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Ethnobotanical Study of Medicinal Plants in Traditional Medicine of The Karo Tribe Based on Local Wisdom

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Abstract: This research aims to uncover the taxonomy of medicinal plants and ethnobotanical aspects in the traditional medicine of the Karo tribe in North Sumatra. The study was carried out in a qualitative descriptive manner with an ethnobotanical approach through direct observation, in-depth interviews, and documentation of the use of medicinal plants by the local community. The results show that there are 78 species of medicinal plants belonging to 26 families, with the highest dominance in the Zingiberaceae family. The most commonly used parts of plants are leaves (55%) and rhizomes (25%). These plants are used in various herbs such as Karo oil, param, spray, and traditional herbal medicine. Processing processes such as refining, boiling with coconut oil, and drying reflect a local understanding of the principles of extraction and synergy of active ingredients. This study shows that the local knowledge of the Karo people is closely related to scientific principles and has great potential to be developed in contextual science education and biodiversity conservation.

Keywords: Ethnobotany, Traditional medicine, Medicinal plants, Local wisdom, Karo tribe

Introduction

Indonesia is known as a country with immense biodiversity, particularly in its tropical forests which host thousands of plant species, many of which have medicinal properties (Maulana, 2024; Mukti, 2024; Nugroho et al., 2022). These natural resources are not only ecologically valuable but also hold cultural and therapeutic significance for indigenous communities. One of these communities is the Karo tribe in North Sumatra, which continues to preserve and practice traditional medicine as part of their daily life and cultural heritage (Affandi & Batubara, 2019). Karo tribe use various plant species for their daily life including for medicines. In terms of illness treatment, they have a philosophy "lit bisa lit tawar" which means that all diseases can be treated or cured (Situmorang et al., 2015). The traditional use of plants by this community has been passed down through generations, reflecting a close relationship between humans and their environment.

Medicinal plants are central to the health practices of the Karo people. These plants are used to treat various illnesses such as fever, digestive problems, pain, skin diseases, and respiratory disorders (Alamgeer et al., 2018; Hasan et al., 2010). The local community typically utilizes plant parts like leaves, rhizomes, and roots, prepared through boiling or pounding to extract their active compounds (Singarimbun et al., 2024). Among the most frequently used plant families are Zingiberaceae, Asteraceae, and Fabaceae, known for their strong bioactive properties. The traditional healers in Karo society—such as herbalists and massage practitioners—play a key role in maintaining this knowledge and transmitting it through oral traditions (Hati, 2021).

The ethnobotanical knowledge possessed by the Karo tribe is not only valuable in terms of health benefits but also represents a significant component of

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ethnoscience. Ethnoscience refers to the study of indigenous knowledge systems, particularly how local communities understand, classify, and interact with natural phenomena (Efendi & Muliadi, 2023; Rist & Dahdouh-Guebas, 2006). This includes their taxonomic understanding of plants based on morphology, use, and efficacy—insights that align with scientific principles (Gani et al., 2024). When documented and analyzed properly, these knowledge systems can contribute meaningfully to science education and biodiversity conservation.

In addition to preserving cultural identity, the integration of ethnobotanical knowledge into education can support more contextual and meaningful learning (Hikmawati et al., 2020; Sari et al., 2023). Embedding local wisdom into science learning enables students to connect abstract scientific concepts with real-life experiences in their communities. This approach fosters cultural appreciation, environmental awareness, and critical thinking among learners (Tarigan & Dwi Widayati, 2021).

Based on the background, this study aims to describe the taxonomy of medicinal plants and examine its ethnobotanical aspects. This research aims to identify the plant species used, describe the parts used, analyze the dominant plant families, and understand the processing process that reflects the local wisdom of the Karo Tribe.

Method

This research was conducted in Karo Regency, North Sumatra, a highland area that still maintains the traditions and traditional medicine practices of the Karo ethnic community. This location was chosen because of its rich culture and local knowledge of the use of medicinal plants.

This type of research is qualitative descriptive with ethnobotanical approaches (Fakchich & Elachouri, 2023). The goal is to explore public knowledge related to medicinal plants.

Data were collected through direct observation of traditional medicine practices, interviews with traditional medicine users, documentation and literature studies on local names, plant parts used, and their benefits (Alemu et al., 2024; Asfaw et al., 2022; Ikinyom et al., 2023).

