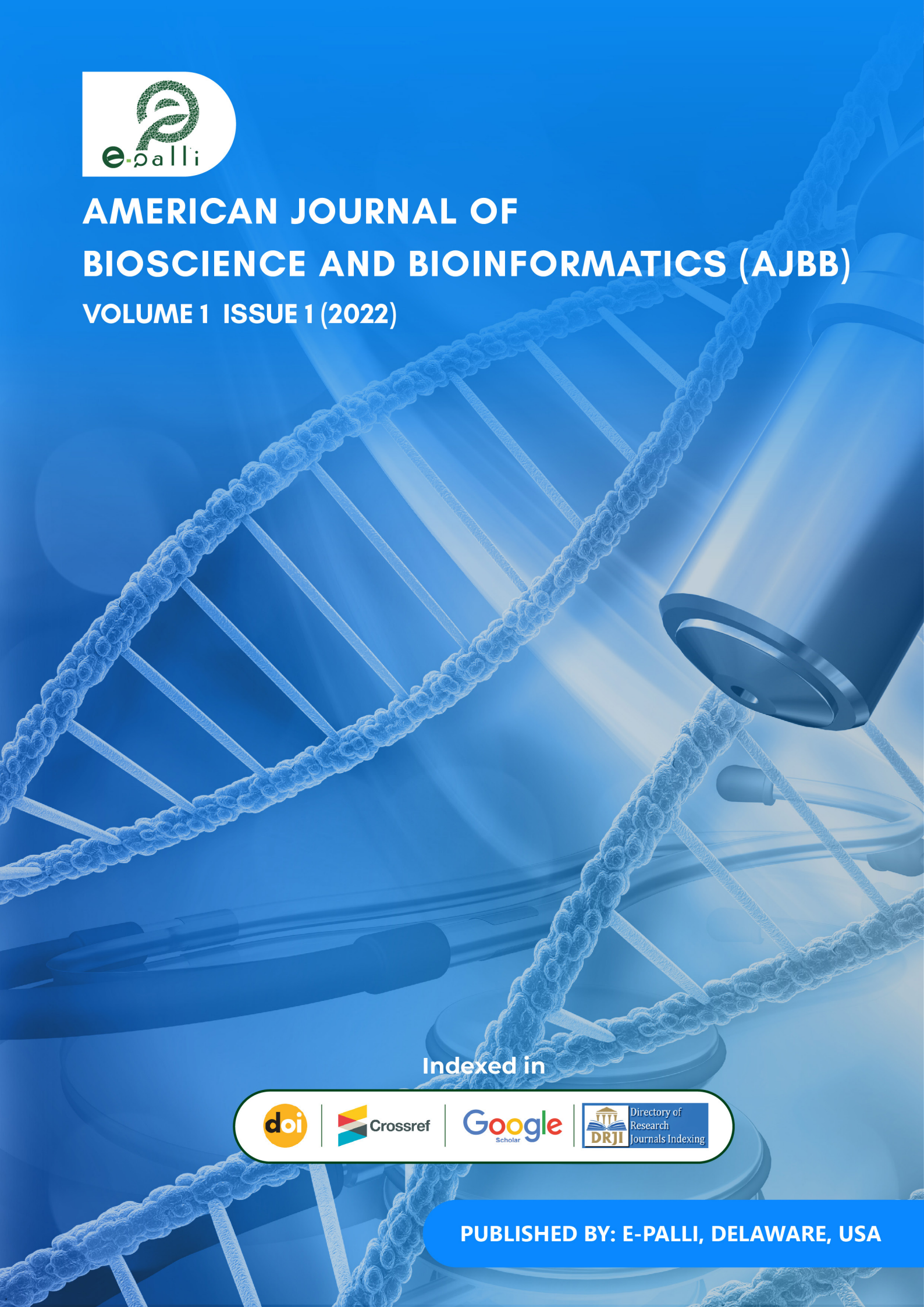

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Ethnobotanical Study and Phytochemical Screening of Selected Medicinal Plants in Agusan del Sur

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ABSTRACT

This study assessed the selected medicinal plants in selected municipalities of Agusan del Sur through ethnobotanical study and phytochemical screening. Findings revealed 71 plant species comprising of 36 families and 65 genera used in 14 different disease categories. Lamiaceae, represented with 6 species, had the highest Family Importance Value index. *Blumea balsamifera* was the most cited plant used to treat respiratory diseases and gastrointestinal disorders. Highest Informant Consensus Factor was for Category VIII or diseases of the respiratory system. Leaves were the most frequently used part in this study due to the accessibility in obtaining these parts. Decoction, employed alone or in combination, was the most common method of preparation. Four plants, *Acmella grandiflora*, *Anodendron borneense*, *Hellenia speciosa*, and *Homalomena philippinensis*, were used for phytochemical screening. Presence of alkaloids was detected for *A. grandiflora*. Presence of steroids was evident in *A. grandiflora*, *A. borneense*, and *H. philippinensis*. Presence of flavonoids was evident in *A. borneense*. Presence of saponins was evident in *H. speciosa* and *H. philippinensis*. Presence of condensed tannins was evident in *A. grandiflora* and *H. speciosa*. This study concluded that traditional knowledge was still being practiced among Agusan Manobo tribe as indicated in the high percentage of middle and younger age group informants. Most of these plants were safe to use and readily available as they were cultivated. It was recommended to consider thorough study on the biochemical activities, quantitative analyses, and methodical phytochemistry of novel medicinal plants and to intensify policies and priorities to promote conservation and protection of these plants.

