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Ethnomedicinal plants used by Manobo Tribe in Ugnop Cave Landscape Forest Reserve, Agusan del Sur, Philippines

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Abstract. *Paraguison LD, Salamanes JJDP, Dapar MLG, Alejandro GJD. 2024. Ethnomedicinal plants used by Manobo Tribe in Ugnop Cave Landscape Forest Reserve, Agusan del Sur, Philippines. Biodiversitas 25: 4223-4232.* As a protected and conserved area, Upland Prosperidad in Agusan del Sur, harbors medicinal plants traditionally used by local communities and indigenous groups. This study investigates the ethnomedicinal practices of the Manobo tribe in the Ugnop Cave Landscape Forest Reserve, Prosperidad, Agusan del Sur. Data were gathered through semi-structured interviews, guided field walks, and focus group discussions with 150 key informants. A total of 55 medicinal plants, belonging to 31 families and 49 genera, were documented for their use in treating various diseases and ailments. The Fabaceae family dominated with five species reported for medicinal use. Piperaceae (FIV=98.67) and Asteraceae (FIV=96.66) were identified as the families with the highest Family Importance Value, receiving the most citation reports from key informants. The most frequently reported plant species was *Piper aduncum* L., traditionally used for treating cuts and wounds. Leaves were the most commonly used plant part, constituting 32% of usage. Decoction was the most common mode of preparation (55%), followed by poultice (22%) and direct eating (16%). The forest reserve was found to be rich in medicinal plant knowledge and resources among the locals and indigenous communities, emphasizing the need for ongoing protection and conservation of these valuable genetic resources.

Keywords: Ethnobotany, Manobo Tribe, medicinal plants, Prosperidad, Ugnop Cave

Abbreviations: FIV: Family Importance Value, RFC: Relative Frequency Citation

INTRODUCTION

Medicinal plants are the main and most effective source of healing for a wide range of human diseases globally. Known as botanical medicines, they are used in the formulation of pharmaceuticals (Batubara and Suwardi 2024). These plants serve as reservoirs of naturally occurring chemicals beneficial in treating various ailments (Lefrioui et al. 2024). For generations, edible plants have been essential for nutrition and medicine due to their biological diversity and phytochemical content (Bi et al. 2024). The discovery and development of novel compounds with pharmacological relevance based on ethno-medical knowledge has renewed natural product research over the past 20 years (De La Cruz-Jiménez et al. 2022). Indigenous people in Prosperidad, Agusan del Sur, have traditionally used numerous plants for medicinal purposes. This knowledge, shared orally across generations, is at risk as younger generations show less interest in these traditions due to modern technological advances. In recent decades, drug discovery has increasingly incorporated quantitative methods within ethnobotany and ethnopharmacology, which study the complex relationships between people and plants (Anwar et al. 2024). Ethnobotany, a scientific field that investigates ancestral beliefs and customs related to plant usage, has notably included the application of multivariate analysis (Dapar et al. 2020a).

Despite the Philippines rich plant biodiversity and cultural diversity, there is a notable scarcity of quantitative ethnobotanical research in the country. Approximately 80% of the global population utilizes medicinal plants to prevent and cure illnesses, with rising demand in midrange and poor countries (Mogha 2024). The lack of resources is particularly evident in regions like Agusan Del Sur, a province in Mindanao, home to diverse indigenous communities and unique plant species. However, it remains untouched in terms of documenting ethnomedicinal knowledge and practices. Ethnobotanical research in biologically rich areas is vital to identify, record, prioritize, conserve, and promote the sustainable use of therapeutic plants (Charwin et al. 2023). Indigenous knowledge results from a complex interaction between people and their environment, influenced by factors such as verbal

communication, ideology, religion, aesthetic value, historical context, social linkages, and information availability (Haq et al. 2020). Ethnomedicine, a specialized plant knowledge, seeks to uncover resources for herbal medicines, food plants, and other uses. Utilizing traditional plants for medicinal purposes is essential in primary health care to safeguard foreign exchange and protect cultural heritage (Bassa 2017). Tribal communities have distinct and detailed ethnomedicinal protocols preserved over generations (Tripathi 2019).

The indigenous Manobo people hold Bega Falls in high esteem for its abundant biodiversity, particularly the diverse range of medicinal plants. These plants can alleviate health problems, including colds, digestive disorders, dengue fever, and skin infections (Paraguison et al. 2021). The city relies on it as a significant source of medicinal remedies, positively impacting inhabitants health and welfare. Artificial and chemical-based medicines often lead to adverse reactions and can impact the immune system. Traditional medicine techniques include proven and inherited practices that have established their safety and effectiveness (Ayoubi et al. 2024). Nowadays, government and non-governmental entities are actively validating recently discovered therapeutic plants. Research institutes are recording and investigating local and indigenous knowledge about these plants. Conducting studies and establishing a comprehensive database is key to preserving and documenting these valuable traditions, preventing their extinction (Phengmala et al. 2024).

A comparable pattern emerged worldwide. Today, the herbal products market offers a wide range of therapeutic remedies, including herbal remedies, medicinal plant products, natural personal-care products, essential oils, and food supplements. Currently, 170 out of 194 World Health Organization (WHO 2019) members report using traditional medicine. It encompasses a broad understanding, abilities, and methodologies that many indigenous and different societies have used throughout history to safeguard well-being and address the prevention, diagnosis, and treatment of ailments (Muanga et al. 2024).

The current research aims to record the indigenous knowledge of Manobo Tribe in the Bega Falls situated in Ugnop Landscape Forest Reserve of Prosperidad by documenting ethnomedicinal value and identifying plant species on the ecological significance of these plants, promoting sustainable harvesting and biodiversity conservation efforts.

MATERIALS AND METHODS

Study area

The study was conducted in Bega Falls (08°69'76.2" N and 125°97'39.1"E), Ugnop Cave Landscape Forest Reserve, situated in the northern region of Prosperidad in Agusan del Sur, Philippines (Figure 1). It is a breathtaking natural landmark renowned for its falling waters and tranquil surroundings. The waterfall, with many levels, is at a height of about 40 feet surrounded by abundant vegetation, creating a scenic environment for visitors. The falls are not just a popular attraction for visitors seeking a peaceful getaway, but they also possess significant cultural and ecological significance.

