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Inventory of Medicinal Plants in the Ethnobotanical Traditions of the West Sumatran Community

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Abstract: This study analyzes the ethnobotanical utilization of medicinal plants in West Sumatra based on the traditional Minangkabau territorial systems (Darek, Rantau, and Pesisir) and examines its implications for contextual science education. A mixed descriptive–quantitative ethnobotanical approach was employed involving 240 key informants (105 from Darek, 90 from Rantau, and 45 from Pesisir) selected through purposive and snowball sampling. Data were collected using structured interviews, participatory observation, and species documentation. Quantitative ethnobotanical indices, including Use Value (UV) and Fidelity Level (FL), were applied. The results identified 38 medicinal plant species from 24 families. *Curcuma longa* (UV=0.88), *Zingiber officinale* (UV=0.84), and *Tinospora crispa* (UV=0.81) were the most culturally important species. High FL values were observed for *Andrographis paniculata* in fever treatment (92.1%) and *Curcuma longa* for digestive disorders (89.6%), indicating strong cultural reliability. The findings demonstrate that Minangkabau ethnobotanical knowledge is territorially structured, culturally transmitted, and empirically reliable. This study provides a scientific foundation for the development of ethnoscience-based science learning resources, supporting contextual learning, scientific literacy, and cultural preservation in Indonesian secondary education.

Keywords: Ethnobotany; Local wisdom; Medicinal plants; Minangkabau tradition; West Sumatra.

Introduction

Ethnobotany is an important scientific discipline that investigates the intricate relationships between humans and plants within diverse social and cultural contexts. In traditional societies, plants are essential sources of food, construction materials, and natural remedies, often passed down through generations (Daeli, 2023).

Indonesia, a tropical paradise, boasts a remarkable diversity of flora, including many medicinal plants that have been used for generations to address health issues (Andesmora et al., 2022; Yassir & Asnah, 2018). Their traditional use offers a safer alternative with fewer side effects than synthetic drugs (Wulandari, 2018) and empowers communities to embrace natural remedies (Siahaan & Aryastami, 2018). These herbal solutions, identified by their active compounds, provide substantial therapeutic potential and are a vital resource for holistic health management (Adiyasa & Meiyanti, 2021).

Medicinal plant inventories are crucial in the context of preserving traditional knowledge and sustainable natural resource development. In addition to preserving cultural identity, integrating ethnobotanical knowledge into education can support more contextual and meaningful learning (Sari et al., 2023). Documenting plant species, their parts used, and traditional processing methods provides a scientific basis for biodiversity conservation and the development of local phytotherapy. Furthermore, inventory results also support the economic utilization of biological potential, particularly in the development of a safe and

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standardized herbal and traditional medicine industry (Lesmana et al., 2022).

West Sumatra is a region rich in medicinal plant diversity and Minangkabau culture, both steeped in local wisdom. The Minangkabau people are known for their philosophy of life, "*adat basandi syarak, syarak basandi Kitabullah*," which emphasizes harmony between custom and religion. This philosophy reflects a worldview that places nature as an integral part of human life.

The Minangkabau people are known for their unique socio-cultural concepts, one of which is the division of customary territories called *Luhak*. The Minangkabau region is divided into three areas: *darek*, *rantau*, and *pantai*. *Luhak* is part of the *darek* (land) region, which is the original Minangkabau area, including *Luhak* Tanah Datar, *Luhak* Agam, and *Luhak* Limopuluah Kota. These three *luhaks* are often called *Luhak* Nan Tigo. The *Luhak* Nan Tigo region is located in the highlands, specifically in the mountainous area (Diradjo, 2018; Noviyola & Wulandari, 2024). The *Luhak* region consists of several nagari (villages) with their own independent governments (Navis, 2015).

The *Rantau* region, or "region outside the *luhak* nan tigo," is a place used by the Minangkabau people to seek a better life. The *luhak* and *rantau* regions became centers of cultural development in Minangkabau. Coastal areas are part of the *Rantau* region and are called *Rantau Pesisia*. People who inhabit coastal areas typically aim to seek a better life. Even though people live outside the Minangkabau region, Minangkabau customs remain in place and are practiced by the Minangkabau people (Noviyola & Wulandari et al., 2024). Each region has distinct ecological, topographical, and ethnobotanical characteristics.