INTRODUCTION

According to the World Health Organization (WHO, 2019), traditional and complementary medicine is used by 70 percent of the world's population. In many regions of the world, ethnobotanical research has proven more critical in creating health care and conservation initiatives. Many effective plant-derived medicines have been discovered due to ethnobotany and ethnopharmacology. Synthetic or chemical medications can have larger or faster effects than similar phytomedicines but they also have more side effects and dangers.

Indigenous knowledge guides traditional medicinal plant management and herbal medicine practices. Medicinal plants have a long history for preventative and curative health care in rural societies. Locals have evolved trustworthy knowledge and practical ways to identify, harvest, utilize, maintain, and preserve medicinal plants and their habitats for long-term use.

People who rely on ecosystem services directly, such as subsistence farmers, the rural poor, and traditional communities, suffer the most significant and immediate threats from biodiversity loss. This is a common occurrence with medicinal plants (Mertz *et al.*, 2007). There is a need to preserve indigenous knowledge and traditional culture to increase awareness for conservation. The indigenous people's ritual beliefs are crucial for understanding local community customs and biodiversity protection. Indigenous peoples face various challenges, including a biodiversity crisis and the risk of losing traditional knowledge (Dapar & Alejandro, 2020). Plant species' local occurrence is threatened by deforestation, habitat loss, overexploitation, agricultural expansion, forest grazing, selective species removal, and environmental degradation (Khan & Khatoon, 2008). Ethnobotanical study should be encouraged to document important information, especially in the case of native medicinal plant knowledge.

The latest global problem, the COVID-19 pandemic, has no absolute treatments and just preventative and supportive therapy to limit additional problems and organ damage. As a result, the world's focus has shifted to utilizing medicinal herbs to boost our bodies' natural antiviral immunity. A single medicinal plant yields many phytochemical components that can work alone or with other components to create the desired pharmacological effects (Parasuraman *et al.*, 2014).

This study documented the use of medicinal plants and healing practices in Agusan del Sur, particularly of medicinal plants used by the Agusan Manobo. This study determined also the phytochemical constituents of selected medicinal plants used by the Agusan Manobo. To support the protection of biocultural variety, ethnobotanical discourses must be positioned in both academic and political arenas, especially in the framework of natural rights. The representation of the indigenous people (IPs) on the conservation and preservation of their traditional practices allows the younger generation to be personally immersed in the continuity of such practices.

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LITERATURE REVIEW

Traditional medicine, also known as folk medicine or indigenous medicine, is a collection of knowledge gathered by several generations from many communities prior to the advent of modern medicine (Principe & Jose, 2002). Ethnobotanical-based medicinal plant selection has lately gained favor as a method of determining whether plants contain necessary chemicals for further research and development of novel medications. Traditional medical knowledge of medicinal plants and their usage by indigenous healers are critical for community healthcare and drug development in the present and future, in addition to conserving cultural traditions and biodiversity (Pei, 2001).

Plants are the primary medicinal source for health care in emerging Asian countries, as evidenced by ancient literature and contemporary scientific records of traditional medicinal knowledge. Plants have supplied man with all he requires, including shelter, clothes, food, flavors and perfumes, and, last but not least, medicines. Plants have been the foundation of complex Traditional Medicine (TM) systems for thousands of years, and they continue to supply mankind with novel treatments. The extensive and well-defined herbal pharmacopeias of ancient societies are well-known for their methodical gathering of knowledge on plants (Manandhar, 1980).

Locals have evolved accurate knowledge and practical procedures for identifying, harvesting, using, maintaining, and preserving medicinal plants and their ecosystems for long-term usage. Researchers have developed and applied quantitative methods to ethnobotanical data to evaluate different hypotheses about the relationship between plant species and humans over the last two decades, as shown by their development and application of quantitative methods to ethnobotanical data to evaluate the different hypotheses about the relationship between plant species and humans (Reyes-Garcia *et al*., 2006).

As evidenced by historical descriptions dating back to the pre-colonial Spanish period, medicinal plants are critical components of indigenous medical systems in the Philippines. The first books on Philippine medicinal plants, such as Father Blanco's "*Flora de Filipinas*" in 1737 and Trinidad Pardo de Tavera's "*Plantas Medicinales de Filipinas*" in 1892, were written during the Spanish period (De Padua *et al*., 1999). Several scientists later worked on medicinal plants and publications such as "Medicinal Plants of the Philippines," with over 850 identified medicinal plant species (Quisumbing, 1951).

Diverse ethnic groups in the Philippines exhibited the same trends in the usage of their medicinal plants, most likely because their knowledge of traditional medicine was intrinsic among them and passed down from their forefathers. Due to geographical isolation, Manobo indigenous peoples have clustered accordingly, inhabiting territories with distinct languages and specific characteristics of a culture. Their traditional way of life and daily livelihood is rural agriculture, and they rely on rice harvests, root crops, and vegetables for food (Opeña & Taguchi, 1975). The Manobo tribe revolves upon rituals, such as asking permission and agreement from deities before doing anything on their ancestral grounds and indigenous territories (Dapar & Alejandro, 2020; Dapar *et al*., 2020b; Jamera *et al*., 2020).

