



Research Paper

Quantitative ethnobotanical study of the medicinal plants used by the Ati Negrito indigenous group in Guimaras island, Philippines



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ABSTRACT

Ethnopharmacological relevance: This study is (1) a documentation of medicinal plant use in traditional therapies, and (2) an evaluation of the medicinal plant knowledge and practices of the Ati Negrito indigenous people in Guimaras Island, Philippines.

Materials and methods: A semi-structured interview was conducted to 65 informants in order to determine the medicinal plants and their uses in traditional therapies. The plants were collected, identified and deposited as voucher specimens. Plant importance was determined using quantitative ethnobotanical indices such as Use Value (UV), Fidelity Level (FL) and Informant Consensus Factor (ICF). Descriptive and the inferential statistics Mann–Whitney *U* and Kruskal–Wallis tests were used to measure and compare the informants' medicinal plant use knowledge and practices.

Results: This study was able to identify 142 medicinal plant taxa in 55 families used in 16 categories of diseases. Plants with the highest recorded UVs were *Psidium guajava* (2.52), *Blumea balsamifera* (2.15) and *Cocos nucifera* (2.06). A total of 24 species were found to have 100% FL values with *Senna alata*, *Hibiscus rosa-sinensis* and *Breynia vitis-idaea* recording the highest number of use-mentions (48) for treating white spot, boils, and child sleeplessness, malaise and fatigue, respectively. The highest ICF value (1.00) was cited for Category 6 (Diseases of the ear) and Category 16 (Factors that influence health status and services). Finally, significant differences in medicinal plant use knowledge were recorded when informants were grouped according to location, educational level, gender and age.

Conclusions: This documentation of medicinal plants and their uses shows the rich tradition in ethno-medicinal knowledge of the Ati Negrito indigenous people although results might also imply that knowledge is eroding. Nevertheless, this study could open an avenue for pharmacological research works, or serve as reference for future quantitative ethnobotanical investigations.

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1. Introduction

1.1. Quantitative ethnobotany in the Philippines

Over the last century ethnobotany has evolved into a scientific discipline that looks at the people–plants relationship in a multi-disciplinary manner using not only botany and anthropology, but also ecology, economics, public policy, pharmacology, public health, and other disciplines as needed (Balick and Cox, 1996).

In particular, the interest in quantitative ethnobotany has grown steadily in the last two decades. Researchers have developed and applied quantitative methods to ethnobotanical data to test different hypotheses about the relation between plant species and humans (Reyes-García et al., 2006). As a result, early authors (Prance et al., 1987; Phillips and Gentry, 1993) have developed indices that measure cultural significance and importance of

plants quantitatively. Quantitative ethnobotanical indices were utilized to measure plant uses whether as food (Pieroni, 2001), veterinary medicine (Upadhyay et al., 2011), particular human body system disease remedies (Kim and Song, 2013), or economic value of goods derived from plants (Reyes-García et al., 2006). Although varying in subject and scope, one common purpose of these quantitative ethnobotanical studies was to determine how important these plants are to ethnic and indigenous cultures.

In spite of these developments in this field of ethnobotany in recent years, and despite the rich plant biodiversity and cultural diversity in the Philippines, our review of previous studies showed only a single conducted quantitative ethnobotanical research (Abe and Ohtani, 2012) in the country that is made up of more than 7,100 islands.

1.2. Philippine indigenous groups

The Philippines is a multi-cultural country with over 169 living ethnolinguistic groups and about 140 of which are acknowledged

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as indigenous (Hirtz, 2003). These indigenous peoples represent 10 to 20% of the total Philippine population. Collectively, indigenous populations in the Philippines have been estimated at 12 million and are broadly classified as Lumad, Igorot, Ilongot, Palawan, Mangyan, and Negrito (Respicio et al., 2008).

The Negritos (“little blacks”) was the term coined by early Western colonizers for Philippine indigenous people who have specifically dark and oily skin, kinky hair, and are short in height (Jocano, 1997), somewhat resembling Africans. It is estimated that there are more or less 30 Negrito subgroups inhabiting all over the archipelago. The origin of these Negrito groups is still unclear but they are considered to be the earliest inhabitants of the Philippines. Bellwood (1978) described the groups as Australoid people, while genetic data show that they are more closely related to the Asia Pacific groups than to the African group (Omoto, 1983). It is probable that prior to the arrival of Austronesian-speaking people into the northern Philippines from Taiwan, the Negrito groups had been occupying coastal areas, subsisting off the readily available shell fish, and exploiting the animal and vegetable products widely available in the largely undisturbed grasslands and forests that filled the valleys (Reid, 2007).

The Ati Negrito subgroup from the central islands of the Philippines also subsist on hunting and gathering of forest products, wage labor, and occasional shifting of agriculture. But in particular, this Negrito subgroup is more popularly identified as peddlers of traditional medicines, including medicinal plants they locally call “herbal”. These activities are still the basis of the Ati economy, except that permanent rice and corn cultivation has replaced traditional shifting agriculture (Stewart, 1992). The expertise of the Ati lies in their knowledge of forests as they have penetrated the forests as swidden farmers, hunters and collectors of plants. Their proximity to forests enabled them to preserve the knowledge on medicinal plants (De la Peña, 2009). Zayas (2008) also described their knowledge of *materia medica* and peddling activities.

The Philippine National Commission for Indigenous Peoples (NCIP) acknowledges the role of the Ati people as peddlers of medicinal plants and, likewise, recognizes their good knowledge of these plants. NCIP recognizes that this particular indigenous knowledge must be preserved, as it comprises one of the few remaining indexes of the Ati culture.

1.3. Objectives

With further economic development in the Philippines, there is rapid disappearance of traditional culture and natural resources. Hence, there is an urgent need to systematically document the medicinal plants used by the Ati and how these plants are used in their culture. Although ethnographic and ethnobotanical studies about the Ati in central Philippines (Madulid et al., 1989; Zayas, 2008; De la Peña, 2009) and other Philippine Negrito subgroups (Sia et al., 1998; Novellino, 2008; Datiles and Heinrich, 2013) have been conducted, none of them were able to document medicinal plant data using quantitative ethnobotanical techniques. One advantage of using this method, in addition to the systematic quantification of medicinal plant relative cultural importance, is that researchers are able to utilize the data in measuring a culture's traditional ecological knowledge and even compare these data with those in other cultures.

This need for the conservation of ethnobotanical knowledge motivated us to conduct this research with the use of quantitative techniques, the first to be applied in a research on a Negrito subgroup and among the Ati of Guimaras Island. This study was specifically conducted (1) to document the medicinal plants and their use in traditional therapies, and (2) to evaluate the medicinal plant knowledge and practices of the Ati indigenous people in Guimaras Island, Philippines.

2. Materials and methods

2.1. Study site

The study was conducted in Guimaras, an island province in central Philippines which lies between 10°25'00" and 10°46'09" north latitude, and 122°28'20.99" and 122°28'40.53" east longitude. A great part of the island's land area is above 100 m above mean sea level. Guimaras has two pronounced seasons: the dry season usually between the months of November and April, and the rainy or wet season, which occurs during the rest of the year. The doctor to population ratio is over than the standard of 1:20,000 indicating a need for more doctors. The province also needs more sanitary inspectors and other rural health workers

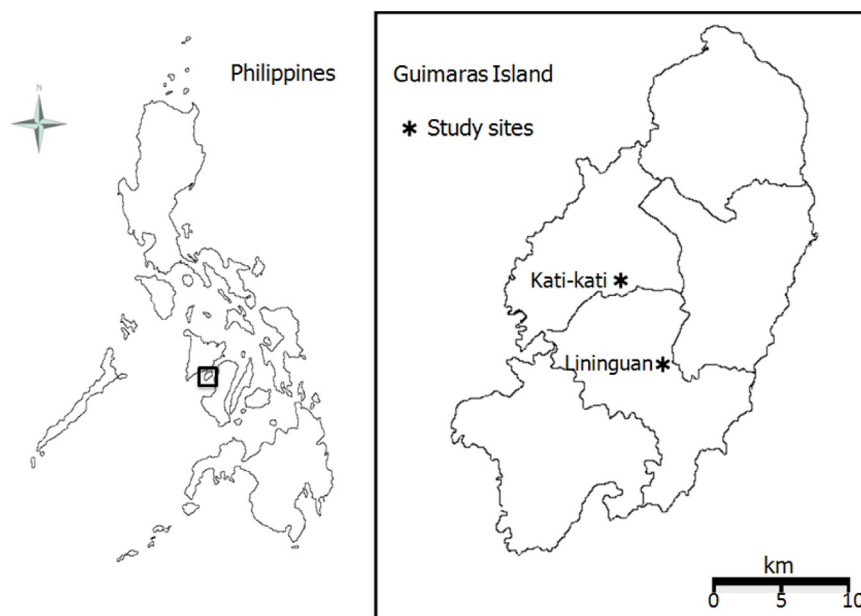


Fig. 1. Study sites in Guimaras Island, Philippines.

(Province of Guimaras Development and Physical Framework Plan, 2008–2013).

In particular, 2 Ati Negrito “sitios” or villages (in different towns), officially identified by NCIP as Guimaras Ati communities, namely Sitio Kati-kati (in San Miguel, Jordan) and Sitio Lininguan (in Maabay, Sibunag) were purposively chosen as the study sites due to comparability. The distance between the 2 villages is around 10 km apart, with both sites being accessible by public transportation, usually by hiring motorcycle service from their respective town centers. Each village is located near (within 2 km) elementary and high schools, and a hospital or health centers. The research sites are shown in Fig. 1.

