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RESEARCH PAPER

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Ethnomedicinal diversity and cultural resilience among the Manobo of west Lamidan, Philippines: Bridging traditional knowledge and biodiversity conservation

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ABSTRACT

Indigenous knowledge systems form a vital component of biodiversity conservation and community resilience. This study documents the ethnomedicinal diversity of the Manobo tribe in West Lamidan, Davao Occidental, Philippines, and explores how traditional plant use sustains both human and ecological well-being. Using semi-structured interviews and focus group discussions with tribal healers and elders, 125 plant species from 48 families were recorded, including 62 medicinal taxa. Leaves were the most frequently used plant part, and decoction was the predominant preparation method. Use-value and informant-consensus analyses identified culturally salient species such as *Coffea* sp., the locally known "Manggulibas," *Allium cepa*, and *Vitex negundo*, which are widely used to treat infectious and parasitic diseases. Beyond quantitative indices, ethnographic insights revealed that remedies are prepared only when needed, transmitted orally, and occasionally revealed through dreams, reflecting a dynamic and adaptive healing tradition. This oral system demonstrates both resilience and vulnerability, as modernization threatens its continuity. The Manobo pharmacopeia not only reflects prevailing community health conditions but also highlights conservation concerns for culturally significant yet threatened species, including *Vanda sanderiana* and native *Coffea* spp. By linking indigenous ethnomedicine with biodiversity stewardship, this study underscores the role of traditional knowledge in maintaining socio-ecological resilience. Documenting and protecting such heritage is crucial for sustaining cultural identity, ecosystem integrity, and future opportunities for biocultural conservation research.

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INTRODUCTION

Traditional ecological knowledge, particularly ethnomedicinal practices, embodies generations of adaptive interaction between people and their environment. For many indigenous groups, plants serve not only as remedies for illness but also as vital components of cultural identity and ecological stewardship. The World Health Organization (WHO, 2013) recognizes traditional medicine as a crucial element of primary healthcare for over 80% of the global population, underscoring its continuing relevance amid modern medical systems.

In biodiversity-rich regions such as the Philippines, these oral traditions preserve ecological knowledge that complements scientific understanding of plant diversity and sustainable use.

Ethnobotanical studies serve as both cultural documentation and conservation tools. They reveal how communities maintain ecological balance through customary use of plant resources, and how these practices can inform biodiversity management. However, the erosion of indigenous knowledge has become increasingly pronounced as modernization, migration, and formal education weaken oral transmission systems (Palaganas *et al.* 2001).

Once regarded as sacred or secret, ethnomedicinal knowledge is now at risk of disappearing with the aging of tribal healers and the changing aspirations of younger generations.

Documenting and validating these traditional systems are therefore critical not only for cultural preservation but also for sustaining the ecological knowledge that underpins local resilience.

The Philippines ranks among the world's biodiversity hotspots and cultural heritage centers, hosting more than 110 ethnolinguistic groups with distinct ecological knowledge systems (Camacho *et al.*, 2015). Despite this, many tribal healing systems remain poorly documented, especially in Mindanao where indigenous communities live in remote areas. Previous ethnobotanical work among the B'laan of Mt. Matutum (Alinsug *et al.* 2022), the Subanen of Zamboanga (Pizon *et al.* 2016), and the Talaandig of Bukidnon (Naïve *et al.* 2021) revealed that plants play a central role not only in health but also in shaping social cohesion and ecological ethics. These studies demonstrated how local perceptions of health often mirror ecological realities, and how plant knowledge contributes to the community's capacity to cope with environmental and socio-economic stress.

Among Mindanao's indigenous groups, the Manobo represent one of the largest yet least documented tribes in terms of their ethnomedicinal heritage. Their traditional healing system remains embedded in oral and spiritual transmission, where plant knowledge is whispered from elders to apprentices or revealed through dreams. Such practices reflect both resilience and vulnerability—resilience in their persistence despite cultural change, and vulnerability due to the absence of written records and the decline of intergenerational transmission.

Understanding these dynamics offers insights into how traditional ecological knowledge supports both cultural continuity and biodiversity conservation.

This study aimed to document the ethnomedicinal plants and associated traditional knowledge of the Manobo tribe in West Lamidan, Davao Occidental, and to examine their implications for biodiversity conservation and socio-ecological resilience. Specifically, it identified plant species used in traditional medicine, analyzed their cultural salience and disease associations through quantitative indices such as Use Value (UV) and Informant Consensus Factor (ICF), and explored the oral and spiritual modes of knowledge transmission within the community. These findings contribute to the growing understanding of how indigenous ethnomedicine serves as a biocultural bridge between human health and ecosystem stewardship.

By framing ethnomedicine as part of the broader socio-ecological system, this study highlights the potential of indigenous healing traditions to inform contemporary biodiversity management. It also underscores the urgency of recording and safeguarding these oral traditions before they fade from collective memory. Documenting the Manobo's ethnomedicinal heritage not only honors a cultural legacy but also provides a scientific and ethical foundation for integrating traditional knowledge into sustainable conservation practices.