Data analysis is carried out in a qualitative descriptive manner through data reduction, presentation, and conclusion drawn. The plants found are taxonomorally classified. Ethnoscience interpretation is carried out by connecting local practices with science principles in science learning.

Result and Discussion

The results of the study show that 78 species of medicinal plants have been identified as part of the traditional medicine practices of the Karo people. The species is spread across 26 plant families, with the largest dominance in the Zingiberaceae family (11 species), which is widely known to have warming and anti-inflammatory effects. These findings support the results of previous research, which also found that the Zingiberaceae family is most widely used due to its high content of essential oils and bioactive compounds (Nasution et al., 2020; Purba et al., 2016). The distribution of the number of species by plant family can be seen in the following diagram.

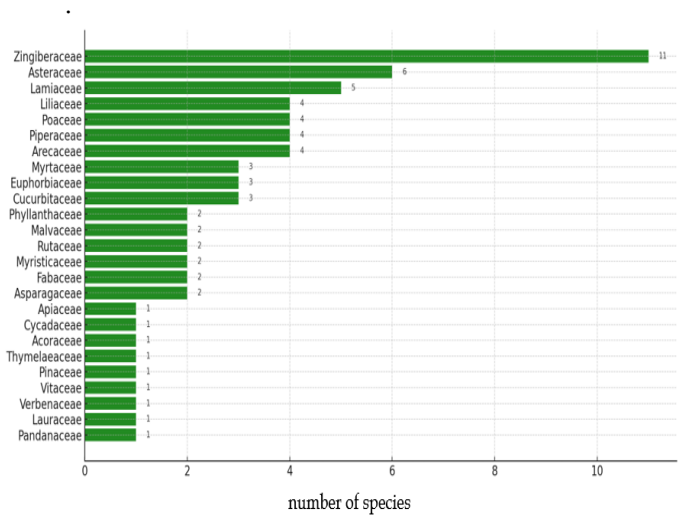

Figure 1. The distribution of species medicinal plants by plant family

Based on research, several main herbs were found in traditional medicine of the Karo Tribe that utilize various types of plants: Karo Oil: It is the most complex herb, using 56 types of plants from 26 families. This herb serves as a massage oil for sciatica, sprains, treating wounds, and warming the body; Param: Is a boreh (scrub) ingredient used to warm the body, especially for postpartum mothers. It was identified that 14 types of plants from 8 families were used in its manufacture; Sembur: A herb that is sprayed to treat fever, colds, and flatulence. 7 types of plants from 5 families were identified; Jamu Karo: Herbal drink to maintain health and overcome various complaints such as ulcers, menstrual pain, and increasing appetite. 13 types of plants were identified; and Other Ingredients: Such as Hazelnut Oil, Red Ginger Juice, and Benalu Kopi stew.

From the overall data, the Zingiberaceae family is the most dominant and fundamental plant group in Karo medicine. Study said that Zingiberaceae was the most important family This is in line with the main

functions of the herb which are warming (*carminative*) and anti-inflammatory (Nisyawati et al., 2017).

Some of the most commonly mentioned species of the Zingiberaceae family include *Zingiber officinale* (ginger), *Curcuma longa* (turmeric), and *Kaempferia galanga* (kencur) (Darlian et al., 2025; Fadillah et al., 2023). The plant was also confirmed in a study of diabetes treatment as part of the Karo herbal pharmacopoeia (Raja Nasution et al., 2018). These plants are known to contain secondary metabolites such as terpenoids, flavonoids, alkaloids, saponins, and phenolic compounds that provide therapeutic effects (Nurjannah et al., 2022; Raja Nasution et al., 2018). The dominance of the Zingiberaceae family suggests that the Karo people have a deep understanding of the properties of rhizomes as anti-inflammatory and warming agents, which are particularly relevant for conditions of sciatica, colds, and stamina recovery.

