

# Ethnomedicinal Plants in Bayabas, Sablan, Benguet Province, Luzon, Philippines

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## Abstract

The traditional knowledge on medicinal plants is inherent in indigenous communities and important in the development of drugs and plant-based medicine as it lays down the foundation of drug discovery. Ethnobotanical survey using interviews and focused group discussions in the local community of Sablan, Benguet province revealed that there are 75 plants that belong to 68 genera and 43 families to have medicinal value. The leaves are predominantly used for the treatment of the various ailments. Decoction is the major mode of preparation for the cure of cough, kidney ailments, and stomach disorders such as diarrhea, ulcers and related ailments. In Benguet province, documentation of the claimed medicinal plants by local communities will not only provide a baseline data but also unlock opportunities for the discovery and development of new and less expensive plant-based medicines.

**Keywords:** Bayabas; Sablan; Ethnobotany; *Ibaloi* Tribe; Plant-Based Medicine; Traditional Knowledge.

## 1. Introduction

In many parts of the world, traditional uses of plants by local communities for the treatment of various ailments are valuable in the development of present-day medicines. In fact, most plant-based medicines that were developed by pharmaceutical companies have their beginnings in ethno-medicine [1-5]. In Africa, medicinal and aromatic plants are reservoirs of curative elements in the treatment of various diseases such as malaria, diabetes and many more [6-10]. In the Philippines, there is rich ethnomedicinal knowledge among local communities however; this knowledge is only transferred to the next generation through verbal means and personal experience. Earlier documentation of this knowledge that has been published has been focused on selected indigenous tribes [11-15]. Recently, however, piecemeal documentation of ethnomedicinal knowledge of some additional indigenous groups has been conducted [16-20].

Lately, the value of traditional knowledge on medicinal plants is recognized worldwide such that at present, finding solutions to emerging diseases and

health problems had led to a plethora of published related materials [21-25]. India, a country that is very rich in traditional knowledge on plants has published numerous related studies [26-29]. In recent years, the Philippine government through the Department of Science and Technology and related agencies are taking a lead in initiating researches on drug discovery from the plants that are being used by local communities. Academic and research institutions are currently being funded by the Philippine government for drug discovery researches.

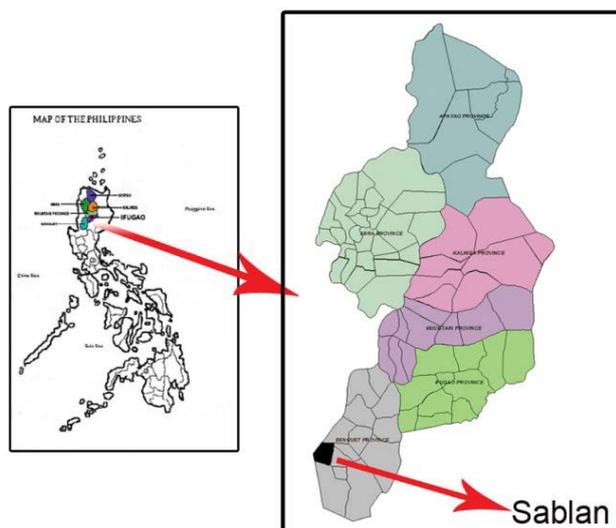
Conversely, with the emerging diseases and the need for more affordable medicine, documentation of the claimed medicinal plants by local communities is very important because it will unlock opportunities for the discovery and development of new and less expensive plant-based medicines. In Benguet province and the Cordillera region, Luzon, Philippines, the traditional knowledge on plant use is usually trapped in the older generation hence there is danger that the ethnobotanical knowledge will be irretrievably lost if not immediately documented. Cognizant of this problem, this study aimed to establish and document the medicinal plants and the traditional knowledge that is associated with the plants such as plant part used, manner of preparation, ailments cured and the like among local residents of Bayabas, Sablan, Benguet. Bayabas, Sablan is one of six municipalities in the province of Benguet and is predominantly inhabited by the *Ibaloi*, one of the indigenous groups in the Cordillera Administrative Region (CAR), Luzon Island, Philippines. With the scarcity of literature about traditional knowledge on plant use specifically in the CAR, the result of this study will be a great contribution most especially in future researches on plant drug discovery.

## 2. Methodology

### 2.1 The study area

Bayabas is one of eight barangays in Sablan, a municipality of Benguet Province. Sablan is a 5th class municipality with a population of 9,652 people in 1,873 households based on the 2000 census. Sablan covers an estimated area of 91.68 sq.km or roughly 9,168 hectares, which roughly represents 3.45 percent of the land area of Benguet province. There

are two public elementary schools in Bayabas; Talete Elementary School and Bayabas Central Elementary School. Bayabas, Geographically, Sablan is located at 16°27'640" latitude and 120°29'908" longitude (Figure 1). It has a predominantly dipterocarp type of forest and the biodiversity of flora and fauna are relatively intact.



**Figure 1.** Location map of the study area.

Sablan is predominantly peopled by the *Ibalois*, one of the tribes or indigenous groups in the Cordillera Administrative Region, Luzon, Philippines. The major source of income comes from farming although most of the younger generation has sought employment outside of the barangay. Generally, the *Ibalois*, just like other tribes in the Philippines, are closely entwined with their surrounding environment from where they obtain their basic needs like food, medicine, sources of building materials for their houses and furniture, and many other needs. Because they are always closely in contact with the natural environment, specifically the adjoin dipterocarp forests, they hold a traditional knowledge on plant uses including medicinal plants. To date, no documentation has been prepared of the ethnomedicinal knowledge of the *Ibalois* in Bayabas, Sablan. Consequently, it is imperative that efforts to document this knowledge should be done before it will be irretrievably lost. This study focused on the ethnobotanical survey of medicinal plants in the study area and rests on the belief that the traditional knowledge on plants can only be recognized if documented and shared.