Indigenous societies' information on medicinal plants and their applications is valuable for cultural preservation, biodiversity, community health care, and drug development. This data is used to drive medicine research, with the notion that a plant that indigenous societies have used for a long time might have an allopathic application (Farnsworth, 2007).

Plants acquire phytochemicals in various places, including the roots, stems, leaves, flowers, fruits, and seeds. Many of these compounds, particularly pigment molecules, are concentrated in the outer layers of the various plant tissues (Costa *et al*., 1999). Though not required by the human body to support life, these phytochemicals have essential qualities that can be beneficial in avoiding or combating certain illnesses. Secondary plant metabolites are molecules with biological features such as antioxidant activity, antibacterial activity, detoxification enzyme modulation, immune system stimulation, platelet aggregation reduction, hormone metabolism regulation, and anticancer effects. Plants create thousands of known and undiscovered phytochemicals to defend themselves, but the current study shows that many phytochemicals can also protect humans against disease (Rao, 2003).

According to their involvement in plant metabolism, phytochemicals are now classed as primary or secondary components. The primary components are sugars, amino acids, proteins, nucleic acid purines and pyrimidines, chlorophylls, and other primary ingredients. The remaining plant compounds, such as alkaloids, terpenes, flavonoids, lignans, plant steroids, curcumins, saponins, phenolics, flavonoids, and glucosides, are secondary constituents. According to literature reviews, phenolics are the most abundant and structurally varied plant phytoconstituents (Hahn, 1998). Phytochemical screening of medicinal plants is critical for discovering new therapeutic and commercial value sources. Preliminary qualitative testing can help find bioactive principles, leading to drug discovery and development (Vaghasiya *et al*., 2011). Numerous phytochemical investigations on medicinal plants that have been conducted to fully grasp their phytotherapeutic properties (Laruan *et al*., 2013; Galvez, 2016; Recuenco *et al*., 2020). Characterization and separation of the active chemical components carried by these traditional plants for future investigation might lead to the creation of a possible medicine that could cure many types of illnesses and lead to full use by the local population.

MATERIALS AND METHODS

Study area

Fieldwork was conducted in Barangay Mabuhay and Ugnop Landscape, Prosperidad, Agusan del Sur, Philippines (8˚43.81" E125˚59.74). This research focused

on specific locations of Barangay Mabuhay and Ugnop, for accessibility, availability, and security to barangays. Agusan del Sur is bordered on the west by Bukidnon and on the east by Surigao del Sur. On the eastern and western borders, mountain ranges from an extended basin or valley in the longitudinal center portion of the country. The municipality has limited healthcare supplies and facilities especially for remote locations. As a result, the long-standing use of medicinal plants is still practiced in the area.

Sampling procedure and data collection

Ethnobotanical data were gathered through semi-strucutred interviews with key informants from Agusan Manobo using purposive and snowball sampling. Key informants were Agusan Manobo who were knowledgeable with their medicinal plant uses and practices, ranging from 18-80 years old. The semi-structured questionnaire was adapted from Dapar *et al.* (2020) study. The interviews were conducted in the local language with the help of translators in the community to communicate with the interviewees.

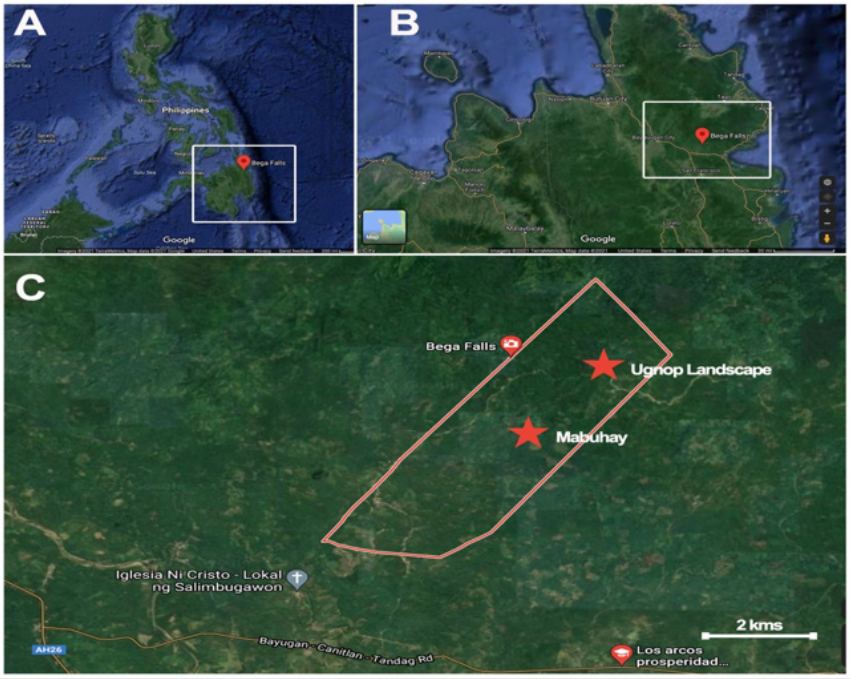

Figure 1 : (A) Location of Agusan del Sur in the Philippines, (B) relative location of Barangay Mabuhay and Ugnop Landscape, Prosperidad, Agusan del Sur showing (C) sampling sites (http:/www.maps.google.com, 2020)

Plant Collection and Identification

Plant specimens were collected during guided field excursions led by skilled plant gatherers and tribal community members. Plant habit, habitat, morphological characteristics, vernacular names, and indigenous terms of their uses

were documented. Plant part samples were placed in zip-locked bags in preparation for phytochemical analysis. Voucher specimens were collected for those unidentified plant species and placed in an herbarium.

