



Plants with benefits: Ethnomedicinal plants used by the Talaandig tribe in Portulin, Pangantucan, Bukidnon, Philippines

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With respect to the diversity of many plant taxa the Philippines is one of the world's most species-rich countries. However, the use of plants by indigenous people in the archipelago has been underreported. Nowadays, indigenous knowledge of medicinal plants is increasingly declining and as more plants are lost and so is the awareness of their importance to humanity. Ethnobotanical studies are therefore important to explore these diverse biological tools for medicinal purposes. The purpose of this study was to record the traditional knowledge of the Talaandig tribe in Portulin, Pangantucan, Bukidnon, Philippines, with regard to the usage of medicinal plants to cure human illnesses and diseases. A total of 19 respondents including 8 men and 11 women were selected through semi-structured interviews and group discussions to gather ethnobotanical information by means of a stratified purposive sampling system and they were evaluated by descriptive statistics, use value (UV) and ranking methods. In total, 97 medicinal plants belonging to 46 families and 86 genera were recorded. The most numerous plant species were Poaceae (7 species), followed by Asteraceae, Fabaceae and Lamiaceae (6 species each). The dominant growth habit was herbs (40%), followed by trees (27%) with leaves (41%) as the most frequently used plant part which are commonly prepared as a decoction (45%), with internal (65%) as the main route of administration. Most of the documented ethnomedicinal plants were used to treat diseases of the respiratory system (16%), followed by diseases of the circulatory system (13%). *Vitex negundo* (0.7895) was considered as the most important medicinal plant in the community, followed by *Psidium guajava* (0.7368). This ethnobotanical study shows that many plant species play an important role in local healing practices and that in the Talaandig tribe of Portulin, Pangantucan, Bukidnon, knowledge of traditional medicine is still used and plays a significant role.

Keywords: Biodiversity, Ethnobotany, Mindanao, Talaandig tribe, Traditional medicine

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Ethnobotany is the traditional local knowledge of the use of indigenous plants, such as for food, medicine and instruments, that has been practiced by local people for a long time¹. In understanding the complex relationships between biological diversity and social and cultural structures, ethnobotany plays an important role. Studies have shown that plants used as medicine provide a wide variety of substances that can be used to treat both chronic and infectious diseases and are rich in therapeutically significant secondary metabolites and essential oils². In addition to being inexpensive, reliable and usable, an important advantage claimed for the therapeutic use

of medicinal plants in different illnesses is their safety.

In various indigenous groups in the Philippines, traditional medicine has remained as the most inexpensive and easily available source of treatment for the different illnesses and diseases. Among these is the Talaandig tribe, one of the indigenous groups in the province of Bukidnon, Mindanao, Philippines, which, amid the heavy influx of modernization and reform, has continued to maintain and promote its indigenous customs, beliefs and practices. It is one of the interesting tribes in the country defined by its history and traditions. The community of Talaandig in Barangay Portulin consists of 465 individuals in 93 households. The diverse species-rich forests

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surrounding the community are of great importance to the tribe providing it continuous existence and survival such as the source of medicine for the village healers³. Modern healthcare services are not sufficient in this area and certain parts of the population have minimal means of buying modern medicine, so the most common solution to health problems remains traditional medicine. To date, however, there have been no data from the current study area quantitatively assessing the resource capacity and indigenous information on the use and management of medicinal plant species.

Due to the transition of traditional culture and more economic growth in the Philippines, the indigenous traditional knowledge of herbal plants in communities where it has been transmitted orally for many years is gradually disappearing. To maintain traditional medicinal knowledge, it is important to perform research on different plants of therapeutic value and record the knowledge relating to their use in systematic studies⁴. However, despite all the ethnobotanical studies carried out across the region, there are relatively few pharmacological documents in Mindanao, some of which concentrate on well-known indigenous groups such as the Zamboanga del Sur Subanens⁵ and the Agusan del Sur Manobos⁶. The proportion of medicinal plants and the importance of indigenous knowledge associated with them by the Talaandig people in Barangay Portulin, Pangantucan, Bukidnon, Philippines, are expected to be relatively high. However, no systematic research on the

knowledge of traditional medicine in the area was conducted. We hope to provide data and knowledge through this study as a basis for the protection and sustainable use of local wild plants as well as contribute to the preservation of cultural and genetic diversity.

Materials and Methods

Study area

This study was conducted at Portulin, Pangantucan, Bukidnon, Philippines, which is situated at the foot of Mt. Kalatungan Range Natural Park. Portulin, as shown in Fig. 1 and is one of the 19 Barangays of the municipality of Pangantucan in the island of Mindanao and province of Bukidnon. Portulin is situated in the northern part of the municipality with an elevation of approximately 1,200 m above sea level which can be located at geographic coordinates 4° 22'33.36"N (latitude) and 128° 21'58.70"E (longitude). It consists of six villages: Mapayag, Bolohon, San Vicente, Kauswagan, Lower Sinasaan and Ootah. The Barangay is bordered by the municipality of Lantapan to the North, the Barangay of New Eden, Pangantucan, to the South, the municipality of Maramag to the East and the Barangay of Concepcion, Pangantucan to the West³.