2.2. Data collection

2.2.1. Sampling and interview

The fieldwork and interview was conducted in June and July 2013, and in February 2014. Prior informed consent was obtained from informants through the assistance and following the by-laws of NCIP, the government agency in charge for the welfare and protection of indigenous peoples. After several consultation meetings and discussion together with the concerned parties (community elders, community council and NCIP officers), assurance that the research was purely academic, and finalization of the mutually agreed terms, the proposal was approved for conduct.

Purposive stratified sampling was the method used in choosing the informants, who accepted the request for interview in their own free will. A total of 65 informants (about 10% of the entire Guimaras Ati population) with age range of 18–83 years old representing different social roles and positions were interviewed to measure the medicinal plant knowledge of the Guimaras Ati community as a whole. The considered plant experts/key informants in this study were the medicinal plant gatherers, peddlers and traders whether working full-time or part-time. Etkin et al. (1990) explained that knowledge of medicinal plants is carried in varying amounts by almost everyone in the community, and focusing only on specialists, such as herbalists or shamans, may give a biased view of plants utilized by a group of people. Hoffman and Gallaher (2007), on the other hand, required at least 35 independent samples for a robust statistics.

Each participant was interviewed in isolation to avoid the possibility of one informant's answer influencing another's answer. The informants were asked about their personal experience or participation in the use and preparation of medicinal plants. At times, pictures were shown to informants to make sure that they could identify what plant was being asked about. This semi-structured interview was conducted in Hiligaynon/Ilonggo language, the language that most Guimaras Ati people presently and commonly use, and the primary author's mother language. According to Albuquerque et al. (2006), semi-structured interviews allow researchers to gather a great deal of information from a large number of people in a relatively short period of time, while leaving the interviewee more at ease to answer or comment on the questions put to them.

2.2.2. Plant collection and identification

Plant specimens were collected together with village expert plant gatherers, or when possible, with the non-expert informants themselves. The plants were then pressed, dried, and brought out of the country in compliance with the phytosanitary requirements set by the agriculture department of the Philippine government. Voucher specimens were identified and deposited at the Herbarium of Hallym University (HHU) for documentation. The local names of plants, as well as the indigenous terms of their uses were also documented.

Scientific names were determined by identifying herbarium specimens and by referring to several volumes of Philippine flora (Merrill, 1903) and Philippine plant names dictionary (Merrill, 1923). In order to check the spelling, eliminate the use of older synonyms, and ensure a uniform nomenclature, all plant names presented here were verified using The Plant List (2013) and followed APG III family circumscriptions (Stevens, 2001).

2.2.3. DNA extraction, PCR, and sequencing

Specimens which could not be identified morphologically due to unfamiliarity or lack of reproductive parts were determined molecularly by DNA sequencing in Korea, and by comparing the sequences with those found in the GenBank through BLAST search. This molecular barcoding method provides consistent and reliable results regardless of the age, plant part, or environmental factors of the sample (Techen et al., 2014).

DNA extractions from silica gel-dried leaves were done using QIAGEN DNeasy Plant Mini Kit. PCR amplification of the *rbcL* region of the chloroplast was done using TaKaRa Ex Taq. The thermal cycler (GeneAmp® PE 9700) was programmed to perform 30 amplification cycles with 1 min denaturation at 95 °C, 1 min annealing at 50 °C, and 1 min 30 s extension at 72 °C. All PCR products were separated by agarose gel electrophoresis and purified using QIAQuick PCR Purification Kit. All steps were done following the manufacturers' instructions. Product concentration was determined by visual comparison. Purified products were then sent to Macrogen Inc., Korea for DNA sequencing reactions (ABI sequencer, Applied Biosystems). Final edited sequences were submitted to NCBI GenBank (<http://www.ncbi.nlm.nih.gov/>).

2.3. Data analysis

2.3.1. Use categories

In this study, data of medicinal plant use were grouped into 16 categories mostly based on the International Classification of Diseases (ICD-10) by the WHO (World Health Organization, 2011). The categories are (1) Infectious and parasitic diseases, (2) Neoplasms, tumor and tissue growth, (3) Endocrine and metabolic diseases, (4) Diseases of the nervous system, (5) Diseases of the eye, (6) Diseases of the ear, (7) Diseases of the circulatory system, (8) Diseases of the respiratory system, (9) Diseases of the digestive system, (10) Diseases of the skin and subcutaneous tissue, (11) Diseases of the musculoskeletal system and connective tissue, (12) Diseases of the genitourinary system, (13) Uses in pregnancy and childbirth, post-partum care, and infant care, (14) Symptoms, signs and abnormal clinical findings not elsewhere classified, (15) Injury, poisoning and certain other consequences of external causes, and (16) Factors influencing health status and contact with health services. Table 1 presents the reported diseases and uses under each category.

2.3.2. Use-report

Every time a plant was mentioned as being used in a particular purpose, it was considered to be one use-report. However, if an informant used a plant in more than one purpose under the same category, it was still considered as a single use-report (Amiguet et al., 2005). A multiple use-report was considered when at least two informants mentioned the same plant for the same purpose.

2.3.3. Use Value (UV)

Use Value (UV), developed by Phillips and Gentry (1993), is computed to provide a quantitative measure for the relative importance of species. UV, which is based on the number of uses and the number of people that cite a given plant, is used to indicate the species that are considered most important by a given population. UV is calculated using the following formula: $UV = (\sum U_i) / N$,

Table 1
Categories of diseases, Informant Consensus Factor (ICF) and Fidelity Level (FL) of notable plants.

Category no.	Category name	Reported diseases or uses under each category	ICD-10	No. of use-report	No. of taxa	ICF	Frequently used species	FL (%)	Particular disease or purpose
1	Infectious and parasitic diseases	Ascariasis, chicken pox, scabies, jaundice (hepatitis), mumps (parotitis), athlete's foot, wart, white spot (tinea flava), measles, colds (influenza), dengue fever	I	707	34	0.95	<i>Senna alata</i>	100	White spot
2	Neoplasms (tumor/tissue growth)	Cancer, tumors	II	23	2	0.95	<i>Annona muricata</i>	14.29	Cancer
3	Endocrine and metabolic diseases	Diabetes, goiter	IV	63	3	0.97	<i>Barringtonia asiatica</i>	91.93	Goiter
4	Diseases of the nervous system	Migraine, nervous breakdown	VI	5	2	0.75	<i>Centella asiatica</i>	21.43	Migraine
5	Diseases of the eye	Sore eyes, blurred vision	VII	53	4	0.94	<i>Euphorbia hirta</i>	45.20	Sore eyes
6	Diseases of the ear	Discharging ear (otorrhoea/otopyorrhea)	VIII	14	1	1.00	<i>Gmelina elliptica</i>	30.95	Discharging ear
7	Diseases of the circulatory system	Anemia, high blood pressure, varicose veins, internal bleeding, hemorrhage, proper blood circulation enhancer	IX	218	20	0.91	<i>Ipomoea batatas</i>	79.41	Anemia
8	Diseases of the respiratory system	Asthma, cough with phlegm, sore throat	X	180	10	0.95	<i>Vitex trifolia</i> subsp. <i>litoralis</i>	89.74	Cough with phlegm
9	Diseases of the digestive system	Constipation, diarrhea, infant diarrhea ("balaud"), peptic ulcer, toothache, indigestion, mouth sore (chancre), stomach acidity, swollen/bleeding gums (gingivitis), appetite enhancer, teeth strengthener	XI	491	39	0.92	<i>Chrysophyllum cainito</i>	73.77	Diarrhea
10	Diseases of the skin and subcutaneous tissue	Boils (furuncle/carbuncle), skin eruptions, ingrowing nail, pimple, hairloss, dandruff	XII	356	17	0.95	<i>Hibiscus rosa-sinensis</i>	100	Boils
11	Diseases of the musculoskeletal system and connective tissue	Arthritis, rheumatism, sprain, swollen muscles/swellings, muscle pain in rib area ("sikmat")	XIII	266	22	0.92	<i>Jatropha curcas</i>	41.79	Swellings
12	Diseases of the genitourinary system	Urination difficulty, kidney stones, dysmenorrhea, delayed menstruation, urinary tract infection	XIV	207	27	0.87	<i>Allophylus cobbe</i>	61.54	Urination difficulty
13	Uses in pregnancy and childbirth, postpartum care, and infant care	Pregnancy, labor and delivery enhancer, childbirth tool, maternal care, postpartum care and recovery, new-born baby care, milk production enhancer	XV	557	44	0.92	<i>Canarium asperum</i>	73.58	Post-partum care and recovery
14	Symptoms, signs and abnormal clinical findings not elsewhere classified	Abdominal pain, backache, body aches, sudden cough, headache, fever, "hilas" (child sleeplessness, malaise and fatigue), "pasm" (cramp and spasm), "tapuyong" (dizziness and fainting), body chills, "tikos" (a particular skin rash), enlarged lymph nodes, gas pain and flatulence	XVIII	1897	91	0.95	<i>Breynia vitis-idaea</i>	100	Child sleeplessness, malaise and fatigue
15	Injury, poisoning and certain other consequences of external causes	Allergy, burns, cuts and wounds, fracture and dislocation, sprain, animal bites, insect bites, poisoning, contacts with plant or animal parts	XIX	737	36	0.95	<i>Cocos nucifera</i>	41.61	Insect bites
16	Factors influencing health status and contact with health services	Circumcision antiseptic	XXI	29	1	1.00	<i>Psidium guajava</i>	18.07	Circumcision antiseptic

where U_i is the number of use-reports cited by each informant for a given species, and N is the total number of informants.

UVs are high when there are many use-reports for a plant, implying that the plant is important, and low (approach to 0) when there are few use-reports. However, UV does not distinguish whether a plant is used for single or multiple purposes.