MATERIALS AND METHODS

Study area

The study was conducted in West Lamidan, Municipality of Don Marcelino, Davao Occidental, located in the southwestern portion of Mindanao, Philippines (Fig. 1). West Lamidan is a predominantly rural coastal barangay, characterized by small-scale farming, fishing, and traditional resource use. The Manobo of West Lamidan represent one of the major ethnolinguistic groups in Mindanao. Despite exposure to modernization, their traditional belief systems and healing practices remain integral to community health and resource management. Field observations revealed a landscape shaped by customary use of plant species for both subsistence and healing, indicating a close link between biodiversity and local well-being.

Fig. 1. Geographical location of study site in west Lamidan, Don Marcelino, home of the Manobo tribe community in Davao Occidental, Philippines

Data collection and ethnobotanical survey

A total of 72 informants (38 males, 34 females), aged 25–86 years, were interviewed using purposive sampling. Key informants included traditional healers (albularyo), elders, and community leaders, identified through snowball sampling with the assistance of the barangay captain and local translators. General community members were also included to capture broader plant knowledge. Prior informed consent was obtained from the Manobo elders and the local government in accordance with ethical standards for indigenous research.

Semi-structured interviews and focus group discussions (FGDs) were employed following standard ethnobotanical approaches (Martin, 1995). Data gathered included local plant names, parts used, preparation methods, mode of administration, and perceived efficacy.

Informants were also asked about non-medicinal uses such as food and industrial applications (e.g., weaving, construction, and boat-building). Plant specimens mentioned during interviews were observed in situ, photographed, and when possible, collected for taxonomic identification. Species were identified using available floras and online databases (POWO, Co's Digital Flora of the Philippines), and verified through consultation with taxonomists in Mindanao State University – General Santos City.

Plant identification and voucher preparation

Collected specimens were photographed, pressed, and preliminarily identified in the field using local names and morphological traits. Voucher specimens were deposited at the University Herbarium of Mindanao State University - General Santos City, where final identification and nomenclature verification were conducted by institutional taxonomists with reference to Co's Digital Flora of the Philippines and online databases such as Plants of the World Online (POWO).

Quantitative ethnobotanical analysis

The cultural importance and agreement among informants were assessed using two established quantitative indices. The Use Value (UV), following the method of Philips *et al.* (1994), was calculated to determine the relative importance of each medicinal species. A higher UV indicates a greater number of use citations per species across all informants, suggesting a broader therapeutic usefulness regardless of the diseases treated. To determine the homogeneity of responses, the Informant Consensus Factor (ICF), based on the method of Heinrich *et al.* (1998), was derived for each disease category. ICF values range from 0 to 1; values approaching 1 reflect a strong consensus that a few species are primarily used to treat the ailments within that category. Disease categories were standardized using the International Classification of Diseases by the World Health Organization (2016).

Ethical considerations

Ethical approval and prior informed consent were secured from community elders, the local tribal council, and the Barangay leadership. The research adhered to the principles of Free, Prior, and Informed Consent (FPIC) under the Indigenous Peoples' Rights Act (IPRA) of 1997. Findings were validated in a final community presentation, where participants reviewed plant names, uses, and cultural interpretations. This participatory validation ensured that the data authentically represented community knowledge and that intellectual ownership remained with the Manobo people.

Data analysis and visualization

Quantitative data were summarized using descriptive statistics and presented through tables and charts showing species richness, plant part utilization, and use categories. UV and ICF values were visualized using bar and network diagrams to illustrate cultural salience and plant-disease associations. Species were further categorized according to their conservation status using the IUCN Red List (2023). Narrative data from FGDs were thematically analyzed to identify patterns of oral transmission and socio-ecological relevance.

RESULTS AND DISCUSSION

Plant diversity and ethnobotanical composition

A total of 125 plant species, representing 48 families, were recorded from the Manobo of West Lamidan. The full inventory is detailed in Table 1. This rich diversity highlights the multi-functional role of plants in sustaining their health, nutrition, and livelihood. As illustrated in Fig. 2, the recorded species break down as: 62 (49.6%) used medicinally, 42 (33.6%) as food, and 21 (16.8%) for industrial and material purposes. This composition reflects a holistic view of biodiversity, where plants are interwoven into daily life as sources of health, sustenance, and livelihood.

The Manobo ethnobotanical system is a holistic socio-ecological system that extends beyond health to encompass material culture. Specific plants like bamboo (*Bambusa* sp.), breadfruit (*Artocarps* sp.), and Gmelina (*Gmelina arborea*) are essential for construction and boat-making, while rattan (*Calamus* sp.) and abaca (*Musa textilis*) are used for weaving and ropes, and lauan (*Shorea* sp.) for housebuilding. This multi-use strategy confirms that the same ecosystems which yield medicinal species also underpin essential economic and cultural practices, contributing significantly to community resilience.

The dual-use of certain species such as *Moringa oleifera* and *Coffea* sp., which serve as both food and medicine, further reflects the seamless and integrated nature of this knowledge, where boundaries between function are fluid.

The extensive ethnomedicinal repertoire of 62 species underscores the continuing reliance on plant-based healthcare, especially in areas with limited access to modern health facilities.

This reliance and the resulting resilience are consistent with findings among other Mindanao indigenous groups, including the B'laan (Alinsug *et al.*, 2022), Subanen (Pizon *et al.*, 2016), and Talaandig (Naïve *et al.*, 2021).