Table 1. The Most Dominant Plant Family Used in Traditional Medicine of the Karo Tribe

Family	Number of Types	Species	Main Role
Zingiberaceae	11	*Zingiber officinale*, *Curcuma longa*, *Curcuma zedoaria*, *Curcuma xanthorrhiza*, *Zingiber zerumbet*, *Zingiber cassumunar*, *Kaempferia galanga*	Warming, anti-inflammatory, promotes blood circulation
Asteraceae	6	*Chromolaena odorata*, *Centipeda minima*, *Bidens chinensis*	Anti-inflammatory, wound medicine
Lamiaceae	5	*Ocimum tenuiflorum*, *Mentha arvensis*	Aromatic, anti-bacterial, refreshing
Liliaceae	4	*Allium cepa, Allium sativum*	Antiseptic, anti-bacterial
Poaceae	4	*Oryza sativa*, *Cymbopogon citratus*, *Imperata cylindrica*	Basic ingredients (rice), aromatics, diuretics
Piperaceae	4	*Piper betle*, *Piper nigrum*, *Piper aduncum*	Antiseptic, warming, stimulant
Arecaceae	4	*Areca catechu*, *Calamus spp.*, *Cocos nucifera*	Base ingredients (coconut oil), astringent

Analysis of the parts of the plant used shows a clear pattern, where certain parts are used more often than others.

Table 2. Percentage of Utilization of Plant Parts in Karo Tribe Traditional Herbs

Plant Parts	Usage Percentage %	Examples Plants	Reasons for Utilization
Leaf	55	Sirih, Sembung	Easy to obtain, rich in essential oils and other active compounds.
Rhizome	25	Ginger, Turmeric, Curcuma, Temulawak, Kencur	High concentrations of active compounds such as curcuminoids and gingerol.
Flower	15	Hibiscus Flower, Kiung	Used for special benefits, such as antipyretics or refreshers.
Seeds & Fruits	5	Lada, Pala, Kemiri, Kelapa	Contains oils and warming compounds, plays a role in medicine and complements.
Roots & Bark	5	Areca nut root, Orange root	Contains alkaloids and other active compounds for certain diseases.

Based on Table 3, the most commonly used parts of plants are leaves (55%) and rhizomes (25%), followed by fruits, roots, seeds, flowers, stems, and bulbs. This is in line with the findings of previous research which showed that the leaves are very commonly used because they are easy to obtain and easy to process (Affandi & Batubara, 2019; Purba & Silalahi, 2021). The high utilization of leaves and rhizomes suggests that local knowledge is focused on the parts of the plant that are richest in bioactive compounds and are easily accessible.

The process of processing medicinal herbs of the Karo Tribe reflects a deep understanding of the principles of extraction and synergy between ingredients. Smoothing: The process of mashing or grinding ingredients (rhizomes, leaves) aims to expand the surface so that the active compounds are more easily extracted when cooked or mixed; Cooking with Coconut Oil: The use of green coconut milk cooked to oil (in Karo Oil) serves as a very effective non-polar solvent to attract fat-soluble active compounds, such as essential oils from spices; Drying: The drying process (in Sembur and Param) aims to reduce the moisture content, so that the herb is more durable and not easily overgrown by fungi. It is a natural preservation technique; and Synergistic Combination: The Karo people do not use plants alone, but in herbs consisting of dozens of ingredients. This is based on the belief that the combination of ingredients

will provide a stronger and more balanced healing effect (synergistic effect).

Conclusion

This study succeeded in identifying 78 species of medicinal plants used in traditional medicine of the Karo Tribe, which are spread in more than 26 plant families. These findings reflect the wealth of local knowledge that is still alive and passed down from generation to generation. Of all the families recorded, Zingiberaceae emerged as the most predominantly utilized group, confirming its important role in the provision of traditional herbs of warming and anti-inflammatory properties. Leaves and rhizomes are the most commonly used parts of plants by the community, showing a focus on the use of organs that are known to be rich in bioactive compounds. More than just the use of natural ingredients, the process of compounding herbs by the Karo people contains deep ethnoscience values. This can be seen from their understanding of simple extraction techniques, natural preservation principles, and synergistic mixing of ingredients, which indirectly demonstrate a strong link between local traditions and scientific principles.

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Author Contributions

W.D.P.S : formulates research ideas, prepares designs, collects data, and writes the main manuscript. S : performs data analysis, interpretation of results, and revision of manuscript content. C.S : responsible for literature review, documentation, and reference preparation. A.N : plays a role in data validation, identification of plant taxonomy, and final editing of the manuscript. All authors read and approve the final manuscript to be published.

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Conflicts of Interest

This research is a manifestation of the institution's commitment to strengthening academic capacity through the exploration of local wisdom. This taxonomic study of medicinal plants of the Karo community supports the preservation of culture and the integration of traditional knowledge into science education. The results are expected to encourage local-based innovation and human resource development in the academic field.

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