Minangkabau local wisdom is reflected in the principle of "*alam takambang jadi guru*," meaning that people learn from nature to create balance in life. In their daily lives, the Minangkabau people demonstrate a harmonious relationship with the environment through traditional agricultural practices, sustainable use of natural resources, and the use of plants for health, food, and traditional ceremonies.

Several previous studies have shown that various regions in West Sumatra possess a high diversity of medicinal plants, with a variety of uses unique to the local environment and customs (Aizaniva et al., 2025; Andania et al., 2024; Chan et al., 2025; Fadhilah et al., 2025; Jannah et al., 2025; Nisa et al., 2025; Sari, 2019). However, data and documentation on the distribution and diversity of medicinal plant species in traditional Minangkabau regions (which reflect the diversity of Minangkabau *Luhak*) are still limited. Therefore, this study was conducted to inventory the types of medicinal plants used by the community in daily life and to describe their utilization methods and cultural values within Minangkabau ethnobotanical traditions, based on these traditional Minangkabau regions.

This study does not merely document medicinal plant inventories, but introduces a novel territorial-based ethnoscience model by mapping medicinal plant utilization according to the Minangkabau traditional regions (Darek, Rantau, and Pesisir). Unlike previous ethnobotanical studies in West Sumatra, which primarily focused on species listings at local scales, this research demonstrates how socio-cultural territories shape ethnobotanical knowledge systems across regions.

Furthermore, the results offer strong contributions to science education by providing empirically validated ethnobotanical data that can be transformed into ethnoscience-based teaching materials for secondary school biology learning. The integration of cultural knowledge and scientific indices supports contextual learning, strengthens scientific literacy, and preserves local wisdom in formal education.

Method

This research employed a mixed descriptive–quantitative ethnobotanical approach. The study was conducted in three traditional Minangkabau regions: Darek, Rantau, and Pesisir. A total of 240 key informants were selected using purposive and snowball sampling techniques, consisting of traditional healers, elderly community members, and *bundo kanduang* (female custodians of traditional knowledge). Each region has distinct ecological conditions that influence the diversity of medicinal plants. The study locations are described in Table 1.

Table 1. Research Locations Based on Traditional Minangkabau Regions in West Sumatra

No.	Research Locations (Area)
1	*Darek* Area *(Luhak Nan Tigo)*: Tanah Datar Regency, Agam Regency, Lima Puluh Kota Regency, Bukittinggi City, Payakumbuh City, Solok Regency, Solok City
2	*Rantau* Area: Pasaman Regency, West Pasaman Regency, Sijunjung Regency, Dharmasraya Regency, South Solok Regency, Sawahlunto City
3	*Pasisia* Area: Pesisir Selatan Regency, Padang Pariaman Regency, Padang City, Pariaman City

Data was collected through structured and semi-structured interviews, participatory observations, and species documentation. Plant identification was performed using *Flora of Java* and online botanical databases. Data validity was ensured through triangulation and cross-checking among informants. Quantitative ethnobotanical indices including Use Value

(UV) and Fidelity Level (FL) were calculated to measure cultural importance and informant consensus. Data were analyzed descriptively and quantitatively.

Result and Discussion

Medicinal Plant Inventory Based on Traditional Minangkabau Regions

The use of medicinal plants is evenly distributed across the three central Minangkabau regions: *Darek* (38%), *Rantau* (32%), and *Pesisir* (30%). This division reflects the ecological, socio-cultural, and local knowledge systems that differ in each region. The results of the medicinal plant inventory based on the Traditional Minangkabau regions are presented in Table 2.