2.3.4. Fidelity Level (FL)

Fidelity Level (FL) developed by Friedman et al. (1986) is the ratio between the number of informants who mentioned the use of a plant for a particular purpose and the total number of informants who mentioned the use of the plant for any purpose (regardless the category). FL is calculated using the following formula: $FL(\%) = (I_p/I_u) \times 100$, where I_p is the number of informants who independently suggested the use of a plant for a particular purpose, and I_u is the total number of informants who mentioned the plant for any use or purpose.

High FL values (near 100%) are obtained for plants for which almost all use-mentions refer to the same purpose, that is the plants (and their use for a particular purpose) are most preferred, whereas low FLs are generally obtained for plants that are used for many different purposes.

2.3.5. Informant Consensus Factor (ICF)

Informant Consensus Factor (ICF) was used to analyze the agreement degree of the informants' medicinal plant knowledge about each category. This quantitative method is based on the classic paper by Trotter and Logan (1986) who introduced the Informant Agreement Ratio (IAR), which has come to be called as Informant Consensus Factor. ICF is computed using the following formula: $ICF = (N_{ur} - N_t) / (N_{ur} - 1)$, where N_{ur} is the number of use-report of informants in each category, and N_t is the number of taxa used for a particular category.

High ICF values (approach to 1.00) are obtained when only one or a few plant species are reported to be used by a high proportion of informants for a particular category, whereas low ICF values indicate that informants disagree over which plant to use (Heinrich et al., 1998). ICF can thus be used to pinpoint particularly interesting species for the search of bioactive compounds (Canales et al., 2005).

2.3.6. Statistical tools

To measure and compare the informants' medicinal plant knowledge and practices, plant use-reports were computed and analyzed using SPSS software (SPSS Inc. Released, 2009). The descriptive statistics median score, and nonparametric inferential

statistics Mann–Whitney *U* and Kruskal–Wallis tests were used to find significant difference(s) between two and among three related groups, respectively, all set at 0.05 alpha level of significance. Inferential measures allow an educated guess about information for an entire population when only a subsample of people in the community has been spoken to (Martin, 2004), exclude that something happened by chance, and are relevant in inter-cultural comparisons (Heinrich et al., 2009).

3. Results and discussion

3.1. Medicinal plant knowledge

When grouped according to location, descriptive and inferential statistics revealed that the informants from Sitio Kati-kati ($Md=96$, $n=35$) showed higher medicinal plant knowledge than the informants from Sitio Lininguan ($Md=73.50$, $n=30$) as revealed by the significant difference presented in Mann–Whitney *U* test ($U=394.50$, $p<0.05$). The reason might be that many of the Kati-kati village members are medicinal plant gatherers, peddlers, traders or occasional hunters, while Lininguan village members are mostly weavers of bags and other accessories if not employed elsewhere without any relation to the utilization of their natural environment. More cases of intermarriage with the Bisaya (lowlanders with Malay descent) were also observed in the latter community than the former.

When grouped according to level of education, descriptive and inferential statistics revealed that the informants with lower (none to complete primary) education ($Md=98$, $n=37$) showed higher medicinal plant knowledge than the ones with higher (secondary to tertiary) education ($Md=69$, $n=28$) as revealed by the highly significant difference presented in Mann–Whitney *U* test ($U=321$, $p<0.01$). This might imply that the latter group is more exposed to knowledge about biomedicine and science as these are taught in schools. It might also be inferred that informants with higher level of education are more exposed to modern medical treatments and commercial medicines brought about by having a better income due to education. In addition, all the medicinal plant gatherers and peddlers belonged to the group with lower educational level.

When grouped according to gender, descriptive and inferential statistics revealed that the women ($Md=96.50$, $n=36$) showed higher medicinal plant knowledge than the men ($Md=70$, $n=29$) as revealed by the significant difference presented in Mann–Whitney *U* test ($U=399.50$, $p=0.05$). In Ati culture, the women are more involved in medicinal plant gathering and peddling because they are less shy when talking to buyers and customers. In addition, the women play a big role in medicinal plant preparation, application and care of the sick children in the family. Most men interviewed in this research work as occasional farm or construction laborers, or have occupations not related to utilizing the natural environment.

When grouped according to age, descriptive and inferential statistics revealed that the informants from the age group of 53 yrs. old and above ($Md=109$, $n=20$) showed the highest medicinal plant knowledge as compared to the informants from the age groups of 34–52 yrs. old ($Md=97$, $n=21$) and 18–33 yrs. old ($Md=43$, $n=24$) as revealed by the very highly significant difference presented in Kruskal–Wallis test ($\chi^2(2, n=65)=34.35$; $p<0.001$). The relatively high score of the older informants, as expected, is due to experience. It might also be implied that the younger members, especially from the youngest age group, are not interested in the tradition of medicinal plant gathering and peddling as nobody from this age bracket mentioned their direct participation in plant collection and trade. The generational gaps

that differentiate the age groups also imply Ati generations' varying social and cultural experiences that might have influenced plant traditional knowledge and attitudes. Unfortunately, the low scores as the informants' age decrease might mean that the medicinal plant knowledge and practices is disappearing.

3.2. Medicinal plants and characteristics

This study documented 142 medicinal plant taxa in 56 families across 16 categories. About 33% of the plants are trees, 25% shrubs, 25% herbs and 17% are climbers. The higher number of medicinal plant taxa documented here than those recorded in another Negrito subgroup study (Novellino, 2008) shows that the Ati may have a richer tradition in medicinal plant use and therapy, but may also be less rich as compared to the findings in another Negrito subgroup study (Sia et al., 1998). This paper also shows more detailed taxonomic information since all reported medicinal plant taxa were identified (nearly all in species level) as shown in Table 2. The authors, however, do not intend to emphasize this paper's merit (or demerit) since different methods, scope, and delimitations were used here and in previous Negrito ethnographic/ethnobotanical studies (Madulid et al., 1989; Sia et al., 1998; Novellino, 2008; Zayas, 2008; De la Peña, 2009; Datiles and Heinrich, 2013).

Fabaceae was the best represented plant family with 13 species, followed by Lamiaceae with 9, and Poaceae with 8. Members of Fabaceae possess important medicinal properties and have been widely used as components of pharmaceutical products (Gao et al., 2010). Chew et al. (2011) also assessed the antioxidant potential, antibacterial activity and classes of phytochemicals of some of the medicinal members of the bean family. Lamiaceae members, on the other hand, are known for their aromatic smell (Raja, 2012), and their biologically active essential oils present are frequently isolated and used traditionally in various cultures (Kleftoyanni and Kokkini, 2003; Naghibi et al., 2005). Members of the Poaceae or grass family have also been shown to contain bioactive components like flavonoids, phenolic acids and antioxidants (Adom and Liu, 2002), and several members have also been reported to have therapeutic effects (Katewa et al., 2001).

Due to difficulties in morphological identification and unfamiliarity, five plants (*Lunasia amara*, *Ixora philippinensis*, *Ardisia elliptica*, *Salacia* sp., and *Rauvolfia amsoniifolia*) were identified and determined by DNA sequencing and by comparing the sequences with those present in the GenBank. The data from this research were then deposited in NCBI GenBank with accession numbers as follows, respectively: KJ89063, KJ890364, KJ890365, KJ890366 and KJ890367.

The method used here might also be viewed as an example of an ethnopharmacological data deposited in a repository. Such data could be of help for authors and investigators in comparing available knowledge as suggested by Verpoorte (2008). In addition, the correct identification of taxa to ensure the safe usage of potential drugs made from these medicinal plants is very important and cannot be more emphasized. The molecular data can also be helpful in the growing barcoding studies of medicinal plants.

3.3. Recommended Philippine medicinal plants

The Philippine health department has recommended in its traditional health maintenance program the following 10 species of medicinal plants: (1) *Blumea balsamifera*, (2) *Senna alata*, (3) *Psidium guajava*, (4) *Allium sativum*, (5) *Momordica charantia*, (6) *Vitex negundo*, (7) *Mentha* sp., (8) *Combretum indicum*, (9) *Peperomia pellucida* and (10) *Ehretia microphylla* (Department of Health, 2007). The pharmacological effects of these plants have been clinically proven to be significant, and are being discussed in

Table 2

Medicinal plants used by the Ati Negrito indigenous group in Guimaras Island, Philippines.

