

Quantitative ethnopharmacological documentation and molecular confirmation of medicinal plants used by the Manobo tribe of Agusan del Sur, Philippines

Mark Lloyd Granaderos Dapar (✉ marklloyd.dapar.gs@ust.edu.ph)

University of Santo Tomas <https://orcid.org/0000-0002-1906-1191>

Grecebio Jonathan Duran Alejandro

University of Santo Tomas

Ulrich Meve

Universitat Bayreuth

Sigrid Liede-Schumann

Universitat Bayreuth

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Abstract

Background Philippines is renowned as one of the species-rich countries and culturally megadiverse in ethnicity worldwide. Ethnomedicinal knowledge of Indigenous Cultural Communities/Indigenous Peoples (ICCs/IPs) is vital for biodiversity conservation and healthcare improvement. This study aims to document the traditional practices, medicinal plant use, and knowledge; to determine the relative importance, consensus, and the extent of all medicinal plants used; and to integrate molecular confirmation to some medicinal plants used by the Agusan Manobo. **Methods** Quantitative ethnopharmacological data were obtained using semi-structured interviews, group discussions, field observations, and guided field walks with a total of 335 key informants comprising of tribal chieftains, traditional healers, community elders and residents of the community with their traditional medical knowledge. The use categories (UC), use report (UR), fidelity level (FL), and informant consensus factors (ICF) were quantified. The informants' medicinal plant use knowledge and practices were statistically analyzed using the descriptive and inferential statistics Mann-Whitney U and Kruskal-Wallis tests. **Results** A total of 122 medicinal plant species belonging to 108 genera and 51 families, used in 16 use categories, were collected and identified. Integrative molecular approach confirmed 24 species with uncertain identity using multiple universal markers. The highest ICF (0.96) was cited for the category of abnormal signs and symptoms (ASS). The maximum FL values of 100% were found for *Carica papaya* L., *Premna odorata* Blanco, *Cinnamomum mercadoi* S.Vidal, *Tinospora crispa* (L.) Hook.f. & Thomson, and *Ficus concinna* (Miq.) Miq. used for the treatment of dengue fever, cough with phlegm, stomach trouble, joint pain, and fracture and dislocation, respectively. The highest UR (1134) and UC (12) was reported for *Anodendron borneense* (King & Gamble) D.J.Middleton. Statistically, the medicinal plant knowledge among respondents was significantly different ($p < 0.001$) when grouped according to education, gender, position, occupation, civil status, and age but not significantly different ($p = 0.379$) when grouped according to location. **Conclusion** Documenting such traditional knowledge of medicinal plants and practices is highly important for future management and conservation strategies of these plant genetic resources. This quantitative ethnopharmacological study will serve as a future reference not only for more ethnopharmacological documentation but also for further pharmacological studies and public healthcare improvement.

Introduction

The application of traditional medicine has gained renewed attention for the use of Traditional, Complementary, and Alternative Medicine (TCAM) in the developing and industrialized countries [1,2]. Conventional drugs these days may serve as effective medicines and therapeutics, but some rural communities still prefer natural remedies to treat selected health-related problems and conditions. Medicinal plants have long been used since the prehistoric period [3], but the exact time when the use of plant-based drugs has begun is still uncertain [4]. The WHO has accounted for about 60% of the world's population relying on traditional medicine, and 80% of the population in developing countries almost depend on traditional herbal remedies for their primary health care [5]. Estimates for the numbers of plant species used medicinally worldwide include 35,000–70,000 [6], with 7,000 in South Asia [7] comprising ca. 6,500 in Southeast Asia [8,9]. In the Philippines, more than 1,500 medicinal plants used by traditional healers have been documented [10], and 120 plants have been scientifically validated for safety and efficacy [11]. Of all documented Philippine medicinal plants, Tan and Sia [12] determined a top list of plants used for TCAM. Most of these Philippine medicinal plants have been further studied to validate their biological and biochemical potential [13–17] scientifically.

Because of the increasing demand for drug discovery and the development of medicinal plants, the application of the quantitative approach in ethnobotany [18] and ethnopharmacology [19] has been rising continuously in the last few decades including multivariate analysis [20]. However, few studies of quantitative ethnobotanical research were conducted despite the rich plant biodiversity and cultural diversity in the Philippines. In particular, the Ivatan community in Batan Island of Luzon [21] and the Ati Negrito community in Guimaras Island of Visayas [18] have been documented, while Mindanao has remained less studied. Even though Philippines is rich in indigenous knowledge, few ethnobotanical studies have been conducted and published [22].

The Philippines is culturally megadiverse in diversity and ethnicity among Indigenous Peoples (IPs) embracing more than a hundred divergent ethnolinguistic groups [23,24] with known specific identity, language, socio-political systems, and practices [25]. Of these IPs, 61% are mainly inhabiting Mindanao, followed by Luzon with 33% and some groups in Visayas (6%) [26]. One of these local people and minorities are the indigenous group of *Manobo*, inhabiting several areas only in Mindanao. They are acknowledged to be the largest Philippine ethnic group occupying a wide area of distribution than other indigenous communities like the Bagobo, Higaonon, and Atta [27]. The *Manobo* ("river people") was the term named after the "Mansuba" which means river people, coined from the "man" (people), and the "suba" (river) [28]. Among the provinces dwelled by the *Manobo*, the province of Agusan del Sur is dominated by this ethnic group known as the *Agusan Manobo*. The origin of *Agusan Manobo* is still uncertain and immemorial. However, they are known to be one of the settlers from South China as the proto-Philippine or proto-Austronesian people earlier than the Ifugao and tribes in northern Luzon [29].

Manobo indigenous people are clustered accordingly, occupying areas with varying dialects and some aspects of culture due to geographical separation. Their historic lifestyle and common livelihood are rural agriculture and primarily depend on their rice harvest, root crops, and vegetables for consumption [30]. Some members of *Agusan Manobo* are widely dispersed in highland communities above mountain drainage systems, indicating a suitable area for their indigenous medicinal plants in the province. Every city or municipality is governed with a tribal

chieftain known as the “datu” (male) or “bae” (female) with his or her respective tribal healer “babaylan” and the tribal leaders “datu” of each barangay leading their community. Their tribe has passed several challenges over the years but has still maintained to conserve and protect their ancestral domain to continually sustain their cultural traditions, practices, and values up to this present generation. This indicates that there is rich medicinal plant knowledge in the traditional practices of *Agusan Manobo*, but their indigenous knowledge has not been systematically documented. Furthermore, there is no comprehensive ethnobotanical studies of medicinal plants used among the *Manobo* tribe in the Philippines.

Documenting the ethnomedicinal plant use and knowledge, and molecular confirmation of species using integrative approach will help in understanding the nature of medicinal plants in the treatment of health-related problems of the people of Agusan del Sur. This will also help the entire *Agusan Manobo* community to implement conservation priorities of their indigenous plant species. Furthermore, the provincial government of Agusan del Sur may enforce the proper utilization of their natural resources from IPs. Ideas and knowledge about ethnomedicinal use and practices of medicinal plants give credence to the traditional methods and preparation of herbal medicine by ethnic groups.

Despite the limited funds and qualified personnel in the region, it is highly relevant to recognize the role of ethnopharmacology and species identification in the conservation of these plant genetic resources with medicinal properties. With the introduction of the molecular barcodes for species identification by Hebert et al. [31] the problem of unauthenticated medicinal species can now be resolved [32-39]. Significantly, researchers have recently developed the application of ethnopharmacological study into a quantitative approach with measuring indices to quantify the relationship between plant species and humans [40-42].

This study, therefore, aims to (1) conduct a quantitative ethnopharmacological documentation of traditional therapy (2) evaluate the medicinal plant use and knowledge, and (3) utilize integrative molecular approach for species confirmation of medicinal plants used by the *Manobo* tribe in Agusan del Sur, Philippines.

Materials And Methods

Study Area

Fieldwork was conducted in the province of Agusan del Sur, Philippines (8°30'N 125°50'E), bordered from the north by Agusan del Norte, to the south by Davao del Norte, and from the west by Misamis Oriental and Bukidnon, to the east by Surigao del Sur. Agusan del Sur is bounded with mountain ranges from the eastern and western sides, forming an elongated basin or valley in the central longitudinal section of the land. The province is subdivided into 13 municipalities (from the largest to smallest land area): La Paz, Esperanza, Loreto, San Luis, Talacogon, Sibagat, Prosperidad, Bunawan, Trento, Veruela, Rosario, San Francisco, and Sta. Josefa; and the only component city, the City of Bayugan. Forestland comprises almost two-thirds (74%) of the province of Agusan del Sur, while alienable and disposable (A&D) areas constitute around one-third (26%) of the total land area [43]. Every city or municipality has a respective community hospital and health center with limited doctors and rural health workers. Typically, local people only visit hospitals or health centers for surgical and obstetric emergencies. Most residents rely on their medicinal plants for disease treatment and medication due to cost and poor access to healthcare services. This study purposively covered areas of selected city and municipalities (Bayugan, Esperanza, and Sibagat) for accessibility, availability and security reasons to barangays with Certification of Ancestral Domain Title (CADT) as endorsed by the National Commission on Indigenous Peoples - CARAGA Administrative Region (NCIP-CARAGA) (Fig. 1).

Sampling and interview

Fieldwork was undertaken from March 2018 to May 2019. It consisted of obtaining prior informed consent, observing rituals, acquiring resolutions, certifications, and permits, conducting semi-structured interviews, focus group discussions, plant observations, and medicinal plant collections in selected barangays of Bayugan, Sibagat and Esperanza. This study was initiated in coordination with the Local Government Unit (LGU), NCIP-LGU, and Provincial Environment and Natural Resources Office (PENRO) of Agusan del Sur. Consultation meetings and discussions were carried out together with the concerned parties (tribal leaders, tribal healers, and NCIP officers) to discuss research intent as purely academic, and to acquire mutual agreement and respect to conduct this study. As approved, the research intent was certified through resolution and certification duly signed by the tribal council of elders following the by-laws of NCIP for the welfare and protection of indigenous peoples, and finally certified by NCIP-CARAGA.

A total of 335 *Agusan Manobo* (more than 10% of the total *Manobo* population of selected barangays; see Additional file 1: Table S1) were selected through purposive and snowball sampling with 106 female and 229 male individuals in an age range from 18–87 years old (median age 42 years) (see Additional file 2: Table S2). Ethnopharmacological data were collected through semi-structured interviews with *Manobo*

residents. The respective barangay tribal leaders assisted interviews among respondents with no appointments made prior to the visits. The semi-structured questionnaire used was modified and adapted from the Traditional Knowledge Digital Library (TKDL) template, as suggested by the Department of Health – Philippine Institute of Traditional and Alternative Health Care (DOH-PITAHC) (Additional file 3: Table S3). The ethics review committee of the Graduate School, University of Santo Tomas (USTGS-ERC) approved this questionnaire and secured a valid translation to *Manobo* dialect (Minanubu) with the help of a community member and NCIP officer. It has series of questions about the common health problems encountered by the respondents, the actions undertaken to address such problems, the medicinal plants they used (vernacular name), the plant's part(s) used, the forms, modes, quantity or dosage and frequency of administration, the source or transfer of knowledge and the experienced adverse or side effects. Interviews were accompanied by nurses and allied workers as coordinated by the rural health center to verify reported diseases accurately by the informants.

Meetings and focus group discussions were also performed to review the accuracy of acquired data among the respondents with the help of guided questions among the tribal council of elders comprising the NCIP-recognized indigenous peoples mandatory representatives (IPMRs), the tribal chieftains, the tribal healers and the respective tribal leaders of every barangay tribal communities together with the NCIP officer.

Plant collection and identification

Collection of plant specimens was conducted through guided field walks with the aid of the traditional healers, expert plant gatherers and members within the tribal community. The plant habit, habitat, morphological characteristics, vernacular names, and some indigenous terms of their uses were documented. Leaf samples were placed in zip-locked bags containing silica gel for molecular analysis [44] in preparation for further molecular confirmation. Voucher specimens were deposited in the University of Santo Tomas Herbarium (USTH). Putative plant identification using vernacular names was compared to the reference of local names, *Dictionary of Philippines Plant Names* by Madulid [45]. Plant identification was assisted by Mr. Danilo Tandang, a botanist and researcher at the National Museum of the Philippines. Specimens unidentifiable by morphology were selected for molecular confirmation. All scientific names were verified, checked for spelling and synonyms, and family classification using *The Plant List* [46], *World Flora Online* [47], *The International Plant Names Index* [48], and *Tropicos* [49]. The occurrence, distribution, and species identification were further verified using the updated *Co's Digital Flora of the Philippines* [50].

DNA extraction, amplification, and sequencing

Collected plant specimens with insufficient material for identification due to lack of reproductive parts and unfamiliarity were subjected to molecular confirmation. The total genomic DNA was extracted from the silica gel-dried leaf tissues of samples following the protocols of DNeasy Plant Minikit (Qiagen, Germany). The ITS (nrDNA), *matK*, *trnH-psbA*, and *trnL-F* (cpDNA) markers were used for this study. Primer information and PCR conditions used for amplification using Biometra T-personal cycler (Germany) can be found in (Additional file 4: Table S4) for future parameter reference. PCR amplicons were checked on a 1% TBE agarose to inspect for the presence and integrity of DNA. Amplified products were sent to Eurofins Genomics for DNA sequencing reactions. Sequences were then assembled and edited using Codon Code Aligner v4.1.1. All sequences were then evaluated and compared using BLAST n search query available in the GenBank (www.ncbi.nlm.nih.gov). The BLAST n method estimates the reliability of species identification as a sequence similarity search program to determine the sequence of interest [51] regardless of the age, plant part, or environmental factors of the sample [52].