Table 1. Inventory of ethnobotanical knowledge of the Manobo tribe in Davao, Philippines

#	Plant species	Local name	Plant Family	Plant part used	Mode of preparation	Application	Disease(s) treated	UV	ICF	Non-medicinal		Status
										Food	Industry	
1.	*Musa textilis*	Abacca	Musaceae	Stem							Fishing	CR
2	*Persea Americana*	Abokado	Lauraceae	Root	Decoction	Oral	Stomachache	0.33	0.42			LC
3	*Vanda sanderiana*	Agdao	Orchidaceae	Leaves	Decoction	Oral	Epilepsy	0.04	0.6			VU
4	*Urtica dioica*	Alingatong	Urticaceae	Root	Decoction	Oral	Recovery after childbirth	0.21	0.33			LC
5	*Aloe vera*	Aloe vera	Asphodelaceae	Leaves	Grinding	Topical	Dry skin	0.25	0.19		Cosmetic	EN
6	*Basella alba*	Alugbati	Basellaceae	Leaves	Raw	Topical	Boils	0.21	0.19			NA
7	*Momordica charantia*	Ampalaya	Cucurbitaceae	Shoot	Decoction	Oral	Vomiting, Diabetes	0.17	0.14			LC
8	*Annona*	Anonas	Annonaceae	Fruit						•		LC
9	*Graptophyllum pictum*	Atay-atay	Acanthaceae	Root	Decoction	Oral	Liver disease	0.17	0.42			VU
10	*Annona squamosal*	Atis	Annonaceae	Fruit						•		LC
11	*Capsicum annuum*	Atzal	Solanaceae	Fruit						•		LC
12	*Hibiscus tilliaceus L.*	Balibago	Malvaceae	Leaves	Raw	Topical	Headache, Sorcery	0.17	0.25			LC
13	*Donax canniformis*	Balis	Marantaceae	Stem							Weaving	NA
14	*Cordyline fruticosa*	Baston ni San Jose	Asparagaceae	Root	Decoction	Oral	Hematemesis	0.17	0.43			LC
15	*Allium sativum*	Bawang	Amaryllidaceae	Root						•		NA
16	*Ocicum sanctum*	Bawing	Lamiaceae	Leaves	Grinding	Topical	Allergy	0.25	0.19			NA
17	*Psidium guajava*	Bayabas	Myrtaceae	Leaves	Decoction	Oral	Stomachache	0.33	0.42			LC
18	*Centella asiatica*	Betek-betek	Apiaceae	Leaves	Grinding	Topical	Wound	0.21	0.19			LC
19	*Unidentified species*	Bulbulan		Stem							Fishing	NA
20	*Dioscorea divaricate*	Buloy	Dioscoreaceae	Stem	Decoction	Oral	Headache	0.21	0.6			LC
21	*Theobroma cacao*	Cacao	Malvaceae	Fruit	Grinding	Topical	Inflammation	0.21	0.19	•		LC
22	*Chrysophyllum cainito*	Caimito	Sapotaceae	Shoot	Decoction	Oral	Stomachache	0.33	0.42			LC
23	*Citrus x microcarpa*	Calamansi	Rutaceae	Fruit	Extraction	Oral	Coughs	0.21	0.43	•		LC
24	*Zea mays*	Corn	Poaceae	Fruit							Economic	LC
25	*Leucaena leucocephala*	Diyawa	Fabaceae	Stem	Extraction, Decoction	Oral	Thrush, Love spell	0.25	0.25			CD
26	*Durio* sp.	Durian	Malvaceae	Fruit						•	Economic	VU
27	*Heliotropium indicum*	Elepante	Boraginaceae	Leaves	Grinding, Extraction	Topical	Wound	0.21	0.19			LC
28	*Andrographis paniculata*	Flor de Liza	Acanthaceae	Leaves, Root	Boiling	Oral	Stomachache	0.33	0.42			NA
29	*Annona muricata*	Gabano	Annonaceae	Fruit						•		LC
30	*Colocasia esculenta*	Gabi	Araceae	Root						•		LC
31	*Blumea balsamifera*	Gabon	Asteraceae	Leaves	Decoction	Oral	Coughs	0.17	0.43			LC
32	*Unidentified species*	Galusod		Stem							Infrastructure	NA
33	*Gossypium sp.*	Gapas	Urticaceae	Leaves	Decoction, raw	Oral	Fever, Coughs	0.29	0.43			LC
34	*Hibiscus rosa-sinensis*	Gumamela	Malvaceae	Flower	Extraction, Grinding	Oral	Boils	0.29	0.19			CR
35	*Chromolaena odorata*	Hagonoy	Asteraceae	Stem	Grinding	Topical	Blood clot	0.13	0			NA
36	*Moringa oleifera*	Hybrid kamunggay	Moringaceae	Leaves						•		LC
37	*Unidentified species*	Indalamay		Shoot	Grinding	Oral	Stomachache, Delivery	0.25	0.33			NA
38	*Unidentified species*	Indalawi		Leaves	Decoction	Topical	Snakebite, Rabies	0.21	0.62			NA
39	*Unidentified species*	Indalobong		Stem	Grinding	Topical	Mouth ulcer	0.13	0.42			NA
40	*Unidentified species*	Inkakama		Leaves, Root	Decoction	Oral	Fever	0.13	0.14			NA