Plant no.	Scientific name	Family	Local name	No. of use-report	Use Value (UV) ^a	No. of category	Parts used ^b	Disease or purpose	Administration and preparation ^c
1	<i>Andrographis paniculata</i> (Burm.f.) Nees ^d	Acanthaceae	Marabilos	9	0.14	1	Lf	Abdominal pain	I Drink decoction
2	<i>Justicia gendarussa</i> Burm. F.	Acanthaceae	Bunlaw	39	0.60	2	Lf	Headache	E Apply as poultice
3	<i>Pseuderanthemum carruthersii</i> (Seem.) Guillaumin ^d	Acanthaceae	Pasyawan/Pasaw	4	0.06	1	Lf	Post-partum care Fever	E Boil with #23 and apply as wash or hot compress E Apply as poultice
4	<i>Aerva lanata</i> (L.) Juss.	Amaranthaceae	Buti-buti	10	0.15	2	Wh Wh St	Child sleeplessness, malaise and fatigue Sudden cough, fever Sore eyes	E Infuse with oil and apply; Burn as incense I Drink decoction I Drop stem latex
5	<i>Allium cepa</i> L.	Amaryllidaceae	Sibuyas bombay	13	0.20	2	Bl	Sudden cough	I Chew bulb
6	<i>Allium sativum</i> L.	Amaryllidaceae	Ahos	88	1.35	5	Bl	Swollen gums (of children)	I Heat bulb, grind and apply on swollen gums
7	<i>Anacardium occidentale</i> L.	Anacardiaceae	Kasuy	17	0.26	2	Bl	Ascariasis; body chills; dog bite; toothache	E Apply crushed bulb
8	<i>Mangifera indica</i> L.	Anacardiaceae	Paho	11	0.17	2	Bl	Abdominal pain; high blood pressure	I Drink decoction of roasted bulb
9	<i>Spondias purpurea</i> L. ^d	Anacardiaceae	Sirguelas	11	0.17	1	Lf	Headache, fever	E Apply young leaves as poultice
10	<i>Annona muricata</i> L.	Annonaceae	Babana	50	0.77	7	Sd	Scabies	E Apply fresh seed resin
							Lf, Bk	Cuts and wounds; scabies	E Rub crushed leaves or scraped bark
							St, Bk	Mouth sore	I Scrape and drop extract
							Lf	Ascariasis; high blood pressure; cancer; stomach acidity; urination difficulty; sudden cough	I Drink decoction
11	<i>Annona squamosa</i> L.	Annonaceae	Atis	48	0.74	4	Lf	Headache	E Apply on neck and forehead as poultice
							Fr	Diabetes	I Eat fresh fruit
							Lf	Ascariasis	E Apply crushed leaves around ears and stomach
							Lf	Urination difficulty	I Drink decoction
							Lf	Headache; mumps	E Apply leaves as poultice; Grind and rub
							Bk	Cuts and wounds	E Scrape bark and apply
12	<i>Uvaria grandiflora</i> Roxb.	Annonaceae	Kalansaging/ Saging-saging	36	0.55	3	St	Post-partum care; cramp and spasm	E Boil and apply as wash or hot compress
							St/Bk	Sore throat	I Drink decoction
							St/Bk	Child sleeplessness, malaise and fatigue	E Dry and burn as incense
13	<i>Uvaria rufa</i> Blume	Annonaceae	Banawak	33	0.51	2	St	Post-partum recovery	I Dry, boil and drink decoction
							St	Post-partum care	E Apply as wash or hot compress
							St	Child sleeplessness, malaise and fatigue	E Burn dried stem with #64 as incense
14	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Yahong-yahong	14	0.22	4	Lf	Urination difficulty	I Drink decoction
							Lf	Sore eyes; burns	I/ Grind leaves and apply extract
							Lf	Migraine	E
15	<i>Alstonia macrophylla</i> Wall. ex G.Don	Apocynaceae	Hitang-hitang/ Itang-itang	15	0.23	2	Bk	Stomachache	I Chew leaves
							Bk	Snake bite, contact with fish spine	I Scrape bark and drink extract
16	<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Bitá	60	0.92	4	Bk	Abdominal pain; dysmenorrhea, delayed mens	I Scrape, mix extract with #20 leaf extract and drink
							Bk; Lf	Boils; swollen muscles, swellings	I Powder dried bark and take as pill
17	<i>Catharanthus roseus</i> (L.) G. Don	Apocynaceae	Rosas de baybayon	124	1.91	5	Bk	Toothache	E Apply bark latex; Apply young leaves as poultice
							Lf	Diarrhea; dysmenorrhea	I Apply scraped bark into tooth cavities
							Lf	Cough; cancer; high blood pressure	I Drink decoction
							Lf	Fever	I Powder dried leaves and take as pill
18	<i>Parameria laevigata</i> (Juss.) Moldenke	Apocynaceae	Tagulaway	82	1.26	2	Bk	Scabies; cuts and wounds	E Crush leaves and apply as poultice
19	<i>Plumeria rubra</i> L.	Apocynaceae	Kalachuchi	37	0.57	4	Bk	Peptic ulcer	E Infuse dried bark in coconut oil and apply
							Lf	Scabies	I Boil scraped bark and drink decoction
							Lf	Toothache; boils	E Boil leaves and apply as wash
							Lf	Abdominal pain, headache	I/ Apply leaf latex
							Lf		E
							Lf		E Apply fresh or heated leaves as poultice

Table 2 (continued)

Plant no.	Scientific name	Family	Local name	No. of use-report	Use Value (UV) ^a	No. of category	Parts used ^b	Disease or purpose	Administration and preparation ^c
20	<i>Rauvolfia amsoniifolia</i> A.DC.	Apocynaceae	Agoparit/ Agoparik/ Magoparit	20	0.31	4	Lf Rt Bk St	Headache Abdominal pain; urination difficulty Snake bite Post-partum recovery	E Apply on forehead as poultice I Drink decoction I Scrape and drink extract or mix with #15 extract I Drink decoction
21	<i>Tabernaemontana pandacqui</i> Lam.	Apocynaceae	Alibotbot	84	1.29	5	Lf	Boils; cuts and wounds; urination difficulty	E Apply leaf latex; Apply crushed leaves; Drink decoction
22	<i>Alocasia macrorrhizos</i> (L.) G. Don	Araceae	Badiang	58	0.89	2	Lf	Abdominal pain, headache Post-partum recovery	E Apply fresh leaves as poultice E Apply leaves on abdomen as poultice
23	<i>Schefflera elliptica</i> (Blume) Harms	Araliaceae	Kamoy-kamoy/ Kalangkang	16	0.25	2	Lf	Toothache, swollen gums Abdominal pain	I Heat petiole, grind and apply E Heat leaves and apply as poultice
24	<i>Areca catechu</i> L.	Arecaceae	Bunga	81	1.25	3	Lf, St	Headache Post-partum care	E Apply as poultice E Boil with #2 and apply as wash or hot compress
25	<i>Cocos nucifera</i> L.	Arecaceae	Lubi	134	2.06	4	Lf Sd Fl/Fr	Post-partum care Indigestion; gas pain and flatulence Scabies; insect bite	E Boil and apply as wash or hot compress E Chew with #108 (or #136) and apply on stomach E Process into vinegar or oil and apply as ointment or infusion
26	<i>Corypha utan</i> Lam.	Arecaceae	Buri	38	0.58	4	Fr Fr Fr St Sh	Urination difficulty; sudden cough White spot Skin rashes Urination difficulty Post-partum care	I Drink coconut water E Burn coconut shell and apply ash E Roast mature coconut meat and apply I Cut trunk and drink extract E Boil young shoot and apply as wash or hot compress
27	<i>Aloe vera</i> (L.) Burm.f.	Asparagaceae	Alobera	75	1.15	2	Lf	Headache Arthritis; cramp and spasm	E Apply leaves as poultice E Boil leaves and apply as hot compress
28	<i>Cordyline fruticosa</i> A. (L.). Chev. ^d	Asparagaceae	Baston ni San Jose	2	0.03	1	Lf	Alopecia; burns Sudden cough	E Apply leaf extract I Heat leaves and drink extract
29	<i>Artemisia vulgaris</i> L.	Asteraceae	Artamisa	67	1.03	2	Lf	Cough with phlegm; fever	I/ E Drink decoction; Rub leaves on neck and back
30	<i>Blumea balsamifera</i> (L.) DC	Asteraceae	Alibhon	140	2.15	3	Lf Lf Lf	Fever Headache Abdominal pain, body pains	I Boil with #30, #76, #113 and drink decoction E Grind and apply with #76 and vinegar E Apply leaves as poultice, or mix with #56, #30 and rub
31	<i>Blumea laciniata</i> (Wall. ex Roxb.) DC. ^d	Asteraceae	Sitim/Simsim/ Pali-pali	20	0.31	1	Lf Lf Lf Wh	Abdominal pain, body pains Sore throat, cough with phlegm Post-partum recovery Post-partum care Fever Headache Scabies	E Apply crushed leaves or with #56 and #29 I Drink extract; Boil with #113, #125 and drink decoction I Mix with #95 and drink decoction E Apply as wash or hot compress I Drink mixed decoction with #76, #113 and #29 E Grind with #76 and apply with vinegar E Grind and apply
32	<i>Chromolaena odorata</i> (L.) R.M. King & H. Rob ^d	Asteraceae	Hagonoy	38	0.57	1	Lf	Cuts and wounds	E Grind leaves and apply
33	<i>Elephantopus scaber</i> L.	Asteraceae	Dila-dila baka	11	0.17	3	Lf	Cuts and wounds; abdominal pain	E Rub crushed leaves
34	<i>Impatiens balsamina</i> L.	Balsaminaceae	Kamantigi	16	0.25	2	Lf, Fl	Ascariasis Burns, insect bites; swollen muscles	I Drink decoction E Apply ground leaves and flowers
35	<i>Basella rubra</i> L.	Basellaceae	Alugbati	34	0.52	3	Lf Lf Lf	High blood pressure Boils Ascariasis	I Eat boiled/cooked leaves E Apply crushed leaves as poultice E Smell leaves or apply crushed leaves around ears and mouth
36	<i>Bixa orellana</i> L.	Bixaceae	Istiwitis	43	0.66	2	Lf	Headache, fever	E Apply as poultice or with #123 leaves