Ethnobotanical data collection

The study was performed from August 2018 to March 2019. With the active collaboration of the Portulin Talaandig Tribe Association, an exhaustive list of households in the village was prepared. Prior

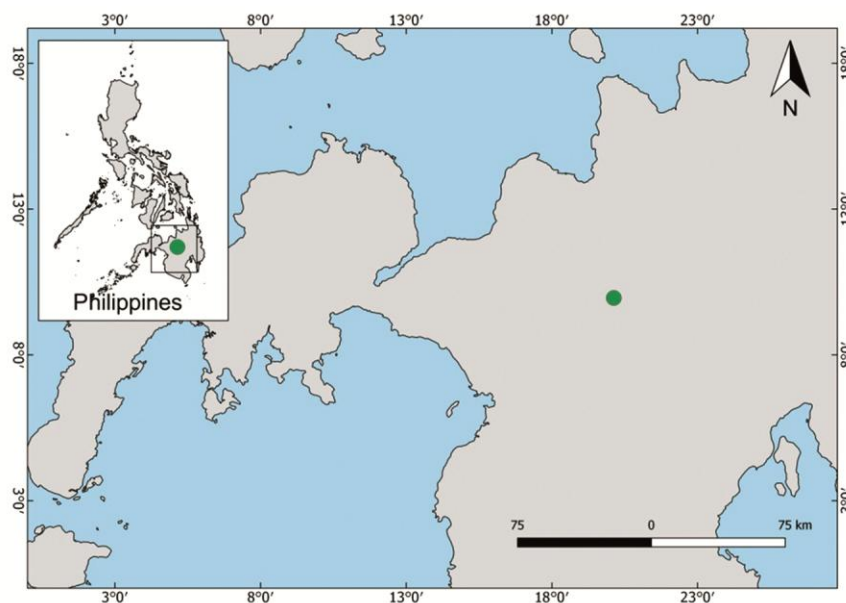


Fig. 1 — Geographical location of the study area

informed consent was obtained from the tribal chieftain, and permission to interview villagers was sought verbally. The respondents of the study were identified through snowball method, starting from the chieftain of the Talaandig tribe in Portulin, Pangantucan, Bukidnon, Philippines. After the respondents were identified and consent was sought, they were briefed about the objectives of the study. Interviews were then carried out at the convenience of the respondents. The identity of the respondents from the tribe was kept confidential. For the purposes of evaluating the data collected, code numbers were assigned accordingly.

As provided in the survey questionnaire, 19 respondents (8 males and 11 females) were asked a series of questions relating to the medicinal plants they recognized, their efficacy and uses. The researchers performed a triangulation on the data collected along with the tribesmen to validate the observations shared by the Talaandig tribe. To validate the veracity of the interpretation and translation of the data obtained, a focus group discussion was conducted. The Talaandig tribe underwent social planning via., gatherings and group organization. In compliance to their cultural practice, tribal ritual was performed. The folkloric survey was carried out via informal interviews in the snowball-sampled key informants of the Talaandig ethnic group in the area. Conversations with key informants were used to gather information for this survey on the usage of different medicinal plants species. Public input and statements from the documentation were basically recorded for review after the interview.

Identification of the collected specimens

Sample specimens were collected, numbered, pressed and dried for identification of the plants cited for their medicinal use. In the field, preliminary plant identification was carried out and the findings were reconfirmed at the University of Santo Tomas Herbarium (USTH). Identification of plant specimens was done using the relevant literature sources⁷⁻¹⁰. Some open access websites were also utilized such as Co's Digital Flora¹¹, Philippine Medicinal Plants¹² and Global Plants on JSTOR (<https://plants.jstor.org>)¹³. Voucher specimens were prepared and deposited in USTH.

Data analysis

Based on the interviews, the details of the Talaandig individuals (socio-demographic data) and

the medicinal plants were tabulated. The Use Value (UV) of plants was determined to measure the ethnobotanical data collected. The ratio of the number of citations per species (U) to the number of informants (N) is defined as the use value, and it is given by the formula: $UV = U/N$ ^{7,8}. High UV shows high consumption reports for a plant, which suggests its relative significance to the local community⁹. Low UV suggests that there are few records concerning its use¹⁰.

Results and Discussion

The use of plants for traditional medicine has been established, maintained and developed in all indigenous communities in the world¹¹⁻¹³. Awareness is inherent among indigenous groups in the Philippines and is inherited through oral/verbal contact from their great ancestors^{5,14,15}. The relationship between the Talaandig people in Portulin, Pangantucan, Bukidnon, with plants is demonstrated in this study. Medicinal plants were used by both men and women, but the use among females was dominant, comprising 58% of the respondents. The respondents ranged in age from 26 to 76 years. In general, 68% of respondents were over 45 years of age and most of them were registered as farmers in this investigation (Table 1).

The survey showed a total of 97 different medicinal plants species belonging to 86 genera and 46 families used by the Talaandig tribe in Portulin, Pangantucan, Bukidnon. The Check List includes details about their botanical name, vernacular name, relatives, part used and ethnomedical uses (Table 2). The highest number of species was represented by family Poaceae (7 spp.), followed by Asteraceae, Fabaceae and

Table 1 — Demographic profile of the informants.

Factor	Categories	No. of people	Percentage of people
Gender	Male	8	0.4211
	Female	11	0.5789
Age	Male <45	3	0.1579
	Male >50	5	0.2632
	Female <50	3	0.1579
	Female >50	8	0.4211
Marital status	Single	1	0.0526
	Married	13	0.6842
	Widowed	4	0.2105
	Separated	1	0.0526
Profession	Farmer	16	0.8421
	Housekeeper	2	0.1053
	Government employee	1	0.0526

Table 2 — List of documented plants used by the Talaandig tribe in Portulin, Pangantucan, Bukidnon, Philippines.