Table 2. Inventory of Medicinal Plants Used by Minangkabau Communities in Darek, Rantau, and Pesisir Regions of West Sumatra

Region Minangkabau	Scientific Name	Local / common Name	Family	Part Used	Method of Use	Main Benefits / Efficacy
Darek	*Curcuma longa*	Turmeric	Zingiberaceae	Rhizome	Decoction / herbal medicine	Anti-inflammatory, fever reducer
	Zingiber officinale	Ginger	Zingiberaceae	Rhizome	Infusion	Warms the body, treats flu, and coughs
	Kaempferia galanga	Kencur	Zingiberaceae	Rhizome	Mashed/ rubbed	Cough medicine, aches, and pains
	Centella asiatica	Gotu Kola	Apiaceae	Leaves	Direct/ raw salad	Wound healer, tonic
	Aloe vera	Aloe vera	Asphodelaceae	Leaves	Gel	External wounds, cosmetic
	Curcuma xanthorrhiza	Javanese ginger	Zingiberaceae	Rhizome	Decoction	Appetite stimulant
Rantau	*Tinospora crispa*	Brotowali	Menispermaceae	Stem	Decoction	Antidiabetic, antihypertensive
	Orthosiphon aristatus	Kumis kucing	Lamiaceae	Leaves	Decoction of leaves	Diuretic, kidney function
	Phyllanthus niruri	Meniran	Phyllanthaceae	Leaves	Decoction of leaves	Immune system
	Peronema canescens	Sungkai	Verbenaceae	Leaves	Decoction of leaves	Fever, stamina
	Annona muricata	Soursop	Annonaceae	Leaves	Decoction of leaves	Antioxidant, anticancer
	Curcuma aeruginosa	Black turmeric	Zingiberaceae	Rhizome	Decoction	Stomach ache
Pesisir	*Piper betle*	Betel leaf	Piperaceae	Leaves	Chewed/ poultice	Antiseptic, external wounds
	Moringa oleifera	Moringa	Moringaceae	Leaves	Salad/ decoction	Natural multivitamin
	Acorus calamus	Jerangau	Acoraceae	Rhizome	Decoction /oil	Colds, rituals
	Ziziphus mauritiana	Sea jujube	Rhamnaceae	Leaves	Decoction of leaves	Skin diseases, ruqyah (exercises)
	Curcuma longa	Turmeric	Zingiberaceae	Rhizome	Decoction	External wounds, antibacterial
	Andrographis paniculata	Sambiloto	Acanthaceae	Leaves	Decoction	Fever reducer, detoxification
	Cymbopogon citratus	Lemongrass	Poaceae	Leaves	Decoction / minyak	Antioxidant, aromatherapy
	Hibiscus rosa-sinensis	Hibiscus	Malvaceae	Flowers	Poultice/ decoction	Hair care, menstruation

The species distribution in Table 2 shows that medicinal plants in West Sumatra serve not only medicinal purposes but also social and ritual purposes. Leaves are generally used by boiling or grinding them,

while rhizomes are more often grated, boiled, or finely ground. The diversity of plant parts used demonstrates the community's adaptation to the availability of adequate local resources in traditional medicine.

The *Darek* region, a center of Minangkabau culture encompassing Tanah Datar, Agam, Lima Puluh Kota, Solok, and the surrounding areas, is known for its rhizome-based medicinal practices, including turmeric (*Curcuma longa*), ginger (*Zingiber officinale*), and galangal (*Kaempferia galanga*). Plant use occurs in fields and yards (*parak*). This use of plants is closely linked to the traditional *parak* agroforestry system, which combines medicinal, food, and spice plants in a single plot (Hapni et al., 2025; Jannah et al., 2025).

The *Rantau* region (Pasaman, Dharmasraya, South Solok, Sijunjung, and Sawahlunto) is a region where Minangkabau culture expanded beyond its original territory, demonstrating a more varied ethnobotanical adaptation. Communities in this region utilize medicinal plants from forests and mixed gardens, uch as *Tinospora crispa* (brotowali), *Orthosiphon aristatus* (cat's whiskers), and *Phyllanthus niru*ri (meniran), which are used to treat metabolic diseases. Approximately 32% of the species found are native to secondary forest ecosystems. Medicinal knowledge in this region demonstrates cultural acculturation from the other areas without abandoning indigenous traditions, resulting in a combination of adaptive ethnobotanical knowledge passed down within families and indigenous communities.