### 2.1 Ethnobotanical survey

Prior to the conduct of the study, a prior informed consent was sought from the local community of Bayabas, Sablan, Benguet Province. Ethnomedicinal knowledge was gathered through interviews and focused group discussions with the local residents

using a semi-structured questionnaire as guide. Most of the conversations were performed in *Ilocano* or sometimes in the local dialect. Specifically, face to face interviews and focused group discussions, mostly with key informants. The choice of the key informants was based on recommendations from the local government officials which include mostly the older generation and the members of the households. The ages of the informants ranged from 13 to 89 years old and have been a resident in the barangay from one to 89 years (Table 1). The interviews were focused on the medicinal plants that are being used by the local community. The ethnobotanical survey was conducted for one year. A list of plants that were identified by the local residents as medicinal are presented and summarized in Table 2. The data were analyzed using Statistical Package for the Social Sciences (SPSS) software. Variables used to characterize and summarize the data were; parts of the plant used, ailments cured, how the plants were used and citation frequency. The Use Value (UV) was also computed following the formula,  $UV = \sum U_i / n$  where:  $U_i$  = the number of uses mentioned by each informant for a given species,  $n$  = the total number of informants [30].

### 2.3 Collection of voucher plant specimens

Plants that were mentioned by the respondents to have medicinal value were collected. Each of the specimens were pressed between newspapers that were sandwiched between wooden pressers, dried in an oven and mounted on herbarium sheets following herbarium techniques. These specimens served as vouchers of the plants identified as medicinal plants by the respondents. Identification of the specimen were done by comparing them with the herbarium collections of the University of the Philippines Baguio Herbarium and keying them using a taxonomic key [31]. The use of phyto images and the list of plant names in the International Plant Name Index (IPNI) were very useful references for the scientific names. The preserved specimens are deposited in the University of the Philippines Baguio Herbarium.

## 3. Results

### 3.1 The profile of the respondents

In this study, documentation of the traditional knowledge in Bayabas, Sablan was participated in by 80 respondents or informants. Most of the respondents are farmers. As farmers, the ethnobotanical knowledge that they keep is a response to their local needs and had been tested for generations. Similarly, the advantage of farmer's knowledge is that it is driven by local needs and is based on socio-cultural norms [32]. Based on the survey, it was observed that the older generation is

**Table 1.** Demographic profile of the respondents in Bayabas, Sablan, Benguet Province.

Respondent	Age	Sex	Years of stay in Bayabas	Civil status	Respondent	Age	Sex	Years of stay in Bayabas	Civil status
1	87	Male	87	Married	41	49	Male	49	Single
2	68	Female	68	Married	42	89	Male	89	Married
3	55	Female	29	Married	43	83	Female	83	Married
4	40	Female	22	Married	44	16	Male	16	Single
5	48	Female	5	Married	45	20	Male	20	Single
6	41	Female	1	Married	46	45	Male	45	Single
7	16	Male	16	Single	47	33	Male	33	Single
8	16	Male	16	Single	48	64	Male	45	Married
9	16	Male	16	Single	49	55	Female	55	Married
10	61	Male	3	Married	50	84	Male	84	Married
11	32	Female	9	Married	51	62	Female	62	Married
12	15	Female	15	Single	52	77	Female	77	Married
13	54	Female	54	Married	53	61	Male	61	Married
14	75	Male	75	Married	54	20	Female	20	Single
15	62	Female	62	Married	55	31	Female	31	Married
16	50	Female	50	Married	56	64	Female	64	Married
17	23	Female	23	Single	57	72	Male	72	Married
18	51	Female	51	Married	58	30	Female	10	Married
19	67	Male	67	Married	59	63	Male	63	Married
20	25	Male	25	Single	60	29	Male	29	Married
21	64	Female	64	Married	61	39	Male	39	Married
22	45	Male	45	Married	62	37	Female	37	Married
23	76	Female	76	Married	63	47	Male	47	Married
24	80	Male	80	Married	64	51	Female	51	Married
25	24	Male	24	Married	65	46	Female	46	Married
26	32	Male	23	Married	66	50	Male	50	Married
27	59	Female	59	Married	67	24	Female	24	Married
28	28	Male	28	Married	68	51	Male	51	Married
29	56	Male	56	Married	69	64	Male	64	Married
30	25	Female	25	Married	70	47	Male	47	Single
31	21	Female	21	Married	71	48	Male	48	Married
32	29	Male	29	Married	72	61	Male	61	Married
33	44	Female	44	Married	73	53	Male	53	Married
34	40	Female	40	Married	74	72	Male	72	Married
35	18	Male	18	Single	75	24	Male	24	Single
36	45	Male	45	Married	76	24	Female	24	Single
37	32	Female	32	Married	77	13	Female	13	Single
38	23	Male	23	Single	78	34	Female	34	Married
39	30	Male	30	Married	79	28	Female	28	Married
40	28	Female	28	Single	80	69	Female	69	Married
<b>Total Respondents</b>					<b>80</b>				

more knowledgeable about the traditional medicinal plants.

### 3.2 Ethnobotanical survey

Ethnobotanical survey showed that there are 75 species of plants that belong to 68 genera and 43 families that are used by the local community in Bayabas, for the treatment of various ailments. The ailments include cough, kidney problems, stomach ache, headache, boils, rheumatism, skin allergy, diarrhea, arthritis to mention a few. The medicinal

plants were either cultivated (60.91%) or collected from the wild (30.09%) or nearby forests (Figure 2).

Tables 2 lists a summary of the medicinal plants that are used to treat various ailments, local names, cultivated or taken from the wild, plant parts used, mode of preparation and claimed medicinal use.