Species name	Vernacular name	Habit	Parts used	Preparations	Applications	Ethnomedicinal uses	Use value
Amaryllidaceae							
<i>Allium ascalonicum</i> L.	sibuyas	Herb	bulb	freshly eaten	internal	diarrhea	0.0526
<i>Allium cepa</i> L.	sibuyas dahon	Herb	leaves	poultice	external	cough	0.0526
<i>Allium sativum</i> L.	ahos	Herb	bulb	freshly eaten, poultice	external, internal	hypertension, diuretic, toothache, arthritis	0.0526
<i>Allium tuberosum</i> Rottler ex Spreng	ganda	Herb	whole plant	leaves are crushed thoroughly until watery juice is extracted	external	fatigue, relapse	0.1579
Annonaceae							
<i>Annona muricata</i> L.	abana	Tree	bark, leaves, fruit	decoction	internal	cancer, hypertension, UTI	0.2632
<i>Annona squamosa</i> L.	atis	Tree	leaves	decoction	internal	diarrhea	0.1579
Apiaceae							
<i>Centella asiatica</i> (L.) Urban	yahong-yahong	Herb	leaves	decoction	internal	hypertension	0.1053
Apocynaceae							
<i>Catharanthus roseus</i> (L.) G. Don.	kumintang	Shrub	leaves	decoction	internal	birth control for women	0.0526
<i>Tabernaemontana</i> <i>pandacacqui</i> Poir	agtumalay/ ulahuan	Shrub	leaves	decoction	internal	muscle spasm, menstrual cramps, headache	0.0526
<i>Wrightia pubescens</i> subs. <i>laniti</i> (Blanco) Ngan	bitaos	Tree	latex	applied directly	external	wounds	0.0526
Araceae							
<i>Schismatoglottis</i> <i>calyptrata</i> (Roxb.) Zoll. & Moritzi	apusaw	Herb	flower shoot	cooked and eaten	internal	kidney stone	0.1053
Arecaceae							
<i>Calamus</i> sp.	ambuka	Shrub	roots	decoction	internal	fever	0.0526
<i>Calamus microcarpus</i> Becc.	rattan	Shrub	young shoot	grilled and eaten	internal	diabetes	0.0526
<i>Cocos nucifera</i> L.	lubi	Tree	fruit	decoction	internal	heart diseases	0.0526
Asparagaceae							
<i>Cordyline fruticosa</i> (L.) A.Chev.	kilala	Shrub	roots	decoction	internal	hemoptysis	0.2105
Asteraceae							
<i>Artemisia vulgaris</i> L.	helbas	Herb	leaves, roots	decoction, poultice	internal, external	cough, colic	0.4737
<i>Bidens pilosa</i> L.	amorseko	Herb	leaves	decoction	internal	snake bite	0.0526
<i>Blumea balsamifera</i> (L.) DC.	gabon	Shrub	leaves, leaf shoots	decoction, infusion	external, internal	hypertension, cough, arthritis	0.4737
<i>Cyanthillium cinereum</i> (L.) H. Rob.	kanding-kanding	Herb	roots	decoction	internal	headache	0.0526
<i>Elephantopus scaber</i> Linn.	dila-dila	Herb	leaves, roots	decoction	internal	arthritis, fever, UTI	0.1579
<i>Smallanthus</i> <i>sonchifolius</i> (Poepp.) H. Rob.	yakon	Herb	tuber	tubers are boiled until cooked	internal	body pain, muscle spasm	0.1053
Begoniaceae							
<i>Begonia</i> aff. <i>acuminatissima</i> Merr.	tungtung-batu	Herb	leaves	freshly eaten/consumed	internal	cough	0.0526

(Contd.)

Table 2 — List of documented plants used by the Talaandig tribe in Portulin, Pangantucan, Bukidnon, Philippines — (Contd.)

Species name	Vernacular name	Habit	Parts used	Preparations	Applications	Ethnomedicinal uses	Use value
Bixaceae							
<i>Bixa orellana</i> L.	aswetes	Tree	leaves	decoction	internal	dysmenorrhea	0.0526
Boraginaceae							
<i>Cordia dichotoma</i> G. Forst.	anonang/hagpa	Tree	bark, leaves	decoction	internal	fever, flu, anemia	0.1579
Burseraceae							
<i>Canarium album</i> (Lour.) DC.	lunay	Tree	bark	bark are crushed thoroughly until watery juice is extracted	external	stomach ache	0.1053
Cannabaceae							
<i>Trema orientalis</i> (L.) Blume	hanagdong	Tree	bark	applied directly	external	boils, swelling	0.0526
Caricaceae							
<i>Carica papaya</i> L.	kapayas	Shrub	leaves, roots	decoction	internal	headache, UTI	0.2105
Chloranthaceae							
<i>Chloranthus elatior</i> Link	manalak	Herb	leaves, flowers	infusion	internal	cough, fever	0.0526
Commelinaceae							
<i>Tradescantia spathacea</i>	bangka-bangkaan	Herb	leaves	decoction	internal	cough	0.0526
Convolvulaceae							
<i>Ipomoea batatas</i> L.	kamote	Vine	leaf shoots	leafy shoot are soaked into the boiling water and removed after a brief period of time	internal	anemia	0.0526
Crassulaceae							
<i>Bryophyllum pinnatum</i> (Lam.) Oken	dunggaw/katakataka	Herb	leaves	poultice	external	headache, toothache, fever	0.2105
Cucurbitaceae							
<i>Benincasa hispida</i> Cogn.	kondol	Vine	fruit	freshly eaten	internal	hemoptysis, diuretic, dyspepsia, fever	0.1053
<i>Cucumis sativus</i>	pipino	Vine	fruit	freshly eaten	internal	UTI	0.0526
<i>Cucurbita maxima</i> Duchesne	kalabasa	Vine	fruit, roots	poultice, decoction	external, internal	boils, dehydration, ulcer	0.1053
<i>Luffa acutangula</i> (L.) Roxb.	patola	Vine	fruit	boiled until cooked	internal	hypertension	0.0526
<i>Sechium edule</i> (Jacq.) Sw.	sayote	Vine	fruit	boiled until cooked	internal	hypertension	0.1579
Elaeagnaceae							
<i>Elaeagnus triflora</i> Roxb.	yagot	Shrub	roots	decoction	internal	flu	0.0526
Euphorbiaceae							
<i>Euphorbia hirta</i> L.	tawa-tawa	Herb	whole plant	decoction	internal	dengue, fever	0.2632
<i>Euphorbia tirucali</i> L.	pobreng kahoy	Herb	stem	poultice	external	wounds	0.0526
<i>Jatropha curcas</i> L.	tuba-tuba	Shrub	leaves, bark	poultice	external	body pain, wounds	0.0526
<i>Manihot esculenta</i> Crantz	binggala/balanghaiy	Shrub	roots	poultice	external	body pain	0.2632
Fabaceae							
<i>Cajanus cajan</i> (L.) Millsp.	kadyos	Shrub	seeds	boiled until cooked	internal	inflammation	0.2105

(Contd.)

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Species name	Vernacular name	Habit	Parts used	Preparations	Applications	Ethnomedicinal uses	Use value
<i>Gliricidia sepium</i> (Jacq.) Steud.	madre de cacao	Tree	bark, leaves	decoction	internal	dermatitis	0.0526
<i>Mimosa pudica</i> L.	kipi-kihi/makahiya	Herb	roots	decoction	internal	flu	0.0526
<i>Pterocarpus indicus</i> Willd.	narra	Tree	bark	decoction	internal	cough	0.1053
<i>Samanea saman</i> F.Muell.	ampyon	Tree	leafy shoot	decoction	internal	UTI	0.0526
<i>Senna alata</i> (L.) Roxb.	sunting	Shrub	leaves	poultice	external	ringworm, scabies, eczema, insect bites	0.4211
Hypoxidaceae							
<i>Curculigo orchooides</i> Gaertn.	taloangi	Herb	roots	decoction	internal	arthritis, hypertension	0.0526
Lamiaceae							
<i>Gmelina arborea</i> Roxb.	gemilina	Tree	leaves	freshly applied directly to the affected area	external	sprain	0.1053
<i>Mentha epticum</i> L.	hierbabuena	Herb	leaves	poultice	external	flu	0.0526
<i>Plectranthus amboinicus</i> (Lour.) Spreng.	kalabo	Herb	leaves	infusion	internal	cough	0.3684
<i>Plectranthus scutellarioides</i> (L.) R. Br.	mayana	Herb	leaves	decoction	internal	cough, wounds	0.2105
<i>Vitex negundo</i> L.	lagundi	Tree	leaves	decoction	internal	cough, fever, headache	0.7895
<i>Vitex parviflora</i> Juss.	tugas	Tree	bark	decoction	internal	flu	0.0526
Lauraceae							
<i>Cinnamomum mercadoi</i> S. Vidal	kalingag	Tree	bark	decoction	internal	heartburn, stomach ache, arthritis, anemia	0.5263
<i>Persea epticum</i> Mill.	abokado	Tree	seed	decoction, infusion, poultice	external, internal	appetite enhancer, arthritis, toothache	0.3158
Lythraceae							
<i>Lagerstroemia speciosa</i> (L.) Pers.	banaba	Tree	fruit	fruits are eaten directly	internal	arthritis	0.0526
Malvaceae							
<i>Gossypium epticum</i> L.	gapas	Shrub	leaves	leaves are crushed until watery juice is extracted	external	fever	0.2632
<i>Hibiscus rosa-sinensis</i> L.	gumamela	Shrub	flower	poultice	external	boils, swellings	0.1579
<i>Sida acuta</i> Burm.f.	eskobia	Shrub	roots	decoction	internal	flu	0.2632
<i>Theobroma cacao</i> L.	kakaw	Tree	fruit	poultice	external	boils, swellings	0.2632
Meliaceae							
<i>Sandoricum koetjape</i> (Burm.f.) Merr.	santol	Tree	bark	decoction	internal	diarrhea, vomiting	0.1053
Menispermaceae							
<i>Tinospora crispa</i> (L.) Hook.f. & Thomson	panyawan	Vine	stem	infusion, stems are ground into paste	internal	helminthic, diabetes	0.0526
Moraceae							
<i>Artocarpus heterophyllus</i> Lam.	nangka	Tree	leaves	poultice	external	skin diseases, wounds, diarrhea	0.1053
<i>Ficus eptica</i> Burm.f.	lagnub/timbeg	Tree	leaves	poultice	external	warts	0.0526
<i>Ficus stricta</i> (Miq.) Miq.	balete	Tree	bark	poultice	external	fracture	0.3157

(Contd.)

