge	13	1,51
Kunyit melai	*Zingiber purpureum* Roscoe	12	1,08	*Jerangau*	*Acorus calamus* L.	11	1,27
Sedingin	*Kalanchoe pinnata* (Lam.) Pers.	11	0,99	*Paku resam*	*Dicranopteris linearis* (Burm.f.) Underw.	10	1,16
Jerangau	*Acorus calamus* L.	8	0,72	*Limau sundai*	*Citrus x aurantiifolia* (Christm) Swingle	8	0,93
Bungo rayo	*Hibiscus rosa-sinensis* L.	5	0,45	*Talasih hitam*	*Ocimum* sp.	7	0,81
Sekerau	*Enydra fluctuans* Lour.	3	0,27	*Sirih*	*Piper betle* L.	5	0,58

values of 1.53%, 1.35%, and 1.26%, respectively (Tab. 2). In Pulau Tengah Village, *limau kapau* (*Citrus x aurantiifolia* (Christm.) Swingle), *kunyit melai* (*Zingiber purpureum*), and *limau pagar* (*Citrus medica*) are the top three important medicinal plants with LUVI values of 1.74%, 1.62%, and 1.51%, respectively (Tab. 2). Despite *limau pagar* scoring the same LUVI as *limau kunci* (*Cirus* × *microcarpa* Bunge), all the participants believed that former is more potent than the latter. The Paraji in this village uses the fruit of *limau kapau* to treat stroke disease by mixing its juice with roasted pepper and Kampong chicken eggs. *Limau kapau* is also used to treat bradyphrenia (slowed thinking and processing of information).

This study identified three species of medicinal plants, namely *kanalu* (*Aeschyanthus albidus*), *pulai* (*Alstonia scholaris*), and *rumput bungo* (*Austroeupatorium inulifolium*), used to treat dangerous diseases such as cancer and malaria. In Rantau Kermas Village, drinking boiled water infused with *kanalu* is believed to cure cancer. *Kanalu* is an epiphyte of parasitic plant species from the Euphorbiaceae family. According to key informants, its medicinal properties are only present when it grows on coffee trees. Additionally, boiled water from the leaves of *pulai* and *rumput bungo* can be used to treat malaria.

Discussion

The use of plants as medicine has become a local cultural practice among the people of Rantau Kermas and Pulau Tengah villages. However, informants in this study believed that the interest in traditional (plant) medicine practices has declined among the younger generation. The decline could be attributed to globalization which cannot be avoided by the younger generation (Manurung *et al*., 2022). Salsabila *et al*. (2014) found that only 2.74% of the younger generation in Cisantana Village, Kuningan Regency possess knowledge of medicinal plants. In Ecuador, younger people may know less about medicinal plants than older people (Weckmüller *et al*., 2019). Similarly, the traditional healing knowledge of the Mulam, a tribe from Guangxi, China, may be lost

as younger generations gradually lose interest (Hu *et al*., 2020). Nahak (2019) asserted that the loss of local culture among the younger generation is partly due to the lack of cultural education.

The practices of traditional plant medicine among the people of Rantau Kermas and Pulau Tengah villages are regulated by customary law. This law is a strategic measure implemented by traditional elders and village officials to preserve their traditional forests. Integrating customary law into regulations can support forest management and educate the public about environmental protection (Asteria *et al*., 2021). This approach also contributes to achieving Sustainable Development Goal (SDG) 15, which aims to protect tropical forests as the home of the world's terrestrial biodiversity (Sayer *et al*., 2019; Sjaf *et al*., 2021)

The high utilization of the Lamiaceae, Rutaceae, and Poaceae by the communities of both villages indicates that these families are rich in plant species with medicinal properties. Moerman *et al*. (1999) reported the use of various species from the families of Lamiaceae, Rutaceae, and Poaceae as medicinal plants in several regions, such as North America, Korea, Khasmir, Chiapas Highlands, and Ecuador. In addition, the wide application of leaves for medicinal purposes in this study is probably due to their rich secondary metabolites (Assi *et al*., 2017; Jain *et al*., 2019; Gurning & Sinaga, 2020), minimal impact on plant death (Qamariah *et al*., 2020), and ability to regrow quickly after being harvested (Qamariah *et al*., 2020). Leaves are also commonly used in traditional medicines by various ethnic groups due to their medicinal properties (Nugroho *et al*., 2022; Suharjito *et al*., 2014).

Medicinal plant cultivation as part of conservation efforts has also been practiced by communities in the two villages investigated in this study. However, this study found that some of the cultivated plants are exotic, and not native to Sumatra. Exotic plants are occasionally used in traditional medicine or essence they do not cause problems, because they can serve to supplement needs or provide resources when native plants are not available, while also reducing the over extraction of native plants from the narural environment. Nevertheless, it is important to note that they are not indigenous to the area. Moreover, relying on exotic plants may result in the neglect of native plants (Alencar *et al*., 2014).