As to citation or frequency, the top ten medicinal plants that are commonly used to treat various ailments include *bayabas* (*Psidium guajava*, 9.24%), lemon grass or *tanglad* (*Cymbopogon citratus*, 7.42%),

lagundi (*Vitex negundo*, 6.97%), oregano (*Origanum vulgare*, 5.15%), guyabano (*Annona muricata*, 4.55%), banaba (*Lagerstroemia speciosa*, 4.55%), marunggay (*Moringa oleifera*, 3.18%), laya (*Zingiber officinale*, 3.18%), bain-bain (*Mimosa pudica*, 3.03%), and kupkupit (*Centella asiatica*, 3.03%), in descending order. (Figure 3, Table 2).

Some of the ailments and diseases that are usually treated by the plants are cough, stomachache, kidney ailments specifically urinary tract infection, stomach ulcer, diarrhea, skin diseases such as boils, toothache, skin allergy, fresh wounds, diabetes, dysmenorrhea, fever, mouth sore, sore throat, headaches, skin diseases and rashes, hypertension, wounds, boils, athlete's foot, arthritis and others. Cough, stomach ache, and urinary tract infection in successive order, rank the first three ailments that are treated with the medicinal plants (Figure 4).

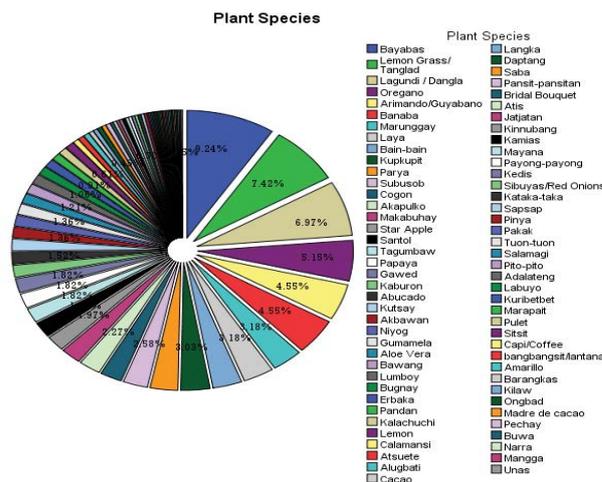
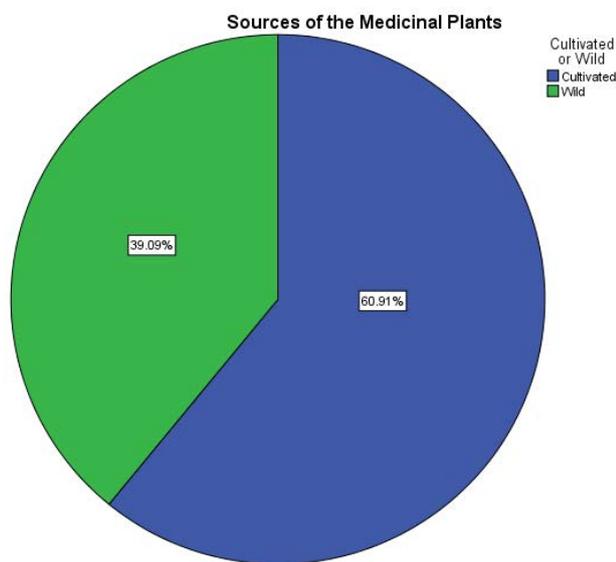


Figure 2. Sources of medicinal plants in Bayabas, Sablan.

Figure 3. Medicinal plants used by the local community of Bayabas, Sablan, Benguet Province and their citation frequency.

Table 2. List of medicinal plants used by the local community of Bayabas, Sablan, Benguet Province.

Scientific Name/ Family	Local Name	C/W*	Plant part used	Mode of preparation	Ailment/Disease cured	Citation frequency	UV*
<i>Allium cepa</i> L. (Alliaceae)	Sibuyas/Red Onions	C	Rhizme/blk	Crushed and applied onto affected area	Chicken pox, skin rashes	2	1
<i>Allium odoratum</i> L. (Alliaceae)	Kutsay	C	Lvs, Whle Plnt	Crushed and applied as poultice, infusion	Fresh wound, swelling, bruise & sprain	10	0.4
<i>Allium sativum</i> L. (Alliaceae)	Bawang	C	Rhizme/bulb, Lvs	Freshly eaten or chewed, crushed and applied	Snake bites, toothache, hypertension	8	0.38
<i>Aloe vera</i> L. (Aloaceae)	Aloe vera	C	Lvs	Sap applied onto the scalp	Balding or loss of hair	8	0.13
<i>Ananas comosus</i> (L.) Merr. (Bromeliaceae)	Pinya	C	Frt	Freshly eaten / Chewed	Hypertension, ringworm	2	1
<i>Annona muricata</i> L. (Annonaceae)	Arimando/ Guyabano	C	Lvs	Decoction, freshly eaten	Anti-cancer, diabetes, diarrhea, cough, arthritis	30	0.17
<i>Annona squamosa</i> L. (Annonaceae)	Atis	C	Lvs	Ashed, decoction	Fresh wound, cleansing drink	2	1
<i>Antidesma bunius</i> (L.) Spreng. (Euphorbiaceae)	Bugnay	W	Lvs	Decoction	Cough, kidney problem, colds, UTI, diabetes	7	0.71
<i>Areca catechu</i> Linn. (Arecaceae)	Buwa	C	Frt	Chewed	Toothache, strengthen teeth	1	2