Meanwhile, the *Pesisir* region, encompassing the west coast of Sumatra, such as Padang, Padang Pariaman, Pariaman, Pesisir Selatan, and Mentawai, possesses unique characteristics: a maritime region that blends Minangkabau customs and marine culture. Thirty percent of medicinal plant species are found in this region, with most growing in the lowlands and coastal areas. Plants such as *Piper betle* (betel leaf), *Moringa oleifera* (moringa), *Ziziphus mauritiana* (sea jujube), and *Acorus calamus* (jerangau) are commonly used in traditional medicine and traditional ceremonies.

Quantitative Ethnobotanical Indices

To strengthen the scientific reliability of the ethnobotanical data, quantitative indices were applied to measure the cultural importance and therapeutic consistency of medicinal plant species. Use Value (UV) was calculated to determine the relative importance of each species based on the frequency of citation by informants, while Fidelity Level (FL) was used to assess the level of informant consensus regarding specific medicinal uses, as presented in Table 3. These indices provide quantitative evidence of how deeply medicinal plant knowledge is embedded within Minangkabau communities and enable cross-species comparison of ethnobotanical significance.

Table 3. Quantitative Ethnobotanical Indices (Use Value and Fidelity Level) of Major Medicinal Plants Used by Minangkabau Communities in West Sumatra

Species	(UV)	Main Therapeutic Use	(FL %)	Interpreta-tion
Curcuma longa	0.88	Digestive disorders, fever	89.6	Most culturally important species
Zingiber officinale	0.84	Flu, stamina	86.2	High cross-regional use
Tinospora crispa	0.81	Antidiabetic, immunity	85.4	Strong medical reliability
Andrographis paniculata	0.78	Fever, detoxification	92.1	Highest informant consensus
Curcuma xanthorrhiza	0.76	Appetite, liver tonic	83.0	High regional consistency
Orthosiphon aristatus	0.73	Kidney disorders	81.5	Specific disease reliability
Moringa oleifera	0.71	Multivitamin, nutrition	79.4	Nutrition–health plant
Annona muricata	0.69	Vitality, antioxidant	78.1	Moderate consensus
Aloe vera	0.67	External wounds, skin	80.3	Strong topical use
Hibiscus rosa-sinensis	0.64	Women's health	76.2	Specialized ethnomedi-cine

The quantitative analysis demonstrates that *Curcuma longa* exhibits the highest cultural importance (UV=0.88), indicating its dominant role in daily traditional medicinal practices across Minangkabau regions. High UV values were also recorded for *Zingiber officinale* (UV=0.84) and *Tinospora crispa* (UV=0.81), reflecting their widespread utilization and cross-regional acceptance.

High Fidelity Level values, particularly for *Andrographis paniculata* (FL=92.1%) in fever treatment and *Curcuma longa* (FL=89.6%) in digestive disorders, indicate strong informant consensus and high therapeutic reliability. These findings suggest that the Minangkabau community consistently selects and applies specific plant species for particular ailments based on long-standing empirical experiences.

The dominance of Zingiberaceae species observed in this study is consistent with previous ethnobotanical reports from other regions in Sumatra and Java, which also identified *Curcuma longa* and *Zingiber officinale* as primary medicinal resources due to their broad-spectrum pharmacological properties and cultural familiarity. Similar patterns of high UV and FL values for these species have been reported in ethnobotanical studies among Karo and Javanese communities, indicating that Zingiberaceae plays a central role in Indonesian traditional medicine systems. However, the territorial-based mapping presented in this study reveals a unique Minangkabau-specific structuring of medicinal plant utilization that has not been explicitly highlighted in earlier studies.

Categories of Medicinal Plant Utilization

The medicinal plants found can be grouped into four main categories of utilization, as presented in Table 4.

Table 4. Categories of Medicinal Plant Utilization in Minangkabau Ethnobotanical Traditions

Usage Category	Percentage %	Brief Description
Internal medicine	42	Used to maintain the health of internal organs, digestion, and respiration.
External medicine	27	For wounds, skin diseases, sprains, and fever.
Medicine for women and children	18	For reproductive purposes, maternal, infant, and child care.
Fitness and vitality	13	To maintain stamina, increase energy, and prevent minor illnesses.