According to LUVI values obtained from both villages, respondents placed a higher significance on exotic plants than the native (Tab. 2). The LUVI value, which provides an overview of the most important biological sources based on the views of local communities (Sheil *et al*., 2002), is influenced by two main factors: the convenience of obtaining materials and the confidence in the benefits of plants. As Turner (1988) noted, the importance of a plant increases with its frequency of use. Therefore, comprehensive studies are necessary to identify native plants with medicinal properties similar to those of exotic plants. For instance, it is recommended to use *paku resam* (*Dicranopteris linearis*) instead of marimun (*Clausena harmandiana*) or *junjung* (*Cordyline fruticosa*) in the treatment of fever.

Paku resam obtained the highest LUVI value as it is used by villagers to treat common fever. The leaves are squeezed while healing spells are recited before topically applied to the body. *Paku resam* is a species of fern from the Gleicheniaceae family that grows in customary forests. Fever treatment using traditional medicine made from this plant is also among the local wisdom of Malay communities (Chin, 1992). Indians have been using the juice of its young leaves to treat allergic symptoms, cough, and respiratory disorders (Sarker & Hossain, 2009). Several biopharmaceutical studies have reported the antibacterial, antidepressant, anti-inflammatory, antinociceptive, antioxidant, and antipyretic properties of *paku resam* (Zakaria *et al*., 2008; Lai *et al*., 2009; Kamisan *et al*., 2014; Billah *et al*., 2021).

The customary communities of Rantau Kermas and Pulau Tengah villages in Jambi Province have a tradition of using medicinal plant species to treat various diseases. They have used approximately 65 plant species from 56 genera and 32 families to treat various health concerns, such as newborn care, digestive system disorders, fever, and non-clinical diseases. In Rantau Kermas Village, *Dicranopteris linearis* is particularly noteworthy, which scored the highest LUVI value and is locally recognized for its effectiveness in reducing fever. In Pulau Tengah Village, *Citrus x aurantiifolia* scored the highest LUVI value and is traditionally used to treat conditions such as stroke and bradyphrenia.

A Paraji plays an important role in preparing potions from plants before it is used to treat diseases. This local wisdom has been passed down from their ancestors, but they risk losing it due to the lack of interest among the younger generation. This shift in interest poses a significant threat to the preservation of traditional medicine in the two villages involved in this study. In addition to the documented information on medicinal plants obtained from the Paraji in this study, it is believed that knowledge on several types of plants remains undocumented, especially wild plants in customary forests. Due to time constraints and language barriers, collecting information for this study proved to be challenging. Therefore, further studies are required to gather data on medicinal plant types in Rantau Kermas and Pulau Tengah villages, which should involve the younger generation in the villages. Moreover, all of the key informants interviewed for this study indicated that traditional healing is often perceived as an unprofitable profession, prompting young people to forsake it. Additionally, there is a growing interest in pursuing careers as farmers among the young generation. This change in emphasis marks a significant danger to conserving traditional medicine in these communities.

This study also discovered the preference to use exotic plants over native Sumatran plants in the practice of traditional medicine among the communities of Rantau

Kermas and Pulau Tengah. The use of exotic plants may supplement needs or provide resources when native plants aren't available, while also reducing excessive extraction of native plants from natural environments. Therefore, it is necessary to educate the communities on the responsible use of exotic plants. Additionally, assistance from local governments and other stakeholders is required to encourage the use of original germplasm as a conservation effort. However, information on medicinal plants gathered from this study may be limited by factors, such as time constraints. Therefore, further studies are required to gather data and determine the phytochemistry and pharmacology of these medicinal plants. The knowledge provides insight for the development of new drugs and validates ethnomedicine knowledge.

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Authors' Contributions

Muhamad Nikmatullah: Writing – review & editing, writing – original draft, validation, resources, project administration, methodology, investigation, funding acquisition, formal analysis, data curation, conceptualization. Elga Renjana: Writing – review & editing, writing – original draft, validation, resources, methodology, investigation, formal analysis, data curation. Dicky Rachmawan: Writing – review & editing, writing – original draft, resources, project administration, investigation, funding acquisition, formal analysis, data curation. Robert Siburian: Writing – original draft, visualization, software, resources, project administration, investigation, formal analysis, data curation. Letsu Vella Sundary: Writing – original draft, visualization, software sources, project administration, investigation, formal analysis, data curation. Herman Hidayat: Writing review & editing, writing original draft, visualization, resources, project administration, investigation, formal analysis, data curation. Mulyati Rahayu: Writing – review & editing, writing – original draft, validation, supervision, resources, methodology, funding acquisition, formal analysis, data curation, conceptualization.

Conflicts of Interest

No potential conflict of interest was reported by the author(s).

Research Ethics

Indonesian National Research and Innovation Agency's Ethics Commission for Social Humanities granted research ethics clearance for this project. This clearance was based on a document titled Ethics Clearance Decision Letter with the reference number 037/KE.01/SK/4/2022

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