41	*Cucurbita maxima*	Kalabasa	Cucurbitaceae	Fruit						•		LC
42	*Impatiens balsamina*	Kamantige	Balsaminaceae	Root, Flower	Decoction	Oral	Urinary Tract Infection, Pelvic pain	0.33	0.43			VU
43	*Solanum lycopersicum*	Kamatis	Solanaceae	Fruit						•		LC
44	*Unidentified species*	Karlang		Fruit						•		NA
45	*Bambusoideae*	Kawayan	Poaceae	Stem							Infrastructure	NA
46	*Manihot esculenta*	Kilawin	Euphorbiaceae	Root						•		DD
47	*Jatropha gossypifolia*	Kota	Euphorbiaceae	Leaves	Grinding	Topical	Bone inflammation	0.21	0.6			NA
48	*Imperata cylindrica*	Kugon	Poaceae	Leaves	Decoction	Oral	Amoebiasis	0.13	0.62		Infrastructure	LC
49	*Catharanthis roseus*	Kumintang	Apocynaceae	Shoot	Decoction	Oral	Stomachache	0.17	0.42			NA
50	*Annona muricata*	Labana	Annonaceae	Flower, Leaves	Decoction	Oral	Heart disease	0.13	0			LC
51	*Raphanus raphanistrum*	Labanos	Brassicaceae	Root						•		LC
52	*Vitex negundo*	Lagundi	Lamiaceae	Leaves	Decoction	Oral	Coughs	0.38	0.43			LC
53	*Artocarpus heterophyllus*	Langka	Moraceae	Fruit						•		NA
54	*Unidentified species*	Lanot		Leaves							Economic	NA
55	*Lansium domesticum*	Lansones	Meliaceae	Fruit						•		NA
56	*Caulerpa lentillifera*	Lato	Caulerpaceae	Whole plant						•		NA
57	*Donax canniformis*	Lauan	Dipterocarpaceae	Stem							Fishing	LC
58	*Glycosmis sp.*	Limaw	Rutaceae	Leaves	Decoction	Topical	Recovery after childbirth	0.17	0.33	•		LC
59	*Cocos nucifera*	Lubi	Arecaceae	Fruit, Leaves, Stem	Grinding	Topical	Mouth ulcer	0.17	0.42	•	Economic, Infrastructure	LC
60	*Unidentified species*	Lumbron		Stem							Weaving	NA
61	*Unidentified species*	Lupal		Stem							Infrastructure	NA
62	*Zingiber officinale*	Luya	Zingiberaceae	Root						•		DD
63	*Curcuma longa*	Luyang dilaw	Zingiberaceae	Root	Grinding, Decoction	Topical, Oral	Wounds, Hypertension	0.29	0.19			DD
64	*Unidentified species*	Madaga		Root	Decoction	Oral	Delivery (post partum)	0.25	0.33			NA
65	*Gliricidia sepium*	Madre cacao	Fabaceae	Stem							Infrastructure	LC
66	*Hibiscus tiliaceus*	Malabago	Malvaceae	Root	Decoction	Oral	Kidney pain	0.29	0.43			LC
67	*Unidentified species*	Maliubod		Shoot	Decoction	Oral	Fever	0.25	0.14			NA
68	*Moringa oleifera*	Malunggay	Moringaceae	Leaves, Shoot	Grinding, Decoction	Topical, Oral	Wound, Hang-over	0.29	0.19	•		LC
69	*Mangifera indica*	Mangga	Anacardiaceae	Fruit						•	Economic	DD
70	*Unidentified species*	Manggulibas		Stem, Root	Decoction	Oral	Dysentery, Stomachache	0.38	0.42			NA
71	*Arachis hypogaea*	Mani	Fabaceae	Root						•	Economic	NA
72	*Rhamnus jujuba*	Mansanitas	Rhamnaceae	Root, Leaves	Decoction	Oral	Stomachache	0.25	0.42			LC
73	*Synsepalum dulcificum*	Miracle tree	Sapotaceae	Leaves	Decoction	Oral	Asthma	0.21	0.43			LC
74	*Ipomoea batatas*	Muti-muti	Convolvulaceae	Leaves						•		DD
75	*Unidentified species*	Nating		Root, Shoot, Root	Decoction, Extraction	Oral, Topical	High-risk childbirth, fainting spells	0.21	0.33			NA
76	*Coffea* sp.	Native Coffee	Rubiaceae	Shoot, leaves, fruit	Extraction, Decoction	Oral	Nausea, Abdominal pain	0.38	0.14	•		EN
77	*Abelmoschus esculentus*	Okra	Malvaceae	Fruit						•		NA
78	*Origanum vulgare*	Oregano	Lamiaceae	Leaves	Decoction	Oral	Coughs	0.33	0.43			LC
79	*Unidentified species*	Pagolipas		Stem							Infrastructure	NA
80	*Pandanus amaryllifolius*	Pandan	Pandanaceae	Leaves						•		NA
81	*Tinospora cordifolia*	Panyawan	Menispemaceae	Root, Leaves	Decoction	Oral	Delivery, Allergy, Kidney pain, Stomachache	0.21	0.42			EN

Continued

82	*Carica papaya*	Papaya	Caricaceae	Root, Shoot, Fruit	Decoction, Raw	Oral	Allergy, Dengue, Tonsilitis	0.29	0.43	•		DD
83	*Phaseolus lunatus*	Patani	Fabaceae	Fruit						•		LC
84	*Luffa acutangula Linn*	Patola	Cucurbitaceae	Fruit						•		NA
85	*Ananas comosus*	Pinya	Bromiliaceae	Fruit						•		NA
86	*Musa* sp.	Saging	Musaceae	Fruit, stem						•	Economic	LC
87	*Unidentified species*	Sakalig		Root	Decoction	Oral	Dysentery	0.21	0.425			NA
88	*Corchorus olitorius*	Saluyot	Malvaceae	Leaves						•		NA
89	*Sandoricum koetjape*	Santol	Meliaceae	Fruit						•		LC
90	*Allium cepa*	Sibuyas	Amaryllidaceae	Leaves, Root	Decoction	Oral	Urinary tract infection	0.38	0.43	•		NA
91	*Capsicum annum*	Sili	Solanaceae	Leaves	Raw	Topical	Inflammation	0.33	0.19			NA
92	*Pachyrhizus erosus*	Singkamas	Fabaceae	Fruit						•		NA
93	*Vigna unguiculata*	Sitaw	Fabaceae	Fruit						•		NA
94	*Opuntia cochenillifera*	Sugpat	Cactaceae	Stem	Extraction	Topical	Bone fracture	0.13	0.6			DD
95	*Solanum melongena*	Talong	Solanaceae	Root, Fruit	Decoction	Oral	Fainting	0.21	0.14	•		NA
96	*Artemisia vulgaris*	Tambisan	Asteraceae	Leaves	Extraction	Oral	Cough, Colds	0.25	0.43			LC
97	*Ficus septica*	Tanabeg	Moraceae	Root	Decoction	Oral	Love spell	0.17	0.25			LC
98	*Cymbopogon citratus*	Tanglad	Gramineae	Leaves	Decoction	Oral	Hypertension	0.25	0	•		NA
99	*Euphorbia hirta*	Tawa-tawa	Euphorbiaceae	Leaves, Root	Decoction	Oral	Dengue	0.33	0.62	•		NA
100	*Croton tiglium*	Tuba-tuba	Euphorbiaceae	Leaves	Raw	Topical	Inflammation	0.13	0.19			LC
101	*Saccharum officinarum*	Tubo	Poaceae	Shoot, Root	Decoction	Topical	Snakebite, Rabies	0.25	0.62			NA
102	*Unidentified species*	Tugal		Stem							Infrastructure	NA
103	*Unidentified species*	Tugas		Stem							Fishing, Infrastructure	NA
104	*Arenga tremula*	Ubod	Arecaceae	Stem	Grinding	Oral	Supplement	0.25	0.5			NT
105	*Cyperus brevifolius*	Uli-uli	Cyperaceae	Leaves	Decoction	Topical	Applied after labor	0.21	0.33			LC
106	*Lagenaria siceraria*	Upo	Cucurbitaceae	Fruit						•		NA
107	*Flagellaria indica*	Uwag	Flagellariaceae	Leaves, Shoot	Decoction	Oral, Topical	Dengue, Snakebite, Rabies	0.17	0.62			NA

Abbreviation: EN, Endangered; LC, Least Concern; VU, Vulnerable; DD, Data Deficient; CR, Critically Endangered; CD, Conservation Dependent; NT, Near Threatened; NA, Not Assessed

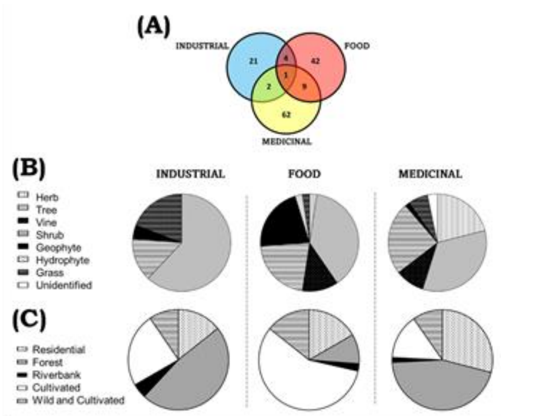

Fig. 2. Distribution of the 125 documented plant species based on three key characteristics: (A) Ethnographic Uses (Medicinal, Food, and Industrial); (B) Plant Life Form (e.g., Tree, Herb, Vine); and (C) Habitats where the species were collected

Predominant plant parts and preparation methods

Leaves were the most commonly used plant part (41%), followed by roots (22%), bark (14%), fruits (12%), and other parts (11%) as shown in Fig. 3. Decoction was the dominant preparation method (46%), followed by poultice (28%), infusion (12%), and others (14%).

Most remedies were administered orally, while approximately one-third were applied topically. The preference for leaves and decoctions reflects both practicality and ecological sensibility. Leaves are renewable, easy to collect, and require minimal destruction of the plant, supporting sustainable use. Decoction, the simplest and most reliable method, is deeply ingrained in the cultural fabric of healing, signifying trust in traditional practices. Similar findings among the B'laan (Alinsug *et al.*, 2022) highlight a shared pattern in Mindanao ethnomedicine where accessibility and renewability dictate plant use.