37	<i>Heliotropium indicum</i> L.	Boraginaceae	Kobra-kobra	1	–	–	Sd	Boils	E	Wet seeds and apply colored dye
38	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Pinya	9	0.14	2	Lf	Gas pain and flatulence	E	Apply crushed leaves
							Sh/Lf	Fever	E	Apply crushed shoot or leaf on forehead as poultice
39	<i>Canarium asperum</i> Benth.	Burseraceae	Salong	53	0.82	2	Fr	Ascariasis	I	Eat fruit for breakfast
							St	Post-partum care and recovery	I/	Drink decoction of dried resin; Burn dried resin as incense
							St	Cough with phlegm (babies & children)	I	Burn and collect resin soot on #29 leaf and give extract
40	<i>Carica papaya</i> L.	Caricaceae	Kapayas	57	0.88	5	Lf	Rheumatism; fever, cramp and spasm, body aches	E	Heat leaves and/or apply fresh as poultice
							Lf	Insect bites	E	Rub young leaves
							Lf	Fever	I	Grind young leaves and drink extract
							Fl/Fr	Dog bite, contact with fish spine	E	Apply latex
							Fr	Constipation; milk production	I	Eat ripe fruit; Eat cooked young fruit with #97 leaves
41	<i>Salacia</i> sp.	Celastraceae	Montawi/ Muntaui	31	0.48	2	St	Gas pain and flatulence; post-partum recovery	I	Drink decoction of dried stem
42	<i>Ipomoea batatas</i> (L.) Poir.	Convolvulaceae	Kamote (pula)	34	0.52	3	Rt	Burns	E	Grind swollen root and apply as poultice
							Lf	Milk production; anemia	I	Eat cooked leaves
43	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	Maritana	53	0.82	2	Lf	Toothache; boils	I/	Apply crushed leaves
44	<i>Cucurbita maxima</i> Duchesne	Cucurbitaceae	Kalabasa	13	0.20	2	Lf; Fl	Burns	E	Heat leaves and apply as poultice; Apply flowers directly
45	<i>Lagenaria siceraria</i> (Molina) Standl.	Cucurbitaceae	Kalubay	14	0.22	2	Fr	Blurred vision	I	Eat cooked fruit or drop extract onto eyes
							Fr	High blood pressure	I	Eat cooked fruit
46	<i>Luffa acutangula</i> (L.) Roxb. ^d	Cucurbitaceae	Patola	14	0.22	1	Fr/Lf	Urination difficulty	E	Grind young fruit or leaves, and apply as poultice
47	<i>Momordica charantia</i> L.	Cucurbitaceae	Margoso	60	0.92	3	Fr	High blood pressure	I	Eat cooked fruit
							Lf	Infant care; sudden cough	I	Give extract to infant; Drink extract
							Fr	Anemia	I	Eat fresh or cooked
48	<i>Kyllinga odorata</i> Vahl	Cyperaceae	Botoncillo	39	0.60	2	Wh	Measles, chicken pox	I	Boil with #115, #103 and drink decoction
							Rt	Fever	I	Boil with #115, #64, #54 and drink decoction
49	<i>Dioscorea alata</i> L. ^d	Dioscoreaceae	Ubi	2	0.03	1	Rt	Constipation	I	Eat boiled swollen root
50	<i>Dioscorea esculenta</i> var. <i>spinos</i> (Prain) R.Knuth ^d	Dioscoreaceae	Burot/Kurut	13	0.20	1	Rt	Skin rash called “tikos”	E	Apply ground root as poultice
51	<i>Dioscorea esculenta</i> var. <i>fasciculata</i> (Roxb.) R.Knuth ^d	Dioscoreaceae	Tam-is	18	0.28	1	Lf	Skin rash called “tikos”	E	Apply leaves as poultice
52	<i>Dioscorea glabra</i> Roxb. ^d	Dioscoreaceae	Banayan	4	0.06	1	Rt	Constipation	I	Eat boiled swollen root
53	<i>Tacca palmata</i> Blume ^d	Dioscoreaceae	Corazon de anghel	2	0.03	1	Rt	Indigestion	I	Drink decoction of swollen root
54	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Tawa-tawa	74	1.14	3	Wh	Dengue fever	I	Boil (except flowers) and drink decoction; Mix with #48, #115, #64 and drink decoction
							Lf	Sore eyes; cuts and wounds	E	Apply leaf latex
55	<i>Homonoia riparia</i> Lour. ^d	Euphorbiaceae	Miagos	20	0.31	1	Rt	Urination difficulty/ kidney stones	I	Mix with #118 silk, #104 shoot and drink decoction
56	<i>Jatropha curcas</i> L.	Euphorbiaceae	Kasla	125	1.92	3	Bk	Fracture and dislocation; swellings	E	Scrape and apply
							Bk	Body pains, abdominal pain	E	Apply as poultice with #29 and #30
							Lf	Headache	E	Heat leaves and apply as poultice
57	<i>Manihot esculenta</i> Crantz	Euphorbiaceae	Balinghoy	36	0.55	5	Rt	Peptic ulcer	I	Drink decoction of swollen root
							Rt	Burns; skin rash called “tikos”	E	Apply scraped swollen root as poultice
							Lf	Fever	I/	Drink decoction; Apply leaves on forehead as poultice
							Lf	Sprain; milk production; headache	E	Apply leaves as poultice
58	<i>Caesalpinia crista</i> L.	Fabaceae	Dalogdog	63	0.97	3	Sd	Abdominal pain, gas pain and flatulence	I/	Powder, boil and drink; Mix with oil and apply as ointment
							Sd	Athlete's foot, mumps; enlarged lymph node	E	Mix powdered seed with oil and apply
							Sd	Toothache	I	Place powdered seed into tooth cavity
59	<i>Caesalpinia sappan</i> L.	Fabaceae	Sibukaw	70	1.08	5	St	Post-partum recovery; asthma; sudden cough	I	Drink decoction
							St	Fracture and dislocation; internal bleeding	I	Drink decoction of inner part of stem (pith)
							Lf	Fracture and dislocation; headache	E	Heat leaves and apply as poultice
60	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Kadios	23	0.35	3	Lf	Wart, white spot	E	Apply ground leaves

Table 2 (continued)

Plant no.	Scientific name	Family	Local name	No. of use-report	Use Value (UV) ^a	No. of category	Parts used ^b	Disease or purpose	Administration and preparation ^c
							Lf	Post-partum recovery	E Apply leaves as poultice
							Sd	Ascariasis; gas pain and flatulence	I/ Eat raw seeds; Eat seeds or chew and rub on stomach
61	<i>Erythrina variegata</i> L.	Fabaceae	Dapdap	17	0.26	3	Lf	Diarrhea; scabies	I/ Drink decoction; Boil and use as wash
							E		E
62	<i>Gliricidia sepium</i> (Jacq.) Walp.	Fabaceae	Madre cacao	72	1.11	4	Lf, Bk	Urination difficulty, kidney stone	E Apply scraped bark and leaves as poultice
							Bk	Fracture and dislocation	E Scrape bark and apply as poultice
							Lf	Fracture and dislocation; body pain	E Heat leaves and apply as poultice
							Lf	Scabies	E Crush and apply
63	<i>Leucaena leucocephala</i> (Lam.) de Wit	Fabaceae	Agho	68	1.05	2	Lf	Post-partum recovery	E Sit on heated leaves or burn as incense
							Lf	Post-partum care	E Apply as wash or hot compress
64	<i>Mimosa pudica</i> L.	Fabaceae	Huya-huya	28	0.43	2	Sd	Ascariasis	I Eat young seeds
							Wh	Child sleeplessness, malaise and fatigue	E Burn with #13 as incense
							Rt	Fever	I Drink decoction with #115 roots, #54 and #48
65	<i>Mucuna pruriens</i> (L.) DC.	Fabaceae	Nipay	27	0.42	2	Rt	Urination difficulty	I Drink decoction
							St	Mouth sore, gingivitis	I Drop or gargle stem extract
66	<i>Phaseolus lunatus</i> L.	Fabaceae	Patani	50	0.77	2	St, Bk	Labor/delivery enhancer	E Mix scraped bark, stem, and apply
							Sd	Gas pain and flatulence	E Chew seeds and apply on stomach
							Lf	Mumps	E Crush leaves and apply
67	<i>Pithecellobium dulce</i> (Roxb.) Benth	Fabaceae	Kamunsil	11	0.17	4	Lf	Ascariasis	I Heat leaves, squeeze and drink extract
							Rt	Arthritis	I Drink decoction
							Bk	Cuts and wounds	E Scrape bark and apply as poultice
							Fr	Ascariasis; diabetes	I Eat fresh fruit
68	<i>Senna alata</i> (L.) Roxb. ^d	Fabaceae	Palochina	48	0.74	1	Lf	White spot	E Apply crushed leaves
69	<i>Senna occidentalis</i> (L.) Link ^d	Fabaceae	Kamantolan	7	0.11	1	Lf	Swollen muscles/swellings	E Grind leaves and apply as poultice
70	<i>Tamarindus indica</i> L.	Fabaceae	Sambag	58	0.89	2	Lf	Asthma, cough with phlegm; sudden cough	I Drink extract; Drink decoction
71	<i>Flagellaria indica</i> L.	Flagellariaceae	Huag/Uai	15	0.23	2	Rt, St	Gas pain and flatulence	I Drink decoction
							Sh	Headache	E Apply ground young shoot as poultice
							Sh	Fever; sore throat	I Drink decoction
72	<i>Callicarpa candicans</i> (Burm.f.) Hochr. ^d	Lamiaceae	Tigau	7	0.11	1	Lf	Swollen muscles/swellings	E Grind leaves and apply as poultice
73	<i>Clerodendrum quadriloculare</i> (Blanco) Merr.	Lamiaceae	Saling uwak	8	0.12	2	Lf	Headache; swollen muscles	E Apply young leaves as poultice
74	<i>Gmelina elliptica</i> Sm.	Lamiaceae	Talungon	43	0.66	3	Lf	Abdominal pain; contact with spine or thorn	E Grind leaves and apply
							Fr	Discharging ear	I Heat and drop extract into ear canal
75	<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Luko-luko/ Albaka	49	0.75	2	Lf, Rt	Abdominal pain; diarrhea	I Chew leaves; Drink decoction of leaf and root
76	<i>Ocimum basilicum</i> L.	Lamiaceae	Kalooy	60	0.92	2	Lf	Stomachache; dislocation	E Apply ground leaves
							Lf	Fever, headache	E Boil with #30, #113 and drink; Grind and apply with vinegar
77	<i>Plectranthus amboinicus</i> (Lour.) Spreng	Lamiaceae	Oregano	126	1.94	2	Lf	Asthma, cough with phlegm; sudden cough	I Drink decoction or chew leaves
78	<i>Plectranthus scutellarioides</i> (L.) R.Br.	Lamiaceae	Lampunaya	124	1.91	3	Lf	Swollen muscles; fracture and dislocation; boils	E Heat leaves and apply as poultice
79	<i>Premna odorata</i> Blanco	Lamiaceae	Adgaw/Agdaw	28	0.43	3	Lf	Rheumatism; post-partum care	E Apply ground leaves; Apply as wash or hot compress
							Lf	Sudden cough	I Drink decoction
80	<i>Vitex trifolia</i> subsp. <i>litoralis</i> Steenis	Lamiaceae	Lagundi	41	0.63	2	Lf	Cough with phlegm; post-partum recovery	I Drink decoction
81	<i>Persea americana</i> Mill.	Lauraceae	Abukado	14	0.22	2	Lf	Headache	E Apply young leaves as poultice
							Lf	Diarrhea, appetite enhancer	I Drink decoction
82	<i>Barringtonia asiatica</i> (L.) Kurz	Lecythidaceae	Burubitoon	62	0.95	2	Sd	Goiter; abdominal pain	E Apply ground seed as poultice
83		Lythraceae	Banaba	30	0.46	4	Rt/Lf	Urination difficulty	I Drink decoction

	<i>Lagerstroemia speciosa</i> (L.) Pers.						St	Fever, body aches; jaundice	I	Drink decoction of scraped stem
84	<i>Corchorus olitorius</i> L.	Malvaceae	Tugabang	11	0.17	3	Lf	Swellings; measles	E	Apply crushed leaves; Burn leaves as incense
							Lf	Constipation	I	Eat cooked leaves
85	<i>Hibiscus rosa-sinensis</i> L. ^d	Malvaceae	Tapulanga	48	0.74	1	Lf	Skin rashes; labor/delivery enhancer	E	Grind leaves and apply
86	<i>Sida acuta</i> Burm.f. ^d	Malvaceae	Silhigon de kastilya	13	0.2	1	Fl	Boils	E	Crush and apply as poultice
							Wh	Measles	I/	Drink decoction or burn as incense
87	<i>Urena lobata</i> L.	Malvaceae	Dalupang/ Darukot	29	0.45	2	Wh, Rt	Fever	E	Mix with #112 boil and drink decoction
							Fr	Infant care	E	Burn into ash and apply onto infant navel
88	<i>Sandoricum koetjape</i> (Burm. f.) Merr.	Meliaceae	Santol	24	0.37	2	Bk	Diarrhea	I	Boil scraped bark with #129 and drink decoction
							St	High blood pressure	I	Drink decoction of chopped stem
							Lf	Toothache	I	Crush leaves and apply into tooth cavities
89	<i>Swietenia mahogani</i> L.	Meliaceae	Mahogani	56	0.86	2	Fr	Diarrhea; high blood pressure	I	Drink decoction of mesocarp
90	<i>Arcangelisia flava</i> (L.) Merr.	Menispermaceae	Albutra	47	0.72	2	Sd	Abdominal pain; dysmenorrhea, delayed mens	I	Take powdered seed
							St	Abdominal pain; dysmenorrhea	I	Drink decoction of powdered stem; Infuse in alcohol with #127 bark and drink
91	<i>Tinospora crispa</i> (L.) Hook.f. & Thomson	Menispermaceae	Manunggal	28	0.43	3	St	Boils; swellings	E	Grind and apply as poultice
							St	Toothache	I	Drop extract into tooth cavities or onto eyes
							St	Delayed menstruation, dysmenorrhea	I	Drink extract
92	<i>Artocarpus heterophyllus</i> Lam. ^d	Moraceae	Langka	15	0.28	1	Fr	Ascariasis	I	Eat ripe fruit before breakfast
93	<i>Ficus elastica</i> Roxb. ex Hornem.	Moraceae	Lunok	17	0.26	2	Rt	Urination difficulty; arthritis	I	Drink decoction of hanging (adventitious) roots
							Rt	Muscle pains	E	Infuse hanging root in coconut oil and apply
94	<i>Ficus nota</i> (Blanco) Merr.	Moraceae	Tabuyog	31	0.48	2	St	Post-partum recovery; milk production	I	Drink decoction
							Lf	Headache	E	Apply young leaves as poultice
95	<i>Ficus pseudopalma</i> Blanco	Moraceae	Sulamyog	25	0.38	2	Lf, St	Post-partum recovery	I	Boil with #30 and drink
							St	Post-partum care	E	Apply as wash or hot compress
							Lf	Headache	E	Grind and apply as poultice
96	<i>Ficus septica</i> Burm.f.	Moraceae	Labnog/Lamnog	37	0.57	2	Lf	Fever, headache, sudden cough, abdominal pain; swellings	E	Apply young leaves as poultice
97	<i>Moringa oleifera</i> L.	Moringaceae	Balunggay	73	1.12	4	Lf	Sudden cough; sore eyes	I	Drink extract; Drop extract onto eyes
							Lf	Milk production	I	Eat boiled leaves or with #40
							Lf	Cuts and wounds	E	Apply crushed leaves
98	<i>Musa balbisiana</i> Colla	Musaceae	Saging (Sab-a)	46	0.71	5	Fr	Peptic ulcer; high blood pressure	I	Eat fruit
							Lf	Milk production	E	Apply young leaves on breast as poultice
							St, Lf	Fever	E	Cover or wrap body parts as poultice
							Cr	Cuts and wounds	E	Grind and apply by rubbing
99	<i>Musa x paradisiaca</i> L.	Musaceae	Saging (Tundal)	21	0.32	4	Cr	Cuts and wounds	E	Apply ground corm
							Fr	Diarrhea	I	Eat fruit; Drink decoction of dried peelings
							St	Gingivitis	I	Apply extract
							Lf	Skin rash called “tikos”	E	Apply leaves as poultice
							Lf	Blood circulation enhancer	I	Chew young leaves
100	<i>Psidium guajava</i> L.	Myrtaceae	Bayabas	164	2.52	4	Lf	Scabies; cuts and wounds	E	Boil and use as wash
							Lf	Abdominal pain	I	Drink decoction
							Lf	Circumcision antiseptic	E	Apply chewed leaves
101	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Lumboy	29	0.45	2	Bk	Diarrhea	I	Chew or boil scraped bark and drink decoction
							Bk	Mouth sore	I	Apply scraped bark
							Fr, Sd	Infant diarrhea (“balaud”)	I	Give decoction to infant
							Fr, Sd	High blood pressure	I	Roast dried fruit, boil and drink
102	<i>Averrhoa bilimbi</i> L. ^d	Oxalidaceae	Iba	6	0.09	1	Lf	Stomach acidity	E	Mix crushed leaves with salt and apply
103	<i>Oxalis corniculata</i> L. ^d	Oxalidaceae	Himbis-himbis puyo	35	0.54	1	Rt	Measles	I	Boil with #48, #115 and drink decoction
104	<i>Pandanus tectorius</i> Parkinson ex Du Roi	Pandanaceae	Pandan	5	0.08	2	Sh	Urination difficulty, kidney stones	I	Drink decoction with #118 silk and #55 root
							Lf	Infant care	E	Burn dried leaves and apply ash onto infant navel
105	<i>Antidesma bunius</i> (L.) Sreng.	Phyllanthaceae	Bugnay	41	0.63	2	Lf	Measles, chicken pox	E	Boil and apply as hot compress
								Post-partum care	E	Boil and apply as wash or hot compress
106	<i>Antidesma ghaesembilla</i> Gaertn.	Phyllanthaceae	Inyam	7	0.11	2	St	Diabetes	I	Drink decoction
							Lf	Boils	E	Apply young leaves as poultice
107		Phyllanthaceae	Turug-turugon	48	0.72	1	Lf	Child sleeplessness, malaise and fatigue	E	

Table 2 (continued)