<b>Artemisia vulgaris</b> L.(Asteraceae)	Erbaka	W	Lvs	Decoction	Dysmenorrhea, stomach ache	7	0.14
<b>Artocarpus communis</b> J.R et G. Forster (Moraceae)	Pakak	C	Lvs, Rts	Decoction	Dysmenorrhea, enhances energy	1	2
<b>Artocarpus integrifolia</b> L. (Moraceae)	Langka	C	Lvs	Decoction, crushed	Hypertension, boils	3	0.67
<b>Averrhoa bilimbi</b> L.(Oxalidaceae)	Kamias	C	Fr	Applied as poultice	Mumps	2	0.5
<b>Basella rubra</b> L.(Basellaceae)	Alugbati	W	Lvs	Applied as poultice	Boils	4	0.25
<b>Bidens pilosa</b> L.(Asteraceae)	Ongbad	W	Lvs	Decoction	Stomach ache	1	1
<b>Bixa orellana</b> L.(Bixaceae)	Atsuete	C	Lvs	Decoction, crushed, ashed	Relieves pain on burns	4	0.25
<b>Blumea balsamifera</b> L. DC (Asteraceae)	Subusob	W	Lvs	Decoction, boiled for steam inhalation	Diabetes, cough, stomach ache, asthma	17	0.24
<b>Brassica chinensis</b> L. (Brassicaceae)	Pechay	C	Whle Plnt	Cooked and eaten	Diarrhea	1	1
<b>Capsicum frutescens</b> L. (Solanaceae)	Labuyo	C	Fr	Crushed and applied on affected area	Rheumatism	1	1
<b>Carica papaya</b> L. (Caricaceae)	Papaya	C	Fr, Lvs, Sp	Freshly eaten, crushed and extract can be applied onto affected area,	Indigestion, dog bites, Constipation, tonsillitis, fresh wound, snake bites	12	0.5
<b>Catharanthus roseus</b> (L.) G.Don (Apocynaceae)	Kalachuchi	C	Lvs	Crushed, steam inhalation or spray, decoction	Skin allergy, skin rashes, asthma	6	0.67
<b>Centella asiatica</b> (L.) Urb. (Apiaceae)	Kupkupit	W	Lvs	Decoction, crushed and applied as poultice	Cough, UTI, memory enhancer, fresh wound	20	0.2
<b>Chromolaena odorata</b> (L.) R.M.King & H.Rob. (Asteraceae)	Kedis	W	Lvs	Crushed and applied on affected area	Fresh wound	2	0.5
<b>Chrysophyllum cainito</b> L. (Sapotaceae)	Star apple		Lvs	Decoction	Diarrhea, stomach ache	13	0.15
<b>Citrus grandis</b> Hassk. (Rutaceae)	Barangkas	C	Fr	Fruits are eaten raw	Hypertension	1	1
<b>Citrus limon</b> (L.) Burm.f. (Rutaceae)	Lemon	C	Lvs, Fr	Decoction, juice drink	Stomach ache, cough	6	0.17
<b>Citrus microcarpa</b> Bunge (Rutaceae)	Calamansi	C	Fr, Lvs	Juice drink, decoction	Sore throat, high fever	4	0.5
<b>Cocos nucifera</b> L. (Arecaceae)	Niyog	C	Fr, Lvs, Ccnt shll	Juice drink, decoction, ashed	Kidney problem, cleansing, Diarrhea, skin itchiness, UTI	9	0.56
<b>Coffea robusta</b> L.Linden (Rubiaceae)	Capi/Coffee	C	Fr	Decoction	Enhances energy	1	1
<b>Coleus blumei</b> Benth. (Lamiaceae)	Mayana	C	Lvs	Crushed, poultice	Fresh wound	2	0.5
<b>Cymbopogon citratus</b> (DC.) Stapf. (Poaceae)	Lemon Grass/ Tanglad	W	Lvs, Whle Plnt	Decoction, ashed	Hypertension, cleansing, cough, fresh wound, diarrhea, colds stomach ache, UTI	49	0.16

<b>Desmodium sandwicense</b> E. Mey. (Fabaceae)	<i>Pulet</i>	W	Lvs	Crushed and applied	Fresh wound	1	1
<b>Drymaria cordata</b> (L.) Willd. ex J.A. Schultes (Caryophyllaceae)	<i>Sitsit</i>	W	Lvs	Crushed and applied onto affected area	Boils	1	1
<b>Elephantopus tomentosus</b> L. (Asteraceae)	<i>Kaburon</i>	W	Lvs	Crushed and applied onto affected area	Fresh wound	10	0.1
<b>Eleusine indica</b> (L.) Gaertn. (Poaceae)	<i>Jatjatan</i>	W	Lvs	Decoction	Kidney problem, arthritis	2	1
<b>Flemingia strobilifera</b> (L.) W.T.Aiton (Fabaceae)	<i>Tuon-tuon</i>	W	Lvs	Applied as poultice	Skin infection	1	1
<b>Imperata cylindrica</b> (L.) Beauv. (Poaceae)	<i>Cogon</i>	W	Rts, Lvs	Decoction	Diarrhea, UTI, kidney 15 problem, colds		0.27
<b>Ipomoea purpurea</b> (L.) Roth (Convolvulaceae)	<i>Daptang</i>	W	Lvs	Decoction	Ulcer, stomach ache, 3 arthritis		1
<b>Jatropha curcas</b> L. (Euphorbiaceae)	<i>Tagumbaw</i>	W	Brk, Lvs	Crushed and applied as poultice, Infusion	Rheumatism, removes milk deposits on baby's tongue, sprain	12	0.25
<b>Kalanchoe pinnata</b> (Lam.) Pers. (Crassulaceae)	<i>Kataka-taka</i>	W	Lvs, Rts	Applied as poultice	Headache, rheumatism	2	1
<b>Lagerstroemia speciosa</b> (L.) Pers. (Lythraceae)	<i>Banaba</i>	W	Lvs, Brk, Rts	Decoction	Stomach ache, UTI, Diarrhea, Hypertension	30	0.13
<b>Lantana camara</b> L. (Verbenaceae)	<i>Bangbangsit</i>	C	Lvs	Applied as poultice	Mumps	1	1
<b>Livistona rotundifolia</b> Mart. (Arecaceae)	<i>Payong-payong</i>	W	Lvs	Crushed and applied on affected area, decoction	Fresh wound, diarrhea	2	1
<b>Macaranga grandiflora</b> Merr. (Euphorbiaceae)	<i>Kinnubang</i>	W	Lvs	Crushed and applied onto affected area, ashed	Fresh wound, chicken pox	2	1
<b>Maesa denticulata</b> Mez. (Myrsinaceae)	<i>Kilaw</i>	W	Lvs	Crushed and applied on affected area	Fresh wound	1	1
<b>Malvaviscus penduliflorus</b> DC. (Malvaceae)	<i>Gumamela</i>	C	Flwr, Lvs	Crushed and applied as poultice onto affected area	Boils, athlete's foot	9	0.22
<b>Mangifera indica</b> L. (Anacardiaceae)	<i>Mangga</i>	C	Lvs	Decoction	High fever	1	1
<b>Mikania cordata</b> (Burm.f.) B.L. Rob. (Asteraceae)	<i>Akbawan</i>	W	Lvs	Applied as poultice, crushed and applied on area, ashed	Fresh wound	9	0.11
<b>Mimosa pudica</b> L. (Fabaceae)	<i>Bain-bain</i>	W	Rts	Decoction, crushed and applied on affected area	Stomach ache, diarrhea, mumps, UTI, arthritis, tooth ache	20	0.3
<b>Miscanthus floridulus</b> (Labill.) Warb. ex K. Schum. & Laut. (Poaceae)	<i>Sapsap</i>	W	Lvs	Freshly eaten / chewed, decoction	Diarrhea, ulcer	2	1

<b>Momordica charantia</b> L. (Cucurbitaceae)	<i>Parya</i>	C	Lvs, Frt	Crushed, decoction, cooked and eaten, juiced	Athlete's foot, fresh wound, anemia, diabetes	19	0.21
<b>Moringa oleifera</b> Lam. (Moringaceae)	<i>Marunggay</i>	C	Lvs	Decoction, juice drink, Cooked and eaten	High fever, anemia, Diabetes	21	0.14
<b>Musa paradisiaca</b> L. (Musaceae)	<i>Saba</i>	C	Lvs	Crushed and applied, Decoction, freshly eaten	Skin allergy, urinary tract infection, diarrhea	3	1.33
<b>Origanum vulgare</b> L. (Lamiaceae)	<i>Oregano</i>	C	Whle Plnt, Lvs	Decoction, applied as poultice, crushed	Ulcer, cough, fresh wound, sore throat	34	0.12
<b>Pandanus amaryllifolius</b> Roxb. (Pandaneaceae)	<i>Pandan</i>	C	Lvs	Decoction	Stomach ache, cleansing drink, UTI	6	0.5
<b>Peperomia pellucida</b> (L.) Kunth (Piperaceae)	<i>Pansit-pansitan</i>	W	Whle Plnt	Decoction	Kidney problem	3	0.33
<b>Persea americana</b> Gaertn. (Lauraceae)	<i>Abucado</i>	C	Lvs, Brk	Decoction	Stomach ache, hypertension, colds, diarrhea, UTI, cleansing	10	0.6
<b>Piper betle</b> L. (Piperaceae)	<i>Gawed</i>	W	Lvs	Applied as poultice	Cough, fresh wound	12	0.17
<b>Psidium guajava</b> L. (Myrtaceae)	<i>Bayabas</i>	C	Lvs	Decoction, ,ashed, freshly eaten / chewed, Applied as poultice, steam bath	Diarrhea, cough, skin allergy, fever, athlete's foot, wound, scabies, asthma, tooth ache	61	0.15
<b>Pterocarpus indicus</b> Herb.Madr. ex Wall. (Fabaceae)	<i>Narra</i>	C	Brk	Used as wash or gurgle	Mouth ulcer	1	1
<b>Saccharum officinarum</b> L. (Poaceae)	<i>Unas</i>	W	Lvs	Crushed and applied	Mouth ulcer	1	1
<b>Sambucus javanica</b> Reinw. ex Blume (Caprifoliaceae)	<i>Bridal bouquet</i>	W	Lvs	Decoction, crushed and applied onto affected area	Diabetes, wash for fresh wound	2	1
<b>Sandoricum koetjape</b> Merr. (Meliaceae)	<i>Santol</i>	C	Lvs	Decoction	Cough, ulcer, stomach ache, diarrhea, high fever	13	0.38
<b>Senna alata</b> L. (Fabaceae)	<i>Akapulko</i>	W	Lvs	Crushed, decoction	Skin allergy, acne	15	0.13
<b>Senna spectabilis</b> (DC.) Irwin& Barneby (Fabaceae)	<i>Madre de cacao</i>	W	Lvs	Applied as poultice	Fresh wound	1	1
<b>Syzygium cumini</b> (L.) Skeels (Myrtaceae)	<i>Lumboy</i>	C	Brk, Lvs	Decoction	Urinary tract infection, Diarrhea, colds	8	0.38
<b>Tabernaemontana cumingiana</b> A.DC. (Apocynaceae)	<i>Kuribetbet</i>	W	Lvs	Freshly eaten / chewed	Diarrhea	1	1
<b>Tagetes erecta</b> L. (Asteraceae)	<i>Amarillo</i>	C	Lvs	Applied as poultice	Boils	1	1
<b>Tamarindus indica</b> L. (Fabaceae)	<i>Salamagi</i>	C	Lvs	Ashed	Fresh wound	1	1
<b>Theobroma cacao</b> L.(Sterculiaceae)	<i>Cacao</i>	C	Lvs	Decoction, poultice	Cough, eczema	3	0.67

<b>Tinospora rumphii</b> Boerl. (Menispermaceae)	Makabuhay	W	Brk, Sp, Stm, Lvs	Decoction, ashed, applied directly onto affected area	Scabies, athlete's foot, dysmenorrhea, diarrhea	14	0.29
<b>Tithonia diversifolia</b> (Hemsl.) Gray (Asteraceae)	Marapait	W	Lvs	Crushed	Fresh wound	1	1
<b>Urtica meyeniana</b> Walp. (Urticaceae)	Adalateng	W	Flwr	Crushed and applied onto affected area, poultice	Boils	1	1
<b>Vitex negundo</b> L. (Verbenaceae)	Lagundi / Dangla	W	Lvs	Decoction, boiled for steam inhalation, ashed	Cough, high fever, stomach ache, asthma, skin allergy	46	0.11
<b>Zingiber officinale</b> Roscoe (Zingiberaceae)	Laya	C	Rhizme/blb	Decoction, freshly eaten / chewed	Sore throat, cough	21	0.10
<b>A mixture of seven leaves (santol, guyabano, etc)</b> (Different families)	Pito-pito	C	Lvs	Decoction	A mixture of seven leaves from different plants has higher efficacy as energy booster	1	1