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Species name	Vernacular name	Habit	Parts used	Preparations	Applications	Ethnomedicinal uses	Use value
Moringaceae							
<i>Moringa oleifera</i> L.	kalamunggay	Shrub	leaves	leaves are crushed thoroughly and watery juice is extracted, infusion	external, internal	wounds, snake bites, ulcer	0.2632
Musaceae							
<i>Musa textilis</i> Née	abaka	Herb	leaves, roots	infusion	internal	relapse for new mothers	0.0526
Myrtaceae							
<i>Psidium guajava</i> L.	bayabas	Tree	leaves	decoction	internal	diarrhea	0.7368
Nyctaginaceae							
<i>Bougainvillea spectabilis</i> Willd.	bougainvillea	Shrub	roots, flower	decoction, poultice	external, internal	UTI, inflammation, swellings	0.0526
Nepenthaceae							
<i>Nepenthes saranganiensis</i> Kurata	baso sa unggoy	Herb	leaves	poultice	external	enhancement of milk production for mothers	0.0526
Piperaceae							
<i>Peperomia pellucida</i> (L.) Kunth	atay-atay	Herb	leaves	leaves are crushed until watery juice is extracted	internal	cough, colds	0.2105
<i>Piper betle</i> L.	buyo	Vine	stem	decoction, leaves are crushed thoroughly and watery juice is extracted	external, internal	ulcer, wounds, body pains	0.2632
Poaceae							
<i>Cymbopogon citratus</i> (DC.) Stapf	tanglad	Herb	roots	leaves are roasted and then crude leaf juice is extracted	external	flu	0.2632
<i>Cynodon dactylon</i> (L.) Pers.	bermuda grass	Herb	roots	decoction	internal	hypertension	0.0526
<i>Echinochloa crus-galli</i> (L.) P. Beauv.	talahib	Herb	leaves, stem	leaves are crushed thoroughly and watery juice is extracted	external	wounds, snake bites	0.0526
<i>Eleusine indica</i> (L.) Gaertn.	bila-bila	Herb	whole plant	decoction	internal	fatigue, cough, relapse	0.2105
<i>Imperata cylindrica</i> (L.) P. Beauv.	kogon	Herb	leaves	poultice	external	wounds	0.0526
<i>Paspalum conjugatum</i> P.J. Bergius	konan	Herb	leaves	poultice	external	wounds	0.0526
<i>Zea mays</i> L.	mais	Herb	seeds	decoction	internal	UTI	0.1053
Portulacaceae							
<i>Portulaca grandiflora</i> Hook.	vietnam rose	Shrub	flower	poultice	external	wounds	0.0526
Rosaceae							
<i>Rubus fraxiniifolius</i> Poir.	lagyawat	Shrub	roots	decoction	internal	kidney stones, UTI	0.0526
<i>Rubus luzoniensis</i> Merr.	sapinit	Vine	roots	decoction	internal	flu, hemorrhage	0.1579

(Contd.)

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Species name	Vernacular name	Habit	Parts used	Preparations	Applications	Ethnomedicinal uses	Use value
Rubiaceae							
<i>Coffea arabica</i> L.	kape	Shrub	seeds	infusion	internal	headache	0.0526
Rutaceae							
<i>Citrus maxima</i> Merr.	pomelo/baongon	Shrub	leaves	infusion	internal	cough, fever	0.0526
<i>Triphasia trifolia</i> P. Wils.	limonsito	Shrub	fruit	infusion	internal	cough, sore throat	0.2632
Salicaceae							
<i>Flacourtia rukam</i> Zoll. & Mor.	lanagon	Tree	roots	decoction	internal	flu	0.1053
Sapotaceae							
<i>Chrysophyllum cainito</i> L.	kaymito	Tree	fruit, leaves	decoction	internal	hemorrhage	0.0526
Solanaceae							
<i>Capsicum frutescens</i> L.	sili	Herb	leaves	leaves are ground	external	dandruff	0.2632
<i>Solanum melongena</i> L.	talong	Herb	leaves	poultice	external	wounds	0.0526
<i>Solanum ptychanthum</i> Dunal	hagpa	Herb	leaves	decoction	internal	flu, anemia	0.1053
Urticaceae							
<i>Dendrocnide meyeniana</i> (Walp.) Chew	alingatong/ kug-kog/ sagay	Tree	roots	decoction	internal	hypertension, diabetes, arthritis, anemia, UTI, kidney stones	0.3157
<i>Pilea melastomoides</i> (Poir.) Wedd.	kalambo-lambo	Herb	whole plant	decoction	internal	diuretic	0.0526
<i>Pipturus arborescens</i> (Link) C.B. Rob.	kapool	Shrub	stem, leaves	poultice	external	wounds, skin diseases	0.0526
<i>Poikilospermum lanceolatum</i> (Trécul) Merr.	anopol	Shrub	leaves	decoction	internal	fever	0.0526
Zingiberaceae							
<i>Zingiber officinale</i> Roscoe	luy-a	Herb	rhizome	infusion, poultice	external, internal	acid-reflux, sore throat, cough, swellings	0.5789
<i>Curcuma longa</i> L.	luyang dilaw	Herb	rhizome	decoction, poultice, infusion	external, internal	UTI, boils, swellings, hypertension, cancer, muscle spasm, body pain	0.6316