Putative plant identification using vernacular names compared to local names, Dictionary of Philippines Plant Names by Madulid (2001) and Philippine Traditional Knowledge Digital Library on Health (http://www.tkdlph.com). For plant identification, internet sources (taxonomic and pictorial keys) from legitimate sites such as www.philippineplants.org/Co's Digital Flora (Pelser *et al.*, 2011 onwards), www.phytoimages.siu.edu (Nickrent *et al.*, 2006 onwards), and www.stuartxchange.com (Stuart, 2003 onwards) were used. Furthermore, authenticating plant species was followed using the international plant name index (http://www.ipni.org) and GRIN taxonomy site (https://npgsweb.ars-grin.gov/gringlobal/search), whereas names of plant families followed APG system (Stevens, 2001 onwards). The Plant List (2013 onwards), World Flora Online (2019 onwards), The International Plant Names Index (2019 onwards), and Tropicos (2019 onwards) were used to verify and confirm all scientific names for spelling, synonyms, and family classification.

Quantitative ethnobotanical documentation

Family Importance Value (FIV) was used to determine the relative importance of families. It was calculated by taking the percentage of informants mentioning the family. This was determined by using the formula:

$$FIV = FC/N \times 100 \quad (1)$$

where FC was the number of informers revealing the family, while N is the total number of informants participating in the research.

Data on medicinal plant use was based on the WHO's International Classification of Diseases (ICD-10) (WHO, 2011). Use-report indicated each time a plant was described as being utilized for a certain purpose. Even if an informant used a plant for many purposes under the same category, it would still be counted as a single use-report (Amiguet *et al.*, 2005). When at least

two informants described the same plant for the same purpose, it was termed a multiple usage report. Use Value (UV) is a quantitative measure of the relative significance of species created by Phillips & Gentry (1993). UV, based on the number of uses and persons who mention a certain plant, is used to identify the most significant plants to a particular population. UV is computed using the formula:

$$UV=(\sum Ui)/N \quad (2)$$

where Ui was the number of use reports, each informant mentions a particular species, and N was the total number of informants.

Informant Consensus Factor (ICF) is used to assess how well the informants agree on each category of medicinal plants. This quantitative technique is based on Trotter & Logan's (2019) landmark study, which developed the Informant Agreement Ratio (IAR), often known as the Informant Consensus Factor. The following formula is used to calculate:

$$ICF=(Nur-Nt)/(Nur-1) \quad (3)$$

where Nur is the number of informant use-reports in each category and Nt is the number of taxa utilized. Fidelity Level (FL) (Friedman *et al.*, 1986) is the proportion of informants who acknowledged using a plant for a specific purpose to the total number of informants who indicated using the plant for any reason (regardless of the category). Formula used to determine:

$$FL\ (\%)=Np/N \times 100 \quad (4)$$

where Np is the number of informants who independently advised using a plant for a specific purpose, and N is the total number of informants who cited the plant for any reason.

Knowledge and practices in the use of medicinal plants

Demographic data such as age, gender, address, educational status, respondents' civil status, address, and ethnobotanical knowledge (medicinal plants and their uses) were gathered. The interviews were designed as informal conversations to allow respondents to speak freely and to reduce, if not eliminate, the element of pressure. Data such as the medicinal plants used, the part/s of the plant used, the methods of preparation, the modes of administration, and the ailments treated were gathered.

Phytochemical screening analysis

Dried samples of four medicinal plant for phytochemical screening were sent to the Department of Science and Technology Laboratory – Regional Standards and Testing Laboratory – Caraga (DOST-RSTL) in Ambago, Butuan City. Three hundred to five hundred grams of air-dried plant samples were sent for the phytochemical screening for alkaloids, quaternary bases, amine oxide, steroids deoxysugars, unsaturated steroids, flavonoids, saponins, and tannins. Qualitative phytochemical screening was carried out to investigate the various classes of natural compounds present in the extract. This was accomplished using standard methods as indicated in the book "A Guidebook for Plant Screening: Phytochemical and Biological" by Claustra *et al.* (2005).

RESULTS AND DISCUSSION

Quantitative ethnobotanical documentation of medicinal plants

In this ethnobotanical survey, a total of 71 medicinal plant species comprising of 36 families and 65 genera were reported in Barangay Mabuhay and Ugnop Landscape, Prosperidad, Agusan del Sur (Figure 2). Results indicated that Lamiaceae had the highest FIV index (229.58), followed by Asteraceae (188.73), Zingiberaceae (60.56), Euphorbiaceae (39.44), and Costaceae (36.62). Meanwhile, the study of Low FIV indices (1.41) represented by one plant species for each was reported. Lamiaceae are medicinally used for cough, cough with phlegm, asthma, gas pain or panuhot, stomachache, and amoebiasis. Lamiaceae is the most significant family in this study with six species.