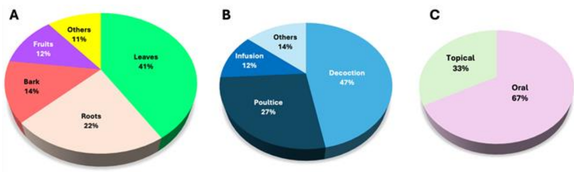

Fig. 3. Manobo ethnomedicinal knowledge. Among the plant parts used, leaves were most common, followed by roots, bark, fruits, and other plant parts (A). Decoction was the dominant preparation method, followed by poultice, infusion, and other techniques (B). Majority of these plants are administered orally while one-third are used through topical application (C)

Interestingly, during focus group discussions (FGDs), healers revealed that plants are rarely prepared in advance. Instead, remedies are made only when a community member comes to them for help. There are no written manuals, recipes, or "cookbooks." Rather, knowledge is preserved orally, whispered from one generation to the next, remembered in detail, and in some cases, revealed through dreams. This oral tradition highlights both the fragility and resilience of indigenous knowledge: fragile because much may be lost as younger generations turn to modern pharmaceuticals, but resilient because it has endured for centuries without written documentation.

Culturally salient species

Use Value analysis identified native *Coffea* sp., "Manggulibas" (an unidentified local taxon), *Allium cepa*, and *Vitex negundo* as the most culturally significant species (UV = 0.38). These plants were cited across multiple informants and disease categories. Their prominence arises from their versatility in treating multiple ailments and their symbolic importance in community life. The high UV of these plants underscores their centrality to daily life and health. Plants with high UV often overlap with species previously studied for pharmacological properties, supporting the ethnopharmacological principle that culturally important plants are promising candidates for bioactive compound screening.

Coffea sp. is especially noteworthy as both a medicinal tonic and a food crop. The prominence of "Manggulibas" is striking, as it suggests the existence of undocumented taxa with ethnopharmacological potential. These species' high UV underscores their centrality to daily life and health due to their versatility in treating multiple ailments and their symbolic importance. The ten most culturally important plants are listed in Table 2. By comparison, the B'laan identified *Lunasia amara* as their most important plant (UV = 1.81), valued for its alkaloids and anti-inflammatory properties (Alinsug *et al.,* 2022). These cultural anchors emphasize how each tribe's pharmacopeia reflects ecological availability, cultural valuation, and potential leads for pharmacological research.

Table 2. Ten most culturally important medicinal plants of the Manobo as determined by use value (UV), with corresponding scientific names, families, primary uses, and notes

Local name	Scientific name	Family	UV	Primary uses	Notes
Native coffee	*Coffea* sp.	Rubiaceae	0.38	Fatigue, digestive tonic	Dual role as food & medicine
Manggulibas	*Unidentified* sp.	–	0.38	Infectious diseases	Locally unique taxon
Sibuyas	*Allium cepa*	Amaryllidaceae	0.38	Fever, colds	Commonly cultivated
Lagundi	*Vitex negundo*	Lamiaceae	0.38	Cough, fever	Also in B'laan repertoire
Tuba-tuba	*Jatropha curcas*	Euphorbiaceae	0.34	Wounds, inflammation	Multipurpose species
Malunggay	*Moringa oleifera*	Moringaceae	0.32	Nutritional, anti-infective	High consensus food-medicinal plant
Sabila	*Aloe vera*	Asphodelaceae	0.29	Burns, skin disorders	Widely used
Niyog-niyogan	*Quisqualis indica*	Combretaceae	0.28	Anthelmintic	WHO-recommended traditional medicine
Tanglad	*Cymbopogon citratus*	Poaceae	0.28	Fever, cough	Culinary + medicinal
Bayabas	*Psidium guajava*	Myrtaceae	0.26	Diarrhea, wounds	Common Philippine remedy

Consensus of plant use

The Informant Consensus Factor (ICF) demonstrated that agreement among the Manobo is highest for infectious and parasitic diseases (0.62), followed by digestive (0.58) and respiratory conditions (0.55), as detailed in Table 3. This pattern strongly indicates that communicable diseases represent the most culturally salient and urgent health threats in the community, leading to a highly established repertoire of remedies for fever, cough, diarrhea, and infections (Table 4). This consensus is exemplified by the prominent use of species such as *Vitex negundo* (cough, fever), *Euphorbia hirta* (sore eyes, dengue), *Psidium guajava* (diarrhea, wounds), and *Saccharum officinarum* (snakebite). The overall therapeutic focus of the Manobo pharmacopeia is visually summarized by the relationship between plant families and disease categories in the ethnochord diagram (Fig. 4). The resulting high ICF values suggest strong community consensus on the efficacy of these traditional formulations, reinforcing the reliability and empirical soundness of this indigenous knowledge system.

Table 3. Informant consensus factor (ICF) values for disease categories treated by the Manobo, including number of species cited, use reports, and representative examples

Disease category (ICD-10)	No. of species	Use reports	ICF	Example species
Infectious & parasitic	22	61	0.62	*Euphorbia hirta*, *Saccharum officinarum*
Digestive system	18	52	0.58	*Psidium guajava*, *Coffea* sp.
Respiratory system	14	41	0.55	*Vitex negundo*, *Allium cepa*
Skin & subcutaneous	10	26	0.38	*Aloe vera*, *Jatropha curcas*
Musculoskeletal	8	19	0.37	*Cymbopogon citratus*, *Moringa oleifera*

Table 4. WHO disease categories of ailments reported and number of associated medicinal plants

Code	Category	Disease cited	No. of ailments	No. of plants
A	General	Nausea, fever, faint, vomiting, hang over	5	8
B	Wounds and other dermal ailments	Skin allergy, inflammation, boils, dry skin, wounds	5	13
C	Eye	---	0	0
D	Urinary and genital system	Urinary tract infection, pelvic pain, kidney pain	3	4
E	Neurological system	Headache, epilepsy	2	3
F	Musculoskeletal system	Bone inflammation, fracture	2	2
G	Digestive system	Stomachache, abdominal pain, dysentery, thrush, tonsillitis, mouth ulcer, liver disease	7	16
H	Infectious and parasitic disease	Dengue, snake bite, rabies, amoebiasis	4	6
I	Circulatory system	Hypertension, heart disease, blood clot (thrombophilia)	3	4
J	Pregnancy and childbearing problems	Difficulty in childbirth, after-birth recovery stage	2	7
K	Respiratory system	Coughs, colds, hematemesis, asthma	4	8
L	Nutritional and metabolic diseases	Diabetes, malnourishment	2	2
M	Others	Sorcery	1	3

Furthermore, the overlap between species exhibiting high ICF and those already validated in pharmacological literature confirms their potential for modern drug discovery.

Healing knowledge as a mirror of community health

FGD insights revealed that the community's inventory of medicinal plants closely mirrors its health profile. Most remedies address ailments common in rural tropical settings i.e. fevers, skin infections, intestinal worms, and respiratory problems, reflecting the direct relationship between environment, disease, and treatment availability.

When asked whether they possessed remedies for unfamiliar diseases such as HIV/AIDS, tribal healers responded with humor and humility: "No one in our community has complained of such. If it comes one day, our ancestors will give us the cure in our dreams." This statement encapsulates a worldview in which health, environment, and spirituality form a continuous adaptive cycle. It highlights the Manobo's belief that healing knowledge evolves in response to lived experience, guided by ancestral connection and ecological observation.

Whispered knowledge through generations

Knowledge transmission among the Manobos remains entirely verbal, with remedies prepared only when a patient seeks help. Tribal healers and elders stressed that there are no written notes or guides. Knowledge is carried in memory, passed down orally, and occasionally through dreams, a phenomenon also reported among the B'laan and other indigenous healers across Southeast Asia.

This mode of transmission exemplifies both cultural resilience and fragility. Resilience lies in the survival of these oral systems for centuries without formal documentation. Fragility arises as younger generations increasingly favor biomedical practices, perceiving traditional medicine as outdated. Palaganas *et al.* (2001) and Camacho *et al.* (2015) both warn that modernization threatens the continuity of indigenous ecological knowledge, making documentation and community-based education critical for preservation.

Ethnobotanical roles beyond medicine

In addition to medicinal uses, numerous plants serve material and ecological functions. Key species like bamboo (*Bambusa* sp.), breadfruit (*Artocarpus* sp.), and gmelina (*Gmelina arborea*) are essential for construction and boat-making. Similarly, rattan (*Calamus* sp.) and abaca (*Musa textilis*) provide materials for weaving and ropes, with lauan (*Shorea* sp.) used in housebuilding. These practices demonstrate how biodiversity supports the community's material culture and resilience.

While the present study focuses on medicinal plants, recognizing these broader uses contextualizes ethnomedicine within a larger socio-ecological framework. The multifunctional use of plants strengthens community adaptability and fosters stewardship of local flora, a key element of socio-ecological resilience.

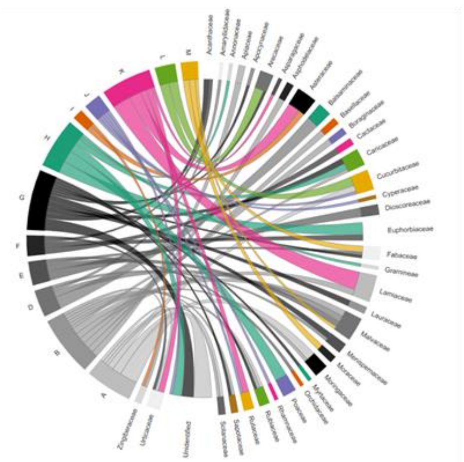

Fig. 4. Ethnochord diagram illustrating the relationship between medicinal plant families and WHO disease categories. Thickness of the connecting bands corresponds to the number of informant citations linking each plant family to a particular ailment category

Conservation crossroads: Endangered species and indigenous stewardship

Several culturally significant species identified by the Manobo are of conservation concern. *Vanda sanderiana* (waling-waling), endemic to Mindanao, is critically endangered, while native *Coffea* spp. are under threat due to deforestation and habitat conversion. The simultaneous cultural and ecological value of these plants places them at the intersection of conservation and tradition.

While traditional use can contribute to harvesting pressure, it can also promote stewardship. Elders discourage overcollection and advocate replanting or respectful gathering during rituals. Such practices echo the "conservation through culture" model observed in other indigenous contexts (Camacho *et al.*, 2015), where reverence for certain species indirectly aids their protection. Integrating such practices into local conservation frameworks could enhance biodiversity management in culturally sensitive landscapes.

Comparative insights with the B'laan ethnomedicine

Comparison with the B'laan tribe of Mt. Matutum (Alinsug *et al.*, 2022) reveals both shared and distinctive patterns (Fig. 5). Both groups rely heavily on leaves and decoctions, emphasizing similar ecological practicality. However, the B'laan catalogued a larger number of medicinal species (101) compared to the Manobo (62), reflecting different ecological zones and disease exposures. The B'laan emphasized digestive and blood-related disorders, while the Manobo focused on infectious and parasitic diseases. These contrasts underscore how ethnomedicine is context-dependent, shaped by environment, resource availability, and health challenges unique to each community.

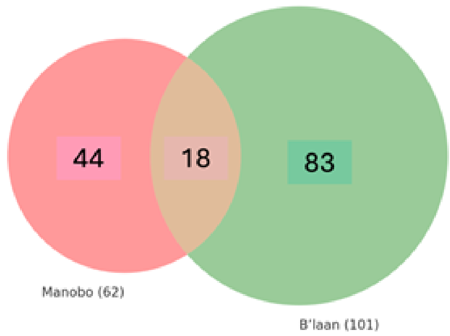

Fig. 5. Venn diagram showing overlap and divergence of medicinal species between the Manobo of west Lamidan (62 species) and the B'laan of mount Matutum (101 species).

Such comparative studies are vital for mapping the ethnobotanical diversity of Mindanao and for understanding how cultural adaptation shapes plant knowledge across ecological gradients. They also help identify overlapping and unique species that could be prioritized for conservation or further biochemical research.

Ethnomedicine as a pillar of socio-ecological resilience

The Manobo healing system exemplifies the intertwined relationship between biodiversity, health, and culture. Their dependence on local flora for medicine sustains not only physical well-being but also cultural identity and ecological awareness. Ethnomedicinal practices embody what scholars describe as biocultural resilience — the capacity of a community to adapt and thrive by maintaining reciprocal relationships with their environment.

This framework situates ethnomedicine as more than a repository of cures; it is a living interface between ecological systems and human survival. As biodiversity loss and cultural homogenization accelerate, indigenous knowledge offers models of sustainable coexistence. The Manobo example demonstrates that conserving cultural heritage and biological diversity are mutually reinforcing goals both essential to the long-term resilience of socio-ecological systems.

Safeguarding Manobo ethnomedicine: Pathways for cultural resilience, conservation, and discovery

The ethnomedicinal knowledge of the Manobo tribe represents an irreplaceable component of the Philippines' biocultural heritage, a living archive of health practices shaped by centuries of close interaction with the environment. This study documents 125 plant species that sustain not only the physical well-being of the Manobo but also the continuity of their cultural identity and environmental ethics. The findings highlight how biodiversity and traditional knowledge coexist in a dynamic equilibrium, forming the foundation of local resilience.

The Manobo healing system is an oral tradition sustained through memory, experience, and spirituality. Remedies are not pre-prepared or recorded but created only when illness arises, guided by ancestral wisdom or dreams. Such practices exemplify the adaptive intelligence of indigenous communities, a system continuously refined through observation, faith, and ecological familiarity. Yet, this same oral mode of transmission makes the tradition vulnerable to loss. As younger generations become increasingly detached from customary practices, centuries of empirical and spiritual knowledge risk fading into obscurity.

Documenting and revitalizing these traditions are therefore crucial steps toward sustaining both cultural and biological diversity. Ethnobotanical documentation serves not merely as academic record but as an act of conservation, ensuring that the healing knowledge embodied in local plants remains accessible to future generations. The Manobo's selective harvesting practices, ritualized plant collection, and oral rules of respect for nature demonstrate a community-based conservation ethic long before modern frameworks defined it. These insights could inform inclusive biodiversity management programs that integrate indigenous stewardship into local governance.

At a broader scale, the Manobo pharmacopeia provides a window into the community's health ecology. The diseases they treat (respiratory, parasitic, and digestive ailment) reflect the living conditions and ecological realities of their environment. By understanding these linkages, biodiversity management can be reframed to include human health and cultural resilience as indicators of ecosystem well-being. This integrative approach, where culture is conservation, underscores the need to protect both natural resources and the cultural systems that safeguard them.

To ensure the persistence of this knowledge, collaborative programs between research institutions, local governments, and indigenous councils should be strengthened. Establishing community herbariums, oral history archives, and participatory mapping of medicinal plant sites can empower local ownership of knowledge while promoting conservation awareness. Recognizing the intellectual and spiritual sovereignty of indigenous peoples is essential to ethical bioprospecting and fair benefit-sharing.

Ultimately, safeguarding the Manobo ethnomedicinal heritage is not only a matter of cultural preservation but a necessity for ecological sustainability. Their wisdom offers a model of coexistence — one where healing, biodiversity, and spirituality are threads of a single tapestry. In an era of climate change and cultural erosion, such perspectives remind us that the path to resilience lies in remembering, respecting, and restoring the living knowledge of those who have long understood how to live with the land.

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