Lamiaceae (6 spp. each), Cucurbitaceae (5 spp.), Amaryllidaceae, Euphorbiaceae, Malvaceae and Urticaceae (4 spp. each), and Apocynaceae, Arecaceae, Moraceae and Solanaceae (3 spp. each). Furthermore, the families Annonaceae, Lauraceae, Piperaceae, Rosaceae, Rutaceae and Zingiberaceae were represented by 2 species each. The 27 families remaining were monotypic (Table 2). Poaceae is the most represented plant family in this ethnobotanical survey with a total of seven species used as medicines. This finding is similar to the results of the study conducted at Northern Surigao del Sur, Philippines¹⁶, with the Talaandig tribe in Lilingayon, Valencia City, Bukidnon, Philippines¹⁷. Asteraceae, Fabaceae and Lamiaceae are the second families with

the most number of representative species used as medicine. Several studies conducted in Bataan, North Cotabato and Bukidnon, Philippines, also listed the highest number of medicinal plants from families Asteraceae¹⁷, Fabaceae¹⁸ and Lamiaceae¹⁵.

The respondents cultivated most of the known medicinal plants in their home garden and it was noticed during the survey that almost all respondents maintained a home garden that contributed to the protection of the species they were using. Similar documentation was also reported in studies carried out in West Bengal¹⁹ and Northern Bengal, India²⁰. In total, the indigenous group residing in and around Portulin, Pangantucan, Bukidnon, has recorded 56 ethnomedicinal plant species to be preserved in the

home gardens (Fig. 2). Similar studies from India^{19,20} and Ethiopia²¹ were also published on home gardens preserving rich biodiversity of ethnomedicinal plants.

Of these ethnomedicinally used species, herbaceous plants dominated the list with 39 species (40%), followed by trees with 26 species (27%), shrubs with 24 species (25%) and vines with 8 species (8%), as shown in Figure 3. The herbs were represented by 32 genera and 19 families, trees represented by 22 genera and 18 families, shrubs represented by 23 genera and 15 families and vines represented by nine genera and five families. Herbs were dominated by the genus *Allium* L. with four species and family Poaceae with seven species; trees were dominated by the genera *Annona* L., *Ficus* L.

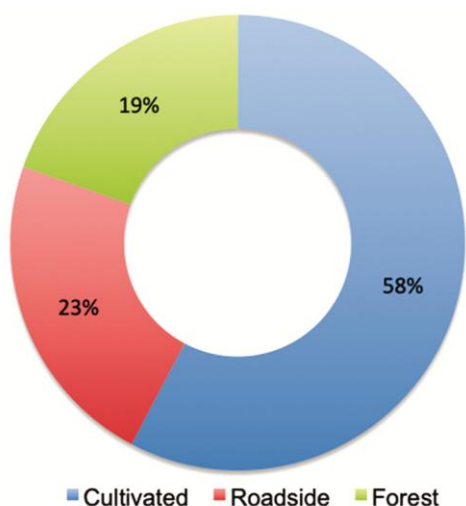


Fig. 2 — Sources of medicinal plants used by the Talaandig tribe

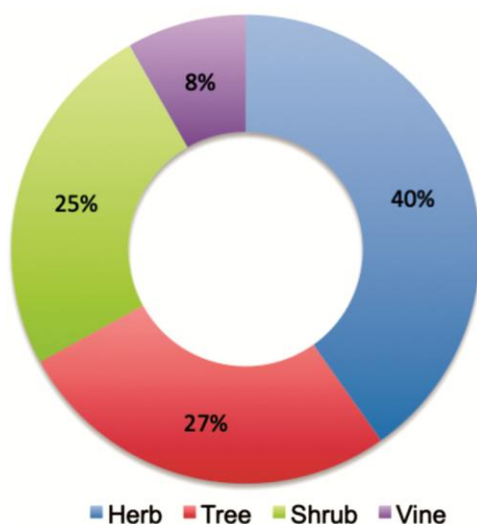


Fig. 3 — Plant habit of the reported medicinal plants used by the Talaandig tribe

and *Vitex* L. with two species each and families Fabaceae, Moraceae and Lamiaceae with three species each; shrubs were dominated by the genus *Calamus* with two species and family Malvaceae with three species and vines were dominated by family Cucurbitaceae with five species. These findings were in congruence to the previous results from other studies²²⁻²⁴. The frequent use of herbs by indigenous people may be due to their accessibility and high effectiveness relative to other life forms in the treatment of diseases²⁵⁻²⁷.

Of the total recorded species, 32 (33%) were found to be native to the Philippines. Seven species (7%) were found to be endemic: *Begonia* aff. *acuminatissima* Merr., *Calamus* sp., *Calamus microcarpus* Becc., *Cinnamomum mercadoi* S.Vidal, *Musa textilis* Née, *Nepenthes saranganiensis* Kurata and *Rubus luzoniensis* Merr. The remaining species (60%) were found to be non-native (which includes cultivated, introduced and naturalized species) and originating from different biogeographic domains of the world (Fig. 4).