The indigenous Manobo people of the area valued Bega Falls in high esteem for its abundant biodiversity, particularly the diverse range of medicinal plants that thrive in the area around it. Sampling activities were carried out at the Bega Watershed, which is in the lowland forest of Barangay Mabuhay, Prosperidad, Agusan del Sur.

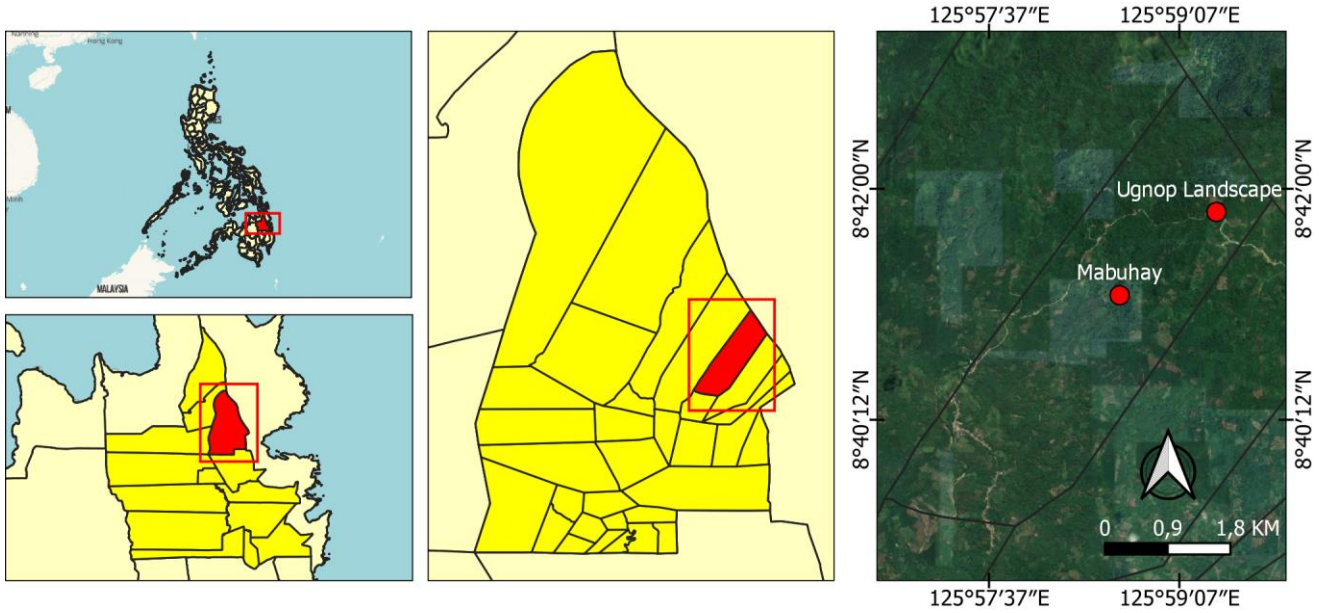

Figure 1. Sampling site situated in Ugnop Cave Landscape Forest Reserve, Barangay Mabuhay, Prosperidad, Agusan del Sur, Philippines

Field survey

Prior to the interview, a thorough field survey and selection process were conducted in Barangay Mabuhay, located in Prosperidad, Agusan del Sur. Essential approvals such as informed consent, certification, and permission were obtained to ensure ethical compliance and respect for the community's autonomy. Meetings and consultations were held in the presence of key community figures, including one tribe chief and one tribal healer, to ensure trust and collaboration. A carefully chosen random group of 150 indigenous respondents was selected using a combination of purposive and snowball sampling methods. This sample represented over 10% of the entire population of the selected barangays, ensuring a diverse and representative cross-section of the community. The respondents included tribal council members and other community members, providing a comprehensive perspective on the issues being studied (Paraguison et al. 2021).

Interviews with key informants

The current study primarily used ethnobotanical techniques, using the snowball technique, information about medicinal plants was gathered from residents through personal interviews, discussions, and questionnaire surveys. The demographic characteristics of local informants, such as their gender, age, and occupation, were included in a semi-structured questionnaire. In addition, it includes the local name of the plant, the part used, the method of preparation, traditional recipes, the method of application, and the treatment of illness with medicinal plants (Luo et al. 2024).

The use of medicinal plants is not limited to a specific season; people utilize them whenever the need arises, regardless of the time of year. Regarding the user population, respondents indicated that various age groups, including children, the elderly, and pregnant women, make use of the plants as long as they are experiencing a relevant condition and the plant is appropriate for treating that disorder.

The questionnaires were filled out by 150 informants, comprising 68 men and 82 women from two localities of Prosperidad, namely Bega falls and Ugnop. The interviewees reported having superior traditional knowledge about the medicinal plants used for the treatment of various illnesses, as well as effective approaches for the synthesis of their remedies. In the snowball method, interviewees also referred knowledgeable individuals regarding medicinal uses for additional interviews. The ages of the informants ranged from 18 to 70 years, with 68 men (45%) and 82 women (55%). The collected data were then entered into a Microsoft Excel spreadsheet and analyzed quantitatively.

Plant collection and identification

Plant collection was done from April to November 2019. The common names and societal applications of every species were carefully documented and subsequently authenticated. A detailed description was required to explain the various methods by which plant-based medicines were used for therapeutic purposes. It is based on a medical ethnobotanical investigation that aims to characterize the native plants used by the Manobo Tribe for the preparation of medicinal remedies and preventative medicine. The analysis used both quantitative and qualitative methods to describe the uses of indigenous medicinal plants. The questionnaire approach was used for conducting the interviews. The use of botanical procedures for collecting, preserving, and describing plant specimens for identification was carried out. Additionally, photographs of plants were captured in the respective sites. The specimens were pressed using a plant press, dried, mounted, and arranged systematically on herbarium sheets according to standard size. The taxonomists at the National Museum assisted in identifying the preserved specimens. These specimens were then confirmed using other sources to verify and validate the family classification, spelling, and synonyms of the scientific names. Plants of the World Online (POWO 2024) and IPNI (IPNI 2019) have been included. In order to confirm the species' identification, occurrence, and geographical distribution, was used Co's Digital Flora of the Philippines (www.philippineplants.org) (Pelser et al. 2011).