Lvs-leaves; Stm-stem; Brk-bark;Flwr-flowers; Rhzme/blb-rhizome/bulb; Frt-fruit; C-cultivated; W-wild; \*Use Value

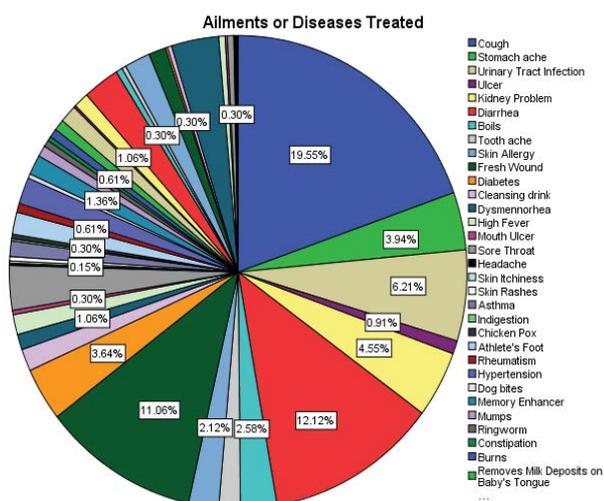


Figure 4. The different ailments that are treated using medicinal plants in Bayabas, Sablan.

The leaves are the most used part of the enumerated medicinal plants with a citation frequency of 78.64%. Almost all parts of the medicinal plants such as roots, bark, stem, fruit, sap, rhizomes or bults are useful in the preparation for treating various ailments. Even the shell of coconut is used (Figure 5). How the medicinal plants are prepared for use also vary but the usual mode of preparation is decoction with a citation frequency of almost 60% (Figure 6). Other modes of preparation include using the plants as poultice, as a wash for disinfecting wounds and skin diseases, crushed and applied directly onto the affected the area, ashed and others. Additionally, some plants are eaten raw or cooked depending on

the type of ailment being cured or treated. Moreover, the ingenuity of local communities is admirable because the knowledge is enhanced through time. During the interviews, it was mentioned that a mixture of leaves, called *pito-pito* (*pito* is a local word which means seven) from seven different plants has a higher efficacy (Table 2).

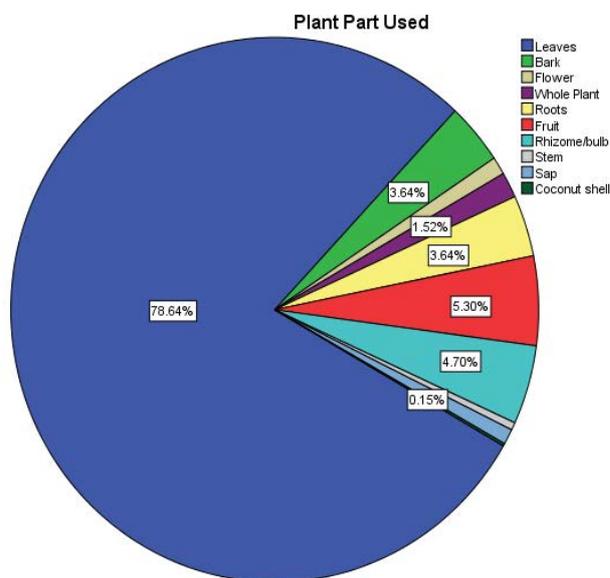
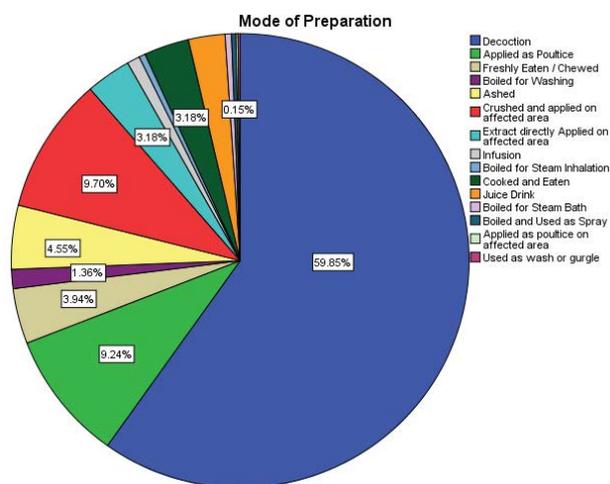


Figure 5. The different plant parts used by the local community in Bayabas, Sablan to treat various ailments.

In Table 2, the Use-Value (UV) was also computed and the three plants with highest UV are as follows: *Buwa* -2, *Pakak* -2, and *Saba* -1.33. The technique of

Use-Value may indicate the distribution of how local communities use a particular species. This technique requires interviewing the respondents separately to ensure that the responses are not influenced by each other.



**Figure 6.** The modes of preparation of the medicinal plants used by the local community in Bayabas, Sablan to treat various ailments.

#### 4. Discussion

The traditional knowledge on plant use is an important part of human existence. Plants are used in various ways from food, shelter, clothing, medicine and the like. Historically, traditional medicinal plants have been used and the efficacy of their uses to treat various ailments has been tested through time. Unfortunately, the traditional knowledge has been kept only within local communities because it has been transferred from generations only through oral communication. Presently, it has been observed that the younger generations no longer maintain the traditional knowledge because most of them leave the community thus this knowledge is particularly trapped within the older generations.