As shown in Figure 5, the results of our study show that the frequency of the usage of leaves was the highest (41%) relative to the other parts of the different plant species used, followed by roots (19%), fruits (9%), barks (8%), stems and flowers (5%), whole plants and seeds (4%), rhizomes and bulbs (2%) and latex and tuber (1%). Similar findings with leaves as the most commonly used plant parts have been recorded by several ethnobotanical surveys conducted in the Philippines^{10,14-16}. It is well known that all parts of the plants are rich in active compounds, leaves are

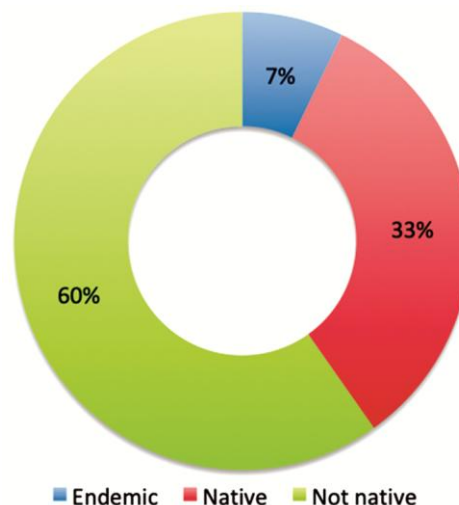


Fig. 4 — Endemicity of the reported medicinal plants used by the Talaandig tribe

commonly used by the local population in their preparations, which could be explained by the conventional and empirically transmitted whole of the information gained by the population of the community from generation to the next. In addition, the leaves are very abundant and easy to harvest, making them the most popular plant part in the preparation of herbal medicine worldwide²⁸⁻³³. The leaves are involved in the synthesis of metabolites, in particular, phytoconstituent secondary metabolites such as alkaloids and flavonoids³⁴. These secondary metabolites such as alkaloids, saponins and phenolic compounds have exhibited numerous types of biological activity, such as antimicrobial, anti-inflammatory, antioxidant, and antifungal activities, that could be responsible for the pharmacological effects experienced by the Talaandig people in Portulin, Pangantucan, Bukidnon.

The Talaandig people use different ways of preparation to combat various types of ailments. The

most common were decoction (45%), followed by poultice (24%), infusion (11%), extraction (10%), cooking/heating (7%) and direct use (3%) of the plants in their natural state (Fig. 6). In addition, some of our respondents recorded the use of adjuvant-mixed plant species such as water, sugar, salt and coconut oil to enhance their taste and/or potentiate their effects. It is clear that, given the ease of preparation and administration by users, decoction, poultice and water infusion are the most commonly used methods, as was similarly seen in other studies^{15,17,18}.

The routes of administration of the ethnomedicinal plants used by the Talaandig tribe are also documented (Fig. 7). The most common mode of administration was the internal route (drinking & eating) whereas the external mode of administration was the least used mode of administration. Majority of medicinal preparations were taken internally (65%) and the rest externally (35%). This result is in congruence with other ethnobotanical surveys conducted in Ayta communities in Dinalupihan, Bataan¹⁸ and Subanens of Dumingag, Zamboanga del Sur⁵. Both previous studies noted that the most common route in the administration of medicinal plants was internal decoction intake, which includes boiling plant materials for a certain period of time to soften the sections of the plant and extract its active compounds.

The documented medicinal plant species were used to treat numerous human diseases and illnesses, which we herein categorized into 12. Diseases of the

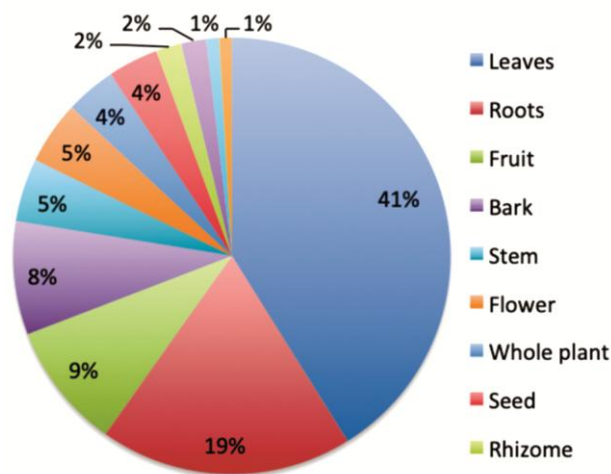


Fig. 5 — Plant part used by the Talaandig tribe

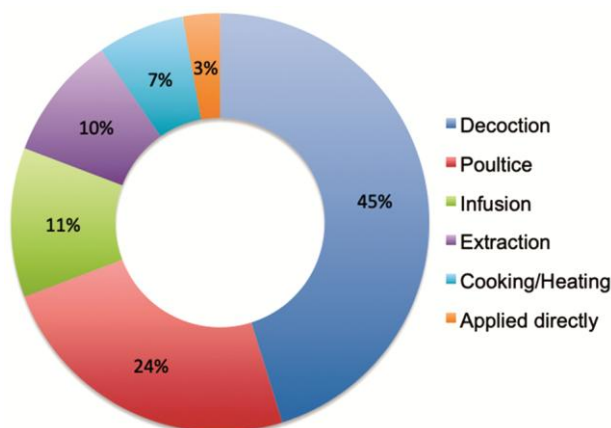


Fig. 6 — Method of preparations of medicinal plants in the study area

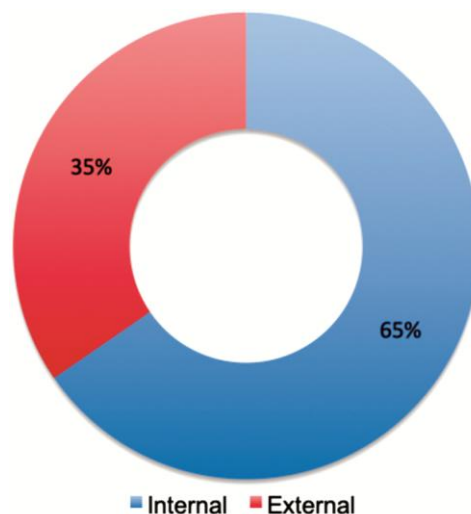


Fig. 7 — Mode of administration/application of medicinal plants in the study area

respiratory system were documented to be treated by the maximum number of plants (16%), followed by diseases of the circulatory system (13%), injury and poisons of external causes (11%), diseases of the musculoskeletal system and connective tissues and diseases of the genitourinary system (11%), diseases of the digestive system and general and unspecified diseases (10%), diseases of the skin and subcutaneous tissues (7%), diseases of the nervous system (4%), endocrine, nutritional and metabolic diseases (3%) and diseases during the postpartum period and infectious and parasitic disease (2%).

To quantify the importance of a specific plant based on how often it is cited by a specific number of people, the UV of plants was computed (Table 2). The lowest UV was estimated at 0.0526 for 47 ethnomedicinal plants with a single informant citing their medicinal use. It was found that *V. negundo* (0.7895) was the most important medicinal plant in the area followed by *P. guajava* (0.7368). The fact that these taxa are very well-known and have been commonly used by our respondents to treat many diseases and illnesses can explain the heavy use of these plant species. The least UV reported for certain plants may be due to limited understanding of the uses of these plants in healing ailments.

The effectiveness and safety use of many species identified by our respondents have been proven by previous experimental and pharmacological studies. Activities claimed by the current ethnopharmacological survey have already been verified for several plant species through phytochemical and pharmacological assays. In fact, different studies have reported that extracts from *V. negundo* (the decoction of its leaves is used by the Talaandig people in treating variety of ailments such as fever, headache and cough) exhibits numerous types of biological activity such as analgesic activity, anti-inflammatory, anti-arthritis activity, antioxidant activity, antimicrobial activity and anti-diabetic effect³⁵⁻⁴². *V. negundo* is also considered as one of the very important plants that have wide applications in traditional systems of medicine⁴² and is one of the recommended medicinal plants by the Department of Health (DOH) in its traditional health maintenance program⁴³.

In our research area, the use of *P. guajava* was especially reported for diarrhea. Through previous study carried out in Bataan Island, Philippines¹⁷, similar findings have been recorded. Moreover, the population of Ayta communities in Bataan,

Philippines²⁵, uses the decoction of *P. guajava* not just for diarrhea but also for stomach ache, dizziness, toothache, cleaning of the uterus after pregnancy, phlegm, colds, indigestion, oral sores and wounds. Aside from being one of the recommended species of medicinal plants in its traditional maintenance by the DOH in the Philippines, many pharmacological studies have proved that *P. guajava* exhibits several biological activities such as antihypertensive, antidiarrheal, antimicrobial, anti-diabetic, antioxidant, antibacterial, analgesic, anti-inflammatory, anti-ulcer, anti-tumor, wound healing, antiplaque and anticancer¹².

A similar research, but from a different study area, reported 66 ethnomedicinal plant species represented by 38 families in Lilingayon, Valencia City, Bukidnon¹⁷. This indicates an increase in the usage by the community of 26 ethnomedicinal plant species. It also means that even though they are of the same tribe, variability in the usage of ethnomedicinal plants within the tribe can be observed. This may be due to the accessibility and visibility of plants in the cultural environment, thus increasing the accessibility of useful plants. The further the species grows from home, the less often it is used, but if the plants are more attractive than they are known, the species is grown closer to home instead of making long trips now and then, domesticating these plants is thus worthwhile²⁰. Therefore, this study accepted that plant accessibility and visibility in the cultural environment seem to be important factors in shaping strategies within the Talaandig tribe for obtaining useful plants. Talaandig people usually know less about plants that grow far from their homes and more about nearby species. The same concept applies to usage: Talaandig people typically select plants for ethnomedicinal use in the immediate vicinity of their place of residence for ethnomedicinal use, which is consistent with previous studies^{20,44}. This explains the reason for the increase in the number of ethnomedicinal plant species used at Portulin, Pangantucan, Bukidnon by the Talaandig tribe.

Conclusions

Overall, this ethnomedicinal study showed that to treat a wide range of human ailments, the Talaandig people rely heavily on a variety of traditional medicinal plants and are aware of the identities and applications of these medicinal plants. For medicinal purposes, a total of 97 plant species spanning 86 genera and 46 families have been documented. The

majority of medicinal plant species have been cultivated for their leaves, so the natural vegetation of the study area is not significantly endangered.

This research also shows that the Talaandig tribe's medical ethnobotany is incompletely documented and that before it is lost forever, there is an urgent need to document traditional information. In future attempts to provide a more comprehensive synthesis of Talaandig ethnomedicine and to maintain their traditional knowledge, which is slowly fading away due to modernization and the influence of non-tribal people, the data presented here, though incomplete, may be helpful. This ethnobotanical information documentation offers a list of the Talaandig people's useful plants and will serve as a physical record of their culture for the education of the future generation of tribes. It will also help the tribe accept its culture by understanding and offering a scientific foundation for its traditional knowledge of medicinal plants.

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Conflict of interest

There is no conflict of interest between the authors.

Authors contribution

MAKN and GJDA designed the work; MAKN and SDAB collected the field data; MAKN wrote the manuscript in consultation with GJDA; MAKN and SDAB identified the species and provide accession number and help in data analysis; and GJDA helped in the manuscript correction.

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