Ethnomedicinal analysis

Relative Frequency of Citation (RFC) measures the local significance of medicinal plant species using this equation: RFC=FC/N represents the Relative Frequency of Citation, where FC is the number of informants who mentioned the plant species, and N represents the total number of informants. The RFC scale spans from 0 to 1, with the values of the more important species being closer to 1 (Faruque et al. 2018).

The Family Importance Value (FIV) also assists in categorizing families based on the quantity of plants used as therapeutic goods within a certain plant family. This is calculated using the formula: FIV=(FC/N)×100, where FC represents the frequency of citations for the plant family and N is the total number of informants (Dapar et al. 2020b). The FIV identifies the most significant family by evaluating the number of citation reports from key informants and the number of medicinal plant species used to utilized for treating common diseases (Hussain et al. 2022).

RESULTS AND DISCUSSION

The survey of medicinal plants includes 55 species from 49 genera, categorized into 31 families (Table 1). The analysis of FIV reveals the remarkable effectiveness of specific plant families, including Piperaceae (98.67), Asteraceae (96.66), Fabaceae (94.00), and Moraceae (86.66). These families were consistently recognized by informants for their efficacy in treating a variety of illnesses such as wound healing, snake and scorpio bites, fever, respiratory conditions such as colds, coughs, flu, and asthma, as well as gastrointestinal problems including acid reflux, diarrhea, stomach ache and ulcer. Scientific confirmation of some species within the same genus and family may indicate comparable medicinal effects attributes that may be used to treat different diseases and health issues (Dapar et al. 2020c).

Table 1. Ethnomedicinal plants used for the treatment of various diseases by the Manobo Tribe in Ugnop Cave Landscape Forest Reserve in Prosperidad, Agusan del Sur, Philippines

Family	Scientific name	Local name	Voucher number	FIV	RFC	Plants used	Preparation and administration	Medicinal use
Anarcadiaceae	*Spondias pinnata* (L.f.) Kurz.	*Abihid*	15599	32.67	0.33	Bk, Lf	Drink the decoction of leaves, and scraped bark	Cold, cough, fever, diabetes
Annonaceae	*Friesodielsia lanceolata* (Merr.) Steen	*Talimughat*	15558	53.33	0.37	Bk, Lf, Rt	Boil the roots. Peel the bark- rub on the skin, Decoction	Body pain, new mother, high fever, backache, fatigue and body pain, muscle cramps and spasm
Annonaceae	*Uvaria zschokkei* Elmer	*Bigo*	15662	53.33	0.17	St	Boil the roots, sap of stem skin	Fever, fatigue, hair loss, hypertension, insect bite, amoebiasis, weakness
Apocynaceae	*Alstonia macrophylla* Wall.ex G.Don	*Dita*	15546	55.33	0.43	Bk, Lf	Boil the bark and leaves	Stomach ache, diarrhea, abdominal pain
Apocynaceae	*Anodendron borneense* (King & Gamble) D.J.Middleton	*Himag (Taga-uli)*	15639	55.33	0.12	St	Boil the bark- extract, sap	Ulcer, diarrhea, nervous breakdown, hypertension, stomach acidity
Araceae	*Homalomena philippinensis* Engl.ex.Engl.& K.Krause	*Payaw*	15597	36.67	0.37	Lf, St	Boil the stem and leaf	Body pain, colds, fever, headache
Arecaceae	*Areca catechu* L.	*Huling huling*	15610	17.33	0.07	Bk	Bark skin- burn- apply to the external part, soft pith can be eaten directly, Decoction	Breast cancer
Arecaceae	*Calamus megaphyllus* Becc.	*Kapi*	15608	17.33	0.11	St	"Ubod"- soft pith can be directly eaten, sap	High blood, astringent for skin
Aristolochiaceae	*Apama affinis* (Planch.ex Rolfe)	*Salimbagat*	15643	28.00	0.28	Lf	Drink decoction	Convulsion
Asteraceae	*Chromolaena odorata* (L.)R.M.King & H.Rob	*Hagonoy*	15632	95.33	0.13	Lf,sap	Rub the leaf then patch / Sap- patch	Wounds, stop bleeding , fever
Asteraceae	*Erechtites valerianifolius* (Link ex. Spreng.)DC	*Gapas gapas*	15666	95.33	0.15	Lf	Boil the leaves	Stomach ache, diarrhea, abdominal pain, indigestions, acid reflux
Asteraceae	*Mikania cordata* (Burm.F.)B.L.Rob.	*Moti-moti*	15543	95.33	0.37	Lf, Sap	Leaf extract, Apply pounded or chewed leaves.	Cough, cuts and wounds, ulcer, skin itchiness, snake and scorpio bites
Athyriaceae	*Diplazium esculentum* (Retz.) Sw.	*Pako-pako*	15545	10.00	0.10	Sh	Drink the boiled shoots	Enchance labor and delivery, postpartum care and recovery
Begoniaceae	*Begonia contracta* Warb.	*Budag-budag*	15654	16.67	0.17	Fl, Lf	Boil the leaf apply to the affected areas, Crushed flowers and leaves to the affected area as poultice	Pimples, dandruff, burns
Byttneriaceae	*Abroma augusta* (L.) L.fil.	*Samboligawan*	15637	29.33	0.12	Bk, Lf, Rt	Drink decoction	Dysmenorrhea irregular menstruation, sterility, tonic
Byttneriaceae	*Melochia umbellata* (Houtt.) Stapf	*Banitlog*	15649	29.33	0.17	Lf	Decoction of leaves or apply leaves as poultice	Back and body pain, headache, rheumatism, burns
Campanulaceae	*Hippobroma longiflora* (L.)G.Don	*Elepanteng puti*	15583	34.00	0.34	Fr	Apply pounded or chewed leaves, Decoction	Asthma, bronchitis, fever, toothache, cuts and wounds
Caricaceae	*Carica papaya* L.	*Kapayas laki*	15668	45.33	0.45	Fr	Directly chew the fresh fruit.	Detox, heart burn, indigestion