Plant no.	Scientific name	Family	Local name	No. of use-report	Use Value (UV) ^a	No. of category	Parts used ^b	Disease or purpose	Administration and preparation ^c
108	<i>Breynia vitis-idaea</i> (Burm.f.) C.E.C.Fisch. ^d <i>Piper betle</i> L.	Piperaceae	Buyo	114	1.75	4	Lf	Fever; fracture and dislocation; arthritis, rheumatism	Burn leaves as incense or place leaves under sleeping mats E Apply heated leaves as poultice
109	<i>Piper caninum</i> Blume	Piperaceae	Kanuyom	22	0.34	2	Lf	Sudden cough	E Rub crushed leaves on neck
110	<i>Pittosporum pentandrum</i> (Blanco) Merr. ^d	Pittosporaceae	Balingkawayan	17	0.26	1	Lf	Gas pain and flatulence	E Chew with #24 and apply on stomach
111	<i>Bambusa vulgaris</i> Schrad.	Poaceae	Kawayan	42	0.65	4	Bk	Toothache	I Chew inner bark, or scrape and apply
112	<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Poaceae	Bariri/Darukot	26	0.4	2	St	Fever	I Drink decoction
113	<i>Cymbopogon schoenanthus</i> (L.) Spreng.	Poaceae	Tanglad	73	1.12	6	Lf	Post-partum care	E Boil and apply as wash or hot compress
114	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Palagtiki	24	0.37	4	Wh, Rt	Nervous breakdown	I Drink water inside the internodes
115	<i>Imperata cylindrical</i> (L.) Raeusch.	Poaceae	Kogon	86	1.32	2	Fl	Fish poisoning	I Mix in cooking intoxicating fish ("aloy")
116	<i>Saccharum spontaneum</i> L.	Poaceae	Tigbaw	22	0.34	4	Lf	High blood pressure	I Drink decoction of young leaves
117	<i>Schizostachyum lumampao</i> (Blanco) Merr.	Poaceae	Bagakay	46	0.71	5	Wh, Rt	Post-partum care	E Apply as wash or hot compress
118	<i>Zea mays</i> L.	Poaceae	Mais	28	0.43	2	St	Fever	I Boil with #87 and drink decoction
119	<i>Portulaca oleracea</i> L.	Portulacaceae	Alusiman	20	0.31	4	Wh	Boils	E Crush and apply as poultice
120	<i>Ardisia elliptica</i> Thunb.	Primulaceae	Tagpo-bayi	28	0.43	3	Wh	High blood pressure; hairloss	I Boil and drink decoction
121	<i>Embelia whiffordii</i> Merr.	Primulaceae	Malaumau	40	0.62	5	Wh	Post-partum care	E Apply as wash or hot compress
122	<i>Ixora philippinensis</i> Merr.	Rubiaceae	Tagpo-laki	28	0.43	3	Lf	Cramp and spasm; rheumatism	E Grind and apply extract as ointment
123	<i>Morinda citrifolia</i> L.	Rubiaceae	Anino	43	0.66	4	Lf	Asthma; cough with phlegm	I Drink decoction; Boil with #30 leaves, #125 and drink decoction
							Sh, St, Lf	Hairloss; cuts and wounds	E Grind and rub; Apply extract
							Wh	Fracture and dislocation; internal bleeding	I Drink decoction
							Wh	Cramp and spasm	E Boil and apply as hot compress
							Rt	Fever; chicken pox, measles	I Boil with #48, #103 and drink decoction
							Lf	Skin rashes; athlete's foot; cuts and wounds	E Burn, mix ash with coconut oil and apply
							Sh	Sore eyes, blurred vision; fever	I Drop shoot extract; Drink decoction
							St	Childbirth tool, infant care	E Use in cutting umbilical cord, or burn and apply ash
							St	Scabies; cuts and wounds	E Burn and apply ash
							St	Child sleeplessness, malaise and fatigue	E Burn as incense with egg shell, and salt
							Lf	Muscle pain in rib area ("sikmat")	E Apply on chest as poultice
							Lf	Fever	I Drink decoction with #2 and #115 roots
							Tr	Child sleeplessness, malaise and fatigue	E Burn corn silk as incense
							Tr	Urination difficulty, kidney stone	I Drink decoction with #55 roots and #104 shoot
							Wh	Abdominal pain; urination difficulty	E Apply crushed plant
							Wh	Fever; boils; swellings	E Apply crushed plant as poultice
							St, Rt	Internal bleeding, hemorrhage	I Drink decoction
							St	Post-partum recovery	I Drink decoction
							Bk	Diarrhea	I Drink decoction of dried bark
							St	Sudden cough; mouth sore	I Cut liana and drink; Gargle extract
							St	Asthma	I Drink decoction of dried and powdered stem
							St	Rheumatism; cramp and spasm	E Infuse in alcohol and apply as ointment
							St, Lf	Post-partum recovery	I Drink decoction
							St, Rt	Internal bleeding, hemorrhage	I Drink decoction
							St	Post-partum recovery	I Drink decoction
							Bk	Diarrhea	I Drink decoction of dried bark
							Bk	Varicose veins	E Infuse in vinegar or in coconut oil and apply
							Bk, St	Post-partum care	E Apply as wash or hot compress
							Lf	Headache	E Apply fresh leaves as poultice or with #36

124	<i>Nauclea orientalis</i> (L.) L.	Rubiaceae	Bangkal	37	0.57	4	Fr, St Fr Rt/Lf St St/Bk Lf	Abdominal pain; urination difficulty Sudden cough Urination difficulty Boils Gas pain and flatulence Rheumatism	I Drink decoction I Drink decoction I Drink decoction E Apply scraped bark as poultice E Infuse in coconut oil and apply as ointment E Apply fresh leaves as poultice
125	<i>Citrus maxima</i> (Burm.) Osbeck	Rutaceae	Kabugao	61	0.94	2	Lf Lf Lf	Skin rashes Cough with phlegm Post-partum care	E Boil leaves and use as wash I Boil with #30 leaves and drink decoction E Apply as wash or hot compress
126	<i>Citrus x microcarpa</i> Bunge	Rutaceae	Suha	77	1.18	4	Fr Fr, Lf Lf	Dandruff Sudden cough; colds Infant care	E Apply fruit extract on scalp I Drink decoction of leaves or fresh fruit juice E Boil leaves and apply as infant bath
127	<i>Lunasia amara</i> Blanco	Rutaceae	Kamias	71	1.09	3	Bk Bk	Jaundice; abdominal pain Dysmenorrhea, delayed menstruation	I Drink decoction I Infuse in alcohol with #90 and drink
128	<i>Allophylus cobbe</i> (L.) Raeusch.	Sapindaceae	Asin-asin	14	0.22	2	Rt St	Urination difficulty Sudden cough	I Drink decoction I Drink decoction
129	<i>Chrysophyllum cainito</i> L.	Sapotaceae	Star apol	59	0.91	3	Lf, Fr Lf Lf Lf	Diarrhea Post-partum recovery Post-partum care Headache	I Drink decoction of leaves or fruit peelings, or with #88 I Drink decoction E Apply as wash or hot compress E Apply leaves as poultice
130	<i>Smilax bracteata</i> C.Presl	Smilacaceae	Banagan	1	–	–	Rt	Urination difficulty; post-partum recovery	I Drink decoction
131	<i>Capsicum annuum</i> L.	Solanaceae	Katumbal (Kutitot)	88	1.35	4	Lf Lf Fr Lf Fr Lf, Fr	Insect bite; white spot, athlete's foot; skin rashes Appetite enhancer Abdominal pain Infant care Ascariasis Diarrhea Burns	E Crush and rub on skin, or mix with vinegar and apply E Rub crushed leaves on stomach E Grind and rub on stomach E Heat leaves and apply as poultice on stomach I Eat ripe fruit E Heat leaves, apply on stomach as poultice E Crush and apply as poultice
132	<i>Physalis angulata</i> L.	Solanaceae	Tino-tino	40	0.62	2	Lf Fr Lf	Gas pain and flatulence, abdominal pain Fever	E Apply as poultice E Spread egg white on leaves and apply as poultice
133	<i>Solanum lycopersicum</i> L.	Solanaceae	Kamatis	28	0.43	2	Fl Lf	Asthma	I Smoke dried flowers
134	<i>Solanum melongena</i> L.	Solanaceae	Talong	52	0.8	1	Wh	Child sleeplessness, malaise and fatigue	E Burn whole plant as incense
135	<i>Solanum torvum</i> Sw. ^d	Solanaceae	Katsubong	7	0.11	1	Lf Lf Lf Lf	Post-partum care Dysmenorrhea, delayed menstruation Scabies	E Apply as wash or hot compress I Drink decoction E Burn, mix ash with coconut oil and apply
136	<i>Lantana camara</i> L.	Verbenaceae	Baho-baho	42	0.65	5	Lf Lf Lf	Indigestion; gas pain and flatulence Boils; cuts and wounds	I Chew with #24 and apply on stomach E Apply crushed leaves as poultice
137	<i>Stachytarpheta indica</i> (L.) Vahl	Verbenaceae	Sentimiento	108	1.66	2	Lf	Headache, abdominal pain	E Crush, apply as poultice with #142 and #139 rhizomes
138	<i>Leea indica</i> (Burm. f.) Merr.	Vitaceae	Mamali	32	0.49	1	Rz Rz Rz Rz	Fever; burns Dizziness, abdominal pain Dog bite; white spot Gas pain and flatulence; stomach acidity	E Grind and apply E Apply as poultice with #138 leaves, #142 E Apply crushed rhizomes
139	<i>Curcuma longa</i> L.	Zingiberaceae	Kalawag	38	0.58	2	Lf	Contact with plant thorns or spines	I Drink decoction
140	<i>Curcuma zerumbet</i> (Pers.) B.L. Burt & R.M.Sm.	Zingiberaceae	Langkawas	29	0.45	4	Rz Lf	Sudden cough	E Grind rhizome and apply as poultice E Grind heated leaves and rub
141	<i>Kaempferia galanga</i> L.	Zingiberaceae	Kusol	27	0.42	2	Rz Rz Rz	Toothache, gingivitis Sudden cough Abdominal pain, headache, skin rashes	I Place ground rhizome onto gums or tooth I Drink decoction E Crush and apply as poultice with #138 and #139 rhizome
142	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Luy-a	76	1.17	2			

^a UV calculation was only considered when use-report came from at least 2 informants.^b Bk, barks; Bl, bulbs; Cr, corms; Fl, flowers; Fr, fruits;; Lf, leaves; Rt, roots; Rz, rhizomes; Sd, seeds; Sh, shoots; St, stems; Tr, trichomes (hair); Wh, whole plant.^c I, internal; E, external.^d FL=100%. Plant use-mention/use-report from only 1 informant was not considered.

science classes in elementary schools (Abe and Ohtani, 2012). Among the 10 plants, the first 5 species are used medicinally in Ati culture. *Combretum indicum* was reported by medicinal plant gatherers to have been used in the past but was also mentioned that it could not be gathered in the island anymore, hence its exclusion in the list. Another species, *Vitex negundo*, popularly called Lagundi in the country, is not used in Ati culture, but its sister species *Vitex trifolia* subsp. *litoralis* is used to treat similar illnesses, and is locally called the same by the Ati people.

3.4. Collection sites

Thirty-five percent (35%) of the reported plants are cultivated as vegetables or bought from the market. Some plants, on the other hand, are taken from the wild and are partly cultivated (14%) for ease of collection in times of necessity, or planted as recommended by the elders and herbalists. More than half the number of the reported medicinal plants is collected in the wild (51%) growing in forests, fields or along streams. Ati medicinal plant gatherers keep secret locations where particular plants are found, and are asked for their services even by fellow Ati peddlers or traders whenever needed. This shows particular roles and division of labor that community members (usually within an extended family) take part in medicinal plant trade. At present, the Guimaras Ati family that is involved in gathering and peddling medicinal plants the longest is in its fourth generation.

3.5. Plant local names

The different (or the same) Ati local names given to some plants, and the mix of other regional local names gave difficulties in classifying and determining plant use-reports. For example, (1) *Urena lobata* (Dalupang) is confused with *Chrysopogon aciculatus* (Bariri) or vice-versa because both are also locally called Darukot; (2) *Uvaria grandiflora* (Kalansaging/Saging-saging), a member of the Annonaceae family is confused with a member of the Cannaceae family when the latter local name is used.

Some medicinal plants also have local names with attached “genders” (male or female) which do not indicate plant sex for a single taxon. Such is the case of Tagpo-laki (*Ixora philippinensis*) and Tagpo-bayi (*Ardisia elliptica*) that belonged to different plant families Rubiaceae and Primulaceae, respectively. In addition, some plants were named after the places where they are normally distributed (e.g. from the beach as in the case of Rosas de baybayon). Conversely, some villages in Guimaras Island (e.g. Alibhon and Tanglad) were named after local names of *Blumea balsamifera* and *Cymbopogon schoenanthus*, respectively due to the abundance of these medicinal plants in the said villages over the past.

3.6. Plant part used

The most frequently used plant parts in this study are the leaves (46%) and stem (14%) as shown in Fig. 2. Similar results were also reported in other Philippine ethnobotanical studies (Langenberger et al., 2009; Balangcod and Balangcod, 2011; Olowa et al., 2012) and in other ethnomedicinal studies in tropical Asia (Grosvenor et al., 1995; Kulip, 2003; Van Sam et al., 2008). The leaves and other aerial organs which are present in most plants the whole year round in these regions make materials for traditional remedies easily available. Ocular examination of leaves (and by crushing and smelling) is also frequently used in identifying medicinal plants by both expert and non-expert informants.

On the other hand, the medicinal plant parts that are usually sold or traded by the Ati are bark (7%), roots (7%) and fruits (7%) or seeds (4%) that are dried and powdered, or infused in oil with other mineral stones. This laborious (sometimes secretive) process

in preparing remedies gives the Ati herbalists the advantage in medicinal plant trade being the intellectual source and providers of raw materials or finished medical products.

3.7. Preparation and administration

Some of the most commonly used methods of preparation is by decoction (23%), application as poultice (18%) or by crushing and rubbing (20%) as shown in Fig. 3. In addition, plants may be applied as is without any mixture (73%), or may be prepared in combination with other plants or materials (27%). Plant parts are sometimes infused in alcohol to be taken orally as tonic, or in coconut oil or vinegar to be applied externally. This is common for traditional medicinal products that are sold in nearby towns or in bigger islands. Oftentimes, the bottles that contain this infusion of plant parts and other mineral stones are decorated with crucifix or other religious (Christian) symbols implying other factors that affect health and well-being. A particular number of plant parts in preparing poultice are also followed. Seven pieces (or at least an odd number) of heated or fresh leaves should only be used for administration. A combination of seven taxa is also commonly

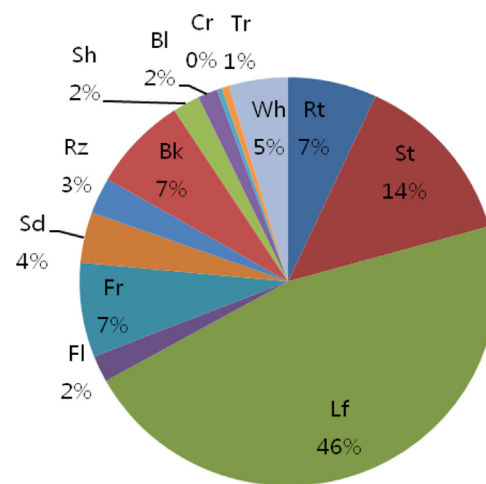


Fig. 2. Plant parts used by the Ati Negritos for traditional remedies. Bk, barks; Bl, bulbs; Cr, corms; Fl, flowers; Fr, fruits; Lf, leaves; Rt, roots; Rz, rhizomes; Sd, seeds; Sh, shoots; St, stems; Tr, trichomes (hair); Wh, whole plant.

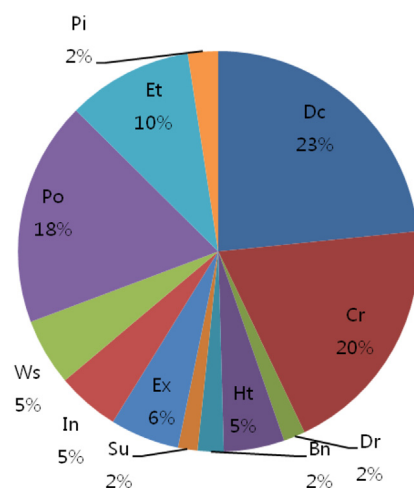


Fig. 3. Mode of preparation of medicinal plants by the Ati Negritos. Bn, burn (and use ash); Cr, crushed (and rubbed); Dc, decoction; Dr, dried; Et, eat (chew, drink, cook); Ex, extract (latex, resin and apply externally); Ht, heated; In, infusion; Pi, pill (powder and take); Po, poultice; Su, sudorification (burn as incense, smoke, inhale); Ws, wash or hot compress.

used in preparing several postpartum therapies such as decoction or wash, which we think is worthy of further investigation. Clearly this shows that botanical medicinal effectiveness in cultures is inevitably some varying combination of pharmacology and meaning (Moerman, 2007).

On the other hand, the more common route of administration is external (55%) rather than internal (45%). The advantage of external application is safety because external application results in indirect yet immediate local effects on the area and allows for easier regulation of dosages depending on the concentrations of beneficial or toxic compounds (Abe and Ohtani, 2012).

3.8. Use Value (UV)

The three plants with the highest UVs are *Psidium guajava* (2.52) used in 4 categories, *Blumea balsamifera* (2.15) in 3 categories, and *Cocos nucifera* (2.06) in 4 categories. UV calculation of plants (e.g. *Smilax bracteata*, *Pandanus tectorius*) was not considered when use-report came from a single informant.

The plants with the highest UV indicate species that are considered most important by the Ati people as shown in their number of use-reports in Table 2. UV has also been associated with issues of conservation, based on the idea that the most important species will suffer the greatest harvesting pressure (Albuquerque et al., 2006). Such is the case of *Blumea balsamifera* which is now almost entirely cultivated but were once naturally distributed in the island (a village was even named after it). *Blumea balsamifera* and *Psidium guajava* also belong to the 10 medicinal plants being promoted for cultivation by the Philippine government. *Cocos nucifera*, on the other hand, is used in many medicinal preparations especially as base solvent for infusion whether as oil or vinegar, and is popularly called the tree of life in the country due to the multiple uses of its parts.

3.9. Fidelity Level (FL)

A total of 24 species were found to have 100% FL values, but the ones with the highest number of use-mentions (48) are *Senna alata* for treating white spot; *Hibiscus rosa-sinensis* for boils; and *Breynia vitis-idaea* for child sleeplessness, malaise and fatigue. A high FL can imply that a particular plant purpose is most preferred as long as there is considerable number of use-mentions from informants. FL for plants mentioned by only a single informant (e.g. *Smilax bracteata*, *Pandanus tectorius*) was not computed.

3.10. Informant Consensus Factor (ICF)

The ICF value of each of the 16 categories was computed using use-reports, and ranged from 0.75 to 1.00 as shown in Table 1. Category 6 (Diseases of the ear) and Category 16 (Factors that influence health status and services) showed ICF values of 1.00 because the informants agreed of using only a single species for each category.

Category 14 with the ICF value of 0.95 revealed that the informants used 91 medicinal plant taxa recorded from 1,897 use-reports. The result might be due to the wide range of disease signs and symptoms under this category. This is also the category for most culture-bound syndromes, and where many diseases from mild to what can be considered fatal, or diseases caused by unexplained forces are grouped together.

Category 13, on the other hand, is another interesting category to further look into since the tradition of using medicinal plants for women's reproductive health and postpartum care is common and widespread in South East Asia. This category recorded 44 plants used in childbirth and postpartum care with a relatively high ICF value of 0.92 computed from 557 use-reports.

4. Conclusion

This documentation of medicinal plants and their applications shows the rich tradition in ethno-medicinal knowledge of the Ati Negrito indigenous group in Guimaras Island. However, the results may also imply that this knowledge is deteriorating as shown by the relatively low medicinal plant knowledge of members from the younger generation. Nevertheless, this study could open an avenue for future pharmacological research works, or serve as reference especially for future quantitative ethnobotanical investigations among over one hundred more ethnolinguistic indigenous groups all over the Philippines.

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