Table 4 shows that the Minangkabau people utilize plants not only for healing diseases but also as part of a well-being system based on the value of balance between the body, nature, and tradition. The largest category, 42% of the identified species, is used for internal medicinal purposes, namely plants used by boiling, brewing, or consuming directly to treat physiological disorders. Dominant species include *Curcuma longa* (turmeric), *Zingiber officinale* (ginger), Kaempferia galanga (galangal), and *Tinospora crispa* (brotowali). People in the *Darek* and *Rantau* regions use these concoctions to treat digestive disorders, fever, menstrual pain, and to increase immunity. The use of rhizome plants rich in curcumin, gingerol, and alkaloids indicates natural selection in the community's knowledge of highly nutritious plants. Phytochemically, the Zingiberaceae family has potent anti-inflammatory, hepatoprotective, and immunostimulant strong effects (Nurjannah et al., 2023; Rahman et al., 2022; Rosyadi et al., 2021). The presence of beneficial phytochemical components in medicine makes the Zingiberaceae family the most widely used medicinal plant (Aini et al., 2024; Nazhifah et al., 2025; Sari et al., 2025) and is often even used as a spice and seasoning (Khumaira et al., 2025).

Approximately 27% of species are used externally to treat wounds, itching, acne, and skin care. Typical examples *are Aloe vera, Piper betel* (betel leaf), and *Hibiscus rosa-sinensis* (hibiscus). The leaves and sap of these plants are often used in herbal remedies to heal external wounds and for beauty purposes. In coastal areas, the use of external medicinal plants is usually associated with traditional rituals. Ethnobotanically, the use of external medicinal plants reflects the community's ecological adaptation to humid tropical conditions that frequently cause skin diseases and minor wound infections.

As many as 18% of plant species are used for the treatment of women and children. Commonly used plants include *Centella asiatica* (gotu kola), *Hibiscus rosa-sinensis* (hibiscus), *Carica papaya* (papaya), and *Curcuma longa* (turmeric). These herbs are used to regulate menstruation, reduce fever in children, and accelerate postpartum healing. Knowledge of plants for women and children is passed down primarily by the "*bundo kanduang*" (female guardian), who plays a crucial role in the Minangkabau matrilineal social system. Socially, this use of plants emphasizes the role of traditional medicine as a means of self-care and social solidarity among women. This tradition strengthens social networks within the extended family (*paruik*) and serves as a medium for informal education about reproductive health, a highly valued aspect of the Minangkabau value system.

The final category is plants for fitness and vitality, comprising 13% of all species. The dominant plant species include *Annona muricata* (soursop), *Tinospora crispa* (brotowali), and *Peronema canescens* (sungkai). These herbs are commonly used to maintain stamina, boost metabolism, and accelerate recovery after illness. In the *Rantau* and *Darek* regions, boiled sungkai leaves are known as "healthy bitter tea" and are drunk every morning to boost immunity. Locals also consume boiled soursop water as a natural detox. This wisdom stems from empirical observations passed down through generations regarding the effects of consuming local plants on maintaining body vitality (Asyira et al., 2025). Phytochemically, plants in this category are high in antioxidants, flavonoids, and polyphenols, which can reduce the risk of oxidative stress and strengthen the immune system. Culturally, consuming vitality herbs is considered part of a healthy lifestyle without neglecting religious values, namely, utilizing God's creation for the well-being of body and soul. This spiritual value

reinforces the meaning of traditional medicine as an expression of gratitude to nature.

Plant Parts Used

The most frequently used plant parts are leaves (38%), rhizomes (31%), and fruit (15%), while stems, bark, and flowers are used in smaller percentages. The selection of leaves and rhizomes is related to ease of collection, active metabolite content, and material stability during processing. Furthermore, preferring easily harvested parts reflects the principle of sustainable use, which involves avoiding plant damage. This aligns with research Andika et al., (2020), which found that the most commonly used organ in traditional medicine is the leaf.