Cyperaceae	*Rhynchospora colorata* (L.) H.Pfeiffr	*Busikad*	15571	30.67	0.31	Wh	Drink boiled parts	Cough, flatulence, gas pain, hyperacidity, baby teething (odontiasis)
Dioscoreaceae	*Stenomeris borneensis* Oliv.	*Banag*	15537	26.00	0.26	Lf, Rt	Leaf- boil or hot water (Tea), Decoction of root	Kabag (gastritis), boost energy after delivery
Euphorbiaceae	*Homalanthus macradenius* Pax & Hoffm.	*Banti puti, Banti tapol*	15633	28.67	0.29	Lf	Use leaf powder as a poultice.	Cuts and wounds, diarrhea, impetigo, stomach pain
Fabaceae	*Bauhinia* cf. *semibifida*	*Talimughat*	15575	92.67	0.21	Bk, Lf, Rt, St	Drink a decoction or tincture of the bark, stem, and root with local alcohol.	Weakness and fatigue, rheumatism
Fabaceae	*Gliricidia sepium* (Jacq.)kunth ex Steud	*Madre de Cacao*	15620	92.67	0.23	Lf, Rt,sap	Sap of roots	Sore eyes, cuts and wounds
Fabaceae	*Mimosa pudica* L.	*Hibe-hibe (makahiya)*	15570	92.67	0.13	Rt	Leaf boiling	Abortion, menstrual flow, urinary
Fabaceae	*Ormosia macrodisca* Baker	*Bahay*	15625	92.67	0.29	Fr	Directly eat the fresh fruit.	Lower bad cholesterol
Fabaceae	*Phanera semibifida* (Roxb.) Benth.	*Alibangbang puti*	15646	92.67	0.06	Lf	Drink decoction	Hemmorhage, internal bleeding
Lamiaceae	*Coleus scutellarioides* (L)	*Wild Mayana -Pula*	15644	68.67	0.15	Lf	Drink boiled parts	Asthma, cough, gas pain, wounds
Lamiaceae	*Hyptis capitata* Jacq.	*Sawan-sawan*	15574	68.67	0.21	Lf	Drink the decoction of leaves or leaf sap	Colds and cough
Lamiaceae	*Ocimum basilicum* L.	*Sangig*	15630	68.67	0.26	Lf, Sh	Drink decoction	Cough, constipation, diarrhea, delayed menstruation, gas pain, headache, fever, flatulence
Lamiaceae	*Teijsmanniodendron ahernianum* (Merr.) Bakh.	*Kulipapa*	15603	68.67	0.07	Rt, St,	Roots and stem- Boil- (Tea), Decoction	Muscle spasm, beri-beri, give energy to birth mother, cramp and spasm
Lauraceae	*Cinnamomum mercadoi* S. Vidal	*Kaningag*	15585	58.67	0.11	Bk, Br, Rt	Drink a decoction or tincture of the bark, stem, and root with local alcohol.	Amoebiasis, diarrhea, hyperacidity, ulcer
Lauraceae	*Litsea cordata* (Jack) Hook.f.	*Loktob*	15580	58.67	0.13	Bk, Rt.	Drink infused bark or decoction in hot water.	Arthritis, asthma, cough, cyst, emphysema, goiter, mumps, myoma, tumor
Lauraceae	*Machilus philippinensis* Merr.	*Efficascent*	15576	58.67	0.35	Sp, St	Peel the bark- put oil- apply, Rub the body, Drink the sap	Cough and colds, high fever
Malvaceae	*Gossypium hirsutum* L.	*Gapas*	15553	20.67	0.21	Rt	Drink decoction	Body ache and chills, fever, hemorrhage, postpartum care and recovery
Melastomataceae	*Medinilla teysmannii* Miq.	*Tampion*	15581	25.33	0.25	Lf	As a hot compress, use heated leaves.	Gas pain, muscle pain, sprain, swollen muscle, sprain
Meliaceae	*Swietenia mahagoni* (L.) Jacq.	*Mahogany*	15671	29.33	0.29	Sd	Drink powdered seed	Dysmenorrhea, menstrual irregularities, and abortifacient
Menispermaceae	*Arcangelisia flava* (L.) Merr.	*Lagtang or Abutra*	15600	12.67	0.13	Rt, St.	Drink decoction	Abortifacient, diabetes, dysentery, dysmenorrhea, indigestion, fever, jaudice
Moraceae	*Ficus cassidyana* Elmer	*Tubog, Tubog tapol*	15551	86.67	0.34	Bk, Rt,	Bark of the stem-kiskis can be applied directly or stem extract can be drank directly; Drink decoction	Asthma, colds, cough, fever, flu, diabetes, fatigue, hypertension, stomachache, UTI,
Moraceae	*Ficus fistulosa* Reinw.ex Blume	*Tobog puti*	15561	86.67	0.29	Bk, Rt	Decoction	Asthma, colds, cough, diabetes, diarrhea, fatigue, stomach ache, UTI, weakness
Moraceae	*Ficus* sp.	*Tuwa Tuwa*	15642	86.67	0.03	Lf	Boil the leaf	Impotent, sterile, birth mother
Mutingiaceae	*Muntingia calabura* L.	*Mansanitas*	15629	40.67	0.41	Lf	Leaf boiling	Stomachache, vomiting, diarrhea, ulcer, abdominal pain

