



Local Wisdom in Traditional Medicinal Plant Utilization: An Ethnobotanical Study in Sonraen Village, Kupang Regency

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Received: April 29, 2026

Revised: June 11, 2026

Accepted: June 25, 2026

Published: June 30, 2026

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DOI: [10.29303/jppipa.v12i6.15421](https://doi.org/10.29303/jppipa.v12i6.15421)

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Abstract: This study aimed to document the diversity of traditional medicinal plants, plant parts used, preparation methods, and their medicinal applications by the community of Sonraen Village, Amarasi Selatan District, Kupang Regency, Indonesia. A descriptive ethnobotanical approach was employed through field observations, semi-structured interviews, documentation, and exploratory surveys involving knowledgeable local informants. A total of 51 medicinal plant species were recorded. Leaves were the most frequently used plant part, followed by rhizomes, stems, shoots, roots, bark, flowers, fruits, and seeds. Boiling was the predominant preparation method, while pounding, brewing, and direct application were also commonly practiced. The species with the highest citation values included *Chromolaena odorata*, *Phyllanthus niruri*, *Curcuma longa*, and *Annona squamosa*. These plants were primarily used to treat gastrointestinal disorders, hypertension, kidney disease, diabetes, malaria, wounds, and skin diseases. The findings demonstrate that traditional medicinal knowledge remains well preserved within the Sonraen community. This study provides baseline ethnobotanical data that support biodiversity conservation, preservation of indigenous knowledge, and future pharmacological investigations of medicinal plant species with high local use values.

Keywords: Ethnobotany; Medicinal plants; Local wisdom; Traditional medicine.

Introduction

Indonesia is one of the world's megabiodiversity countries, characterized by tropical climatic conditions, diverse topography, and a wide range of ecosystems that support exceptionally rich biological resources. These environmental conditions contribute to the high diversity of flora and fauna distributed across different habitats and provide abundant plant resources that can be utilized for food, construction materials, natural dyes, and traditional medicines (Bhagawan et al., 2023; Julung et al., 2023). The long history of medicinal plant utilization reflects the close interaction between Indonesian communities and their surrounding environment, where traditional knowledge has been transmitted across generations through empirical experience (Cahyaningsih et al., 2021; Nugraha et al., 2024).

The utilization of medicinal plants is closely associated with ethnobotany, an interdisciplinary field that examines the interactions between humans and plants, including how local communities identify, manage, and utilize plant resources for healthcare and other cultural purposes. Study Molnár & Babai (2021), ethnobotany explores the reciprocal relationship between local communities and their natural environment while documenting traditional ecological knowledge that has evolved through cultural adaptation. Ethnobotanical knowledge is increasingly recognized as an important source of information for biodiversity conservation, sustainable resource management, and the discovery of novel medicinal compounds (Boylan, 2023; Sinthumule, 2023; Tamene et al., 2023).

East Nusa Tenggara Province is well known for its rich medicinal plant diversity and strong cultural traditions in herbal medicine. Several ethnobotanical

How to Cite:

Bunyani, N. A., Hija, E. A., Finmeta, A., & Leo, N. (2026). Local Wisdom in Traditional Medicinal Plant Utilization: An Ethnobotanical Study in Sonraen Village, Kupang Regency. *Jurnal Penelitian Pendidikan IPA*, 12(6), 999–1005. <https://doi.org/10.29303/jppipa.v12i6.15421>

studies have documented the utilization of medicinal plants in different conservation areas within the province. Previous ethnobotanical studies have documented the richness of medicinal plant diversity in East Nusa Tenggara. Study Ledo & Seran (2019) recorded 31 medicinal plant species in Baumata Nature Tourism Park, while Nufus et al. (2024) reported extensive traditional utilization of medicinal plants by indigenous communities, highlighting the continued reliance on plant-based healthcare. These findings indicate that traditional medicinal knowledge remains actively practiced despite increasing accessibility to modern healthcare services and emphasize the importance of continuous documentation to support biodiversity conservation and prevent the erosion of indigenous knowledge (Hestiyana et al., 2023; Ridwan et al., 2022).

Sonraen Village, located in Amarasi Selatan District, Kupang Regency, is one of the rural communities where medicinal plants continue to play an important role in primary healthcare. Previous research conducted around the Prof. Ir. Herman Johaness Grand Forest Park documented approximately 22 medicinal plant species used by local communities for treating various diseases. However, these studies primarily focused on species inventories and have not comprehensively analyzed the diversity of medicinal plants currently utilized by the community, the plant organs harvested, preparation methods, medicinal applications, or the cultural importance of each species based on quantitative ethnobotanical indices. Consequently, updated ethnobotanical documentation is needed to evaluate the current status of traditional medicinal knowledge in Sonraen Village. Consequently, updated ethnobotanical documentation integrating quantitative indices such as Frequency of Citation (FC) and cultural importance is increasingly recommended to identify priority medicinal plants for conservation and future pharmacological studies (Hestiyana et al., 2023; Navia et al., 2022).