Quantitative Ethnopharmacological Analysis

The Use Report (UR) is counted as the number of times a medicinal plant is being used in a particular purpose in each of the categories [18,21]. Only one use-report was counted for every time a plant cited as being used in a particular disease or purpose and even multiple disease or purpose under the same category [53]. Multiple use-report was counted when at least two interviewees cited the same plant for the same disease or purpose. Fidelity Level (FL) developed by Friedman et al. [54] is calculated using the formula: $FL (\%) = (Ip/Iu) \times 100$, where Ip is the number of informants who independently suggested a given species for particular disease, and Iu is the total number of informants who mentioned the plant for any use or purpose regardless of category [18]. High FL values (near 100%) implies the most preferred medicinal plant species for a particular ailment category, while low FLs are those with many different purposes [21]. The ICF introduced by Trotter and Logan [55] was used to analyze the degree of informants' agreement based on their medicinal plant knowledge in each of the categories [18,21]. This is computed using the formula: $ICF = (Nur - Nt) / (Nur - 1)$, where Nur is the number of UR in each category, and Nt is the number of species used for a particular category by all informants. The maximum value (1.00), means a high degree of informant agreement that the particular medicinal plant species cited could cure a particular disease. However, a minimum value (0.00) means no information exchange among the

informants [56]. High ICF values (approach to 1.00) are anticipated to be effective in treating a particular disease [57], which can be an indicator for interesting medicinal plant species for biochemical studies [58].

Statistical tools

The plant URs were computed and analyzed using IBM SPSS Statistics software v.23 (SPSS Inc. Released, 2015). Descriptive and nonparametric inferential statistics Mann-Whitney U and Kruskal-Wallis tests were employed to test for significant differences at 0.01 level of significance. These two statistical analyses measure and compare the medicinal plant use and knowledge of informants when grouped according to location, education, gender, position, occupation, civil status, and age.

Integrative molecular identification

Selected plant samples unidentifiable by morphology were subjected to an integrative molecular identification approach as previously recommended by Ghorbani et al. [38] for accurate species identification of plant samples. Most of all extracted samples for molecular analyses were successfully amplified and sequenced (91%) using multiple universal markers. Some medicinal plants could not be successfully amplified using the given primer due to low levels of DNA present in the samples [59] or plant secondary metabolites present as inhibitory factors [60]. Selected plant samples were compared with the available morphological characteristics, interview data on vernacular names, and traditional knowledge, determining scientific names based on the reference of local names using the *Dictionary of Philippines Plant Names* [45]. and utilizing multiple molecular markers, ITS (nrDNA), *matK*, *trnH-psbA*, and *trnL-F* (cpDNA) for sequencing and BLAST matching. Two sequence similarity-based methods using BLAST [61] were applied for molecular confirmation. BLAST similarity-based identification was adapted from the study of Ghorbani et al. [38] with slight modification. This involves using the simple method taking the top hits, and optimized method. All successfully sequenced samples were sequentially queried using megablast [61] online at NCBI nucleotide BLAST against the nucleotide database.

For the simple method, all top hits within 5 points deviation down of the max score were considered. If the max score (-5 points) showed only a single species, then a species-level identification was assigned. On the other hand, if the max score (-5 points) showed several species but similar genus, then a genus-level identification was assigned. However, if the max score (-5 points) showed multiple species in several genera of the same family, then a family-level identification was assigned. Besides, within 5 points deviation down of the max score, the highest max score and the highest percent identity were also determined. From the top 5 hits down of the max score, an optimized method using the formula, $[\text{max score} (\text{query cover}/\text{identity})]$, was calculated.

The integrative approach combined the simple and optimized BLAST-based sequence matching results with reference of local names, and expert determination based on comparative morphology. As a result, all species identity, generic, and familial affinity were further confirmed from the recorded occurrence and distribution of putative species in the study area based on the updated *Co's Digital Flora of the Philippines* [50].

Results

Medicinal plant knowledge of *Agusan Manobo*

The majority of the respondents (90.45%) cited their acquisition of medicinal plant knowledge from their parents. They also have mentioned other sources of knowledge like fellow tribe band (67.76%), relatives (64.48%), community (61.49%), and by means of self-discovery (47.76%). However, the descriptive and inferential statistics revealed varying factors affecting the medicinal plant knowledge among the sampled key informants.

When grouped according to location, there was no significant difference on their medicinal plant knowledge as revealed in Kruskal-Wallis test ($p=0.379$) where the City of Bayugan has the highest number of UR ($Md=112$, $n=150$), followed by the two municipalities, Esperanza ($Md=111$, $n=95$), and Sibagat ($Md=108$, $n=90$). This result showed an exchange of information on these adjacent localities among the *Manobo* community may it be the council of elders and members who are medicinal plant gatherers, peddlers, and traders. However, when grouped according to education, respondents who have secondary level as their highest educational attainment ($Md=116$, $n=167$) showed highest medicinal plant knowledge when compared to primary ($Md=105$, $n=57$), and tertiary ($Md=92$, $n=111$) as revealed by the highly significant difference presented in Kruskal-Wallis test ($p<0.001$). This result implied that respondents who finished tertiary are more educated with modern medicine and highly acquainted with commercial drugs available over-the-counter for immediate treatment and therapy. On the other hand,

members with lower educational level have more medicinal plant knowledge, and most traditional healers, gatherers and peddlers have finished at most on the secondary level.

When grouped according to gender, non-parametric tests revealed that men ($Md=116$, $n=229$) have more medicinal plant knowledge than women ($Md=104$, $n=106$), as demonstrated by the significant difference in both Mann-Whitney U test ($p<0.001$) and Kruskal-Wallis test ($p<0.001$). It can be observed that men have more medicinal plant knowledge in *Agusan Manobo* culture, an observation supported by the fact that in two of the three selected localities, the tribal healers are male and most of the tribal officials are also males. This result is contrary to the previous statistical findings of Ong and Kim (2014) in Ati culture where women are more knowledgeable than men because they are more involved in medicinal plant gathering and peddling and women also play a big role in caring for their sick children.

Also, knowledge among the respondents when grouped according to position varies significantly, as revealed by the Kruskal-Wallis test ($p<0.001$). This result means that the *Manobo* tribal officials have more medicinal plant knowledge when compared to their members ($Md=104$, $n=239$), with the exception of their knowledgeable tribal healers ($Md=189$, $n=3$). This is evident with the results among tribal officials, namely tribal leaders ($Md=178$, $n=31$), tribal IPMRs ($Md=177$, $n=6$), tribal chieftains ($Md=172$, $n=45$), *Manobo* tribal council of elders ($Md=164$, $n=7$), *Manobo* NCIP focal persons ($Md=160$, $n=4$).

When grouped according to the occupation, non-parametric Kruskal-Wallis test also significantly revealed ($p<0.001$) that informants with occupation in farming ($Md=118$, $n=205$), and animal husbandry ($Md=116$, $n=47$) have more medicinal plant knowledge compared to employed ($Md=98$, $n=49$), and unemployed ($Md=96$, $n=16$) informants. This result suggested that *Manobo* people who are working in line with agriculture are more exposed to medicinal plant knowledge as they are farming crops and raising animals in hinterlands, and mountainous areas where most medicinal plants are located. Also, when grouped according to civil status, married informants ($Md=136$, $n=147$) showed higher medicinal plant knowledge than single ones ($Md=92$, $n=188$) as revealed by the very high significant difference in both Mann-Whitney U test ($p<0.001$) and Kruskal-Wallis test ($p<0.001$). This result implied that married respondents were more exposed during community gatherings, which involve a discussion about medicinal plants with regards to their uses and applications. Exchange of information could be observed when couples were present during the scheduled tribal meetings.

Finally, when grouped according to age, descriptive and inferential statistics revealed that respondents from the age group of more than 65 years old have the highest medicinal plant knowledge ($Md=173$, $n=37$), followed by 50–65 years old ($Md=155$, $n=53$), 35–49 years old ($Md=102$, $n=103$), and 18–24 years old ($Md=96$, $n=142$), respectively, as revealed by the highly significant difference manifested in Kruskal-Wallis test ($p<0.001$). This result corresponds to our expectation because older informants most likely have more knowledge of medicinal plant uses and practices based on their long term of experience. This result may also imply that younger generations are becoming more acquainted and educated with modern medicinal treatment making them more reluctant in their traditional medicinal plant gathering and peddling. This transforming awareness, social, and cultural experiences may have influenced their medicinal plant interest, traditional knowledge, and attitudes among the *Agusan Manobo*. Younger generation is becoming more privileged to be educated as part of the government scholarship and program for indigenous communities resulting in migration to urban communities.

Medicinal plants used

A total of 122 reported medicinal plant species belonging to 108 genera and 51 families were categorized in 16 uses or diseases, as shown in Tables 1 and 2. All informants interviewed agreed about the healing power of medicinal plants, but only 58.5% of the informants use medicinal plants to treat their health conditions. While some residents (30.75%) directly rely on seeking for tribal healers in their community, all these *Babaylans* utilized their known medicinal plants for immediate treatment and therapy. However, the minority (10.75%) of the respondents depended on seeing a medical practitioner and allied health workers in the treatment of their health conditions at a nearby hospital or health center.

Species molecular confirmation

Due to inconclusive morphological identification, unfamiliarity, and confusing species identity because of local name similarity, a total of 24 medicinal plant species were confirmed by DNA sequencing and by comparing the sequences with those present in GenBank. This method supported ethnopharmacological data to be deposited in a repository [18], which is essential and helpful for future researchers and investigators for use by data mining approaches [62]. The molecular data can also be helpful in the growing barcoding studies of medicinal plants. Putative identification based on literature, expert determination using morphology, and molecular sequences using BLAST search query were tabulated (Additional file 5: Table S5). The integrative approach coalesced with *a priori* data from putative identifications based on the interview data on vernacular names, local plant name dictionary, and assessment of available morphological characteristics along with a

posteriori data from multiple molecular markers, occurrence, and distribution of putative species in the Philippines. This paper applied a more detailed taxonomic identification since all reported medicinal plant taxa were identified (nearly all to species level) as shown in Table 2. While all generic and familial affinities of medicinal plants were confirmed, five medicinal plants were not identified up to species level due to lack of morphological characteristics, concerning especially the reproductive parts of *Piper* species; several cultivars and hybrids of *Rosa* species; and several species and varieties of *Bauhinia* species. Nevertheless, all generic and familial affinities of the medicinal plants documented here were verified combining similarity matching and *a priori* and *a posteriori* data as recommended by Ghorbani et al. [38] to reduce ambiguity and make it possible to assign a single species identification of their unfamiliar species. All determined plant samples with confusing identity having local name similarity and local species pairing, including plant samples with inconclusive morphological identification, were accurately verified using an integrative molecular approach.

Plant local names

Most notable medicinal plants of Agusan Manobo have confusing species identity bearing similar local names, gender identity and local species pairing. It is popular to use medicinal plants known as “Lunas” (meaning “cure”) with several plants associated under its name. For instance, the top four medicinal plants in terms of use-report and use value have local name similarity, namely Lunas tag-uli (*Anodendron borneense*), Lunas bagon tapol (*Piper decumanum* L., Lunas kahoy (*Micromelum minutum* (G.Forst.) Wight & Arn.), and Lunas bagon puti (*Piper nigrum* L.), respectively. These four medicinal plants named “lunas” have almost similar use-reports in nine disease categories which only differ in their use value, informant consensus factor, fidelity level, and efficacy accordingly. Other “lunas”-named specimens such as Lunas pilipo (*Acmella grandiflora* (Turcz.) R.K.Jansen), Lunas buyo (*Piper aduncum* L.), and Lunas gabi (*Alocasia zebrina* Schott ex Van Houtte) also share similarities from the four mentioned samples in terms of ethnomedicinal properties as treatment for cuts and wounds. Also, another three medicinal plants were locally classified with the name “Talimughat” (meaning “recover”), namely “Talimughat lignin” (*Grewia laevigata* Vahl), “Talimughat taas” (*Friesodielsia lanceolata* (Merr.) Steen.) and “Talimughat pikas” (*Bauhinia* sp.). These three medicinal plants were noted with high fidelity for postpartum care and recovery. Plant samples with high fidelity for anemia also have similar local names which are found to be similar species, namely “Mayana kanapkap” (*Coleus scutellarioides* (L.) Benth.), and “Mayana pula” (*Coleus scutellarioides* (L.) Benth.).

Some medicinal plants also have attached “genders” (male or female) in their local names which specify the more effective plant “gender” for a specific medicinal use or purpose. Examples are “kapayas laki” (*Carica papaya* L., male), “dupang bae” (*Urena lobata* L., female), and “Gapas-gapas bae” (*Erechtites valerianifolius* (Link ex Spreng.) DC., female) as effective treatment for dengue virus, postpartum care and recovery, and gas pain and flatulence, respectively. In addition, most species with high use values have local species pairing as classified by the tribe according to distinct white and red coloration, namely “puti” and “tapol,” respectively, with the latter as more effective than the former in treatment for various health conditions. The following recognized local species pairs as white and red plant samples, respectively, are “Alibangbang puti” (*Phanera semibifida* (Roxb.) Benth.) and “Alibangbang tapol” (*Phanera semibifida* (Roxb.) Benth.); “Banti puti” (*Omalanthus macradenius* Pax & Hoffm.) and “Banti tapol” (*Omalanthus macradenius* Pax & Hoffm.); “Lunas-bagon puti” (*Piper nigrum*) and “Lunas-bagon tapol” (*Piper decumanum*); “Tobog puti” (*Ficus fistulosa* Reinw. ex Blume) and “Tobog tapol” (*Ficus cassidyana* Elmer); and “Tuba-tuba puti” (*Jatropha curcas* L. and “Tuba-tuba tapol” (*Jatropha gossypifolia* L.). Local species pairing of “Alibangbang puti” and “Alibangbang tapol” was found to be similar species (*Phanera semibifida* (Roxb.) Benth.). Another species pair, “Banti puti” and “Banti tapol” was also found to be similar species (*Omalanthus macradenius* Pax & Hoffm.). However, molecular confirmation of all species pairs by the locals do not necessarily point to the same species but are mostly referring to another species. Thus, it is always important in any ethnomedicinal, ethnobotanical, and ethnopharmacological study to obtain the correct identification of medicinal plants using an integrative molecular approach for accuracy, consistency, and dependable species identity for future natural product investigations.

Collection sites

The majority (57%) of the medicinal plants were collected in the wild, woods or forest while some were collected within the community village (7.2%) and within the houses (4.8%). Some local people are cultivating some of these medicinal plants near homes for their convenience, but collecting medicinal plants in the wild is highly encouraged for efficacy as the locals believe that the plants should grow in their natural setting rather than cultivation. Scientific studies tend to support the idea of medicinal plant collection in the wild because plant secondary metabolites will be mostly expressed in the natural setting under environmental stress and conditions while they could not be comparably expressed under monoculture conditions [63]. Uniyal et al. [64] reported higher levels of secondary metabolites in wild populations where plants grow slowly, unlike in much faster-growing monocultures.

Plant parts used

All plant parts are used from various plant species against a variety of diseases. The most frequently used plant parts are the leaves (41.6%), followed by roots (16.1%), barks (12.0%), stems (8.5%), sap or latex (6.7%), and flowers (4.1%) (Fig. 2). Sometimes, more than one plant part of the same species is used in combination, like leaves and barks for preparation and administration which the locals believed to have synergistic effect.

Preparation and administration

The primary preparation method was decoction (34.0%), followed by pounding, crushing, rubbing, grinding, and powderizing (13.7%), poultice (12.3%), extracting (9.0%), directly applying or eating (8.5%), infusion (7.1%), or as wash, bath, hot compress (5.5%), heating or warming (3.6%), tincture (2.7%), brewing (1.6%), burning (1.4%) and steaming (0.5%) as depicted in Fig. 3. The more common route of administration is internal (60%) rather than external (40%). This result is similar to previous ethnobotanical reports conducted in Mindanao [65-66] but contrary to other ethnobotanical studies among ethnobotanical survey held in Luzon [21] and Visayas [18] where external application is more common. While external administration could be safer, according to *Agusan Manobo*, the internal application is more common since most of their health conditions are associated internally with decoction as their most common preparation. In cases of external diseases and illnesses, preparation of more prolonged coconut oil infusions of medicinal plant stems and barks are often applied.

Use report (UR)

The Use Report (UR) represents the relative importance of medicinal plants for certain categorized uses or diseases. High URs are considered the most important species among *Agusan Manobo*. Five medicinal plants with the highest URs (more than 900) were *Anodendron borneense* (1,134) in 12 categories, *Piper decumanum* L. (1,018) in 9 categories, *Micromelum minutum* (955) in 9 categories, *Arcangelisia flava* (L.) Merr. (922) in 10 categories, and *Cinnamomum mercadoi* (908) in 9 categories. These high use-reported plants were the most frequently used plant species for pregnancy, skin rashes and itchiness, hemorrhage, tumor, and stomach trouble, respectively. The respondents consistently reported these in all study sites, but only harvested in the wild. Some other plants can be cultivated with high URs, as shown in the number of use-reports in Table 2. While high UR species can often be harvested for medicinal use and purpose, these important species call for conservation priority [67]. The four medicinal plants included among the top 10 recommended medicinal plants by the Department of Health (DOH) of the Philippines, were cultivated by the *Agusan Manobo* residents within their community. These scientifically validated medicinal plants were also reported with high URs, namely "Bayabas" *Psidium guajava* L. (275) "Lagundi" *Vitex negundo* L. (475), "Gabon" *Blumea balsamifera* (L.) DC. (412), and "Tsaang gubat" *Ehretia microphylla* Lam. (336).

Use categories (UC)

Reported medicinal uses of plants in this study were grouped into 16 category names based on the citations of informants and the likeness to the use category. Reported uses and diseases in medical terms were verified by the assigned local physicians and allied workers nearby hospitals and health centers to confirm disease occurrence and epidemiology in the area. A total of 120 reported uses or diseases treated by 122 plant species were documented in the study area (Table 1).

Fidelity level (FL)

FLs imply the most preferred medicinal plant for a particular disease or purpose. FL value ranges from 1% to 100% depending on the URs cited by the informants for a given species for a particular ailment. A total of 38 species were found with the maximum FL of 100%, including the identified species with the highest number of use-mentions, *Carica papaya*, *Premna odorata*, *Cinnamomum mercadoi*, *Tinospora crispa*, and *Ficus concinna*, which are used to treat constipation, dengue fever, cough with phlegm, stomach trouble, joint pain, and fracture and dislocation, respectively (Table 1). Other species with low FL values indicate less preferred species to treat a particular ailment, however, this suggests the extent of medicinal plant use as treatment a for various diseases.

Informant consensus factor (ICF)

ICFs measure the agreement among informants on the use of plant species for a particular use or disease category. While the agreement among the selected informants varies in different categories, the ICF values are all greater than or equal to 0.90 (Table 1). Among the 16 use

categories, the category of abnormal signs and symptoms (ASS) was the highest showing an ICF value of 0.96. This result means that informants agreed to use a single species for this category. Under this category, *Sida rhombifolia* L. was recorded as the most frequently used species, particularly used as a treatment for cramp and spasm locally termed as “pasmo” among the *Agusan Manobo*. This means that most of the informants totally agree on the use of a specific plant for a particular ailment or purpose.

Of all categories, the category of other problems of external causes (OEC) showed the second to the highest number of URs with the highest number of taxa used. This result was similar to the previous findings of Ong and Kim [18] among the *Ati Negrito* indigenous group. This category is known to cover a wide range of disease signs and symptoms from mild to severe conditions and unexplained causes. The recorded most common health problems of *Agusan Manobo* within their household also belong in this category. The percentages of informants who cited their common illnesses under this category were 88.06% fever, 58.21% headache, and 58.51% body ache. Other reported common health conditions were 77.01% cough, 69.55% colds, 37.31% stomach troubles, and 15.52% other illnesses.

Dosage, frequency and experienced adverse or side effects of using medicinal plants

For a detailed ethnopharmacological study, it is essential to consider the therapeutic use, medication action, and possible effects. This study involved documenting the quantity or dosage, administration frequency, and experienced adverse or side effects, as shown in Table 2. A particular number of plant parts were followed in their mode of preparation. Having leaves as their most used medicinal plant part, 3–5 leaves (or at least an odd number) of decocted, heated, and pounded leaves should be used. Most of the medicinal plants (82%) were reported by the respondents with no experiences of adverse or side effects, while 18% of medicinal plants were experienced with adverse or side effects. There were seven medicinal plants reported to cause abortion to pregnant women once taken or applied. Other listed medicinal plants when taken in excess, can cause other adverse or side effects. Five of these medicinal plants can cause anemia, dizziness, and weakening, and also five medicinal plants can cause acid reflux and hypocupremia. Some of the medicinal plants can cause burn, allergy and can be poisonous when eaten or applied while the rest of the reported cases concern excessive intake, which can cause blood viscosity, intestinal weakening, thrombocytopenia, and abnormalities to lactating mothers. These reported adverse or side effects were determined by attending local medical practitioners during their hospital visits and in times of emergency.

Discussion

This ethnopharmacological documentation recorded a total of 122 medicinal plant species belonging to 108 genera and 51 families across 16 use or disease categories. The majority of medicinal plants are trees (36%) and herbs (33%), which are mostly found in the wild while some are cultivated. These are followed by 17% shrubs, 11% climbers, 2% grasses, and 1% ferns. The highest percentage of medicinal trees documented in this study is parallel with the earlier ethnobotanical studies [18, 68]. The highest frequency of using leaves and aerial plant organs was also reported in several ethnobotanical studies in the Philippines [18, 21, 22, 65, 66, 68-70] and other countries [71-73]. The highest frequency of decoction for preparation and administration is similar to previous ethnobotanical investigations [18, 65, 66, 68-70].

Lamiaceae was the most represented family with 12 species, followed by Asteraceae with 11, Moraceae with 8 species, and Fabaceae with 6 species. This result is contrary to previous ethnobotanical studies in which Asteraceae were the most represented family [21, 65, 66, 69]. The Lamiaceae (mint family) possess a wide variety of ornamental, medicinal, and aromatic plants producing essential oils that are used in traditional and modern medicine, food, cosmetics, and pharmaceutical industry [74]. This family is known for effective pain modulation with potential analgesic or antinociceptive effects, which includes several aromatic medicinal spices like mint, oregano, basil, and rosemary [75]. Asteraceae (the aster, daisy, composite, or sunflower family) are the largest family of flowering plants which were reported to have pharmacological activities such as antitumor, antibacterial, antifungal, and anti-inflammatory [76] containing phytochemical compounds such as polyphenols, flavonoids, and diterpenoids [77, 78]. The Moraceae (fig family) was reported to have wide a variety of chemical constituents with potential biological activities as previously investigated in *Ficus racemosa* L. [79], *Ficus carica* L. [80], and *Ficus benjamina* L. [81]. Fabaceae (pea family), which is the third largest family also contain various bioactive constituents with potential pharmacological and toxicological effects [82]. A member of this family which has long been cultivated and introduced in the Philippines, *Gliricidia sepium* (Jacq.) Kunth ex Steud., was investigated to have antimicrobial and antioxidant activities, as well as several phytochemicals present [13].

The Department of Health (DOH) of the Philippines has continually endorsed 10 medicinal plant species in its traditional health maintenance program: (1) *Cassia alata* L., (2) *Momordica charantia* L., (3) *Allium sativum* L., (4) *Psidium guajava* L., (5) *Vitex negundo* L., (6) *Quisqualis indica* L., (7) *Blumea balsamifera* (L.) DC., (8) *Ehretia microphylla* Lam., (9) *Peperomia pellucida* (L.) Kunth and (10) *Clinopodium douglasii* (Benth.) Kuntze. Of all these 10 recommended and clinically tested medicinal plants, 4 species were included in this survey.

The societal gaps which differentiate educational level, gender, position, occupation, and age among the *Manobo* indigenous community may result in the disappearance of their medicinal plant knowledge and traditional practices. While there was no significant difference in their

medicinal plant knowledge in different locations, it is still highly important to document their medicinal plant knowledge to perpetuate their cultural tradition and medicinal practices, as well as protect and conserve these important plant genetic resources.

Many ethnobotanical studies include vernacular names as part of the putative identification. While vernacular names are useful in ethnopharmacology, pharmacognosy, and pharmacovigilance [83, 84], reliance on these vernacular names for species identification and classification can cause ambiguity and incorrect identification resulting to research invalidation [85]. DNA-based identification is a useful tool for accurate species identification. Correct identification of a medicinal plant should be examined using a molecular approach [86] for consistency of species and pharmacological investigations of natural products [87]. Although plant-based drug discovery in the ethnobotanical approach provides future drug leads, authentication of the plant material is a great challenge and opportunity [88].

Comparison with previous ethnobotanical studies

A number of ethnobotanical and ethnomedicinal documentation were conducted in the Philippines, but few involve quantitative analyses in their studies. Most of the ethnobotanical researches conducted in the Philippines purposively selected key informants who are knowledgeable of their medicinal plants like residents, traditional healers, herbalists, gardeners, traders and elders, but a limited count of studies focused on specific IPs or tribal communities in the country.

Among the three major islands in the Philippines (Luzon, Visayas, and Mindanao), the island of Mindanao is still underdocumented despite its largest population of ICCs/IPs in the country. In Luzon, four indigenous groups were documented, namely the *Kalanguya* tribe in Tinoc, Ifugao [89], the *Ivatan* in Batan Island Batanes [21], the *Ayta* in Dinalupihan, Bataan [70], and the *Ilongot-Egongot* in Maria Aurora, Aurora [90] communities. Balangcod and Balangcod [22] also documented plant utilization among local communities in Kabayan, Benguet Province, namely *Ibaloi*, *Kankanaey* and *Kalanguya* in addition to the earlier documented tribes such as the *Negritos* [91], the *Tasadays* [92, 93], the *Ifugao* [94, 95] and the *Bontoc* [96]. Other studies of cultural communities involve indigenous knowledge and practices for sustainable management like the Ifugao forests in Cordillera, Philippines [97].

In Visayas, only the Ati Negrito of Guimaras island (Ong and Kim, 2014), while in Mindanao, three tribes were studied, namely the Higaonon tribe of Iligan City [65], Subanen tribe of Dumingag, Zamboanga del Sur [69], Muslim Maranaos of Iligan City [66], Subanen tribe of Lapuyan, Zamboanga del Sur [68], and Tagabawa tribe of Davao del Sur [98]. Of all reported ethnobotanical studies in Mindanao, this is the first study utilizing detailed quantitative analysis of relative importance, effectivity consensus, and the extent of the potential use of each medicinal plant species among the IPs. Moreover, this study also integrated molecular confirmation for the first time applying multiple universal markers and coalescing a priori and a posteriori data for accurate species identification to resolve complex plant vernacular names.

In comparison with existing ethnobotanical studies in the Philippines, two novel plant medicinal uses were documented, namely *Anodendron borneense* and *Piper decumanum* with no existing records of ethnobotanical and pharmacological investigations to date, and even to other countries. The ethnopharmacological profiles of these medicinal plants are novel findings in this study, which are only known among the *Agusan Manobo* and solely reported in the province of Agusan del Sur, Philippines. Additional information on this study incorporating experienced adverse or side effects is newly introduced and recommended for a more detailed ethnopharmacological documentation in the Philippines. This comprehensive ethnopharmacological documentation could be a reference material for future ethnomedicinal and pharmacological studies.

Conclusion

This study presents the culturally rich ethnomedicinal knowledge and practices of the *Manobo* tribe in Agusan del Sur, Philippines. The results of the study revealed a high diversity of medicinal plants used by the *Agusan Manobo* with 122 species used in 16 use categories. Like any other ethnolinguistic indigenous group in the country, traditional knowledge may be lost or forgotten due to possible migration, acculturation, and declining interest of the younger generation due to the increasing availability of commercial over-the-counter medicine. Their medicinal plants are known by a limited number of individuals, mostly by their healers, elders, and tribal officials. This quantitative ethnopharmacological documentation is the first to show the high consensus and relative importance of medicinal plants used by the *Agusan Manobo* and provides molecular confirmation to some of their medicinal plant species. The combined quantitative ethnopharmacological documentation and species confirmation by an integrative molecular approach of medicinal plants used in traditional medicine is a breakthrough for obtaining more detailed and comprehensive findings that will be a valuable contribution to the repository of knowledge. The findings of this study will serve as reference material for future systematic and pharmacological studies. While the findings of this study are promising, regarding new potential therapeutic agents for healthcare improvement, it is of utmost importance to reconsider important medicinal plant species for conservation priorities as part of the government programs and initiatives to perpetuate the world heritage of traditional knowledge on medicinal plants of our diverse cultural communities.

Declarations

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Ethics approval and consent participate

All necessary approval, prior informed consent, permit and certification were secured from the local government units (LGUs), provincial government administration, PENRO-LGU and NCIP-LGU of Agusan del Sur, DENR-CARAGA gratuitous permit (no. R13-2019-12), NCIP-CARAGA (no. R13-2019-01), and the USTGS-ERC permit (protocol no. GS-2019-PN007). The purpose of the study was discussed to the tribal communities headed by the respective tribal chieftains, and they agreed to provide information after ritual observation.

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Availability of data and materials

The authors declare that all other data supporting the findings of this study are available within the article and its supplementary information files.

Authors' contributions

MLD proposed the research study, carried out the fieldwork, molecular work, and wrote the manuscript as the major contributor of the study. DT assisted with species identification and authentication at the Philippine National Herbarium. GJA evaluated the data of fieldwork and molecular work for inclusion in the manuscript. UM and SCS reviewed, analyzed and gave critical comments. All authors have read and approved of the final manuscript.

Consent for publication

Not applicable

Competing Interest

The authors declare that there is no competing interests.

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Tables

Table 1.

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

Category No.	Category names and abbreviations	Reported diseases or uses under each category name	No. of use-report	% of all use-reports	No. of species	% of all species	ICF	Frequency used species	Local Name	FL (%)	Particular disease or use
1	Diseases caused by bacterial, viral and parasitic infections (BVP)	Ascariasis, chicken pox, herpes simplex, scabies, jaundice (hepatitis), mumps (parotitis), athlete's foot, warts, amoebiasis, white spot (tinea flava), impetigo, measles, colds (influenza), dengue fever, malaria, typhoid fever, ringworm	1020	9.68	60	9.46	0.94	<i>Carica papaya</i>	Kapayas laki	100	Dengue fever
2	Tissue growth problems (TGP)	Cancer, cyst, tumor (myoma)	318	3.02	18	2.84	0.95	<i>Arcangelisia flava</i>	Lagtang or Abutra	87	Tumor
3	Endocrine, nutritional and metabolic (ENM)	Diabetes, tonic, beriberi, hormonal imbalance, goiter	345	3.28	36	5.68	0.90	<i>Hellenia speciosa</i>	Tambabasi or Tawasi	85	Goiter
4	Diseases of the nervous system (DNS)	Migraine, Parkinson's disease, nervous breakdown (depression, anxiety, mental stress, nervousness)	63	0.60	7	1.10	0.90	<i>Rhinacanthus nasutus</i>	Marvelosa or Serpentina	98	Nervous breakdown
5	Diseases of the eye (EYE)	Sore eyes, cataract, eye problem (blurred vision, conjunctivitis, eye infection)	85	0.81	8	1.26	0.92	<i>Ficus septica</i>	Lagnob	82	Eye problem
6	Diseases of the ear (EAR)	Ear congestion, ear infection, discharging ear (otorrhea)	120	1.14	8	1.26	0.94	<i>Jatropha gossypifolia</i>	Tuba-tuba tapol	93	Discharging ear
7	Diseases of the circulatory system (DCS)	Anemia, hypertension, varicose veins, heart problem (enlargement), internal bleeding, hemorrhage	307	2.91	31	4.89	0.90	<i>Micromelum minutum</i>	Lunas kahoy	97	Hemorrhage
8	Diseases of the respiratory system (DRS)	Asthma, pneumonia, emphysema, pulmonary tuberculosis, nasal congestion, lung nodule, cough, cough with phlegm, Respiratory disease complex (rhinitis, tracheitis, bronchitis), sore throat (tonsillitis)	891	8.46	68	10.73	0.92	<i>Premna odorata</i>	Abgaw	100	Cough with phlegm
9	Diseases of the digestive system (DDS)	Constipation, diarrhea, stomach trouble (dysentery, stomachache, bloating), vomiting (nausea), peptic ulcer, toothache, gum swelling, indigestion (dyspepsia), mouth sore (canker sore), stomach acidity (gastritis), swollen/bleeding gums (gingivitis), pancreatitis, liver problem (fatty liver), hemorrhoids, appetite enhancer	1556	14.77	79	12.46	0.95	<i>Cinnamomum mercadoi</i>	Kaningag	100	Stomach trouble
10	Diseases of the skin (DOS)	Boils (furuncle/carbuncle), skin eruptions, skin rashes and itchiness (eczema, dermatitis), psoriasis, pimple and acne, hair loss, dandruff	704	6.68	39	6.15	0.95	<i>Piper nigrum</i>	Lunas bagon puti	95	Skin rashes and itchiness
11	Musculoskeletal system and connective tissue problems (MCP)	Joint pain (arthritis, gout), rheumatism, sprain, tendon mass nodule, swollen muscles/swellings, muscle pain	748	7.10	42	6.62	0.95	<i>Tinospora crispa</i>	Panyawan	100	Joint pain
12	Genito-urinary problems (GUP)	Urination difficulty, kidney stones, kidney problem (high uric acid and creatinine), urinary bladder swelling, dysmenorrhea, delayed or irregular menstruation, urinary tract infection	577	5.48	37	5.84	0.94	<i>Stenomeris borneensis</i>	Banag	98	Urinary bladder swelling
13	Uses in pregnancy to delivery, maternal and infant care (MIC)	Pregnancy (impotence and sterility), abortifacient, labor and delivery enhancer, childbirth tool, miscarriage, maternal care, postpartum care and recovery, new-born baby care, milk production enhancer	420	3.99	37	5.84	0.91	<i>Anodendron borneense</i>	Lunas taguli	87	Pregnancy
14	Abnormal signs and symptoms (ASS)	Abdominal pain, backache, body ache, headache, fever, weakness and fatigue (asthenia), baby teething, child sleeplessness, malaise and fatigue, "pasmo" (cramp and spasm), "bughat" (relapse), skin numbness (paresthesia), dizziness and fainting, body chills, gas pain and flatulence, hangover	1958	18.59	88	13.88	0.96	<i>Sida rhombifolia</i>	Eskuba laki	90	Cramp and spasm
15	Other problems of external causes (OEC)	Allergy, burns, cuts and wounds, fracture and dislocation, bruises and contusions, animal bites (snake, dog), insect bites (mosquito, wasp, scorpion), poisoning, contacts with plant or animal parts	1332	12.65	70	11.04	0.95	<i>Ficus concinna</i>	Balete	100	Fracture and dislocation
16	Other uses (OS)	Circumcision antiseptic and anesthetic	89	0.84	6	0.95	0.94	<i>Piper decumanum</i>	Lunas bagon tapol	95	Anesthetic

Table 2.
Medicinal plants used by the Agusan Manobo in the Philippines.

Plant No.	Scientific Name	Family	Local Name	Voucher No.	No. of use-reports	No. of categories	Disease or purpose	Parts used ^a	Preparation and administration ^b	Quantity or Dosage	Administration frequency	Experienced adverse or side effects
1	<i>Andrographis paniculata</i> Nees ^C	Acanthaceae	White flower	USTH 015616	480	9	Jaundice, malaria, colds; cancer; diabetes; hypertension, heart enlargement, atherosclerosis; cough, respiratory disease complex, sore throat; diarrhea, dyspepsia, ulcer, liver problem; abortifacient; fever, gas pain and flatulence	Lf, Rt	I Drink decoction	3-5 glasses	Once to thrice a day or as needed	Can cause abortion to pregnant women
							Boils, skin rashes and itchiness, dermatitis	Wh	E Apply decoction as wash	3-5 glasses	Once a day or as needed	None
2	<i>Rhinacanthus nasutus</i> (L.) Kurz	Acanthaceae	Marvelosa or Serpentina	USTH 015622	583	6	Colds; diabetes, beriberi; nervous breakdown; hypertension; diarrhea, stomachache; weakness and fatigue, cramp and spasm	Lf	I Drink decoction	1-3 glasses	Once a day for 3-5 days	None
3	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kudyapa	USTH 015589	211	9	Diabetes; anemia; cough, bronchitis; dysentery, constipation; urinary tract infection; fever	Lf	I Drink decoction	3-5 glasses	Thrice a day or as needed	None
							Labor and delivery enhancer	Sd	I Drink water-infused powdered seeds	1-3 glasses	Twice a day or as needed	None
							Boils, psoriasis, skin rashes, eczema, pimple, acne; snake and scorpion bite	Lf	E Apply leaves as poultice	3-5 leaves	Thrice a day or as needed	None
4	<i>Mangifera indica</i> L. ^C	Anacardiaceae	Mangga	USTH 015591	222	5	Constipation	Fr	I Eat fresh fruit directly	1-3 fruits	Thrice a day or as needed	None
							Cough, cough with phlegm, sore throat	Lf	I Drink hot water-infused leaves or decoction	3-5 glasses	Twice a day or as needed	None
							Diarrhea, stomach trouble; headache	Bk	I Drink decoction	3-5 glasses	Twice a day or as needed	None
							Scabies; cuts and wounds	Bk, Lf	E Rub crushed leaves or scraped bark	3-5 leaves, 1 palm sized bark	Twice a day or as needed	None
5	<i>Spondias pinnata</i> (L.f.) Kurz ^C	Anacardiaceae	Abihid	USTH 015599	372	4	Colds; diabetes; cough; fever	Bk, Lf	I Drink decoction of leaves and scraped bark	3-5 glasses	Once or twice a day for 3 days or as needed	None
							Colds; fever	Bk, Lf	E Bath water-infused leaves and scraped bark	1 pail	Once a day	None
6	<i>Annona muricata</i> L. ^C	Annonaceae	Guyabano	USTH 015593	209	8	Cancer; diabetes; hypertension; dysentery	Fr	I Eat fresh fruit directly	3-5 glasses	Once or twice a week	In excess can cause blood viscosity
							Ascariasis; cough; stomach trouble, stomach acidity; urination difficulty, urinary tract infection	Lf	I Drink decoction	3-5 glasses	Once a day or as needed	None
							Skin eruptions, eczema	Lf, Sp	E Apply leaf sap or crushed leaves as poultice	3-5 leaves	As needed	None
7	<i>Cananga odorata</i> (Lam.) Hook.f. & Thomson	Annonaceae	Anangilan or Ilang-ilang	USTH 015577	358	7	Colds; cough; stomach trouble, ulcer; fever, body chills	Bk, Lf	I Drink decoction	5-7 glasses	Once or twice a day or as needed	None
							Scabies, athlete's foot; pimple; rheumatism, swollen muscles or swellings,	Fl	E Apply oil from steamed flowers	Completely on affected part	3-5 times a day until healed	None

							muscle pain; insect bites						
8	<i>Friesodielsia lanceolata</i> (Merr.) Steen.	Annonaceae	Talimughat taas	USTH 015558	198	3	Muscle pain; labor and delivery enhancer, postpartum care and recovery; backache, body ache, cramp and spasm, weakness and fatigue, relapse	Bk, Lf, Rt	I	Drink decoction	3-5 glasses	Once to thrice a day up to 3 days or as needed	None
9	<i>Uvaria zschokkei</i> Elmer	Annonaceae	Bigo	USTH 015662	195	5	Amoebiasis; hypertension; fever, weakness and fatigue	St	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Hair loss; insect bites	St, Sp	E	Apply stem sap	1/2-1 cup	As needed	None
10	<i>Alstonia macrophylla</i> Wall. ex G.Don	Apocynaceae	Dita	USTH 015546	386	9	Tonic; ear congestion; cough; stomach trouble, toothache; urinary tract infection; abdominal pain, weakness and fatigue, hangover	Bk, Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Cuts and wounds, bruises and contusions, sprain	Lf	E	Apply crushed and heated leaves as poultice	3-5 leaves	Once or twice a day or as needed	None
							Scabies, ringworm, impetigo; boils	Bk	E	Apply water-infused powdered bark	1 glass	Once or twice a day or as needed	None
							Stomachache, snake bite	Bk	E	Drink local alcohol-tinctured bark	1/2 to 1 glass	As needed	None
11	<i>Anodendron borneense</i> (King & Gamble) D.J.Middleton	Apocynaceae	Lunas tag-uli	USTH 015639	1134	12	Cancer; diabetes; ear infections; diarrhea, stomach trouble, ulcer, toothache; arthritis, rheumatism; pregnancy; body ache, weakness and fatigue, cramp and spasm, relapse; poisoning	Sp, St	I	Drink stem sap	1-3 glasses	Once a day or as needed	None
							Colon and prostate cancer, cyst, tumor; diabetes; hypertension; pulmonary tuberculosis; diarrhea, stomach trouble, ulcer, toothache, swollen gums; arthritis, rheumatism; impotence and sterility, postpartum care and recovery; body ache, weakness and fatigue, cramp and spasm, relapse, gas pain and flatulence; sprain; poisoning	St	I	Drink local alcohol-tinctured or decocted stem	1/2 to 1 glass	Once or twice a day or as needed	None
							Scabies, warts, impetigo, typhoid fever; boils, skin eruptions, skin rashes and itchiness; arthritis, rheumatism, swellings, muscle pain; backache, body ache, weakness and fatigue, cramp and spasm, relapse gas pain and flatulence; allergy, burns, cuts and wounds, sprain, animal and insect bites,	St	E	Apply coconut or efficascent oil-infused stem	Completely on affected part	Once or twice a day or as needed	None

							contacts with plants and animal parts						
12	<i>Hoya imbricata</i> Decne.	Apocynaceae	Pikot-pikot	USTH 015618	57	2	Boils; cuts and wounds	Lf	E	Apply coconut oil-infused burned and powdered leaves	Completely on affected part	As needed	None
13	<i>Alocasia zebrina</i> Schott ex Van Houtte	Araceae	Lunas gabi	USTH 015614	44	1	Allergy, cuts and wounds, snake and insect bite, poisoning	Lf, Sp, St	E	Apply stem or leaf sap	Completely on affected part	Once a day or as needed	None
14	<i>Homalomena philippinensis</i> Engl. ex Engl. & K.Krause	Araceae	Payaw	USTH 015597	466	7	Colds; body ache, headache, fever	Lf, St	I/E	Sniff sliced and pounded leaf and stem or tie leaf and stem around the neck	1-3 leaves	Once a day or as needed	None
							Tonsillitis; pregnancy, impotence and sterility, labor and delivery enhancer	Rz	I	Drink extracted juice from crushed rhizome	1-3 cups	Once to thrice a day or as needed	None
							Rheumatism; cuts and wounds	Rz	E	Apply extracted juice from crushed rhizome	Completely on affected part	As needed	None
							Hemorrhoids	Lf	E	Insert heated young leaf	1 leaf	Once or twice a day or as needed	None
15	<i>Hydrocotyle vulgaris</i> L.	Araliaceae	Goto Kola	USTH 015563	263	4	Diabetes; hypertension; fever	Lf	I	Eat fresh leaves directly or drink decocted leaves	3-5 leaves; 1 cup	Once a day or as needed	In excess can cause anemia, dizziness and weakening
							Cuts and wounds	Lf, Sp	E	Apply leaf sap or crushed leaves as poultice	1-3 leaves	As needed	None
16	<i>Areca catechu</i> L.	Arecaceae	Huling- huling	USTH 015610	42	1	Breast cancer	Rt	I	Drink decoction	3-5 glasses	Once or twice a day or as needed	None
17	<i>Calamus megaphyllus</i> Becc.	Arecaceae	Kapi	USTH 015608	168	4	Hypertension; asthma; diarrhea, dyspepsia, gastritis, indigestion; arthritis, rheumatism	Rz	I	Drink decoction	3-5 glasses	Twice a day or as needed	None
18	<i>Thottea affinis</i> (Planch. ex Rolfe) ined.	Aristolochiaceae	Salimbagat	USTH 015643	278	3	Amoebiasis; cancer; toothache	Lf, Rt	I	Drink decoction	3-5 glasses	Once a day or as needed	None
19	<i>Dracaena roxburghiana</i> (Schult.f.) Byng & Christenh.	Asparagaceae	Espada- espada	USTH 015647	78	2	Boils; snake bite	Lf	E	Apply leaf sap or pounded leaves as poultice	5-7 drops	As needed	None
20	<i>Acmella grandiflora</i> (Turcz.) R.K.Jansen ^C	Asteraceae	Lunas pilipo	USTH 015548	396	4	Toothache; anesthetic	Fl	I	Apply fresh flower directly	1-3 flowers	As needed	None
							Skin rashes and itchiness, psoriasis; cuts and wounds; anesthetic	Fl, Lf	E	Apply crushed flower or leaves as poultice	1-3 flowers, 5-7 leaves	As needed	None
21	<i>Ageratum conyzoides</i> L.	Asteraceae	Albahaca	USTH 015602	77	3	Abortifacient; weakness and fatigue	Lf	I	Drink decoction	1-3 cups	Once a day or as needed	Can cause abortion to pregnant women
							Cuts and wounds		E	Apply pounded leaves as poultice	1-3 leaves	Once or twice a day or as needed	None
22	<i>Artemisia vulgaris</i> L.	Asteraceae	Helbas	USTH 015619	365	4	Asthma, cough, cough with phlegm; diarrhea, dyspepsia; delayed menstruation; relapse	Lf	I	Drink decoction	1-3 glasses	Thrice a day or as needed	In excess can cause anemia, dizziness and weakening
							Abdominal pain, body ache, fever, cramp and spasm	Lf	E	Apply crushed leaves as poultice	3-5 leaves	Once a day or as needed	None
23	<i>Bidens pilosa</i> L.	Asteraceae	Tuway-tuway	USTH 015582	218	5	Colds; diarrhea; muscle pain; backache, body ache, fever, weakness and fatigue, cramp and spasm,	Rt	I	Drink decoction	3-5 glasses	Once or twice a day up to 3 days or as needed	None

							relapse, gas pain and flatulence						
							Cuts and wounds, animal and insect bites	Lf	E	Apply crushed leaves as poultice	3-5 leaves	Once to thrice a day or as needed	None
24	<i>Blumea balsamifera</i> (L.) DC. ^C	Asteraceae	Gabon	USTH 015573	412	6	Hypertension; cough, cough with phlegm; urination difficulty; postpartum care and recovery; body ache, headache, fever, weakness and fatigue, gas pain and flatulence	Lf, Rt	I	Drink decoction	3-5 glasses	Once or twice a day for 3 days	None
							Headache	Lf	E	Apply steamed or pounded leaves in the forehead	1-3 leaves	Once a day or as needed	None
							Boils, skin rashes	Lf	E	Apply leaves as poultice	1-3 leaves	Once or twice a day or as needed	None
25	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob. ^C	Asteraceae	Hagonoy	USTH 015632	448	5	Tumor; hemorrhage; fever	Lf	I	Drink decoction	3-5 glasses	Once a day for 3 days	None
							Boils; burns, cuts and wounds	Lf	E	Apply leaf sap or crushed leaves as poultice	3-5 leaves	As needed	None
26	<i>Cyanthillium cinereum</i> (L.) H.Rob. ^C	Asteraceae	Kanding-kanding	USTH 015587	476	5	Colds, malaria; pulmonary tuberculosis; dog bite	Lf, Rt	I	Drink decoction	3-5 glasses	Thrice a day or as needed	None
							Chicken pox, herpes simplex, measles; boils, skin eruptions, skin rashes and itchiness; weakness and fatigue, cramp and spasm	Fl, Lf, Rt	E	Bath water-infused leaves and roots or burn leaves and roots as incense	1 pail as bath or 1 bowl as incense	Once or twice a day or as needed	None
27	<i>Erechtites valerianifolius</i> (Link ex Spreng.) DC. ^C	Asteraceae	Gapas-gapas bae	USTH 015666	208	3	Stomachache, dyspepsia; body ache, headache, gas pain and flatulence	Lf	I	Drink decoction	3-5 glasses	Once or twice a day or as needed	None
							Cuts and wounds	Lf, Sp	E	Apply sap or leaves as poultice	3-5 leaves	As needed	None
28	<i>Gynura procumbens</i> (Lour.) Merr. ^C	Asteraceae	Ashitaba	USTH 015645	215	4	Emphysema, cough; diarrhea, stomach trouble; kidney stones; abdominal pain	Lf	I	Drink brewed tea-prepared leaves or decoction	3-5 cups	Once or twice a day or as needed	None
29	<i>Mikania cordata</i> (Burm.f.) B.L.Rob. ^C	Asteraceae	Moti-moti	USTH 015543	397	6	Cough; ulcer	Lf	I	Drink decoction	3-5 glasses	Twice a day or as needed	None
							Sore eyes	Lf, Sp	I	Drop leaf sap	Completely on affected part	As needed	None
							Skin rashes and itchiness; cuts and wounds, snake and scorpion bites; circumcision antiseptic	Lf	E	Apply leaf sap or crushed leaves as poultice	5-7 leaves	As needed	None
30	<i>Pseudelephantopus spicatus</i> (Juss.) Rohr ^C	Asteraceae	Kukog banog	USTH 015564	500	5	Urination difficulty, kidney problem, urinary bladder swelling, delayed menstruation, urinary tract infection; fever, weakness and fatigue, cramp and spasm	Lf, Rt	I	Drink brewed tea-prepared leaves or decoction	3-5 glasses	Once a day or as needed	None
							Sore eyes; eczema, skin rashes and itchiness; cuts and wounds, sprain, snake bite	Lf, Sp	E	Apply drops of leaf sap	Completely on affected part	Thrice a day or as needed	None
31	<i>Diplazium esculentum</i> (Retz.) Sw.	Athyriaceae	Pako-pako	USTH 015545	212	5	Colds; cough; diarrhea, dysentery; labor and delivery enhancer, postpartum care and recovery;	Sh	I	Drink decoction	3-5 glasses	Twice a day or as needed	None

							body ache, headache, fever						
32	<i>Begonia contracta</i> Warb.	Begoniaceae	Budag-budag	USTH 015654	85	2	Pimple, dandruff; burns	Fl, Lf	E	Apply crushed flower and leaves as poultice	1-3 flowers, 1-3 leaves	Once to thrice a day or as needed	None
33	<i>Ceiba pentandra</i> (L.) Gaertn.	Bombacaceae	Doldol	USTH 015535	140	5	Diabetes; pulmonary tuberculosis; diarrhea, dysentery; rheumatism, swollen muscles; snake bite	Bk, Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
34	<i>Ehretia microphylla</i> Lam. ^C	Boraginaceae	Alangitngit or Tsaang- Gubat	USTH 015638	336	4	Diabetes; nervous breakdown; stomach acidity; food and drug allergy	Lf	I	Drink tea- prepared leaves	1/2 to 1 cup	Once a day for 3 days or as needed	None
35	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Pinya	USTH 015667	226	8	Ascariasis, amoebiasis; cancer; diabetes; hypertension; stomach acidity, constipation	Fr	I	Eat fresh fruit directly	1-3 slices	Once to thrice a day or as needed	None
							Headache, fever, weakness and fatigue	Lf, Sh	E	Apply crushed shoot or leaves as poultice	Completely on affected part	As needed	None
							Cancer; swellings	Lf	I/E	Drink decoction or apply decocted leaves	3-5 leaves	Once a day or as needed	None
36	<i>Abroma augusta</i> (L.) L.f.	Byttneriaceae	Samboligawn	USTH 015637	329	8	Diabetes, tonic; bronchitis; stomachache; dysmenorrhea, irregular menstruation; sterility	Bk, Lf, Rt	I	Drink decoction	3-5 glasses	Once a day or as needed	None
							Scabies; boils, skin eruptions, dermatitis; cuts and wounds	Bk, Lf	E	Apply decoction as wash	1-3 glasses	Once or twice a day or as needed	None
37	<i>Kleinhovia hospita</i> L.	Byttneriaceae	Bitan-ag	USTH 015631	146	6	Tumor; asthma, cough, pneumonia; dyspepsia, liver problem; headache; baby teething	Lf	I	Drink decoction	3-5 glasses	Thrice a day or as needed	None
							Scabies; psoriasis	Lf	E	Apply crushed leaves as poultice	3-5 leaves	Once to thrice a day or as needed	None
38	<i>Melochia umbellata</i> (Houtt.) Stapf	Byttneriaceae	Bitanlong	USTH 015649	265	4	Rheumatism; backache, body ache, headache	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Canker sore; burns	Lf	E	Apply leaves as poultice	3-5 leaves	Once a day or as needed	None
39	<i>Hippobroma longiflora</i> (L.) G.Don	Campanulaceae	Elephanteng puti	USTH 015583	213	5	Toothache	Lf	I	Apply chewed or pounded leaves	1-3 leaves	Once or twice a day or as needed	None
							Nervous breakdown; asthma, bronchitis; fever	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Cuts and wounds	Lf	E	Apply decoction	1 glass	As needed	None
40	<i>Carica papaya</i> L. ^C	Caricaceae	Kapayas laki	USTH 015668	659	6	Constipation, milk production enhancer	Fr	I	Eat fresh fruit directly	1-3 slices	Once a day or as needed	None
							Tonic; asthma; stomach problem	Lf, Rt	I	Drink decoction	3-5 glasses	Once a day or as needed	None
							Dengue fever	Lf, Sp	I	Drink leaf sap	5-7 leaves	Thrice a day or as needed	None
							Body ache, fever, cramp and spasm	Lf	I	Apply crushed and heated leaves as poultice	1-3 leaves	Twice a day or as needed	None
41	<i>Hellenia speciosa</i> (J.Koenig) Govaerts	Costaceae	Tambabasi or Tawasi	USTH 015578	744	8	Diabetes, goiter; migraine; ear congestion; cough, lung nodule; urination difficulty, kidney problem; headache, fever	Lf, Rz	I	Drink decoction	3-5 glasses	Once to thrice a day up to 3 days or as needed	None
							Diarrhea, stomachache, dysentery	St	I	Drink stem sap	1/2 cup	As needed	None

							Sore eyes	Lf	I	Apply leaf sap	Completely on affected part	As needed	None
42	<i>Kalanchoe pinnata</i> (Lam.) Pers. ^C	Crassulaceae	Hanlilika	USTH 015584	486	12	Diabetes; anemia, hypertension; asthma; cough; constipation, diarrhea, stomach trouble, hemorrhoids; kidney stone; labor and delivery enhancer; fever	Lf	I	Drink decoction	3-5 leaves	Once a day or as needed	None
							Herpes simplex; hemorrhoids; boils, eczema; swellings; burns, cuts and wounds, bruises and contusions, insect bites	Lf	I	Apply decocted leaves as wash	1-3 leaves	Once a day or as needed	None
							Abdominal pain, body ache, headache, fever	Lf	E	Apply heated leaves as hot compress	1-3 leaves	Once a day or as needed	None
43	<i>Rhynchospora colorata</i> (L.) H.Pfeiff.	Cyperaceae	Busikad	USTH 015571	254	6	Chicken pox, measles; cancer; cough; stomach acidity; fever, relapse, gas pain and flatulence; sprain	Wh	I	Drink decoction	1-3 glasses	Once to thrice a day or as needed	None
							Baby teething	Fl	I	Drink water-infused flower	1/2-1 glass	Once to thrice a day	None
44	<i>Stenomeris borneensis</i> Oliv.	Dioscoreaceae	Banag	USTH 015537	540	6	Myoma; migraine; arthritis, rheumatism; postpartum care and recovery; urination difficulty, urinary bladder swelling; headache, cramp and spasm, relapse	Rt	I	Drink decoction	3-5 glasses	Once or twice a day for 3 days or as needed	None
45	<i>Euphorbia hirta</i> L. ^C	Euphorbiaceae	Tawa-tawa	USTH 015665	305	7	Colds, dengue fever; asthma; diarrhea, vomiting; fever	Wh	I	Drink decoction of whole plant except flowers	5-7 glasses	Thrice a day or as needed	In excess can cause thrombocytopenia
							Ringworm; sore eyes; boils, skin rashes and itchiness; cuts and wounds	Lf	I/E	Apply leaf sap or decocted leaves	5-7 leaves	Thrice a day or as needed	None
46	<i>Jatropha curcas</i> L. ^C	Euphorbiaceae	Tuba-tuba puti	USTH 015595	495	7	Colds; pulmonary tuberculosis; diarrhea; arthritis, rheumatism; backache, body ache, fever, weakness and fatigue, cramp and spasm, relapse, gas pain and flatulence	Lf, Rt	I	Drink decoction	1-3 leaves	once a day or as needed	None
							Scabies, ringworm; ear infection, discharging ear; toothache; swollen muscles and swellings; cuts and wounds, fracture and dislocation, animal and insect bites	Bk, Rt	I/E	Apply decoction or pounded scraped bark as poultice	1-3 palm-sized barks, 1/2-1 arm-sized roots	As needed	None
47	<i>Jatropha gossypifolia</i> L.	Euphorbiaceae	Tuba-tuba tapol	USTH 015586	810	9	Colds, malaria, typhoid fever; pulmonary tuberculosis; diarrhea; arthritis, rheumatism; dysmenorrhea, irregular menstruation; backache, body ache, fever, weakness and fatigue, cramp and spasm, relapse, gas pain and flatulence	Lf, Rt	I	Drink decoction	1-3 leaves, 1/2-1 arm-sized roots	Once a day or as needed	None

							Ringworm; boils, carbuncles, dermatitis; swollen muscles and swellings, muscle pain; backache, body ache, fever; cuts and wounds	Lf	E	Bath or wash decocted leaves	1-3 leaves	Once a day or as needed	None
							Scabies, ringworm; ear infection, discharging ear; toothache, mouth sore; cuts and wounds, fracture and dislocation, animal and insect bites	Bk, Rt	I/E	Apply decoction or pounded scraped bark as poultice	1-3 palm-sized barks, 1/2-1 arm-sized roots	As needed	None
48	<i>Melanolepis multiglandulosa</i> (Reinw. ex Blume) Rchb. & Zoll.	Euphorbiaceae	Awom	USTH 015621	485	5	Beriberi; emphysema, cough; diarrhea, stomach trouble	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Fibroma; body ache, weakness and fatigue	Bk, Fl, Lf	E	Apply fresh or heated flower, leaves and bark; sometimes mixed with little salt	1-3 flowers, 1-3 leaves, 1-3 palm-sized barks	Once or twice a day or as needed	None
49.1	<i>Omalanthus macradenius</i> Pax & Hoffm.	Euphorbiaceae	Banti puti	USTH 015633	202	3	Impetigo; diarrhea, stomach trouble; cuts and wounds	Lf	E	Apply pounded leaves as poultice	3-5 leaves	Once to thrice a day or as needed	None
49.2	<i>Omalanthus macradenius</i> Pax & Hoffm.	Euphorbiaceae	Banti tapol	USTH 015554	203	3	Impetigo; diarrhea, stomach trouble; cuts and wounds	Lf	E	Apply pounded leaves as poultice	3-5 leaves	Once to thrice a day or as needed	None
50	<i>Bauhinia</i> sp.	Fabaceae	Talimughat pikas	USTH 015575	284	4	Rheumatism, muscle pain; delayed menstruation; labor and delivery enhancer, postpartum care and recovery; backache, body ache, weakness and fatigue, cramp and spasm, relapse	Lf, St	I	Drink decoction	3-5 glasses	Once to thrice a day up to 3 days or as needed	None
51	<i>Crotalaria incana</i> L.	Fabaceae	Sagay-sagay	USTH 015598	128	2	Diabetes; joint pain, swollen muscles and swellings, muscle pain	Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
52	<i>Gliricidia sepium</i> (Jacq.) Kunth ex Steud. ^C	Fabaceae	Madre de Cacao	USTH 015620	153	6	Scabies; boils, skin eruption, skin rashes and itchiness; cuts and wounds	Lf, Sp	E	Apply leaf sap or pounded leaves as poultice	Completely on affected part	Once or twice a day or as needed	None
							Eczema, dermatitis; arthritis and rheumatism; burns, cuts and wounds, bruises and contusions	Bk, Rt, Sp	E	Apply sap or decocted bark or root	Completely on affected part	Once or twice a day or as needed	None
							Abortifacient, postpartum care and recovery	Lf	E	Burn leaves as incense or apply heated leaves as hot compress	3-5 leaves	Once a day or as needed	None
							Body ache, headache, fever; fracture and dislocation, sprain	Bk	E	Apply scraped bark as poultice	1-3 palm-sized barks	Once a day or as needed	None
53	<i>Mimosa pudica</i> L. ^C	Fabaceae	Hibi-hibi or makahiya	USTH 015570	355	8	Diabetes; hypertension; dysentery, asthma; fever; urination difficulty	Rt	I	Drink decoction	3-5 glasses	Once a day or as needed	None
							Baby teething	Rt	I	Drink water-infused peeled roots	1/2 to 1 cup	Once a day or as needed	None
							Mumps; boils; child sleeplessness, malaise and fatigue	Sh	E	Apply hot water-infused shoots	1/2 to 1 glass	As needed	None

54	<i>Ormosia macrodisca</i> Baker ^C	Fabaceae	Bahay	USTH 015625	522	6	Atherosclerosis (high cholesterol)	Fr	I	Eat fresh fruit directly	1-3 fruits	Once or twice a day or as needed	None
							Typhoid fever; nervous breakdown; high cholesterol; kidney problem; fever	Bk	I	Drink decoction or local alcohol-tinctured bark	1/2 to 1 cup	Once or twice a day or as needed	None
							Nervousness; skin numbness	Bk, Rt	E	Apply efficascent oil-infused bark and root	Fill a 250ml glass bottle with bark and roots	As needed	None
55.1	<i>Phanera semibifida</i> (Roxb.) Benth.	Fabaceae	Alibangbang puti	USTH 015646	66	1	Internal bleeding, hemorrhage	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
55.2	<i>Phanera semibifida</i> (Roxb.) Benth.	Fabaceae	Alibangbang tapol	USTH 015634	53	1	Internal bleeding, hemorrhage	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
56	<i>Cratoxylum sumatranum</i> (Jack) Blume	Hypericaceae	Bansilay	USTH 015541	96	4	Colds; cough; dysentery	Bk, Lf, Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Toothache	Lf	I	Apply chewed or pounded leaves	3-5 leaves	Once to thrice a day or as needed	None
							Impetigo; cuts and wounds	Lf	E	Apply pounded leaves as poultice	3-5 leaves	Once to thrice a day or as needed	None
57	<i>Callicarpa pedunculata</i> R.Br.	Lamiaceae	Awoy	USTH 015661	378	4	Ulcer, pancreatitis, fatty liver; weakness and fatigue, cramp and spasm	Lf	I	Drink hot water-infused leaves	1/2 to 1 cup	Once or twice a day or as needed	None
							Asthma	Lf	E	Burn leaves as incense	1-3 leaves	Once or twice a day or as needed	None
							Swollen muscles, muscle pain; backache, body ache	Lf	E	Apply leaves as poultice	1-3 leaves	Once or twice a day or as needed	None
58	<i>Coleus amboinicus</i> Lour. ^C	Lamiaceae	Kalabo	USTH 015617	380	4	Asthma, cough, cough with phlegm; dyspepsia; abdominal pain, gas pain and flatulence	Lf	I	Eat leaves directly or drink decoction	1/2 to 1 cup	Once to thrice a day or as needed	In excess can cause anemia, weakness and allergy
							Burns, bruised and contusions, insect bites	Lf	E	Apply water-infused leaves	1-3 glasses	As needed	None
59.1	<i>Coleus scutellarioides</i> (L.) Benth.	Lamiaceae	Mayana kanapkap	USTH 015567	260	5	Anemia; asthma, pneumonia, cough; dyspepsia; gas pain and flatulence	Lf	I	Drink decoction	1-3 glasses	Once a day for 3-5 days or as needed	None
							Cuts and wounds, bruises and contusions, sprain	Lf, Sp	E	Apply leaf sap or crushed leaves as poultice	5-7 leaves	Twice a day or as needed	None
59.2	<i>Coleus scutellarioides</i> (L.) Benth. ^C	Lamiaceae	Mayana pula	USTH 015644	414	6	Anemia; asthma, pneumonia, emphysema, cough, pulmonary tuberculosis; dyspepsia, ulcer; gas pain and flatulence	Lf	I	Drink decoction	1-3 glasses	Once a day for 3-5 days or as needed	None
							Conjunctivitis	Lf	I	Apply decoction as drop	Completely on affected part	Once or twice a day or as needed	None
							Cuts and wounds, bruises and contusions, sprain	Lf	E	Apply crushed leaves as poultice	5-7 leaves	Twice a day or as needed	None
60	<i>Gmelina arborea</i> Roxb. ex Sm.	Lamiaceae	Gmelina	USTH 015635	335	5	Toothache, gum swelling	Lf	I	Apply chewed or pounded leaves	3-5 leaves	As needed	None
							Discharging ear	Fr	I	Drop extract of heated fruit	1-3 fruits	As needed	Poisonous when eaten
							Stomach bloating; maternal care; headache, gas pain and flatulence; cuts and wounds	Lf	E	Apply leaves directly or as poultice	1-3 leaves	As needed	None
61	<i>Hyptis capitata</i> Jacq. ^C	Lamiaceae	Sawan-sawan	USTH 015574	498	7	Colds, malaria; cough; diarrhea, stomachache; new-born baby care; fever, gas	Lf	I	Drink decoction or leaf sap	3-5 glasses decoction or 1/2 cup leaf sap (adult); 1/2 cup	Once or twice a day or as needed	None

							pain and flatulence				decoction or 1 teaspoonful leaf sap (baby)		
							Delayed menstruation	Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Toothache; cuts and wounds	Lf	E	Apply crushed leaves as poultice	3-5 leaves	As needed	None
62	<i>Mentha arvensis</i> L. ^C	Lamiaceae	Herba buena	USTH 015669	174	7	Measles; cough; diarrhea, dysentery; dysmenorrhea; headache, fever, cramp and spasm, gas pain and flatulence	Sh	I	Drink decoction	3-5 glasses	Once or twice a day or as needed	None
							Asthma; dizziness and fainting	Lf	I	Sniff crushed leaves or leaves infused with hot water	3-5 leaves	As needed	None
							Toothache; headache, fever; insect bites	Lf	E	Apply chewed or crushed leaves	3-5 leaves	As needed	None
63	<i>Mentha canadensis</i> L.	Lamiaceae	Sencia	USTH 015670	432	9	Sinusitis, cough; stomachache, vomiting; delayed menstruation; backache, body ache, headache, fever, gas pain and flatulence	Lf	I	Drink hot water- infused leaves or decoction	3-5 glasses	Once or twice a day or as needed	None
							Ringworm; ear infection and congestion; toothache	Lf	I/E	Apply leaf sap	Completely on affected part	As needed	None
							Abdominal pain; muscle pain; cuts and wounds, dislocation, snake bite	Lf	E	Apply crushed leaves as poultice	Completely on affected part	Once a day or as needed	None
							Rheumatism; skin rashes and itchiness, acne; cuts and wounds; animal and insect bites	Lf	E	Apply decoction as wash	5-7 leaves	Twice a day or as needed	None
64	<i>Ocimum basilicum</i> L.	Lamiaceae	Sangig	USTH 015630	385	9	Cough, cough with phlegm; diarrhea, vomiting, constipation, hemorrhoids; delayed menstruation; postpartum care and recovery; headache, fever, gas pain and flatulence	Lf, Sh	I	Drink decoction or add in soup	3-5 glasses	Twice a day or as needed	None
							Ear infection, congestion and discharge	Lf, Sp	I	Drop leaf sap	3-5 leaves	As needed	None
							Arthritis, rheumatism; boils, skin rashes and itchiness; cuts and wounds, bruises and contusions	Lf	E	Apply decoction as wash	3-5 leaves	Twice a day or as needed	None
							Toothache; cuts and wounds, snake bites	Lf, Sh	I/E	Apply crushed shoot or leaves as poultice	3-5 leaves, 1 shoot	As needed	None
65	<i>Orthosiphon aristatus</i> (Blume) Miq. ^C	Lamiaceae	Wachichao	USTH 015550	513	6	Diabetes; hypertension; diarrhea, stomachache; joint pain, gout, rheumatism; urination difficulty, kidney stones, kidney problem, urinary bladder swelling, prostate problem; labor and delivery enhancer	Fl, Lf	I	Drink brewed tea- prepared leaves or decoction of leaves and flower	3-5 cups	Once or twice a day	None
66	<i>Premna odorata</i> Blanco ^C	Lamiaceae	Abgaw	USTH 015559	668	7	Colds; nasal congestion, sinusitis, cough, cough with phlegm; diarrhea,	Lf	I	Drink water- infused leaves	3-5 glasses	Once or twice a day for 3 days or as needed	None

							ulcer; rheumatism; postpartum care and recovery; weakness and fatigue, gas pain and flatulence						
							Cuts and wounds		E	Apply crushed leaves as poultice	1-3 leaves	Once or twice a day or as needed	None
67	<i>Teijsmanniodendron ahernianum</i> (Merr.) Bakh.	Lamiaceae	Kulipapa	USTH 015603	128	3	Beriberi; muscle pain; labor and delivery; backache, body ache, cramp and spasm	Rt, St	I	Drink decoction	3-5 glasses	Thrice a day or as needed	None
68	<i>Vitex negundo</i> L. C	Lamiaceae	Lagundi	USTH 015562	475	5	Cough, cough with phlegm; ulcer; rheumatism; postpartum care and recovery; headache, gas pain and flatulence	Lf	I	Drink decoction	1/4 glass (young leaf) or 1/2 glass (mature leaf)	Thrice a day or as needed	None
69	<i>Cinnamomum mercadoi</i> S.Vidal C	Lauraceae	Kaningag	USTH 015585	908	8	Amoebiasis; cancer; hypertension; cough; diarrhea, stomach trouble, ulcer, stomach acidity; kidney problem, urinary tract infection; weakness and fatigue, cramp and spasm	Bk, Br, Rt	I	Drink decoction or local alcohol- tinctured bark, stem and root	3-5 glasses	Once or twice a day or as needed	None
							Cuts and wounds	Bk, Br, Rt	E	Apply coconut oil-infused bark, stem and root	Completely on affected part	As needed	None
70	<i>Litsea cordata</i> (Jack) Hook.f.	Lauraceae	Loktob	USTH 015580	307	7	Mumps; cyst, tumor, myoma; goiter; asthma, pneumonia, emphysema, cough; ulcer; arthritis; kidney problem, dysmenorrhea	Bk, Rt	I	Drink hot water- infused bark or decoction	1-3 glasses	Once a day in thrice a week for 2 months	In excess can cause anemia, dizziness and weakening
71	<i>Machilus philippinensis</i> Merr.	Lauraceae	Efficascent	USTH 015576	82	2	Cough; weakness and fatigue	Sp, St	I	Drink sap from rubbed stem	1/2 cup	Once a day or as needed	None
72	<i>Lagerstroemia speciosa</i> (L.) Pers. C	Lythraceae	Banaba	USTH 015596	384	4	Ulcer; urination difficulty, kidney stones, high uric acid and creatinine; maternal care; backache, body ache, fever	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
73	<i>Gossypium hirsutum</i> L.	Malvaceae	Gapas	USTH 015553	283	3	Hemorrhage; postpartum care and recovery; body ache, fever, body chills	Rt	I	Drink decoction	1 glass	Once a day for 3 days	In excess, can cause abnormalities to lactating mothers
74	<i>Sida rhombifolia</i> L.	Malvaceae	Eskuba laki	USTH 015601	768	8	Cough; stomach trouble; kidney stone, kidney problem, prostate problem, irregular menstruation	Lf, Rt	I	Drink decoction	3-5 glasses	Once a day or as needed	None
							Chicken pox, herpes simplex, scabies; boils; swellings; backache, body ache, headache; cuts and wounds	Lf, Rt	E	Apply leaves as poultice or leaf and bark decoction as wash	3-5 leaves	As needed	None
							Fever	Bk	I	Drink decoction	1-3 palm- sized barks	Once or twice a day or as needed	None
75	<i>Urena lobata</i> L. C	Malvaceae	Dupang bae	USTH 015664	482	7	Stomach trouble; arthritis; rheumatism; labor and delivery, postpartum care and recovery; fever; cuts and wounds, fracture and dislocation, bruises and contusion, sprain, animal bites	Wh	I/E	Drink or apply decoction or burn as incense	1 bowl	Once a day or as needed	None
							Diabetes; sore	Sh	I	Drink	3-5 glasses	Once or twice a	None

							throat; toothache; abdominal pain			decoction		day or as needed	
76	<i>Angiopteris evecta</i> Sw.	Marattiaceae	Amampang	USTH 015658	126	3	Muscle pain; postpartum care and recovery; backache, body ache, weakness and fatigue, cramp and spasm	Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
77	<i>Medinilla teysmannii</i> Miq.	Melastomataceae	Tampion	USTH 015581	282	3	Swollen muscles and swellings, muscle pain; gas pain and flatulence; sprain	Lf	E	Apply heated leaves as hot compress	1-3 leaves	Once a day or as needed	None
78	<i>Melastoma malabathricum</i> L.	Melastomataceae	Hantutuknaw puti	USTH 015588	274	3	Diarrhea, dysentery, stomachache, hemorrhoids; headache, fever	Sh	I	Drink decoction	3-5 glasses	Once a day or as needed	None
							Toothache; cuts and wounds	Lf	I/E	Drop or drink stem sap	1-3 leaves	As needed	None
79	<i>Lansium domesticum</i> Correa	Meliaceae	Lansones	USTH 015565	103	4	Malaria; diarrhea, dysentery; dyspepsia; fever, gas pain and flatulence	Bk, Lf	I	Drink decoction	3-5 glasses	Twice a day or as needed	None
							Insect bites	Bk	E	Apply powdered bark	Completely on affected part	As needed	None
80	<i>Sandoricum koetjape</i> (Burm.f.) Merr.	Meliaceae	Santol	USTH 015624	464	7	Tonic; hypertension; diarrhea, dysentery; postpartum care and recovery; abdominal pain, fever	Bk, Fr, Lf	I	Drink decoction of mesocarp, leaves and scraped bark	3-5 glasses	Once a day or as needed	None
							Toothache	Lf	I	Apply crushed leaves as poultice	1-3 leaves	As needed	None
							Boils, skin rashes and itchiness, dermatitis	Lf	E	Apply decoction as wash	3-5 leaves	Once or twice a day or as needed	None
							Ringworm	Bk	E	Apply pounded scraped bark as poultice	1-3 palm- sized barks	Once or twice a day or as needed	None
81	<i>Swietenia mahagoni</i> (L.) Jacq.	Meliaceae	Mahogany	USTH 015671	334	8	Dysmenorrhea, delayed menstruation; abortifacient; abdominal pain	Sd	I	Take powdered seed or drink decoction	1-3 glasses	Once a day or as needed	Can cause abortion to pregnant women
							Amoebiasis, malaria; cancer, tonic; hypertension; cough; diarrhea; miscarriage; fever	Bk	I	Drink decoction	1-3 glasses	Once a day or as needed	None
82	<i>Arcangelisia flava</i> (L.) Merr.	Menispermaceae	Lagtang or Abutra	USTH 015600	922	10	Jaundice; tumor, myoma; diabetes, tonic; respiratory disease complex; diarrhea, dysentery, dyspepsia, ulcer, appetite enhancer; dysmenorrhea, delayed menstruation; abortifacient; fever	Rt, St	I	Drink decoction	3-5 glasses	Thrice a day or as needed	Can cause abortion to pregnant women
							Scabies; boils, skin rashes and itchiness; cuts and wounds	Rt, St	E	Apply coconut oil-infused stem	Completely on affected part	Once or twice a day or as needed	None
83	<i>Tinospora crispa</i> (L.) Hook. f. & Thomson ^C	Menispermaceae	Panyawan	USTH 015566	782	9	Malaria; tonic; diarrhea, stomach trouble, vomiting, ulcer, toothache; arthritis, rheumatism; dysmenorrhea; abortifacient; abdominal pain, backache, body ache, fever	St	I	Drink local alcohol- tinctured or decocted stem	1-3 glasses	Once or twice a day or as needed	Can cause abortion to pregnant women
							Scabies; sore eyes; cuts and wounds	Sp, St	E	Drop stem sap	Completely on affected part	As needed	None
							Arthritis, rheumatism; abortifacient; abdominal pain, body ache; gas pain and flatulence	St	E	Apply coconut oil-infused stem or stem mixed	Completely on affected part	As needed	Can cause abortion to pregnant women

										with gasoline			
84	<i>Ficus botryocarpa</i> Miq.	Moraceae	Kabiya	USTH 015672	53	1	Headache, fever	Rt	I	Drink decoction	1 arm-sized root	Twice a day or as needed	None
85	<i>Ficus cassidyana</i> Elmer	Moraceae	Tobog tapol	USTH 015551	492	8	Colds; diabetes; hypertension; asthma, cough, respiratory disease complex; diarrhea, stomachache; urinary tract infection; postpartum recovery, maternal care, milk production enhancer; weakness and fatigue, relapse	Bk, Rt	I	Drink decoction	1-3 glasses	Thrice a day or as needed	None
							Diabetes; hypertension	Fr	I	Eat fresh fruit directly	1-3 fruits	Once a day or as needed	None
							Body ache, headache, fever	Lf	E	Apply leaves as poultice	3-5 leaves	As needed	None
86	<i>Ficus concinna</i> (Miq.) Miq. ^C	Moraceae	Balete	USTH 015552	608	4	Prostate cancer, cyst, tumor; arthritis, rheumatism; kidney problem, prostate problem	Bk, Lf, Rt	I	Drink decoction	5-7 glasses	Once a day in thrice a week for 2 months	In excess can cause anemia, dizziness and weakening
							Cuts and wounds	Bk, Lf, Rt	E	Apply decoction as wash	1-3 glasses	As needed	None
							Fracture and dislocation, sprain	Bk, Rt	E	Apply fresh and heated bark and root as poultice	1-3 palm-sized barks or 1 arm-sized root	Once a day or as needed	Bark can cause skin allergy or burn
87	<i>Ficus fistulosa</i> Reinw. ex Blume	Moraceae	Tobog puti	USTH 015561	480	8	Colds; diabetes; hypertension; asthma, cough, respiratory disease complex; diarrhea, stomachache; urinary tract infection; postpartum recovery, maternal care, milk production enhancer; weakness and fatigue, relapse	Bk, Rt	I	Drink decoction	1-3 glasses	Thrice a day or as needed	None
							Diabetes; hypertension	Fr	I	Eat fresh fruit directly	1-3 fruits	Once a day or as needed	None
							Body ache, headache, fever	Lf	E	Apply leaves as poultice	3-5 leaves	As needed	None
88	<i>Ficus pseudopalma</i> Blanco	Moraceae	Lobi-lobi	USTH 015636	331	7	Diabetes; hypertension, atherosclerosis, hemorrhage; diarrhea, stomach trouble, dyspepsia; kidney stones; muscle pain; postpartum care and recovery; cramp and spasm	Lf, Rt	I	Drink decoction	3-5 glasses	Twice a day or as needed	None
89	<i>Ficus septica</i> Burm.f.	Moraceae	Lagnob	USTH 015623	576	6	Stomach trouble; asthma, sinusitis; muscle pain; backache, body ache, headache, fever, weakness and fatigue	Lf, Rt	I	Drink decoction	3-5 glasses	Once a day for 3 days only	In excess can cause Intestinal weakening
							Warts; cataract, eye problem	Lf, Sp	E	Apply drops of leaf sap	3-5 leaves	Twice a day or as needed	None
							Herpes simplex; boils	Rt, Sp, St	E	Apply stem and root sap	Completely on affected part	Thrice a day or as needed	None
90	<i>Ficus</i> sp.	Moraceae	Tuwa-tuwa	USTH 015642	71	1	Pregnancy, impotence and sterility, postpartum care and recovery	Lf	I	Drink decoction	3-5 glasses	Once a day for 3-5 days or as needed	None
91	<i>Morus alba</i> L.	Moraceae	Tahibo	USTH 015549	277	4	Colds; asthma, cough, pneumonia, lung nodule; muscle pain; cramp and spasm, relapse	Lf	I	Drink decoction	3-5 glasses	Twice to thrice a day for 3-5 days	In excess can cause acid reflux and hypocupremia
92	<i>Muntingia calabura</i> L.	Muntingiaceae	Mansanitas	USTH 015629	169	4	Colds; diarrhea, stomachache,	Lf	I	Drink decoction	3-5 glasses	Twice a day or as needed	None

							vomiting, ulcer; prostate problem; abdominal pain, headache						
93	<i>Myristica agusanensis</i> Elmer	Myristicaceae	Duguang kahoy	USTH 015611	194	2	Measles; respiratory disease complex	Bk	I	Drink decoction	3-5 glasses	Once a day or as needed	None
94	<i>Psidium guajava</i> L. ^C	Myrtaceae	Bayabas	USTH 015663	275	5	Diarrhea, ulcer	Bk, Lf, Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Constipation	Fr	I	Eat fresh fruit directly	1-3 fruits	Once to thrice a day or as needed	None
							Scabies; toothache; skin eruptions; cuts and wounds	Lf	E	Apply chewed or pounded leaves	3-5 leaves	Once to thrice a day or as needed	None
							Dandruff; cuts and wounds; circumcision antiseptic	Lf	E	Apply decocted leaves as wash	3-5 leaves	Once to thrice a day or as needed	None
95	<i>Pandanus amaryllifolius</i> Roxb. ^C	Pandanaceae	Pandantsina	USTH 015555	197	2	Heart enlargement, high cholesterol; urination difficulty, kidney stone, kidney problem, urinary bladder swelling, prostate problem	Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
96	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Phyllantaceae	Talikod or Likod-likod	USTH 015590	459	9	Jaundice, colds; tonic; coughs; stomach problem; kidney stone, kidney problem, urinary bladder swelling; new-born baby care; fever	Wh	I/E	Drink decoction or apply decocted leaves as wash	3-5 glasses decoction or 1/2 cup leaf sap (adult); 1/2 cup decoction or 1 teaspoonful leaf sap (baby)	Once or twice a day or as needed	None
							Scabies, jaundice, ringworm; skin rashness and itchiness, dermatitis, eczema; cuts and wounds	Fr, Rt	E	Apply decoction as wash	3-5 glasses	Thrice a day or as needed	None
97	<i>Piper aduncum</i> L.	Piperaceae	Lunas buyo	USTH 015568	193	2	Skin rashes and itchiness; cuts and wounds, animal and insect bites	Lf, St	E	Apply decoction	Completely on affected part	Once or twice a day or as needed	In excess can cause Intestinal weakening
98	<i>Piper decumanum</i> L.	Piperaceae	Lunas bagon tapol	USTH 015544	1018	9	Typhoid fever; cancer, cyst, tumor; pulmonary tuberculosis; diarrhea, stomach trouble, ulcer; gas pain and flatulence; poisoning	St	I	Drink local alcohol-tinctured stem	1/2 to 1 glass	Once a day in thrice a week or as needed	In excess can cause Intestinal weakening
							Tonsillitis; toothache, gum swelling, canker sore	St	I	Gargle local alcohol-tinctured stem	1/2 to 1 glass	Once or twice a day or as needed	None
							Scabies, warts, impetigo; boils, skin eruptions, skin rashes and itchiness, pimple, acne; arthritis, rheumatism, swellings, muscle pain; backache, body ache, gas pain and flatulence; allergy, burns, cuts and wounds, sprain, snake, dog and insect bites, contacts with plants and animal parts; anesthetic	St	E	Apply coconut or efficascent oil-infused stem	Completely on affected part	Once or twice a day or as needed	None
99	<i>Piper nigrum</i> L. ^C	Piperaceae	Lunas bagon puti	USTH 015560	824	9	Cancer, cyst, tumor; tonsillitis; diarrhea, stomach trouble, ulcer, toothache, gum swelling, mouth sore; gas pain and flatulence; poisoning	St	I	Drink or gargle local alcohol-tinctured stem or drink decocted stem	1/2 to 1 glass of local alcohol tincture or 3-5 glass of decoction	Once a day in thrice a week or as needed	In excess can cause Intestinal weakening
							Scabies, warts, impetigo; breast cancer; boils, skin eruptions, skin rashes and itchiness, pimple,	St	E	Apply coconut oil-infused or decocted stem	Completely on affected part	Once or twice a day or as needed	None

							acne; arthritis, rheumatism, swellings, muscle pain; backache, body ache, gas pain and flatulence; skin allergy, burns, cuts and wounds, animal and insect bites, contacts with plants and animals parts; anesthetic						
100	<i>Piper</i> sp.	Piperaceae	Buyo Pilipog	USTH 015592	296	3	Asthma, cough; rheumatism; fracture and dislocation	Lf	I	Drink decoction	3-5 glasses	Once a day	None
101	<i>Eleusine indica</i> (L.) Gaertn. ^C	Poaceae	Bilabila	USTH 015569	481	11	Measles; diabetes; internal bleeding; cough; diarrhea; arthritis; kidney problem; postpartum care and recovery; fever, cramp and spasm; fracture and dislocation	Wh	I	Drink decoction	3-5 glasses	Thrice a day or as needed	None
							Ringworm; hair loss; cuts and wounds	Wh	E	Apply decoction	1 glass	Once to thrice a day or as needed	None
102	<i>Imperata cylindrica</i> (L.) P.Beauv. ^C	Poaceae	Kogon	USTH 015605	107	4	Urination difficulty	Sh	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Chicken pox, measles; diarrhea, toothache; fever, baby teething	Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
103	<i>Paspalum conjugatum</i> P.J.Bergius	Poeaceae	Miligoy	USTH 015627	124	3	Diarrhea, dysentery	Rt	I	Drink decoction	1 handful of roots	Twice a day or as needed	None
							Hair loss; cuts and wounds	Rt	E	Apply decoction as wash	1 handful of roots	Once a day or as needed	None
104	<i>Rosa</i> sp.	Rosaceae	Rose	USTH 015628	83	3	Colds; nasal congestion, sinusitis	Fl	I	Drink or sniff hot hot water-infused flowers	1 glass	Thrice a day or as needed	None
							Cuts and wounds	Fl	E	Apply hot water-infused flowers as wash	1 glass	As needed	None
105	<i>Mussaenda philippica</i> A.Rich.	Rubiaceae	Buyon	USTH 015556	123	5	Jaundice, colds; stomachache, dysentery; fever; snake bite	Bk, Lf	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
							Cough, asthma	Fl	I	Eat fresh flower directly	1-3 flowers	Once or twice a day or as needed	None
106	<i>Uncaria lanosa</i> Wall.	Rubiaceae	Kawilan	USTH 015557	94	1	Stomach trouble	Sp, St	I	Drink stem sap	1/2 cup	Once or twice a day or as needed	None
							Diarrhea	St	I	Drink local alcohol-tinctured bark	1/2 to 1 glass	As needed	None
107	<i>Melicope latifolia</i> (DC.) T.G.Hartley	Rutaceae	Bagaynga	USTH 015540	43	1	Cough	Bk	I	Drink decoction of scraped bark	1-3 palm-sized barks	Once or twice a day or as needed	None
108	<i>Melicope triphylla</i> (Lam.) Merr.	Rutaceae	Dahile	USTH 015660	86	2	Pulmonary tuberculosis, cough	Lf, Sp	I	Drink decoction or leaf sap	3-5 glasses or 3-5 leaves of sap	Once to thrice a day or as needed	None
							Snake bite	Lf, Sp	E	Apply leaf sap	Completely on affected part	As needed	None
109	<i>Micromelum minutum</i> (G.Forst.) Wight & Arn.	Rutaceae	Lunas kahoy	USTH 015538	955	9	Cancer, cyst; diarrhea, stomach trouble, ulcer; poisoning	Lf, St	I	Drink local alcohol-tinctured or decocted stem	1/2 to 1 glass	Once or twice a day or as needed	In excess can cause Intestinal weakening
							Tonsillitis; toothache, gum swelling, canker sore	Rt, St	E	Gargle local alcohol-tinctured stem	1/2 to 1 glass	Once or twice a day or as needed	None
							Scabies, warts, impetigo; boils, skin eruptions, skin rashes and itchiness, pimple, acne; joint pain, rheumatism, swellings, muscle pain; backache,	Rt, St	E	Apply coconut or efficascent oil-infused stem	Completely on affected part	Once or twice a day or as needed	None

							body ache, gas pain and flatulence; allergy, burns, cuts and wounds; snake, dog and insect bites; contacts with plants and animal parts; anesthetic						
110	<i>Capsicum annuum</i> L.	Solanaceae	Sili na bisaya	USTH 015626	151	6	Diabetes; hypertension	Fr	I	Eat fresh fruit directly or add as spice in cooking	7 fruits	Once or twice a day or as needed	None
							White spot, athlete's foot; appetite enhancer; boils, skin rashes and itchiness, psoriasis, dandruff; insect bites	Lf	E	Rub crushed leaves or leaf sap	3-5 leaves	Once or twice a day or as needed	None
111	<i>Grewia laevigata</i> Vahl	Sparmanniaceae	Talimughat lingin	USTH 015547	474	5	Diabetes; hypertension, heart enlargement; rheumatism; labor and delivery enhancer, postpartum care and recovery; backache, body ache, fever, weakness and fatigue, relapse	Bk, Lf, Rt	I	Drink decoction	3-5 glasses	Once to thrice a day up to 3 days or as needed	None
							Muscle pain; labor and delivery enhancer, postpartum care and recovery; backache, body ache, fever, cramp and spasm; relapse	Bk, Rt	E	Apply coconut or efficascent oil-infused bark and root	Completely on affected part	Once a day or as needed	None
112	<i>Crotalaria incana</i> L.	Fabaceae	Alingatong	USTH 015572	84	5	Myoma; hormonal imbalance; cough; constipation; fever, weakness and fatigue, relapse	Rt	I	Drink decoction	3-5 glasses	Once to thrice a day up to 3 days or as needed	None
113	<i>Leucosyke capitellata</i> Wedd.	Urticaceae	Anagasi	USTH 015542	28	1	Stomach trouble and vomiting	Lf	I	Drink decoction	3-5 glasses	Once or twice a day or as needed	None
114	<i>Oreocnide rubescens</i> (Blume) Miq.	Urticaceae	Kubi or Salin-ubod	USTH 015676	151	3	Cough; diarrhea, stomach trouble; fever	Lf	I	Drink decoction	3-5 glasses	Twice a day or as needed	None
115	<i>Pipturus arborescens</i> (Link) C.B.Rob.	Urticaceae	Handamay	USTH 015673	540	6	Depression, anxiety, nervousness; stomach acidity; backache, body ache, headache, fever, weakness and fatigue	Lf	I	Eat fresh leaves or drink water solution of leaves	3-5 glasses	Thrice a day for a month	None
							Herpes simplex, scabies; boils, dermatitis	Lf	E	Rub crushed leaves	3-5 leaves	Thrice a day or as needed	None
							Skin rashes and infection; cuts and wounds	Bk	E	Apply pulp made from scraped bark as poultice	1-3 palm-sized barks	Twice a day or as needed	None
116	<i>Poikilospermum acuminatum</i> (Trecul.) Merr.	Urticaceae	Hanupi	USTH 015655	243	6	Sore eyes; ulcer; postpartum care and recovery; fever	Sp, St	I	Drink stem sap or decoction stem	1 arm-sized stem	Once or twice a day or as needed	None
							Skin rashes and itchiness; cuts and wounds; animal and insect bites	Rt, Sp	E	Apply decoction as wash	1 arm-sized root	Once or twice a day or as needed	None
117	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Verbenaceae	Elepanteng lingganag	USTH 015594	396	5	Ascariasis; abortifacient; fever	Rt	I	Drink decoction	1 arm-sized root	Once to thrice a day or as needed	Can cause abortion to pregnant women
							Boils; bruises, sprain	Lf	E	Apply crushed leaves as poultice	3-5 glasses	As needed	None
118	<i>Dianella ensifolia</i> (L.) DC.	Xanthorrhoeaceae	Ikug-ikug	USTH 015656	164	4	Maternal care; postpartum care and recovery, milk production enhancer	Lf	I	Drink decoction	3-5 glasses	Once a day or as needed	None
							Cuts and wounds	Lf	E	Apply	3-5 leaves	As needed	None

										leaves as poultice			
							Herpes simplex	Lf, Rt	E	Apply coconut oil-infused ashes of leaf and roots	Completely on affected part	Thrice a day or as needed	None
119	<i>Curcuma longa</i> L. ^C	Zingerberaceae	Duwaw yellow	USTH 015674	248	6	Diabetes; cough; arthritis; rheumatism; delayed menstruation; fever, gas pain and flatulence	Rz	I	Drink grinded and brewed rhizome	1-3 cups	Once or twice a day or as needed	None
							Burns, cuts and wounds, insect bites	Rz	E	Apply extracted juice from crushed rhizome	Completely on affected part	As needed	None
120	<i>Curcuma zedoaria</i> (Christm.) Rosc.	Zingerberaceae	Duwaw violet	USTH 015645	83	2	Cough; fever	Rz	I	Drink grinded and brewed rhizome	1-3 cups	Once or twice a day or as needed	None
121	<i>Alpinia haenkei</i> C.Presl	Zingiberaceae	Yanguas	USTH 015641	86	3	Cough; stomachache; urination difficulty, urinary tract infection	Rt	I	Drink decoction	3-5 glasses	Once to thrice a day or as needed	None
122	<i>Kaempferia galanga</i> L.	Zingiberaceae	Kisol	USTH 015579	200	7	Colds; tonic; cough, sore throat; dyspepsia, toothache; postpartum care and recovery; headache, fever	Rz	I	Drink decoction	3-5 glasses	Twice a day or as needed	None
							Toothache; headache, fever	Rz	I/E	Apply grinded rhizome as poultice	1-3 rhizomes	Thrice a day or as needed	None
							Tonic; postpartum care and recovery; headache, fever	Sh	E	Place washed clean shoot around the neck	1-3 shoots	Once a day or as needed	None
							Cough; rheumatism, swollen muscle	Lf	E	Rub heated and crashed leaves	1-3 leaves	Thrice a day or as needed	None

^a Bk, barks; Br, branch; Fl, flowers; Fr, fruits; Lf, leaves; Rt, roots; Rz, rhizomes; Sd, seeds; Sh, shoots; St, stems; Wh, whole plant.

^b I, internal; E, external.

^c FL=100%

Figures



Map Data @ 2019 Google

Figure 1

Study sites (pinned in yellow) in the province of Agusan del Sur: the only city (Bayugan City), and the two selected municipalities (Esperanza and Sibagat).

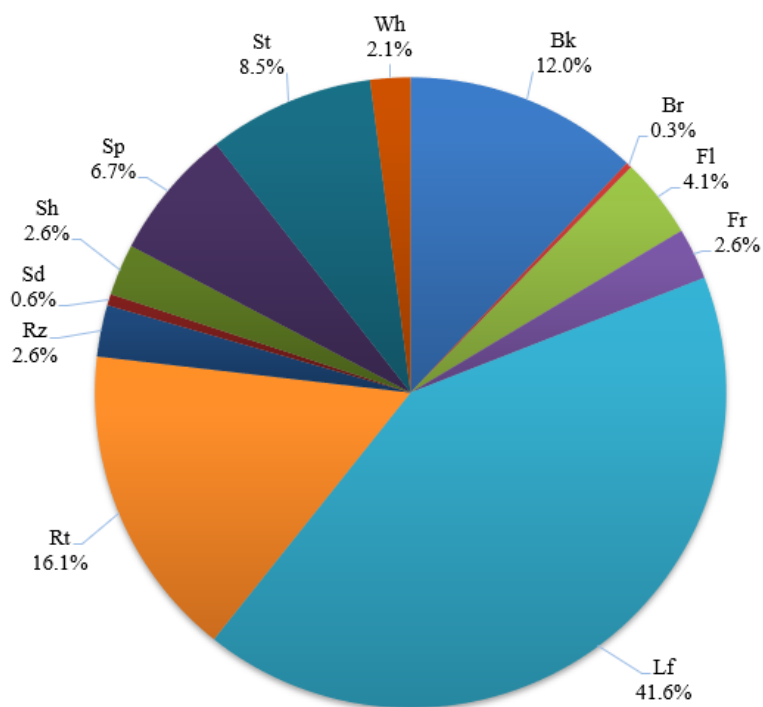


Figure 2

Plant parts used by the Agusan Manobo for medicinal application. Bk, barks; Br, branches; Fl, flowers; Fr, fruits; Lf, leaves; Rt, roots; Rz, rhizomes; Sd, seeds; Sh, shoots; Sp, sap or latex; St, stems; Wh, whole plant.

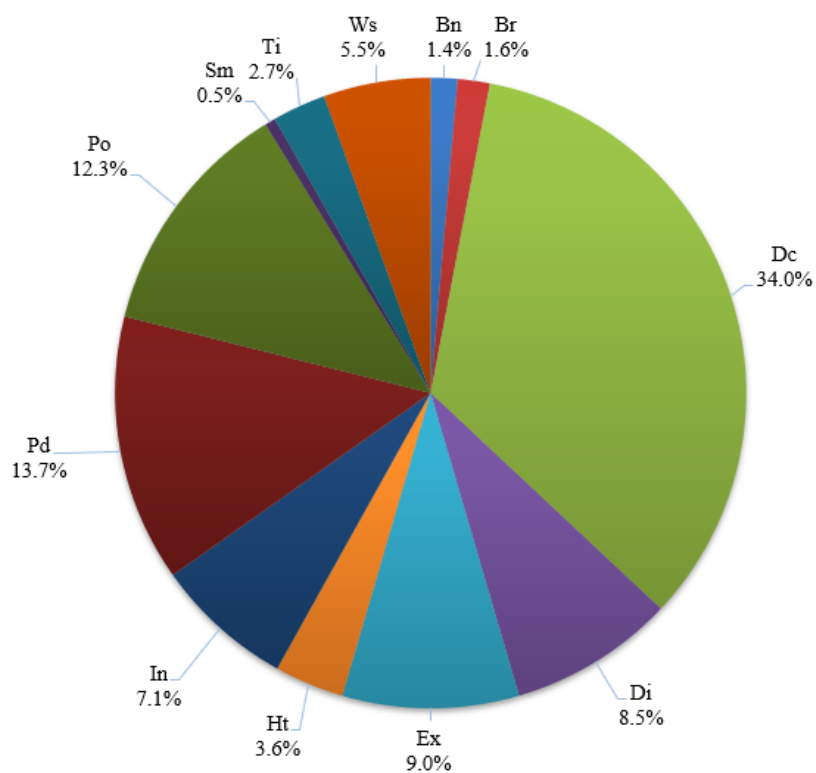


Figure 3

Mode of preparation of medicinal plants used by the Agusan Manobo. Bn, burning; Br, brewing; Dc, decoction; Di, directly applying or eating; Ex, extracting; Ht, heating or warming; In, infusion; Pd, pounding, crushing, rubbing, grinding, powderizing; Po, poultice; Sm, steaming; Ti, tincture; Ws, as wash, bath, hot compress.

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- [7AdditionalFile4Parameters.docx](#)
- [4AdditionalFile1CensusofAgusanManobopopulation.docx](#)
- [6Additionalfile3TableS3.Questionnaire.docx](#)