Myristicaceae	*Myristica agusanensis* Elmer	*Duguan Bagon*	15611	14.00	0.14	Bk	Bark- cut- boil	Blood related diseases, anti-respiratory, early parkinson
Pandanaceae	*Pandanus amaryllifolius* Roxb. ex Lindl.	*Pandan- tsina*	15555	8.00	0.08	Lf, St	Stem- laga	Heart enlargement, cholesterol, kidney and prostate ailment
Piperaceae	*Piper aduncum* L.	*Buyo-buyo, Lunas*	15568	96.67	0.57	St, Lf	Stem soaked in Gasoline (3 days), Chew leaves	Snake bite, colds, flu, cuts and wounds
Piperaceae	*Piper* cf. *nigrum* "wild"	*Lunas -Bagon PutiBuyo # 3*	15560	96.67	0.10	St	Decoction of stem	Decocted stem is applied on cuts and wounds
Piperaceae	*Piper decumanum* L.	*Lunas-Bagon Buyo*	15544	96.67	0.19	St	Drink a decoction or tincture of the bark, stem, and root with local alcohol.	Body pain, diarrhea, skin diseases, tuberculosis, ulcer, wounds
Piperaceae	*Piper* sp.	*Buyo # 4-Pilipog*	15592	96.67	0.11	Lf, Rt, St	Decoction	Asthma, cough
Rutaceae	*Melicope* cf. *triphylla*	*Lais*	15659	21.33	0.06	Lf,St, Rt	Stem-burn-ash- apply to affected area	Carbuncle (pigsang dapa),
Rutaceae	*Melicope triphylla* (Lam.)Merr.	*Dahile*	15660	21.33	0.07	Lf, Sp	Peel the bark and apply the oil.	Snake bite, cuts and wounds
Rutaceae	*Micromelum minutum* (G.Forst.)Wight &Arn.	*Lunas kahoy*	15538	21.33	0.08	St	Decoction of stem	Snake and insect bites, wound.
Urticaceae	*Oreocnide rubescens* (Blume)Miq.	*Kubi*	15676	50.67	0.15	Lf	Combined with himbabasi- Drink decoction	Cough, diarrhea, fever, stomach pain
Urticaceae	*Pipturus arborescens* (Link) C.B.Trob	*Handamay*	15673	50.67	0.15	Lf	Eat fresh leaf	Anxiety, body ache, depression, headache, fever, fatigue, nervousness, stomach acidity
Urticaceae	*Poikilospermum acuminatum* (Trecul.)Merr.	*Hanupi*	15655	50.67	0.21	Rt, Fr	Pulverize the fruits and apply to the affected areas, resin can be `drop directly to the affected eyes, Decocted root is washed for wounds.	Boil, sore eyes
Xanthorrhoeaceae	*Dianella ensifolia* (L.) DC.	*Ikug-ikug*	15656	4.67	0.05	Lf,Rt	Boil the leaf	For lactation, maternal care
Zingiberaceae	*Alpinia haenkei* C. Presl	*Yanguas*	15641	27.33	0.27	Rt	Boil the roots, sap of stem skin	UTI, high fever (forhead)

Notes: Bk: Barks; Br: Branches; Fr: Fruits; Fw: Flowers; Lf: Leaves; Rt: Roots; Sp: Sap; Sd: Seeds; Sh: Shoots; St: Stems

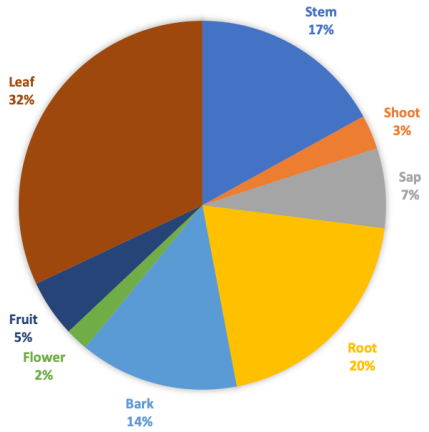

Figure 2. Plant parts used by the Agusan Manobo in Ugnop Cave Landscape Forest Reserve for medicinal application

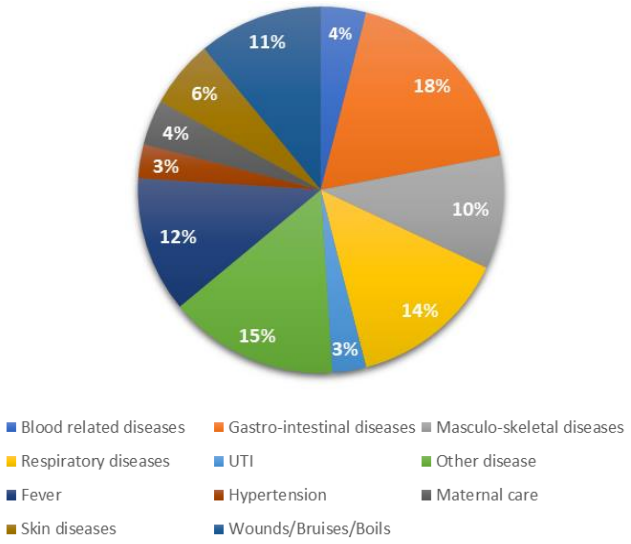

Figure 3. Documented herbal treatments for human illness

The medicinal plants with the highest Relative Frequency of Citation (RFC) values were *Piper anduncum* L. (0.91), *Mikania cordata* (Burm.F.) B.L.Rob. (0.84), *Gliricidia sepium* (Jacq.) Kunth ex Steud (0.75), and *Hyptis capitata* Jacq. (0.75). These plants are frequently recognized for their potency in treating snake bites, sore eyes, fever, colds and flu, cough, and cuts and wounds.

The Manobo Tribe in the Ugnop Cave Landscape Forest Reserve utilizes a wide variety of medicinal plants, encompassing 57 different species. They make use of various plant parts, with a preference for leaves (32%), followed by roots (20%), stems (17%), bark (14%), sap (7%), fruits (5%), shoots (3%), and flowers (2%), as illustrated in Figure 2. This diverse utilization highlights the tribe's extensive knowledge of the medicinal properties of plants in their environment. The findings of the study indicated that responses consistently reported the leaves as the most frequently used part of the plant (Orillaneda and Acero 2023). Leaves are favored for their accessibility and ease of preparation in traditional remedies. Another study corroborated these results, showing that respondents found it more convenient to use the leaves of the plants rather than other parts (Ong and Kim 2014; Ilagan et al. 2022). This preference for leaves could be due to their abundance, ease of harvest, and possibly quicker preparation times compared to roots or bark, which might require more processing. The consistent use of leaves across different studies suggests a common understanding and shared knowledge within the community about the efficacy of leaves in treating various ailments. This practice not only underscores the importance of traditional knowledge in healthcare but also highlights the need to preserve this knowledge for future generations. The reliance on specific plant parts reflects the Manobo Tribe's deep connection to their environment and their ability to utilize available resources sustainably. This information is crucial for ethnobotanical studies and the development of conservation strategies to protect these vital plant species and their habitats.