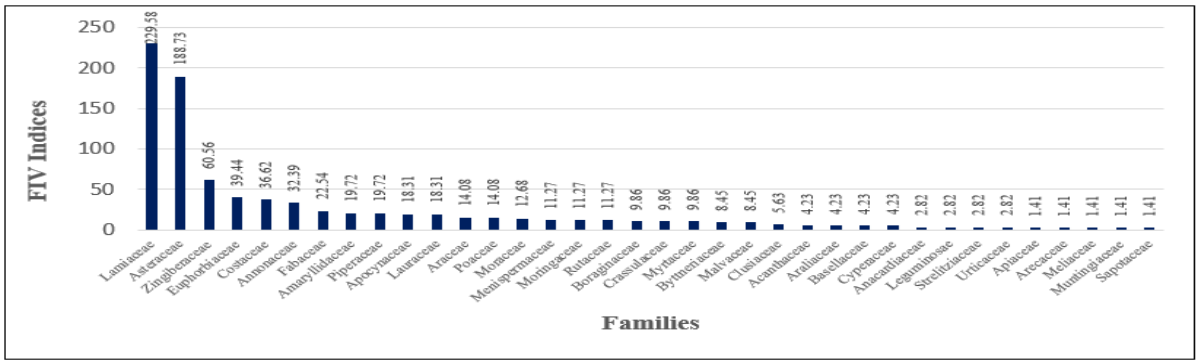

Figure 2: Overall distribution of species across different families of medicinal plants used by Agusan Manobo in Ugnop Landscape and Barangay Mabuhay of Agusan del Sur

UVs, which represents the relative importance of plants, were high for *Blumea balsamifera* (L.) DC. (0.958), followed by *Coleus blumei* Benth. (0.873), *Artemisia vulgaris* L. (0.775), *Plectranthus amboinicus* (Lour.) Spreng. (0.732), and Curcuma longa L. (0.465). Such medicinal plants are highly cited to treat respiratory diseases, gastrointestinal disorders, fever, and rheumatism. The lowest UVs were calculated at 0.014, with only one informant citing the

plant species. For the most frequently used medicinal plant species, *Blumea balsamifera* (L.) DC. is highly used for respiratory system diseases, particularly for cough or cough accompanied by phlegm. The high utilization rates for these medicinal plants were easily accessible and could be easily propagated.

The degree of overall agreement on the treatment of particular health problems was determined using the ICF formula to indicate the homogeneity of the information obtained and the degree of overall agreement on treating specific health disorders (Trotter & Logan, 2019). With the ICF value of 0.88, Category VIII revealed that the informants used 30 medicinal plant taxa recorded from 244 use reports. *Blumea balsamifera* (L.) DC. and *Artemisia vulgaris* L. had high ICF values (0.88 and 0.78, respectively) (Table 1), which indicated that these medicinal plants were of cultural significance, and there's an agreement in the usage of these plants within the community. Meanwhile, low ICF indicates that informants have a lower agreement on the usage of plant species to treat this disease category. Furthermore, a low ICF was linked to many plants with nearly identically high use reports. The ailments with the highest ICF values (1.00) were cysts, migraine, and sore or red eyes. The ailments with high ICFs also had decoction as their specific method of treatment.

FLs for plant species for a specific disease varied widely, ranging between 50% and 100% for plants in the study area. The maximum FL of 100% was found for seven plant species, including *Euphorbia hirta* L., *Piper sp., Homalomena philippinensis* Engl., *Coleus blumei* Benth. *Psidium guajava* L., *Annona muricata* L., and *Tinospora crispa* L., which were used to treat dengue fever, cysts, migraine, sore eyes, skin rashes, urinary tract infection, and as an abortifacient, respectively.

Table 1: Categories of diseases, Informant consensus factor (ICF) and Fidelity level (FL) of notable medicinal plants

No.	Category Name	Reported diseases or uses under each category	No. of UR	% of UR	No. of taxa	% of taxa	ICF	Most frequently used species	FL (%)	Particular disease
1	Infectious and parasitic disease	Amoebiasis, measles, influenza, dengue fever,	13	2.16	6	3.61	0.58	*Euphorbia hirta*	100	Dengue fever
2	Neoplasms (tumor/tissue growth)	Cysts	2	0.33	1	0.60	1.00	*Piper sp.*	100	Cysts
3	Endocrine and metabolic disease	Diabetes, nutrients, tonic, goiter	7	1.16	6	3.61	0.17	*Mimosa pudica*	50	Diabetes
4	Diseases of the nervous system	Migraine	2	0.33	1	0.60	1.00	*Homalomena philippinensis*	100	Migraine
5	Disease of the eye	Red eyes, sore eyes	2	0.33	1	0.60	1.00	*Coleus blumei*	100	Sore eyes
6	Diseases of the circulatory system	Hypertension	15	2.49	10	6.02	0.36	*Mimosa pudica*	80	Hyper-tension
7	Diseases of the respiratory system	Asthma, nasal congestion, cough, sore throat, cough with phlegm, tonsilitis	244	40.53	30	18.07	0.88	*Blumea balsamifera*	90	Cough, Cough with phlegm
8	Diseases of the digestive system	Diarrhea, ulcer, toothache, stomach trouble, dyspepsia, mouth sore	78	12.96	32	19.28	0.60	*Hyptis capitata*	71.43	Diarrhea, stomachache
9	Diseases of the skin and subcutaneous tissue	Skin rashes, skin problems	3	0.50	2	1.20	0.50	*Psidium guajava*	100	Skin rashes

10	Diseases of the musculoskeletal system and connective tissue	Rheumatism, sprain, muscle pain, arthritis	22	3.65	14	8.43	0.38	*Cordia dichotoma*	75	Muscle pain
11	Disease of the genitourinary system	Urinary tract infection, kidney problems	17	2.82	9	5.42	0.50	*Annona muricata*	100	Urinary tract infection
12	Uses in pregnancy and childbirth, postpartum care, and infant care	Abortive, new-born baby care	3	0.50	2	1.20	0.50	*Tinospora crispa*	100	Aborti-facient
13	Symptoms, signs and abnormal clinical findings not elsewhere classified	Abdominal pain, headache, fever, fatigue, baby teething, dizziness, gas pain, flatulence, convulsion	178	29.57	40	24.10	0.78	*Artemisia vulgaris*	95.45	Fever,
14	Injury, poisoning, and certain other consequences of external causes	Allergy, burns, cuts and wounds, fracture, sprain, insect bites, snake bites, poison	16	2.66	12	7.23	0.27	*Acmella grandiflora*	66.67	Insect bites

UR use-report, ICF informant consensus factor, FL fidelity level

Knowledge and practices in the use of medicinal Plants

Demographic characteristics

Demographic characteristics of the key informants from Ugnop Landscape and Barangay Mabuhay, Prosperidad, Agusan del Sur were gathered through informal semi-structured interviews. Seventy-one respondents were interviewed, wherein 7 or 9.86% were male, and 64 or 90.14% were female (Table 2).

Mainly, there were more female informants than male informants in this study. This could be because females were more available than males. After all, females were usually left in the household to do domestic duties while males were working on the farm or away from home, as shown in the higher frequency of the occupation of respondents having domestic duties (53.7%) compared to farming (35.8%). In terms of age, among the respondents, the age group of 50-65 years old (38.8%) has the highest frequency interviewed, followed by 18-34 years old (29.9%), 35-49 years old (20.9%), and more than 65 years old (16.4%). As to marital status, 89.6% of the respondents are married, while only 9.0% are single.

Plant Parts Used

All parts of various plant species were used against a variety of diseases. The most frequently used part were the leaves (27%), followed by sap or latex (17%), roots (14%), rhizomes (14%), and stems (10%), and bark (8%) (Figure

Table 2: Demographic profile of the respondents from Ugnop Landscape and Barangay Mabuhay

Category	Subcategory	No. of Informants	% of informants
Educational Level	None	9	13.4
	Primary	42	62.7
	Secondary	16	23.9
	Higher Education	4	6.0
Gender	Male	7	10.4
	Female	64	95.5

Occupation	Farming	24	35.8
	Domestic duties	36	53.7
	Employed	7	10.4
	Self-employed	4	6.0
Marital Status	Single	6	9.0
	Married	60	89.6
	Others	5	7.5
Age	18-34 years old	20	29.9
	35-49 years old	14	20.9
	50-65 years old	26	38.8
	more than 65 years old	11	16.4

3). In certain situations, more than one organ of the same species was employed to produce various medicines, particularly a mix of leaves and stems. The fact that leaves are the most often utilized component is consistent with findings from much previous ethnomedicinal research in the Philippines (Abe and Ohtani, 2013; Olowa *et al*., 2012; Ong and Kim, 2014; Tantengco *et al*., 2018).

In the current study, sap or latex extracts were also common among Manobos. Kuwamog or fresh sap/latex from plants like *Anodendron borneense* (King & Gamble) D.J. Middleton (*himag*), *Cananga odorata* (Lam.) Hook. f. & Thomson (*anangilan*), and *Melanolepis multiglandiolosa* (Reinw. ex Blume) Rchb. & Zoll. (awom, alom-alom) were taken orally to treat diseases. Although ethnopharmacological surveys have documented the use of exudates in traditional medicine, there have been few studies on the scientific benefits of these products (Lago *et al*., 2016).

Preparation and Administration of Medicinal Plants

The main method of preparation was decoction (25%), followed by juice or sap extraction (23%), heating or warming (17%), and dilution in water or aqueous solution (13%) (Figure 4). Most of the plants were used fresh. Informants during the interview emphasized that fresh plant parts were collected every day and discarded the next day. Some medicinal plants were employed alone or in combination with other plants to treat a certain ailment. Plants were used in a mixture with other plants in *pito-pito* (pito means seven).

In this study, most of the plants were taken internally (decoction or raw juice) (30%) primarily because such plants were proven to be trusted and safe to use by the Agusan Manobo people (Figure 5). External administration of medicinal plants was done by squeezing or rubbing the sap/latex through massage (usually with liniment oil) on any part of the body, or the plant material was applied over the body, or the plant material was roasted/heated and/or pounded and directly applied on the body (skin) by squeezing or rubbing the sap through massage (usually with liniment oil) on any part of the body. Another familiar mode of administration frequently mentioned in the study was the practice of steam inhalation.

Phytochemical characteristics of selected medicinal plants

Various phytochemical constituents were evident in *Acmella grandiflora* (Turcz.) R.J. Jansen, *Anodendron borneense*

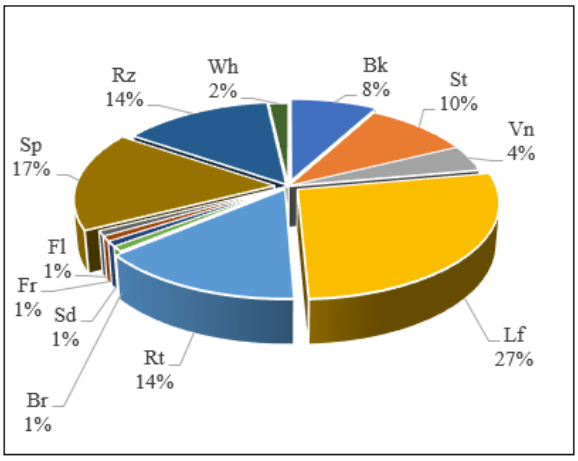

Figure 3: Plant parts used for medicinal applications in Ugnop Landscape and Barangay Mabuhay. Bk, barks; Fr, fruits; Fw, flowers; Lf, leaves; Rt, roots; Rz, rhizomes; Sd, seeds; Sp, sap/juice; St, stems; Wh, whole plant

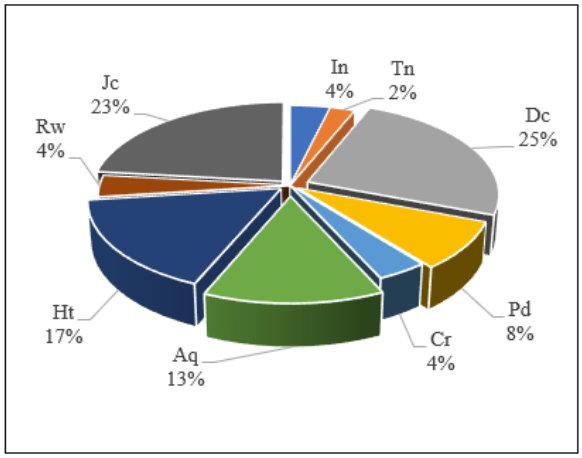

Figure 4: Methods of preparation of medicinal plants in Ugnop landscape and Barangay Mabuhay. In, infusion; Tn, tincture; Dc, decoction; Pd, pounded; Cr, crushed; Aq, acqueous/diluted; Ht, heated/warmed; Rw, raw; Jc, juiced.

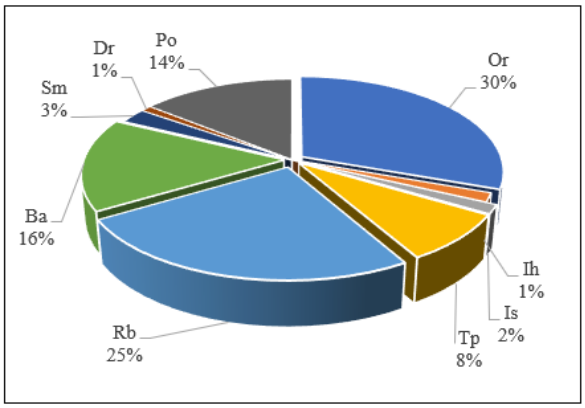

Figure 5: Modes of administration of medicinal plants in Ugnop landscape and Barangay Mabuhay. Or, intake orally; Ih, inhalation; Is, instillation; Tp, topical application; Rb,rub; Ba, bath; Sm, steam inhalation/tuob; Dr, drops; Po, poultice

(King & Gamble) D.J. Middleton, *Hellenia speciosa* (J. Koenig) Govaerts, and *Homalomena philippinensis* Engl. (Table 3).

Alkaloids were found only in *A. grandiflora* plant extracts. Lunas-bitin, as the Manobo locals called it, got its name due to its snake-deterrent ability. *A. grandiflora* is a potentially useful source of bioactive compounds, spilanthol and acmellonate, which stimulates the salivary gland and relieving toothache discomfort (Ramsewak, 1999).

Steroids are renowned for their antibacterial properties linked to membrane lipids and induce liposome leakage. In this study, it was noted that the presence of unsaturated steroids was evident in *A. grandiflora*, *A. borneense*, and *H. philippinensis*. Steroids/2-deoxysugars are antimicrobial and antidiarrheal. In this study, *A. borneense* infusion was used by Agusan Manobo to treat gastrointestinal infections, stomach problems, and ulcers. In the study of Dapar *et al.* (2020), the stem sap and the stem decoction were also used to treat cyst/tumor or colon and prostate cancer.

The Agusan Manobo used *H. philippinensis*, locally called payaw, to treat colds, body ache, headache, fever, rheumatism. In fact, in this study, it was the most preferred medicinal plant for treating migraine by heating it, putting salt and applying it as a poultice on the affected area. It was also used to treat tonsillitis, impotence and sterility, labor and delivery enhancer, and hemorrhoids (Dapar *et al.*, 2020). In the study of Paraguison *et al.* (2020), the Agusan Manobos used *H. philippinensis* to treat kidney problems and urinary tract infections. Although there were quite studies about the medicinal use of Homalomena, the endemic species *H. philippinensis* belonged to the understudied medicinal plants of the Philippines (Stuart, 2003 onwards). Dapar *et al.* (2020a) reported using *H. philippinensis* as a medicinal plant to treat cuts and wounds among the Manobo of Sibagat, Agusan del Sur.

Flavonoids are thought to be responsible for *A. grandiflora*'s antipyretic and anti-inflammatory/analgesic properties (Narayana, 2001). However, in the current study, there was an absence of flavonoids in *A. grandiflora*. Flavonoids are also found in large amounts in the stems and leaves of *A. borneense*, and they have antioxidant, fever-reducing (antipyretic), pain-relieving (analgesic), and spasm-inhibiting (spasmolytic) properties. Fevers and headaches are treated with a decoction made from the leaves. Locally known as lunas tag-uli by the Manobo tribe of Agusan del Sur or *himag* by the Bisaya communities of Mindanao, *A. borneense* is one example of a plant still used by Mindanao's indigenous people and certain locals (Dapar *et al.*, 2020). Cancer, diarrhea, stomach problems, ulcer, toothache,

Table 3: Phytochemical constituents of selected medicinal plants

Phytochemical Constituent	**Type of Test**	*A. grandiflora*	*A. borneense*	*H. speciosa*	*H. philippinensis*
Alkaloids	Mayer's Reagent & Dragendorff's Reagent	+	-	-	-
Primary, Secondary or Tertiary Alkaloidsa	Mayer's Reagent & Dragendorff's Reagent	+	-	-	-
Quaternary Alkaloids or Amine Oxide	Mayer's Reagent & Dragendorff's Reagent	-	-	-	-
Steroids					
2-deoxysugars	Keller-Killiani Test	-	+	-	+
Unsaturated steroids	Liebermann-Burchard Test	+	+	-	+
Flavonoids: Leucoanthocyanins	Bate-Smith & Metcalf Method	-	+	-	-
Saponins	Froth Test	-	-	+	+
Tannins					
Condensed tannins	Ferric Chloride Test	+	-	+	-
Hydrolysable tannins		-	-	-	-

+ presence, - absencea + primary alkaloids, ++ secondary alkaloids, +++ tertiary alkaloids

arthritis, rheumatism, pregnancy, body ache, weakness, exhaustion, cramp, spasm, relapse, and poisoning are all treated by this plant (Dapar, 2020).

In the current study, there was the presence of leucoanthocyanin in *A. borneense*. Leucoanthocyanin is the precursor of anthocyanidin, along with anthocyanins, possesses antioxidative and antibacterial properties, enhance visual and neurological health, and protect against a variety of noncommunicable illnesses (Khoo *et al*., 2017). A.borneense was used to treat cuts and wounds among Agusan Manobo (Dapar *et al*., 2020a). The presence of flavonoids also explains the reason why *A. borneense* leaf infusion is used to treat chronic diarrhea or gastrointestinal infection (Treadway, 1994) as flavonoids are effective against diarrhea (Schuier *et al*., 2005). In the study of Pucot *et al.* (2021), flavonoids, steroids, and saponins were detected. In this study, however, the presence of saponins was not detected in the ethanolic extracts.

Condensed tannins or proanthocyanidins are also studied for their antibacterial, antiviral, and antitumor properties and their cardiovascular, diabetic, and inflammatory health advantages and impacts on innate immune responses. The presence of condensed tannins were evident in *A. grandiflora* and *H. speciosa*. Timbabasi, as called by Agusan Manobo, *H. speciosa* is used to treat convulsion, colds, cough, fever, influenza, diarrhea, and stomachache by dinking the squeezed extract from the leaves or stems. *H. speciosa* belongs to the Costaceae family of plants. *H. speciosa* leaves and rhizomes have been shown to contain the steroid diosgenin, which has anti-diabetic properties. In addition to lowering blood glucose, the leaves have hypoglycemic and insulin-potentiating effects (Rani *et al*., 2012). These plants' potential to be employed in the treatment of a number of diseases is associated with their phytochemical components.

CONCLUSION

The documented study on the use of medicinal plants and the healing practices done by the Agusan Manobo shows that traditional knowledge is still being practiced among the Agusan Manobo tribe, as indicated by the high percentage of middle and younger age groups. Herbal medicine and traditional medicinal plant management continue to be the most common treatment option for health problems, especially among the Agusan Manobo tribe. This study shows that the use of leaves and exudates in the form of decoction as the preparation method enforces the reliability and safety of using such medicinal plants. Consequently, this study also shows that indigenous knowledge and traditional culture are still preserved, and awareness about the protection of these medicinal plants is also evident. The result of the phytochemical screening analysis shows the presence of various secondary metabolites such as alkaloids, steroids, flavonoids, saponins, and tannins. Such phytochemical constituents are linked to the potential of these plants to be used to treat a variety of ailments.

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