Ethnopharmacologically, turmeric, ginger, and galangal rhizomes contain curcuminoids and gingerols, which function as natural anti-inflammatories, antiseptics, and immunostimulants (Nurjannah et al., 2023). The leaves and fruit contain tannins and flavonoids, which are beneficial for wound healing and skin disorders. The use of these parts demonstrates the community's empirical understanding of the pharmacological activities of plants without undergoing a formal scientific process. The nutmeg (Myristica fragrans) seed is also known to contain anticancer properties (Lesmana et al., 2022).

Furthermore, the selection of plant parts is also based on symbolic and traditional values. For example, betel leaves are used not only for their antiseptic properties but also for their sacred and reverent meanings in traditional ceremonies. This demonstrates the inseparable symbolic and therapeutic aspects of the Minangkabau ethnobotany system.

Local Wisdom and Patterns of Medicinal Plant Use

Minangkabau local wisdom in the use of medicinal plants is rooted in the philosophy of "nature is a teacher," which states that everything can be learned from nature. Local wisdom is at the heart of the Minangkabau ethnobotanical system. Knowledge about the processing and use of medicinal plants is passed down orally through generations, especially by women. Communities still practice the principle of sustainable harvesting by harvesting some leaves or digging up rhizomes to maintain plant regeneration.

Practically, this local wisdom pattern supports ethnobotanical sustainability: plant use, combined with garden cultivation practices (*parak*), crop rotation, and the application of conservative knowledge, reduces pressure on wild populations. Several studies recommend strengthening community-based conservation programs that combine traditional knowledge with technical support (e.g., cuttings/rhizome nurseries). Community involvement in research and empowerment programs ensures the continuity of knowledge while preserving biodiversity. The use of plants as traditional medicine is more likely to be obtained from medicinal plants grown in home gardens (Nisyapuri et al., 2018).

Patterns that emerge in each region include: *Darek*: knowledge is passed down through generations within the *paruik* (extended family) system. Treatment is performed by village midwives or traditional healers using ingredients from their own gardens. *Rantau*: knowledge is adaptive and open to external influences. Treatment involves a combination of local plants and plants derived from cross-regional cultural interactions. *Pesisir*: local wisdom is closely linked to spiritual values and traditional rituals. Medicinal plants are used in ceremonial contexts such as batoboh (spirit healing), *turun mandi bayi* (baby bathing), or *batagak penghulu* (traditional inauguration). These patterns demonstrate that traditional medicine has not only medical value but also social and cultural (spiritual) significance. This aligns with Masrizal et al. (2023) assertion that traditional medicine refers not only to processing methods but also to the experiences and skills passed down through generations within the community.

Socially, knowledge of medicinal plants in West Sumatra is still maintained by older generations, particularly women. The community still views medicinal plants as a symbol of balance between the body and nature, as well as a means of strengthening cultural identity. Culturally, medicinal plants are also part of the Minangkabau value system, which emphasizes balance *(bulek aia dek pambuluah, bulek kato dek mufakat*). Traditional healing practices are integrated with custom and religion, such as reciting prayers, using water that has been blessed (*aia tolak bala*), and using certain plants in healing rituals. This utilization demonstrates the synergy between traditional knowledge, spirituality, and environmental conservation, making the Minangkabau people a clear example of the application of sustainable ethnobotany based on local wisdom.

Socially, ethnobotanical knowledge also serves as cultural capital that strengthens social networks: the exchange of herbs, interfamily assistance with treatment, and consultations with traditional healers strengthen community cohesion. From a public policy perspective, recognizing these cultural values is crucial for designing culturally sensitive community-based health programs. Recommendations from ethnobotanical literature emphasize community participation.

The territorial structure of Minangkabau ethnobotanical knowledge demonstrates that cultural landscapes significantly influence plant utilization patterns. This knowledge can be integrated into secondary school biology learning through

ethnoscience-based and project-based learning models. Students may identify local medicinal plants, analyze their phytochemical properties, and connect them with traditional uses, thereby strengthening scientific literacy, critical thinking, and cultural awareness.

Conclusion

Minangkabau ethnobotanical knowledge is territorially structured, culturally transmitted, and empirically reliable. The integration of qualitative documentation and quantitative ethnobotanical indices strengthens the scientific credibility of traditional medicinal practices. These findings provide a strong foundation for the development of ethnoscience-based biology learning resources in Indonesian secondary education.

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