The Agusan Manobo, an indigenous community in the Philippines, have a rich tradition of using medicinal plants to treat a variety of health conditions. As shown in Figure 3, the medicinal plants used by the Agusan Manobo are predominantly effective against gastrointestinal diseases (18%), respiratory diseases (14%), fever (12%), wounds, bruises, and boils (11%), musculoskeletal diseases (10%), and skin diseases (6%). Additionally, these plants have applications in maternal care (4%), blood-related diseases (4%), treating hypertension (3%), and urinary tract infections (3%). Interestingly, the Agusan Manobo also utilize medicinal plants to address various other conditions, such as headaches, toothaches, sore eyes, convulsions, hair loss, cancer, dysmenorrhea, myoma, impotence, and prostate issues corroborating with the results of the study conducted by Batiha et al. (2020).

The use of medicinal plants by the Agusan Manobo is consistent with the traditional practices of other indigenous communities in Asia and Africa, who have relied on plant-based remedies for centuries (Kosalge and Fursule 2009; Noor et al. 2014). The diversity of medicinal plants used by the Agusan Manobo and other indigenous communities highlights the rich traditional knowledge and the potential for these plants to serve as a source of new drug discoveries (Tatan et al. 2020). Further research is needed to investigate the active compounds and therapeutic properties of these medicinal plants, which could lead to the development of new and effective treatments for various health conditions.

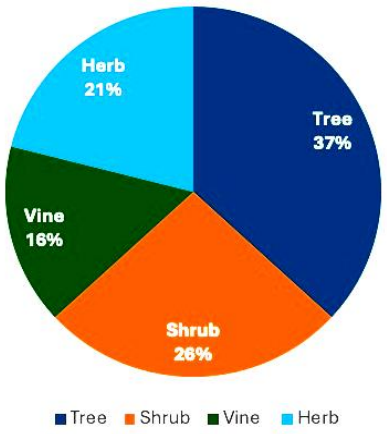

Figure 4. Habits of medicinal plants collected from Bega falls in Ugnop Landscape Forest Reserve, Prosperidad, Agusan del Sur

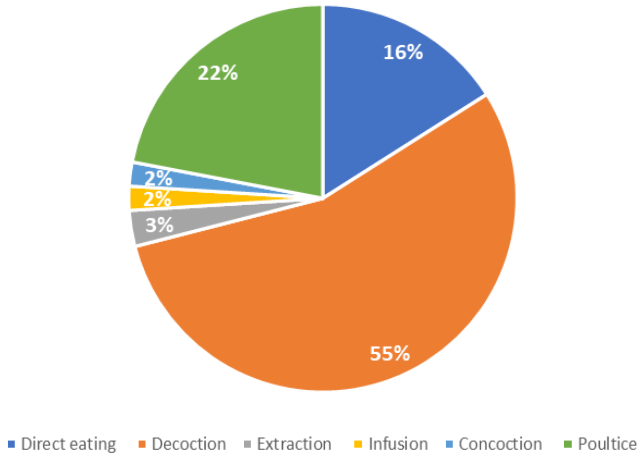

Figure 5. Different methods of preparation in medicinal plants

The categorization of medicinal plants is a critical aspect of understanding the diversity and distribution of these invaluable natural resources. As shown in Figure 4 trees make up the largest percentage of medicinal plants used by the Agusan Manobo in Ugnop Cave Landscape Forest Reserve at 37%, with shrubs at 26%, herbs at 21%, and vines at 16%. This data provides valuable insights into the relative prevalence of different growth forms within the medicinal plant community. When compared to other studies, this finding is consistent with the general trend observed in the phytodiversity of medicinal plants. The dominance of trees in the medicinal plant category is likely due to their ability to produce a wider range of bioactive secondary metabolites, which are often the source of their therapeutic properties (Aquino et al. 2015). Similarly, the significant representation of shrubs and herbs is also in line with their well-documented use in traditional and modern medicine systems (Nandaniya et al. 2023).

The high percentage of trees among medicinal plants highlights the importance of conserving forest ecosystems, as these habitats serve as the primary repository for a vast array of medically relevant plant species. Additionally, the significant proportion of shrubs and herbs suggests that these growth forms also deserve attention in terms of sustainable harvesting and cultivation practices to ensure the long-term availability of medicinal plant resources (Patel 2014). These findings enhance our understanding of the ecological dispersion of medicinal plants and provide guidelines for conservation strategies and sustainable use methods in these biodiverse landscape (Dapar et al. 2020b). Overall, the data on the categorization of medicinal plants, showing the predominance of trees, provides a useful framework for understanding the distribution and composition of these valuable natural resources. This information can inform conservation strategies, guide sustainable harvesting practices, and contribute to the development of effective policies for the management and utilization of medicinal plants.

Results showed that the most common mode of preparation by the tribe is decoction (55%), followed by poultice (22%) and direct eating (16%) as shown in Figure 5. Decoction, which involves boiling plant parts in water to extract their active compounds, is a popular method employed by the tribe. This method is particularly effective for extracting water-soluble compounds and is often used to create medicinal teas or infusions that can be easily consumed. Poultice, the second most common mode of preparation, involves the topical application of crushed plant materials. This method is used to treat a variety of ailments, including wounds, inflammation, and skin infections. The plant materials are typically mashed into a paste and applied directly to the affected area, allowing the active compounds to be absorbed through the skin. Direct eating of certain plant parts, such as leaves or fruits, is the third most common method of preparation in the tribe's traditional medicinal practices. This method is straightforward and convenient, allowing individuals to consume the medicinal parts of plants directly without the need for extensive preparation. It is particularly useful for plants with edible parts that have immediate health benefits. These findings align with studies conducted in other indigenous communities in Southeast Asia (Saikia and Parkash 2016; Faruque et al. 2018; Pandiangan et al. 2019).

These traditional methods of preparation are not only practical but also reflect the tribe's deep understanding of the medicinal properties of their local flora. By employing these techniques, the tribe can effectively harness the therapeutic potential of plants to maintain their health and treat various conditions. The consistency of these findings with other studies highlights the shared knowledge and practices among indigenous communities in Southeast Asia, underscoring the importance of preserving and documenting this valuable traditional knowledge for future generations.