For many decades, man depended on the forest plants for their daily sustenance, such as food and other needs. Local communities in many countries have a lot to share to the world as far as traditional uses of plants are concerned. Cognizant to this, in recent decades, documentation and evaluation of the traditional knowledge of medicinal plants have been done in order to contribute to improved health care services especially in marginalized areas. In Mexico, a study evaluated the uses of the medicinal plants in four indigenous groups of Mexican Indians—Maya, Nahua, Zapotec and Mixe [33]. The relative importance of a medicinal plant within a culture is documented using a quantitative method and the data are compared intra- and inter-culturally [34]. Similarly, in other countries like India, Indonesia,

Thailand, Malaysia, and others, different cultures demonstrate different traditional knowledge and uses of plants as mentioned earlier.

In the Philippines, uses of plants also differ across cultures and tribes, although similarities on the uses exist. For example, *Psidium guajava* seems to be one of the most common and versatile plant that is used in disinfecting wounds. Among the negritos, a study conducted showed that *Psidium guajava* recorded the highest cited medicinal plant, followed by *Blumea balsamifera* and *Cocos nucifera* [35]. Earlier studies also showed that *Psidium guajava* is one of the plants that are traditionally used by various tribes or groups [36-37]. Recently, *Miscanthus sinensis*, a versatile plant which have many uses, was studied to have also medicinal value [38].

Likewise, among the *Ibaloi* tribe which is the focus of this study, many plants have been mentioned wherein the uses as medicine or as treatment for a particular ailment is also shared with other cultures. To mention some examples; *gawed* or *lawed* (*Piper betle*) is used by almost all tribes in the Cordillera as treatment for cough, aside from its use as an ingredient for betel nut chewing. Among betel nut chewers, *gawed* is also claimed to make teeth stronger. *Banaba* (*Lagerstroemia speciosa*) has been known traditionally as cure for many ailments such as kidney problems, stomach ache, urinary tract infection, diarrhea, hypertension and a decoction can also be a good wash for wounds [39]. Other lesser known plants, with low citation frequencies, are those that are still being tested for their efficacy.

The plant part that is commonly used is the leaves primarily because these are readily available, easily gathered and prepared. Gathering the leaves do not necessarily destroy the plants, hence can still continually provide an endless source of medicine. For the different plant parts such as bark, fruit, stem and others, the local communities, with their continued use of the plants around them, have discovered that these parts have active component. As for the mode of preparation, decoction dominates the other methods of preparation because this is the easiest way to prepare especially to cure internal ailments.

Generally, a lot of traditional uses of plants can be mined from local communities. Most of the knowledge has not really been explored because these are trapped among older generation and are only transferred through verbal means. The wisdom of the wise can only be shared and be made known to the world by documenting them and publishing this knowledge.

## 5. Conclusion and Recommendation

The continuous emergence of diseases, the emergence of drug-resistant organisms and the increasing prices of medicines call for the discovery of new and less-expensive plant-based medicines. As an initial effort, documentation of the traditional knowledge of the *Ibaloi* of Bayabas, Sablan on medicinal plants is important. Additionally, local communities share the knowledge across cultures although there are unique ways of using the medicinal plants. With the increasing cost of synthetic drugs and their known side effects, more and more people are going back to herbal medicine as their last resort. Hence, more detailed studies, i.e. determination and identification of the bioactive components should be encouraged and financially supported.

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## Reference

- [1] Zolla C. (1980). Traditional medicine in Latin America, with particular reference to Mexico. *J Ethnopharmacol.* **2**: 37-51.
- [2] Ayoola GA, HAB C, Adesegun SA, et al. (2008). Phytochemical screening and antioxidant activities of some selected medicinal plants used for malaria therapy in southwestern Nigeria. *Trop. J. Pharmaceutical Res* **7**: 1019-1024.
- [3] Arunkumar S, Muthuselvam M. (2009). Analysis of phytochemical constituents and antimicrobial activities of Aloe vera L. against clinical pathogens. *Wild J Agri Sci.* **5**: 572-576.
- [4] Ghatapanadi SR, Johnson, N, Rajasab AH. (2011). Documentation of folk knowledge on medicinal plants of Gulbarga district, Karnataka, Indian. *J Tradit Knowle.* **10**: 349-353.
- [5] Khan MA, Ajab M, Khan G, Mujtaba, Hussain M. (2012). Ethnobotanical study about medicinal plants of poonch valley Azad Kashmir. *Journal of Animal & Plant Sciences.* **22**: 490-500.
- [6] Erasto LP, Adebola PO, Grierson DS, Afolayan AJ. (2005). An ethnobotanical study of plants used for the treatment of diabetes in the Eastern Cape Province, South Africa. *African J of Biotechnology.* **4**: 1458-1460.
- [7] J Afolayan A, O Sunmonu T (2010) In vivo Studies on Antidiabetic Plants Used in South African Herbal Medicine. *J Clin Biochem Nutr* **47**: 98-106.
- [8] Idowu OA, OT Soniran, O Ajana, DO Aworinde. (2010). Ethnobotanical survey of antimalarial plants used in Ogun State, Southwest Nigeria. *A Journ Pharmacy and Pharm.* **4**: 055-060.
- [9] Coopoosamy R M, Naidoo KK. (2012). An ethnobotanical study of medicinal plants used by traditional healers in Durban, South Africa. *A Journ Pharmacy and Pharm.* **6**: 818-823.
- [10] Cheikhoussef A, Shapi M, Matengu K, Ashekele HM. (2011). Ethnobotanical study of indigenous knowledge on medicinal plant use by traditional healers in Oshikoto region, Namibia. *J Ethnobiol Ethnomed* **7**: 10.
- [11] Conklin HC, Ifugao ethnobotany. (1967). The 1911 Beyer-Merrill report in perspective. *Econ Bot.* **21**: 243-272.
- [12] Fox RB. (1952). The Pinatubo negrito: their useful plants and material culture. *Philippine J Sci.* **81**:173-391.
- [13] Yen DH, Guttierrez HG. (1974). The ethnobotany of the Tasaday: the useful plants. *Philippine J Sci.* **103**: 97-140.
- [14] Quisumbing E. (1978). Medicinal Plants of the Philippines, (Katha Publishing Co, Philippines) 1262.
- [15] Rocero M Sr. (1982). Ethnobotany of the Itawes of Cagayan province, Philippines, Anthropological Papers No 14, National Museum, Manila, Philippines 146.
- [16] Balangcod TD. (2001). The useful flora of Tabaan Norte, Tuba, Benguet Province, in: Towards Understanding Peoples of the Cordillera: A Review of Research on History, Governance, Resources, Institutions and Living Traditions, (Cordillera Studies Center, UP Baguio). **3**: 82-83.
- [17] Shanavaskhan AE, Sivadasan M, Alfarhan Ahmed H, Thomas J. (2012). Ethnomedicinal aspects of angiospermic epiphytes and parasites of Kerala, India. *Indian J Tradit Knowle.* **11**: 250-258.
- [18] Balangcod, TD, Balangcod AKD. (2011). Ethnomedicinal knowledge of plants and healthcare practices among the Kalanguya tribe in Tinoc, Ifugao, Luzon, Philippines. *Indian J Tradit Knowle.* **10**: 227-238.
- [19] Penecilla GL, Magno CP. (2011). Antibacterial activity of extracts of twelve common medicinal plants from the Philippines. *J Med Plnts Res* **5**: 3975-3981.