Ethnobotanical studies are essential because they document not only plant diversity but also the cultural knowledge associated with medicinal plant utilization. Plant selection, harvested organs, and preparation techniques are influenced by ecological availability, traditional beliefs, accumulated empirical experience, and socioeconomic conditions (Navia et al., 2022; Zhou et al., 2023). Therefore, ethnobotanical documentation contributes simultaneously to biodiversity conservation, preservation of indigenous knowledge, sustainable utilization of biological resources, and the identification of promising medicinal plant species for future drug discovery and pharmacological development (Alum, 2024; Aremu et al., 2024).

Medicinal plants contain various secondary metabolites, including flavonoids, alkaloids, tannins, terpenoids, saponins, and phenolic compounds, which possess antioxidant, antimicrobial, anti-inflammatory, antiviral, and immunomodulatory activities (Atanasov et al., 2021). Consequently, medicinal plants remain widely utilized as complementary and alternative healthcare resources in many developing countries because they are relatively accessible, affordable, culturally acceptable, and increasingly supported by scientific evidence (Dangana et al., 2024; Romero-García et al., 2024). Despite their importance, traditional medicinal knowledge is increasingly threatened by modernization, changing lifestyles, land-use conversion, biodiversity loss, and declining interest among younger generations in traditional healthcare practices (Alum, 2024; Hestiyana et al., 2023). Without systematic documentation, valuable ethnobotanical knowledge may gradually disappear together with the biological resources upon which it depends.

Based on these considerations, this study aimed to identify the medicinal plant species utilized by the community of Sonraen Village, Amarasi Selatan District, Kupang Regency, document the plant organs used, describe traditional preparation methods, analyze the medicinal uses of each species, and evaluate their cultural importance using quantitative ethnobotanical indices. The findings are expected to contribute to the preservation of local ethnobotanical knowledge, support biodiversity conservation, and provide baseline data for the future development of scientifically validated traditional medicines.

Method

Study Area and Research Design

This study was conducted in Sonraen Village, Amarasi Selatan District, Kupang Regency, East Nusa Tenggara, Indonesia, in December 2025. A descriptive ethnobotanical design with qualitative and quantitative approaches was employed to document the traditional use of medicinal plants by the local community.

Informants

A total of 25 informants participated in this study, consisting of traditional healers and community members recognized for their knowledge of medicinal plants. Eligible informants were at least 30 years old, had lived in Sonraen Village for more than 10 years, and were willing to participate voluntarily.

Data Collection

Data were collected through exploratory surveys using Participatory Rural Appraisal (PRA) (Martin, 1995), field observations, semi-structured interviews,

documentation, and plant specimen collection. Interview questions covered local plant names, plant parts used, medicinal uses, preparation methods, and cultivation status (Supriati & Kasrina, 2003). Plant specimens were photographed, labeled, and identified based on morphological characteristics using standard botanical references.

Instruments and Materials

The study used semi-structured questionnaires, field notebooks, mobile phones for documentation, knives and scissors for specimen collection, and plastic bags for specimen storage. The research materials consisted of medicinal plant species identified from information provided by the informants.

Data Validation

The credibility of the ethnobotanical data was ensured through source triangulation by comparing information obtained from different informants and cross-checking interview results with direct field observations and published ethnobotanical references. Inconsistent information was clarified through follow-up interviews until data consistency was achieved.

Data Analysis

Data were analyzed descriptively using qualitative and quantitative approaches. Medicinal plant species were classified according to their family, plant parts used, preparation methods, and therapeutic uses. The Frequency of Citation (FC) was calculated using:

$$FC = \frac{N}{T} \times 100\% \quad (1)$$

where N is the number of informants mentioning a particular medicinal plant species and T is the total number of informants.

Result and Discussion

This study documented 51 species of traditional medicinal plants actively utilized by the Sonraen community, demonstrating that ethnobotanical knowledge remains well preserved and continues to support the local healthcare system. The relatively high number of recorded species indicates that traditional medicine has not been displaced by modern healthcare but instead complements it through knowledge transmitted across generations. Similar observations have been reported by (Zhou et al., 2023), who emphasized that ethnobotanical knowledge reflects the long-term interactions between local communities, cultural traditions, and surrounding biological resources. Compared with previous ethnobotanical

studies conducted in East Nusa Tenggara, the present study recorded a greater diversity of medicinal plants than several earlier investigations, including the 31 medicinal plant species documented in Baumata Nature Tourism Park by Ledo & Seran, (2019) and the 35 medicinal plant species reported among the Tetun community in Malaka Regency by Hestiyana et al., (2023). The larger number of species documented in Sonraen Village may reflect broader community knowledge, greater vegetation diversity, and continued dependence on traditional medicine in rural areas.

The documented medicinal plants comprised herbs, shrubs, bushes, and trees, with *Chromolaena odorata*, *Phyllanthus niruri*, *Curcuma longa*, and *Annona squamosa* representing the most frequently cited species. Their dominance is likely associated not only with proven therapeutic efficacy but also with their wide availability around settlements, ease of cultivation, and repeated empirical use. Similar utilization patterns have been reported by Made et al., (2023; Tahoangako et al., (2024), who found that medicinal plant selection in Indonesian indigenous communities is primarily influenced by plant accessibility, cultural familiarity, and accumulated empirical experience rather than rarity or commercial value. This finding suggests that species selection is determined by both pharmacological potential and socio-ecological accessibility.

Leaves were the most frequently utilized plant organ (26 species; 50.98%), followed by rhizomes, stems, shoots, roots, bark, flowers, fruits, and seeds. Besides being readily harvested, leaf collection generally does not destroy the entire plant, making this practice relatively sustainable. Leaves also contain abundant secondary metabolites, including flavonoids, alkaloids, tannins, and saponins, which contribute to their widespread medicinal use (Alum, 2024). The predominance of leaves as the most frequently utilized plant part has also been reported in ethnobotanical studies conducted by Navia et al., (2022) in Aceh, Indonesia, and Zhou et al., (2023) among the Bulang ethnic community in Yunnan, China. The consistency of these findings indicates that leaf harvesting represents both an ecologically sustainable practice and an efficient source of bioactive compounds.

Boiling was the predominant preparation method, whereas pounding, infusion, and direct consumption were less frequently practiced. The preference for boiling reflects accumulated empirical knowledge because this method facilitates the extraction of water-soluble bioactive compounds while remaining simple and practical for household application. Similar findings have been reported in recent ethnobotanical studies, where boiling was consistently identified as the dominant preparation method due to its simplicity, affordability, and effectiveness in extracting bioactive

compounds from medicinal plants (Andalan et al., 2024; Maache et al., 2024). Conversely, pounding was mainly used for topical applications, whereas direct consumption was preferred for certain species to preserve heat-sensitive bioactive compounds. Overall, the diversity of preparation methods demonstrates that medicinal plant processing has been adapted according to the characteristics of each plant species and its intended therapeutic application.

The documented medicinal plants were used to treat a broad range of disorders, including gastrointestinal diseases, hypertension, kidney disorders, diabetes, malaria, wounds, and skin diseases. The broad therapeutic spectrum indicates that medicinal plants continue to serve as an important component of primary healthcare within the community. Similar disease categories have also been documented by (Pratami et al., 2024; Tadesse et al., 2024), although the distribution and frequency of reported ailments varied among study areas. This difference may reflect variations in local disease prevalence, cultural treatment preferences, and medicinal plant availability. Nevertheless, the present study focused on documenting traditional knowledge rather than verifying clinical efficacy; therefore, the reported medicinal uses should be interpreted as ethnobotanical information requiring further pharmacological validation.

Analysis of the Number of Use Reports (NP) and Frequency of Citation (FC) identified *Chromolaena odorata* as the most culturally important species (NP = 15.69%; FC = 20%), followed by *Phyllanthus niruri*, *Curcuma longa*, and *Annona squamosa*. In ethnobotanical studies, high FC values indicate that a plant is widely recognized, frequently used, and culturally trusted within a community (Albuquerque et al., 2014). Although there is no universally accepted FC threshold, species with FC values exceeding approximately 15% in the present study can be considered culturally dominant because they were cited by a substantial proportion of respondents. Conversely, species with lower FC values are not necessarily less effective but may have more specific therapeutic indications, limited distribution, or knowledge restricted to experienced healers. Similar interpretations were reported by (Albuquerque et al., 2014; Tardío & Pardo-de-Santayana, 2008), emphasizing that citation frequency reflects cultural importance rather than pharmacological potency. Therefore, FC and NP provide quantitative evidence for prioritizing medicinal plants for future phytochemical and pharmacological investigations.

The knowledge assessment involving 40 respondents revealed that most participants possessed good knowledge regarding medicinal plants, although several respondents exhibited moderate or low

knowledge levels. This variation may reflect differences in age, educational background, personal Experience and involvement in traditional healing practices strongly influence the level of ethnobotanical knowledge. Similar patterns have been reported by (Alum, 2024; Ong & Kim, 2014), who emphasized that traditional medicinal knowledge is generally better preserved among older community members because it is transmitted orally through generations and reinforced by long-term interaction with medicinal plants. The lower level of ethnobotanical knowledge observed among some respondents may indicate a gradual erosion of traditional knowledge driven by modernization, urbanization, socio-cultural change, and increasing reliance on modern healthcare systems. These findings underscore the urgent need for systematic ethnobotanical documentation and community-based knowledge transmission to preserve indigenous knowledge, strengthen biodiversity conservation, and ensure the continuity of local ethnobotanical heritage (Duche-pérez et al., 2025; Rangel et al., 2024).

Compared with previous studies conducted in other regions of Indonesia, this research similarly identified leaves as the dominant plant organ and boiling as the principal preparation method. However, the present study documented a higher number of medicinal plant species (51 species) than studies conducted in Camplong (36 species) and Baumata (31–35 species), while also identifying different culturally dominant species based on quantitative FC and NP analyses. These differences indicate that medicinal plant utilization is strongly influenced by local vegetation composition, disease patterns, and sociocultural traditions, emphasizing that ethnobotanical knowledge is highly location-specific and should be documented at the community level rather than generalized across regions.

Overall, this study confirms that medicinal plants remain integral to the traditional healthcare system of the Sonraen community. Beyond documenting 51 medicinal plant species, this research provides quantitative ethnobotanical evidence through Frequency of Citation (FC) and Number of Use Reports (NP) analyses, enabling the identification of culturally important species that may serve as priorities for future phytochemical, pharmacological, conservation, and domestication studies. Compared with previous ethnobotanical research in East Nusa Tenggara, this study contributes a more comprehensive assessment by integrating species diversity, plant organs, preparation methods, medicinal applications, community knowledge, and quantitative cultural importance indices. Consequently, these findings provide valuable baseline data for biodiversity conservation, preservation

of indigenous knowledge, and the future development of scientifically validated traditional medicines.

Conclusion

This study successfully identified 51 species of plants utilized by the community of Sonraen Village, South Amarasi District, Kupang Regency as traditional medicinal plants. The high number of plant species used indicates that the community still possesses strong ethnobotanical knowledge and continues to maintain traditional healing practices as an important part of daily life. The most commonly utilized plants include *Chromolaena odorata*, *Phyllanthus niruri*, *Curcuma longa*, *Annona squamosa*, *Cymbopogon citratus*, and *Zingiber officinale* because they are easily accessible and are believed to have effective medicinal properties.

The most frequently used plant part was the leaf, accounting for approximately 50.98% of the total plant species identified. In addition to leaves, the community also utilized other plant parts such as roots, stems, bark, flowers, fruits, seeds, shoots, and tubers or rhizomes. The dominance of leaf utilization reflects a relatively sustainable harvesting pattern because collecting leaves generally does not damage the entire plant.

The most dominant method of preparing traditional medicinal plants was boiling, while other methods included pounding, brewing, and direct use without heating. The variation in preparation methods indicates that the community possesses empirical knowledge developed through long-term experience and passed down from generation to generation.

The traditional medicinal plants used by the Sonraen community were applied to treat various diseases, including both minor and chronic illnesses such as stomach disorders, gout, hypertension, cholesterol, kidney disease, malaria, diarrhea, wounds, and cancer. The medicinal benefits and therapeutic uses of these plants demonstrate that traditional medicine is still trusted and continues to play an important role in the local healthcare system.

Overall, this study confirms that the community's knowledge of traditional medicinal plants remains well preserved and holds important value in terms of health, culture, and biodiversity conservation. Therefore, efforts to document and preserve ethnobotanical knowledge should continue in order to prevent its decline due to modernization and to support the future development of scientifically-based traditional medicine.

Acknowledgments

The authors would like to express their sincere gratitude to the community of Sonraen Village, South Amarasi District, Kupang Regency, for their participation and support during this research. The authors also thank all respondents and local

authorities who contributed to the data collection process and provided valuable information related to traditional medicinal plants.

Author Contributions

Conceptualization, N. A. B. and E. A. P. H.; methodology, N. A. B.; investigation, N. A. B.; formal analysis, N. A. B.; data curation, N. A. B.; writing—original draft preparation, N. A. B.; writing—review and editing, E. A. P. H., A. F., and N. L.; supervision, E. A. P. H.; project administration, A. F., and N. L. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

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