In summary, the Agusan Manobo community relies on traditional medicine, passed down through generations by indigenous healers, as the fundamental basis of their healthcare. It is regarded as beneficial, safe, affordable, and accessible for those of low economic status and those in geographically isolated regions. Tribal healers assess the safety of medicinal plants using traditional knowledge and

firsthand experiences. They analyze the properties of the plants and their natural habitats. To limit risks, they detect probable toxicity and side effects, use specialized preparation processes, and adhere to standard protocols. This technique ensures successful treatment and emphasizes the cultural importance and viability of indigenous healthcare methods in remote areas. Participant responses in surveys are essential for verifying the efficacy of medicinal plants in treating illnesses. They provide personal testimony and usage, giving tangible evidence supporting the effectiveness and safety of certain plants in treating specific health concerns. Additionally, the correlation between respondents ages and their experiences with different plants suggests their knowledge increases with greater exposure over time. Validation of ethnobotanical research strengthens its legitimacy and contributes to the preservation and promotion of indigenous healthcare traditions.

This significant study seeks to document the rich cultural heritage of traditional medicine in Prosperidad, Agusan del Sur, and emphasizes the urgent need for conservation efforts to save endangered species. The consensus on the efficacy of plants in addressing health issues underscores the need for further exploration and possible integration into modern medicine. The existence of certain cultivated species in local markets and the unbiased transmission of knowledge suggest the cultural significance and extensive recognition of these therapeutic plants among the community. The significance of plant resources in Bega Falls and Ugnop Landscape Forest Reserve in Upland Prosperidad, Philippines, highlights the crucial role of indigenous knowledge in preserving and responsibly using biodiversity. This area, rich in plant life with notable therapeutic qualities, emphasizes the beneficial connection between indigenous populations and their ecosystem. Findings revealed that some plants were solely effective in treating a particular illness, while others had many beneficial uses for several diseases. Different portions of plants may treat various ailments, where leaves treat one sickness and roots another. The intergenerational transmission of traditional knowledge provides a basis for healthcare in these communities and useful insights for pharmacological research. It is vital to continue documenting and studying these ethnomedicinal practices to preserve this cultural legacy and explore possible novel therapies. Advocating for the preservation of this biologically diverse area ensures the viability of these botanical assets, protecting the environmental equilibrium and cultural heritage of native communities.

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REFERENCES

Anwar T, Qureshi H, Sarwar G, Siddiqi EH, Shakir N, Almoallim HS, Ansari MJ. 2024. Ethnobotanical evaluation and traditional uses of medicinal flora used to treat various ailments by local inhabitants. Adv Integr Med 11 (2): 93-106. DOI: 10.1016/j.aimed.2024.05.002.

Aquino R, Simone FD, Tommasi ND, Pìzza C. 2015. Structure and biological activity of triterpenoids and aromatic compounds from medicinal plants. Stud Nat Prod Chem 17 (113-152). DOI: 10.1016/s1572-5995(05)80083-3.

Ayoubi R. 2024. Medicinal plants used for the treatment of common parasitic diseases by traditional practitioners in Kabul City, Afghanistan. Tradit Med 5 (1): 22. DOI: 10.35702/Trad.10022.

Bassa T. 2017. Ethnobotanical study of medicinal plants in Wolaita Zone, Southern Ethiopia. J Biol Agric Healthcare 7 (23): 60-78.

Batiha GE-S, Beshbishy AM, Wasef L, Elewa YHA, El-Hack MEA, Taha AE, Al-Sagheer AA, Devkota HP, Tufarelli V. 2020. *Uncaria tomentosa* (Willd. ex Schult.) DC.: A review on chemical constituents and biological activities. Appl Sci 10 (8): 2668. DOI: 10.3390/app10082668.

Batubara Y, Suwardi AB. 2024. Ethnobotanical study of medicinal plants by the Batak Tribe in Manisak Village, North Sumatra. J Educ Sci Technol Math Disaster Manag 1 (2): 72-84. DOI: 10.62864/jestmdm.v1i2.17.g21.

Bi Y, Gao F, Guo J, Yao X, Wang A, Liu H, Sun Y, Yao R, Li M. 2024. An ethnobotanical survey on the medicinal and edible plants used by the Daur people in China. J Ethnobiol Ethnomed 20 (1): 55. DOI: 10.1186/s13002-024-00695-8.

Charwin MZ, Mogha N, Muluwa JK, Bostoen K. 2023. Indigenous knowledge and use of medicinal plants among the Kuria Communities in the Tarime and Serengeti Districts of Mara Region, Tanzania. J Herbs Spices Med Plants 29 (6): 288-307. DOI: 10.1080/10496475.2022.2163734.

Dapar MLG, Alejandro GJD, Meve U, Liede-Schumann S. 2020a. Quantitative ethnopharmacological documentation and molecular confirmation of medicinal plants used by the Manobo tribe of Agusan del Sur, Philippines. J Ethnobiol Ethnomed 16 (1): 14. DOI: 10.1186/s13002-020-00363-7.

Dapar MLG, Alejandro GJD, Meve U, Liede-Schumann S. 2020b. Ethnomedicinal importance and conservation status of medicinal trees among indigenous communities in Esperanza, Agusan del Sur, Philippines. J Complement Med Res 11 (1): 59. DOI: 10.5455/jcmr.2020.11.01.08.

Dapar MLG, Meve U, Liede-Schumann S, Alejandro GJD. 2020c. Ethnomedicinal appraisal and conservation status of medicinal plants among the Manobo tribe of Bayugan City, Philippines. Biodiversitas 21 (8): 3843-3855. DOI: 10.13057/biodiv/d210854.

De La Cruz-Jiménez L, Hernández-Torres MA, Monroy-García IN, Rivas-Morales C, Verde-Star MJ, Gonzalez-Villasana V, Viveros-Valdez E. 2022. Biological activities of seven medicinal plants used in Chiapas, Mexico. Plants (Basel) 11 (14): 1790. DOI: 10.3390/plants11141790.

Faruque MO, Uddin SB, Barlow JW, Hu S, Dong S, Cai Q, Li X, Hu X. 2018. Quantitative ethnobotany of medicinal plants used by indigenous communities in the Bandarban District of Bangladesh. Front Pharmacol 9: 40. DOI: 10.3389/fphar.2018.00040.