- [20] Olowa LF, Torres MAJ, Aranico EC, Demayo CG. (2012). Medicinal plants used by the Higaonon tribe of Rogongon, Iligan City, Mindanao, Philippines. *Advances in Environ Biology*. **6**: 1442-1449.
- [21] Dyubeni L, Buwa LV. (2012). An ethnobotanical study of plants used for the treatment of ear, nose and throat (ENT) infections in Nkonkobe Municipality. *S Africa J Med Pl Res*. **6**: 2721-2726.
- [22] Hashim H, Kamali, EL, Lamir E, Yagoub M. (2010). Antibacterial activity and phytochemical screening of ethanolic extracts obtained from selected Sudanese medicinal plants. *Curr Res J Biol Sci*. **2**:143-146.
- [23] Hena JS, Adamu AK, Iortsuun DN, Olonitola OS. (2010). Phytochemical screening and antimicrobial effect of the aqueous and methanolic extracts of roots of *Balanites aegyptiaca* (Del.) on some bacteria species. *Sci Wrld J*. **5**: 59-62.
- [24] Zolla C. (1980). Traditional medicine in Latin America, with particular reference to Mexico. *J Ethnopharmacol*. **2**: 37-51.
- [25] Joshi K, Joshi R, Joshi AR. (2011). Indigenous knowledge and uses of medicinal plants in Macchegaun, Nepal. *Indian J Tradit Knowle*. **10**: 281-286.
- [26] Harsha VH, Hebbar SS, Hegde GR, Shripathi V. (2002). Ethnomedical knowledge of plants used by Kunabi tribe of Karnataka in India. *Fitoterapia*. **73**: 281-287.
- [27] Kumar S, Hamal IA. (2011). Herbal remedies used against arthritis in Kishtwar high altitude National Park. *Indian J Tradit Knowle*. **10**: 358-361.
- [28] Meena KL, Yadav BL (2011) Some ethnomedicinal plants used by the Garasia tribe of District Sirohi, Rajasthan. *Indian J Tradit Knowle* **10**:354-357.
- [29] Survase SA, Raut SA. (2011). Ethnobotanical study of some tree medicinal plants in Marathwada, Maharashtra. *J of Ecobiotechnology*. **3**: 17-21.
- [30] Albuquerque UP, Reinaldo FP, Monteiro, Florentino, ATN. (2006). Almeida, Cecilia de Fatima, Evaluating two quantitative Ethnobotanical techniques. *Ethnobotany Res & Appl*. **4**: 051-060.
- [31] Merrill ED. (1912). A Flora of Manila, (Manila Bureau of Printing). 300.
- [32] Heinrich M. (2000). Ethnobotany and its role in drug development. *Phytother Res*. **14**: 479-488.
- [33] Heinrich M, Ankli A, Frei B, Weimann C, Sticher O. (1998). Medicinal plants in Mexico: healers' consensus and cultural importance. *Soc Sci Med*. **47**: 1859-1871.
- [34] Zolla C. (1980). Traditional medicine in Latin America, with particular reference to Mexico. *J Ethnopharmacol*. **2**: 37-51.
- [35] Ong HG, Kim YD. (2014). Quantitative ethnobotanical study of the medicinal plants used by the Ati Negrito indigenous group in Guimaras Island, Philippines. *J Ethnopharmacol*. **157**: 228-242.
- [36] Egharevba H, Omoregie I, Ibrahim I, et al. (2010). Koma OS, Ibumeh OJ, Broad spectrum antimicrobial activity of *Psidium guajava* Linn. Leaf. *Nature and Science*. **8**: 43.
- [37] Dhiman A, Nanda A, Ahmad S, Narasimhan B. (2011). In vitro antimicrobial activity of methanolic leaf extract of *Psidium guajava* L. *J Pharm Bioallied Sci*. **3**: 226-229.
- [38] Balangcod TD, Balangcod AKD. (2011). Ethnomedical knowledge of plants and health care practices among Kalanguya tribe in Tinoc, Ifugao, Luzon, Philippines. *Indian J Tradit Knowle*. **10**: 227-238.
- [39] Laruan LMV, Balangcod TD, Balangcod K, et al. (2013). Phytochemical and antibacterial study of *Lagerstroemia speciosa* (L.) Pers. and its ethnomedicinal importance to indigenous communities of Benguet province, Philippines. *Indian J Tradit Knowle*. **12**:379-383.