Haq A, Badshah L, Ali A, Ullah A, Khan SM, Ullah I. 2022. Ethnobotanical study of medicinal plants of Pashat Valley, Bajaur, along Pakistan–Afghanistan border: A mountainous region of the Hindu Kush Range. Nord J Bot 2022 (11): e03580. DOI: 10.1111/njb.03580.

Hussain S, Hussain W, Nawaz A, Badshah L, Ali A, Ullah S, Ali M, Hussain H, Bussmann RW. 2022. Quantitative ethnomedicinal study of indigenous knowledge on medicinal plants used by the tribal communities of Central Kurram, Khyber Pakhtunkhwa, Pakistan. Ethnobot Res Appl 23: 1-31.

Ilagan VAD, Alejandro GJD, Paraguison DJB, Perolina SMW, Mendoza GR, Bolina AB, Raterta R, Vales MB, Suarez GJD, Blasco FA. 2022. Ethnopharmacological documentation and molecular authentication of medicinal plants used by the Manobo and Mamanwa tribes of Surigao del Sur, Philippines. Biodiversitas 23 (6): 3185-3202. DOI: 10.13057/biodiv/d230646.

IPNI. 2019. The International Plant Names Index. https://www.ipni.org.

Kosalge SB, Fursule RA. 2009. Investigation of ethnomedicinal claims of some plants used by tribals of Satpuda Hills in India. J Ethnopharmacol 121 (3): 456-461. DOI: 10.1016/j.jep.2008.11.017.

Lefrioui Y, Chebaibi M, Bichara MD, Mssillou I, Bekkari H, Giesy JP, Bousta D. 2024. Ethnobotanical survey of medicinal plants used in north-central Morocco as natural analgesic and anti-inflammatory agents. Sci Afr 25: e02275. DOI: 10.1016/j.sciaf.2024.e02275.

Luo B, Tong Y, Liu Y, Zhang Y, Qin Y, Hu R. 2024. Ethnobotanical insights into the traditional food plants of the Baiku Yao community: A study of cultural significance, utilization, and conservation. J Ethnobiol Ethnomed 20 (1): 52. DOI: 10.1186/s13002-024-00691-y.

Mogha NG. 2024. Ethnobotanical study of medicinal plants used in management of COVID-19 in Dar es Salaam and Morogoro Regions, Tanzania. Ethnobot Res Appl 29: 1-16. DOI: 10.32859/era.29.2.1-16.

Muanga CK, Luzala MM, Landamambou A, Kyana J, Mayuwu MK, Kambale EK, Memvanga PB. 2024. Ethnobotanical survey of anti-infective plants used by traditional healers in Brazzaville, Republic of Congo. Orapuh J 5 (3): e1129. DOI: 10.4314/orapj.v5i3.29.

Nandaniya J, Maitreya B, Kumarkhaniya H, Pandya H, Mankad A. 2023. Ethnobotany and medicinal plants in the Dhandhuka Taluka of Gujarat. Intl Assoc Biol Comput Digests 2 (1): 200-210. DOI: 10.56588/iabcd.v2i1.132.

Noor AOA, Khatoon S, Ahmed M, Razaq A. 2014. Ethnobotanical study on some useful shrubs of Astore valley, Gilgit-Baltistan, Pakistan. Bangladesh J Bot 43 (1): 19-25. DOI: 10.3329/bjb.v43i1.19741.

Ong HG, Kim Y-D. 2014. Quantitative ethnobotanical study of the medicinal plants used by the Ati Negrito indigenous group in Guimaras island, Philippines. J Ethnopharmacol 157: 228-242. DOI: 10.1016/j.jep.2014.09.015.

Orillaneda KNO, Acero LH. 2023. Ethnomedicinal plants used by middle-aged residents in San Antonio, Tandag City, Surigao Del Sur, Philippines. Intl J Bioinformatics Biosci 13 (1): 63-72. DOI: 10.5121/ijbb.2023.13106.

Pandiangan D, Silalahi M, Dapas F, Kandau F. 2019. Diversity of medicinal plants and their uses by the Sanger tribe of Sangihe Islands, North Sulawesi, Indonesia. Biodiversitas 20 (3): 611-621. DOI: 10.13057/biodiv/d200301.

Paraguison LDR, Tandang DN, Alejandro GJD. 2021. Medicinal plants used by the Manobo Tribe of Prosperidad, Agusan Del Sur, Philippines-an ethnobotanical survey. Asian J Biol Sci 9 (3): 326-333. DOI: 10.5530/ajbls.2020.9.49.

Patel DK. 2014. Phyto-diversity study with special reference to herbaceous medicinal plants. J Biodivers Endanger Species 2: 123. DOI: 10.4172/2332-2543.1000123.

Pelser PB, Barcelona JF, Nickrent DL (eds). 2011 onwards. Co's Digital Flora of the Philippines. www.philippineplants.org.

Phengmala K, Saensouk S, Saensouk P, Souladeth P. 2024. Ethnobotanical study of medicinal plants used by Lao ethnic group in Central Laos. Notulae Botanicae Horti Agrobotanici Cluj-Napoca 52 (2): 13633. DOI: 10.15835/nbha52213633.

POWO. 2024. Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew. Published on the Internet; https://powo.science.kew.org/ . Retrieved 29 October 2024

Saikia AJ, Parkash V. 2016. Traditional remedies for ailments prevalent amongst the Thengal-Kacharis of Lakhimpur District, Assam, India. Not Sci Biol 8 (4): 401-407. DOI: 10.15835/nsb849847.

Tatan T, Mehra TS, Semba S, Mohammed H, Puwein F. 2020. Plants used as ethanomedicine by the Adi Tribes of Sille-Oyan Circle of Arunachal Pradesh: Source for livelihood and medicine. Intl J Curr Microbiol App Sci 9 (12): 2941-2951. DOI: 10.20546/ijcmas.2020.912.349.

Tripathi S. 2019. Ethnomedicine and future challenges. Glob J Arch Anthropol 10 (5): 555796. DOI: 10.19080/GJAA.2019.10.555796.

World Health Organization (WHO). 2019. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants.