

An Ethnobotanical Study of Medicinal Plants and Perceptions on Plant Biodiversity Conservation in Leyte, Philippines

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ABSTRACT

A remote location in Leyte, Philippines is known for its traditional healing practices amid the availability of modern treatment methods. However, owing to an almost absent knowledge transfer and aging traditional healers, this knowledge could soon be permanently forgotten. Using focus group discussions, this study sought to document plants used in traditional healing and to look into local attitude towards conservation of medicinal plants in Jaro, Leyte. Among the 77 plant species documented in this study are the following: *Allium sativum*, *Andropogon citratus*, and *Peperomia pellucida* for hypertension; *Peperomia pellucida*, *Cocos nucifera*, *Lagerstroemia speciosa*, and *Cynodon dactylon* for kidney and bladder problems; *Annona muricata*, *Momordica charantia*, and *Moringa oleifera* for diabetes and anemia; *Moringa oleifera* as a galactagogue; *Jatropha curcas*, *Justicia gendarussa*, and *Curcuma domestica* for bone-related and abdominal problems; *Carica papaya*, *Chrysanthemum indicum*, and *Chrysophyllum cainito* for stomach illnesses; *Ananas comosus* as an anthelmintic; *Jatropha curcas* and *Piper betle* for flatulence; *Persea americana* and *Psidium guajava* for diarrhea; *Citrus x microcarpa*, *Plectranthus amboinicus*, *Premna odorata*, *Vitex negundo*, and *Zingiber officinale* for cough, colds, and sore throat; *Euphorbia hirta* and *Carica papaya* for dengue fever; *Hibiscus rosa-sinensis*, *Plectranthus scutellarioides*, and *Senna alata* for skin-related problems; and *Musa x paradisiaca*, *Ageratum conyzoides*, and *Psidium guajava* for cuts and wounds. The lack of ownership and accountability for these resources should be addressed prior to initiating conservation efforts. Moreover, a nationwide ethnobotanical documentation is warranted to respond to the aging population of traditional healers and dwindling knowledge transfer to the younger generation.

Keywords: conservation, healing, medicinal plants, traditional knowledge

INTRODUCTION

In ancient times, tribes in the Philippines have survived illnesses and diseases relying on traditional healing knowledge that predates the intervention of modern medicine. This knowledge has been handed down from generation to generation and continues to be used for the treat-

ment of a range of illnesses and diseases (Abe and Ohtani, 2013; Balinado and Chan, 2016). Although the Philippines has been dubbed as a biodiversity hotspot for conservation priorities and is rich in traditional medicinal plants, the diversity of plant species used in traditional healing are not well-documented (Myers et al., 2000; Olowa et al., 2012; Tantengco et al.

2018; Pinarok et al., 2015). As many of these plant species are endemic to the Philippines and to certain regions of the country, a timely documentation of this precious resource in the form of traditional healing knowledge and prioritization of these plants for conservation efforts is indeed of great importance. This urgent need for documentation and conservation is amplified by the rapid land use conversion in rural areas, which leads to habitat loss, decrease in plant population, or even species extinction. Furthermore, the introduction of modern medicine in remote areas has undoubtedly led to the decline in traditional healing knowledge in the younger generations (Gruyal et al., 2014). Ethnobotanical studies will greatly help biomedical researchers in narrowing down targets for scientific studies, which could lead to the development of new plant-based medicines (Balangcod and Balangcod, 2015; Fiscal, 2017). A timely ethnobotanical documentation and identification of suitable conservation initiatives and priority species for conservation may help prevent further habitat degradation and species loss and promote a better attitude toward plant conservation among villagers (Angagan et al., 2013).

Hence, this study aimed to document medicinal plants used in traditional healing in the remote villages of San Roque and Malobago in the rural town of Jaro in Leyte, Philippines. It is important to note that these areas were devastated by typhoon Haiyan in November 2013, which resulted in the destruction of many plants and their natural ecosystems. This study could ultimately provide recognition to lesser-known plants with great potential for biomedical applications and that warrant further scientific investigation. Furthermore, this study identified the significant factors to consider in planning conservation initiatives by trying to understand villagers' perception towards conservation of medicinal plants.

METHODOLOGY

Study Area

The remote villages of barangays (Brgys.) San Roque and Malobago in Jaro, Leyte, Philippines were selected as study sites based on the availability of older residents who are expected to be knowledgeable on the use of medicinal plants in traditional healing. These villages are located far from the municipal town proper, lack paved roads, and comprise mostly of poor residents, which are contributory factors to the encouragement of traditional healing. Brgy. San Roque has a total land area of 282.12 hectares, with 147 households and 734 residents. Brgy. Malobago has a total land area of 352.76 hectares, with 116 households and 558 residents. Brgys. San Roque and Malobago are 7.0 and 3.5 km. away from Jaro Poblacion, respectively.

Data collection and analysis

Each household in the two villages was visited and residents with knowledge on medicinal plants and traditional healing were personally invited to participate in a focus group discussion (FGD) regardless of age and gender. The objectives of the FGD were also discussed during the initial house visits. An open-ended questionnaire was employed as guide during the discussion, where 20 respondents actively provided information (thereafter considered as respondents for the first FGD session) while others present were not engaged due to lack of knowledge. Respondents freely shared their knowledge on medicinal plants and were not forced in any way during the conduct of the study. Interviews were conducted in the local dialect (Waray) to facilitate better data gathering. With the help of local guides knowledgeable on plant identification, photographs and specimens of plants mentioned during the FGD were collected from the study areas.

Using a different open-ended questionnaire, another FGD session was conducted to determine villagers' perception toward conservation

of medicinal plants. Only ten of the 20 original respondents in the first village were willing to participate in the new round of FGD. For consistency, ten respondents were also selected from the second village. During the second FGD, plant specimens collected were brought to the respondents to confirm identification. Plant specimens collected were brought to the Botany Section of the Department of Biological Sciences, Visayas State University in Baybay, Leyte, Philippines. A botanist identified the scientific names of plants from family down to species level. After identification, plant specimens were pressed for herbarium collection and stored at the Visayas State University, Alangalang Campus, Leyte, Philippines. Assistance from a local general physician was sought to identify the English names of illnesses and diseases mentioned during the FGD. Villagers' perception toward conservation of medicinal plants was determined in terms of supply, frequency of ex-

traction, and cultivation practices.

RESULTS AND DISCUSSION

Plants used in traditional healing practice

Table 1 summarizes the list of 77 medicinal plant species used in traditional healing in the study area. Plant parts most commonly used were leaves, flowers, stems/barks, and roots, while the methods most commonly employed include the application of leaf and root poultice and drinking of fresh extract or decoction from leaves and roots. Respondents vouched for the plants' efficacy in treating the listed ailments and diseases. They stated that they seldom visit doctors since they primarily use medicinal plants to treat common ailments.

Table 1. Ethnobotanical documentation in Leyte and related studies.

	Related studies in the Philippines and other countries ^a
1	SN: <i>Acorus calamus</i> L.; <i>Acoraceae</i> ; LN: <i>Lubigan</i> ; CN: Sweet flag. Cultivated. TS: Fever - drink a leaf decoction. PH: colds [C]; snakebite [L]; flatulence [E]; flatulence, stomachache [F]; urinary tract infection (UTI) [M]. OC: digestive disorders, dysentery [O1]; canker sores [O2].
2	SN: <i>Ageratum conyzoides</i> L.; <i>Asteraceae</i> ; LN: <i>Kurokanding</i> ; CN: Billy goat weed. Not cultivated. TS: Wounds - apply leaf extract on the wound. PH: wounds [B]; cuts, wounds [A]; wounds [M] OC: Diarrhea, headache, painful earache (otalgia) [O3]; Kidney disease, miscarriage, cervical cancer, ring worms, oral thrush, xiphoidalgia, diarrhea, colic pain, tonsillitis [O4]; cutaneous eruptions, diarrhea [O2]. SS: wound and internal bleeding [S2]
3	SN: <i>Allium sativum</i> L.; <i>Alliaceae</i> ; LN: <i>Lasuna</i> ; CN: Garlic. Not cultivated. TS: Hypertension - take a fresh clove of garlic. PH: hypertension, anti-oxidant [J]; hypertension [A]; hypertension, dog bite, ascariasis, body chills, toothache, abdominal pain [K]; hypertension, snake bites, toothache [D] dog bite, phlegm [M]. OC: Intestinal worms in pigs [O5]; Urinary retention, conjunctivitis, allergy itching larynx [O4]; hypertension, flatulence, sciatica, cardiovascular disorders, convulsions, diabetes, cataract, renal failure, wound, ulcer, arthritis, rheumatism, cuts, toxic fish stings, insect bites, asthma, bronchitis, pneumonia and respiratory disorders, colds, earache, gastrointestinal disorders, anthelmintic [O2]; hypertension [S18]
4	SN: <i>Ananas comosus</i> (L.) Merr.; <i>Bromeliaceae</i> ; LN: <i>Pinya</i> ; CN: Pineapple. Cultivated. PH: Fever - apply pound leaves as poultice on the forehead; Anthelmintic - consume unripe fruit [TS]; Constipation [A]; fever [K]; anthelmintic, diabetes [C]; ringworm, hypertension [D]; anthelmintic [M] OC: Yellow fever, ulcers, allergy, scoliosis [O4]; Anthelmintic, purgative, cystitis, diuretic, abortifacient, bladder problems, whooping cough in children [O2].
5	SN: <i>Andropogon citratus</i> hort. ex DC.; <i>Poaceae</i> ; LN: <i>Tanglad</i> ; CN: Lemongrass. Cultivated. TS: Hypertension - use leaves as food ingredient. PH : hypertension, toothache [J]; hypertension [H]; hypertension, arthritis [I]; hypertension, anemia, swelling, joint pains [C]; hypertension, cough, fresh wound, diarrhea, colds stomachache, UTI [D]; hypertension, abdominal pain, diarrhea, nervousness, difficulty in urinating, lamig, flu, nasal congestion, flatulence, for newborn child [E]; diabetes[F]; headache, low blood pressure, colds, postpregnancy [M].
6	SN: <i>Annona muricata</i> L.; <i>Annonaceae</i> ; LN: <i>Guanaba</i> ; CN: Soursop. Cultivated. TS: Diarrhea - drink a leaf decoction. PH: diarrhea [J]; cancer, diabetes, ascariasis, hypertension, hyperacidity, urination difficulty, cough, headache [K]; Hepatitis, flatulence [I]; Diarrhea, stomachache [H]; cancer, diabetes, diarrhea, cough, arthritis [D]; Hypertension, abdominal discomfort, stomachache, goiter, cyst, UTI, cancer, diabetes [C]; diabetes, hypertension, uric acid, cough, abdominal pain [E]; diabetes, hypertension, UTI, wound infection [G]; stomachache, dizziness [M]. OC: Hypertension, fever, fish poisoning, epilepsy, febrifuge, headache, diarrhea, dysentery, wounds, mouth sores [O2]. SS: Fever, respiratory illness, gastrointestinal and hypoglycemic problems [S3]

7	SN: <i>Aralia balfouriana</i> hort.; Araliaceae; LN: Kapwa; CN: Balfours aralia. Cultivated. TS: Paralysis - apply heated and pound leaves on affected area.
8	SN: <i>Arecia catechu</i> L.; Arecaceae; LN: <i>Bunga</i> ; CN: Betel nut plant. Cultivated. TS: Muscle pain- drink a root decoction. PH: ascariasis, abdominal pain [A]; toothache, to strengthen teeth [D]; skin diseases, eczema, wound [E]; postpartum care, indigestion, flatulence [K]. OC: cough [O3]; astringent, anthelmintic [O2]. SS : anti-hyperglycemic [S4]
9	SN: <i>Artemisia vulgaris</i> L.; Asteraceae; LN: <i>Herba maria</i> ; CN: Mugwort. Cultivated. TS: Fever, hemonausea - drink a root decoction; Anthelmintic - Drink a leaf decoction; Stomachache - drink a leaf decoction or use leaves as poultice on stomach. PH: Stomachache [J]; Cough, fever [H]; Cough with phlegm, fever, headache, abdominal and body pains [K]; Hyperacidity [I]; Stomachache, colds, asthma, abdominal discomfort, flatulence, sprain, skin disease, hemorrhage, dyspepsia, cough, fever [C]; Stomachache, dysmenorrhea [D]; Rubefacient [L]; Abdominal pain, swollen muscles, lamig, fever, skin disease [E]; Blood vomiting, lung disease, cough, ringworm [G]; Fever, sore throat, cough, colds, phlegm [M]. OC: deworming agent [O5]; leucorrhea [O2]. SS: Stomachache [S5]
10	SN: <i>Bambusa vulgaris</i> Schrad. ex J.C. Wendl.; Poaceae; LN: <i>Kawayan</i> ; CN: Bamboo. Cultivated. TS: Hypertension - drink a leaf decoction. PH: allergy [A]; nervous breakdown, fish poisoning, hypertension, post partum care [K]; cough, colds [M].
11	SN: <i>Bixa orellana</i> L.; Bixaceae; LN: <i>Siyotes/ Achuete/ Annato</i> ; CN: Lipstick plant. Cultivated. TS : Diarrhea, stomachache - apply a warm leaf poultice on the stomach; insomnia, dysmenorrhea, irregular menstruation - drink a root decoction; fever - apply a warm leaf poultice on the forehead. PH : burns [B]; cough, sprain [H]; headache, fever [K]; Burns [D]; arthritis [F]; headache, fever [E, M] OC : Headache, fever, dysentery, antidote for <i>Jatropha curcas</i> and <i>Manihot esculenta</i> [O2]. SS : Fever, diarrhea, irregular menstruation, and insomnia [S12]
12	SN: <i>Blumea balsamifera</i> DC.; Asteraceae; LN: <i>Gabon</i> ; CN: Blumea camphor. Cultivated. TS : Rheumatism, arthritis, osteoarthritis - use leaf decoction for a hot foot bath; Cough - drink leaf extract; stomachache - apply a leaf poultice on the stomach. PH: cough, UTI [B]; cough, colds, fever [J]; cough, boils, headache, hypertension, urination difficulty [A]; cough, abdominal pain, body pains, sore throat, post-partum care, fever, headache [K]; cough [I]; kidney infection [H]; rheumatism, famish , malaria, hypertension, arthritis, stomachache, body pain, diabetes, spasm, flatulence, overfatigue, UTI [C]; cough, diabetes, stomachache, asthma [D]; renal stones [L]; cough [F]; headache, cold, flu, fever, UTI, stomachache [G]; cough, headache, UTI, edema, muscle pain, rheumatism, fever [E]; cough, colds, kidney stones, hypertension, stomachache, fever [M]. SS: kidney diseases [S10]
13	SN: <i>Carica papaya</i> L. (male); Caricaceae; LN: <i>Kapaya</i> ; CN: Papaya. Cultivated. TS: Dengue (to increase platelet count) - drink leaf extract; Skin problems - apply leaf extract on skin areas with discoloration, scar, sunburn, & pimples; Warts - apply sap from leaf stalk. PH : inflamed tonsils [J]; constipation [A]; constipation, rheumatism, fever, cramps, spasm, bodyaches, insect bites, dog bites, fish stings, galactagogue [K]; anthelmintic [H]; stomachache, tetanus, fever [I]; dengue, skin diseases, tonsillitis [C]; constipation, indigestion, tonsillitis, fresh wound, dog bites, snake bites [D]; hypertension, nasal congestion [E]; dengue [F]; dengue [G]; headache [M]. OC: Malaria, cough, hypertension [O3]; Malaria, toothache [O4]; Constipation, stomach/peptic ulcer, duodenal ulcers, diphtheria, eczema, anthelmintic, hepatitis, anti-pimple, anti-pigmentation, skin moisturizer, high cholesterol level, arthritis, hypertension, anthelmintic, joint and muscle pain [O2]. SS: dengue [S6]; antimicrobial, antifungal [S17].
14	SN: <i>Chrysanthemum indicum</i> L.; Asteraceae; LN: <i>Herba mansanilla</i> ; CN: Chrysanthemum. Cultivated TS : Stomachache - drink a leaf decoction or apply a warm leaf poultice on the stomach. PH : Diarrhea, abdominal pain, boils [A]; Stomachache, bloating [F]. OC : Hemorrhage, whitlow, wounds, scabs, eye problems, contusions [O2]. SS : anti-inflammatory [S7]
15	SN: <i>Chrysophyllum cainito</i> L.; Sapotaceae; LN: <i>Kayomito</i> ; CN: Star apple. Cultivated. TS : Diarrhea, tuberculosis - drink leaf decoction; Hemonausea - consume the fruit or drink a decoction of avocado, guava, and cainito leaves. PH : diarrhea [J]; diarrhea [A]; diarrhea, stomachache [H]; diarrhea, headache, post-partum care [K]; diarrhea, stomachache [D]; diarrhea [E]; diabetes, wound infection [G]; diarrhea, stomachache [M]; Inflammation, hypertension [S9].
16	SN: <i>Citrus maxima</i> (Burm.) Merr.; Rutaceae; LN: <i>Aslom/suha</i> ; CN: Pomelo. Cultivated. TS: Rheumatism, arthritis, osteoarthritis - use a leaf decoction for a hot foot bath. PH: post-partum care, skin rashes, cough [K]; toothache [C]; post-partum care, hypertension [M]. OC: antispasmodic, diabetes, cholesterol [O2].
17	SN: <i>Citrus medica</i> L.; Rutaceae; LN: <i>Sidra</i> ; CN: Citron. Cultivated. TS: Headache - crush all plant parts and apply directly on the forehead as poultice. OC: Diphtheria, fever, rheumatism, cough, respiratory congestion, fever, colds, liver, gastrointestinal discomfort, nausea, ulcer [O2]. SS: antimicrobial [S15].
18	SN: <i>Citrus x microcarpa</i> Bunge; Rutaceae; LN: <i>Lemonsito/Kalamansi</i> ; CN: Citrus. Cultivated. TS : Colds, cough - drink warm fruit juice. OC: cough, colds, hypertension [J]; cough [H]; cough, colds, dandruff, infant care [K]; sore throat, high fever [D]; cough [E]. SS: scurvy, contraception [S8]
19	SN: <i>Clerodendrum minahassae</i> Teijsm. & Binn.; Lamiaceae; LN: <i>Danata</i> ; CN: Tube flower. Cultivated TS: Diarrhea - apply a warm leaf poultice on the stomach; Fever - apply a warm leaf poultice on the forehead [TS]. PH: Headache, swollen muscle [K].

20	SN: <i>Cocos nucifera</i> L.; Arecaceae; LN: <i>Lubi</i>; CN: Coconut. Cultivated. TS: Muscle pain - drink a root decoction. PH : heal navel wounds in newborn [J]; urination difficulty, ascariasis, constipation, scabies, skin eruption [A]; urination difficulty, scabies, insect bites, sudden cough, white spot, skin rashes [K]; arthritis [H]; UTI, toothache, sore eyes, boils [C]; UTI, kidney problem, cleansing, diarrhea, skin itchiness [D]; fracture [F]; UTI, uric acid, diarrhea, lung problem, antibacterial [E]; kidney stone, itchiness, sprain, chest pain, wound, snake venom [M]. OC: Blood clots, wound [O3]; hepatitis, diarrhea, anthelmintic, gonorrhea, burning sensation in the abdomen, indigestion, stomachache, diuretic, venereal disease, toothache, UTI, hair oil, cataract, type 2 diabetes, renal failure, nephritis and bladder infections [O2]
21	SN: <i>Corypha elata</i> Roxb.; Arecaceae; LN: <i>Buri</i>; CN: Buri palm. Not cultivated. TS : Diarrhea - drink a root and leaf decoction; Wound - apply a leaf stalk extract on the wound. PH : overfatigue [I]; urination difficulty, post partum care, headache, arthritis, cramps, spasm [K].
22	SN: <i>Curcuma domestica</i> Valetton; Zingiberaceae; LN: <i>Dulaw</i>; CN: Turmeric. Cultivated. Constipation, cytitis (UTI) - apply a warm leaf poultice on the stomach; Fever - apply a pound leaf poultice on the forehead [TS] ; Arthritis, diarrhea, abdominal pain, flatulence, hypertension [J]; Arthritis, cuts and wounds, cough [A]; Wound, ulcer [I]; Bruises and boils [H]; Fever, burns, dizziness, abdominal pains [K]; Arthritis, hypertension, goiter, UTI, anti-cancer agent [C]; Rheumatism, abdominal pain, nervousness, insomnia, sweaty scalp, lamig, diabetes [E]; Stomachache [G]. OC: Centipede bite, abdominal pain, constipation and loss of appetite (typhoid) [O3]; Cough, eye problems, bronchitis, asthma, fever , ecchymosis , contusions, wounds , catarrh, cough and colds, eyewash, cataract , measles, postpartum bleeding and diastasis as bath, cardiovascular disease, face cleanser, facemask, skin moisturizer, whitening agent [O2]. SS : Anti- bacterial, gastroprotective, antioxidant, anti-platelet [S1].
23	SN: <i>Cynodon dactylon</i> L. Pers.; Poaceae; LN: <i>Bermuda</i>; CN: Bermuda grass. Cultivated. TS: Hypertension - drink a leaf decoction. PH : kidney stones, hair fall [I]; purging [M]. OC: Snake bite [O4]; inflammations, appetite stimulation [O2]; kidney stones, urethral stones, pain killer, snake bite, dog bite, wound, piles and hemorrhoids [O6]. SS: diabetes, diarrhea [S13]
24	SN: <i>Cyperus kyllingia</i> Endl.; Cyperaceae; LN: <i>Baro-batones</i>. Not cultivated. TS: fever - drink a leaf decoction. PH: fever [I]. SS: analgesic, antidiabetic, antioxidant, antimicrobial, hepatoprotective [S14]
25	SN: <i>Cyperus rotundus</i> L.; Cyperaceae; LN: <i>Sud-sod</i>; CN: Cocoglass. Not cultivated. TS: Hangover, stomachache - drink a rhizome decoction. PH: Dyspepsia [F]. OC: Toothache [O3]; Snake bite [O4]; Fever, dyspepsia [O2]; Brain tonic, piles and hemorrhoids, stop excess of urine, hair fall, skin whitening, hiccup, menstrual problem, digestive tonic, heart tonic, mammary glands enhancer, Cholera, Muscular pain [O6]. SS: anti-platelet [S16]
26	SN: <i>Dioscorea hispida</i> Dennst.; Dioscoreaceae; LN: <i>Kurot</i>; CN: Asiatic bitter yam. Not cultivated. TS: Wound - apply pound tuber directly on the wound. PH : dog bites and rabies [M]
27	SN: <i>Ehretia acuminata</i> R.Br.; Boraginaceae; LN: <i>Anonang</i>; CN: Koda. Cultivated. TS: Fever - apply pound leaves as poultice on the forehead or drink a leaf decoction.
28	SN: <i>Eleusine indica</i> (L.) Gaertn.; Poaceae; LN: <i>Talab-angan</i>; CN: Goose grass. Not cultivated. TS: metrorrhagia - drink a leaf decoction to stop bleeding after child birth; muscle pain - drink a root decoction. PH: newborn and post-partum care [J]; hair loss, cuts and wounds, fracture, dislocation, internal bleeding, cramps, spasm [K]; stomach bloating [I]; diuretic [H]; flatulence [C]; kidney problem, arthritis [D]; menstrual problem [F]; fever [M]. OC: erectile dysfunction [O3]; conjunctivitis [O2]
29	SN: <i>Erythrina orientalis</i> Murray; <i>Erythrina variegata</i> L.; Leguminosae; LN: <i>Dapdap</i>. Not cultivated. TS : Rheumatism, arthritis - use leaves for a hot foot bath; fever, cough - drink a cool leaf decoction. PH: diarrhea, scabies, urination difficulty, kidney stone [K]. OC: anthelmintic, bronchitis [O2]
30	SN: <i>Etlingera elatior</i> (Jack) R.M.Sm.; Zingiberaceae; LN: <i>Tikala</i>; CN: Torch ginger. Not cultivated. TS : Cough - apply a warm flower poultice on the chest; Fever - drink a tuber decoction; Hemorrhoids - apply a warm leaf stalk poultice on the affected area.
31	SN: <i>Euphorbia hirta</i> L.; Euphorbiaceae; LN: <i>Gatas-gatas</i>; CN: Australian asthma weed. Not cultivated. TS : Dengue, fever - drink plant decoction; swelling lymph nodes - apply a pound leaf poultice on affected area. PH: wounds [B]; dengue, fever [J]; dengue [K]; dengue [H]; fever, measles, sore eyes, cough [C]; dengue, fever, UTI [E]; dengue [F]. OC: Tinea capitis, xiphoidalgia [O4]; Colic, asthma, eye bath, cataract, diabetes, diarrhea, asthma, febrifuge, abdominal pain [O2]; skin boils, menstrual disorders, pain killer, liver tonic, leucorrhea, piles, urethral ulcer [O6]. SS: Anti-mosquito [S11]
32	SN: <i>Euryclis amboinensis</i> (L.) Lindl.; Amaryllidaceae; LN: <i>Abod</i>; CN: Brisbane Lily. Cultivated. TS : Boils and abscesses - apply pound leaves on the affected area. PH : UTI, inflammation [I]
33	SN: <i>Gossypium hirsutum</i> L.; Malvaceae; LN: <i>Kapok</i>; CN: Silk cotton tree. Cultivated. TS: asthma - drink a root decoction. PH: flatulence [C]; postpartum care – drink a decoction [M]
34	SN: <i>Hibiscus rosa-sinensis</i> L.; Malvaceae; LN: <i>Takoranga</i>; CN: Gumamela. Cultivated. TS: boils and abscesses - apply pound flowers on the affected area. PH: swellings, bruises, anti-inflammatory [J]; boils, skin eruptions, cuts and wounds [A]; boils [K]; anti-inflammatory [H]; cough, difficulty of placenta delivery [C]; boils [E]; fever [F]; boils [M]. OC: menorrhagia, cough, sprains, fever, colds, diarrhea, dysentery [O2]; eye infection [O3]
35	SN: <i>Homalomena philippinensis</i> Engl.; Araceae; LN: <i>Payaw</i>; CN: Payau. Cultivated. TS: Rheumatism, arthritis, osteoarthritis and “beri-beri” - apply a decoction of sun-dried corm or apply a warm leaf poultice overnight on the affected area; headache - apply a warm leaf poultice on the forehead; hemorrhoids, somahache - apply a warm leaf poultice on the affected area; paralysis - apply warm pound leaves on the affected area; sore throat - drink a corm decoction.

36	SN: <i>Hyptis capitata</i> Jacq.; Lamiaceae; LN: <i>Burunganon</i> (red); CN: Ironwort. Not cultivated. TS: Fever, cytitis (UTI) - drink a root decoction; Blood in the stool - drink a leaf decoction. PH: Abdominal discomfort, stomachache, dyspepsia, diarrhea/LBM [C]; Fever and spasm [M]
37	SN: <i>Jatropha curcas</i> L.; Euphorbiaceae; LN: <i>Tuba</i> ; CN: Physic nut. Cultivated. TS: Bone fracture/ dislocations, muscle pain - apply a warm leaf poultice on the affected area; Cough - apply a warm leaf poultice on the chest and back or consume the leaf extract; Fever - apply breast milk on a warm leaf and place on the forehead to bring head temperature down; Stomachache - apply a warm leaf poultice on the stomach. PH: Flatulence, mild stroke, rheumatism, arthritis [J]; Sprain, arthritis, dislocation/fracture [A]; Sprain, flatulence [I]; Flatulence [H]; Fracture and dislocation, swellings, body pains, abdominal pain, headache [K]; Arthritis, abdominal discomfort, stomachache, colic, cough, flatulence, UTI [C]; Sprain, rheumatism, removes milk deposits on baby's tongue [D]; Sprain, fracture, rheumatism, swollen muscles, fever, lamig, headache, wound [E]; Sprain and stomachache [G]; Sprain [F]; Sprain, arthritis, muscle pain [M]. OC: Kidney disease, anthelmintic, diarrhea, pica, tinea capitis, fresh wounds [O4]; Hemorrhoids, rheumatism, scabies, herpes, constipation purgative and emetic, tumors [O2]
38	SN: <i>Justicia gendarussa</i> Burm. f.; Acanthaceae; LN: <i>Kalampisaw</i> ; CN: Yellow-leaved justicia . Cultivated. TS : Rheumatism, arthritis, osteoarthritis - use a leaf decoction for a hot foot bath; Bone fracture/ dislocations - apply a warm leaf poultice on the affected area or use a leaf decoction as a hot bath; Muscle pain, hemorrhoids - apply a leaf poultice on the affected area; Stomachache - apply a warm leaf poultice on the stomach. PH: headache, post-partum care [K]; stomachache, bloating, fracture [I]. OC : Rheumatism, dysentery, jaundice, muscle relaxant, febrifuge, emetic, emmenagogue, diaphoretic, lumbago, hypertension, fever, wounds, swelling [O2].
39	SN: <i>Kaempferia galanga</i> L.; Zingiberaceae; LN: <i>Kusol</i> ; CN: Aromatic ginger; Cultivated TS: Colds - place the chopped tuber inside the baby's pillow or make a baby's bracelet made of tuber; Fever - soak rhizome in cool drinking water. PH: Cough, contact with plant thorns or spines [K]; Colds, cough, flatulence, fever, mumps, ear infection [C]; Boils [M].
40	SN: <i>Kalanchoe pinnata</i> (Lam.) Pers.; Crassulaceae; LN: <i>Sampraviva</i> ; CN: Life plant. Cultivated. TS : Headache - apply a crushed bark and fruit peeling poultice on the forehead; mumps - apply a crushed leaf poultice on the affected area; stomachache - apply a warm leaf poultice on the stomach; toothache - apply a warm leaf poultice on the cheek to reduce the pain. PH : Wounds and boils [J]; hypertension, colds, boils, gastro-intestinal pain, fever, bruise [C]; headache, rheumatism [D]
41	SN: <i>Lagerstroemia speciosa</i> Pers.; Lythraceae; LN: <i>Banaba</i> ; CN: Giant crepe-myrtle. Cultivated. TS: Kidney problem - drink a leaf decoction. PH: difficulty urinating [A]; UTI, diabetes, diarrhea, mouth ulcers [N]; fever, jaundice, measles [K]; kidney problem [C]; UTI, hypertension, diarrhea, stomachache [D]; diabetes [L]; UTI, hypertension, diabetes [E]; UTI, kidney trouble [F]; UTI [G]; UTI, diarrhea, kidney stone, delayed menstruation, headache, low blood pressure [M]. OC : diarrhea, dysentery [O2]
42	SN: <i>Lansium domesticum</i> Corr.; Meliaceae; LN: <i>Lansones</i> ; CN: Langsat. Cultivated. TS : Blisters - cook the bark in coconut oil and apply on blisters.
43	SN: <i>Lantana camara</i> L.; Verbenaceae; LN: <i>Baho-baho/Kantutay</i> ; CN: Lantana. Not cultivated. TS: Cough - drink a leaf/flower decoction. PH: headache [B]; sleeplessness, fatigue, postpartum care, dysmenorrhea, delayed menstruation, scabies, indigestion, flatulence [K]; mumps [D]; indigestion [E]. OC: toothache, ring worm, stomachache, cough, diarrhea, dysentery, colic [O4]; fever, body ache [O2]
44	SN: <i>Luffa acutangula</i> (L.) Roxb.; Cucurbitaceae; LN: <i>Patola</i> ; CN: Bath sponge. Cultivated. TS: Skin problems - apply a leaf extract on the skin area with discoloration, scar, sunburn, and pimples. PH: Hypertension [K]; Dysmenorrhea [H]; Diabetes, amenorrhea [C]. OC: Eczema, skin infections, purgative, emetic, galactogenic, anthelmintic, smallpox, hypertension [O2]
45	SN: <i>Mangifera indica</i> L.; Anacardiaceae; LN: <i>Mangga</i> ; CN: Mango. Cultivated. TS : Cough - drink a leaf decoction. PH : diarrhea [J]; sore throat [A]; dysmenorrhea [H]; wounds, scabies [K]; fever [D]; diarrhea [E]; diabetes, wound infection [G]; scabies [F]; anhidrosis, postpartum care [M]. OC: itchiness, diarrhea, abdominal pain, constipation, and loss of appetite (typhoid) [O3]; cough, influenza, splenomegaly, anthelmintic, stomach wounds, nausea, kidney disease [O4]; throat pain, dysentery, diarrhea, dysentery, bronchitis, fever, burns, bleeding gums, diabetes [O2].
46	SN: <i>Mentha sp.</i> ; Lamiaceae; LN: <i>Herba-ulot</i> . Cultivated. TS: hypertension, stomachache - drink a leaf decoction.
47	SN: <i>Michelia champaca</i> L.; Magnoliaceae; LN: <i>Tsampaka</i> ; CN: Champaca. Cultivated. TS: Boil and abscesses - apply pound leaves on the abscess; Glossitis - drop leaf extract on baby's tongue; Hemonausea - Drink a root decoction.
48	SN: <i>Mimosa pudica</i> L.; Mimosaceae; LN: <i>Harupay</i> ; CN: Touch-me-not. Not cultivated. TS: Hemonausea, dysmenorrhea and irregular menstruation - drink a root decoction. PH: cough [B]; diarrhea, mumps, boils [A]; child sleeplessness, malaise, fatigue, fever, urination difficulty [K]; toothache, flatulence [I]; goiter [H]; stomachache [C]; stomachache, diarrhea, mumps, UTI, arthritis, tooth ache [D]; dysmenorrhea, postpartum care, body pain, kidney disease [M]. OC: Injury swelling [O3]; Laryngitis [O2]
49	SN: <i>Momordica charantia</i> L.; Cucurbitaceae; LN: <i>Marigoso</i> ; CN: Bitter gourd. Cultivated. TS: Cough - drink the leaf extract; Diabetes - pulverize sun-dried fruits and leaves and mix in drinks; Hemorrhoids - apply leaf extract on hemorrhoids; Hypertension - ingest mature sun-dried seeds. PH: Cough [B]; Diabetes, anemia, ascariasis [A]; Anemia, infant care, sudden cough [K]; Diabetes, anemia, athlete's foot, fresh wound [D]; Anemia, viral diseases/ infection [C]; Abdominal pain, cough [E]; Diabetes [F]; Diabetes, wound infection [G]; Cough, phlegm, pneumonia, stomachache [M]. OC: Loss of appetite, cholera, worms, ulcers, type 2 diabetes, body ache, colds, fever anthelmintic [O2]

50	SN: <i>Moringa oleifera</i> Lam.; Moringaceae; LN: <i>Malunggay</i> ; CN: Horse radish tree. Cultivated. TS: Diabetes - take 5 pcs of sun-dried seeds before each meal; Hypertension - take sun-dried seeds; Galactagogue, blood in the stool - use leaves as food ingredient; Stomachache - mix crushed dried seeds in food or drinks; Toothache (tooth decay) - apply pound bark/stem on tooth cavity. PH: Galactagogue, antibiotic for wounds, cuts, and sores, induces normal urination [J]; Hypertension, diabetes, anemia, constipation, ulcer, scabies, skin eruption, cuts and wounds, nutrients [A]; Galactagogue, cough, sore eyes, cuts and wounds [K]; Stomach bloating [I]; Bleeding [H]; Leukemia, anemia, diarrhea/LBM, toothache, wounds, fever, ulcer [C]; Anemia, diabetes, fever [D]; Galactagogue, hypertension, diabetes, cough, gastrointestinal and liver problems [E]; Diabetes and wound infection [G]; Cough, low blood pressure [M]. OC: Uterine pain, erectile dysfunction, malaria [O4]; Pain killer, eye disorders, digestive tonic, gastric problems, cough, blood purifier, urinary disorders [O6]
51	SN: <i>Musa x paradisiaca</i> L.; Musaceae; LN: <i>Baloy/ Bungan</i> ; CN: Banana. Cultivated. TS: Hemorrhage - drink a leaf decoction; Wound - apply leaf sap on wound. PH: Abatement of bleeding wounds [J]; Cuts and wounds, boils, fever, headache [A]; Cuts and wounds, skin rash, diarrhea, gingivitis, blood circulation enhancer [K]; wounds, bleeding [C]; wounds [E]; diarrhea, indigestion, high/low blood pressure, toothache, sprain, indigestion [M]. OC: Pre-leprosy, rash [O3]; Backache, dysentery [O4]; Dysentery, dental problems, headache, antiseptic, wounds, diuretic, dysentery, burns [O2]
52	SN: <i>Peperomia pellucida</i> (L.) Kunth; Piperaceae; LN: <i>Sinaw-sinaw</i> ; CN: Pepper elder. Not cultivated TS: Fever, headache - apply a pound leaf poultice on the forehead or drink a leaf decoction; Hypertension - drink a root decoction; kidney problem - drink a whole plant decoction. PH: kidney stones/problem [I,D]; UTI, lump on armpit [C]; gout [L]; hypertension [G]; hypertension, uric acid [E]
53	SN: <i>Persea americana</i> Mill.; Lauraceae; LN: <i>Abukado</i> ; CN: Avocado. Cultivated. TS: diarrhea - drink leaf decoction; dysmenorrhea, irregular menstruation - mix pound sun-dried seeds in drinks; hemonausea - consume the fruit or drink a leaf decoction of combined avocado, guava, and calamito. PH: diarrhea, stomachache, vertigo [J]; diarrhea [A]; diarrhea, headache, appetite enhancer [K]; diarrhea, stomachache [H]; diarrhea [L]; diarrhea, stomachache, hypertension, colds, UTI, cleansing [D]; diarrhea [E]; diabetes, stomachache, hypertension, UTI [G]; diabetes [M]. OC: diarrhea, dizziness, anemia, cough, worms, influenza, body cleanser, for better skin, ulcers [O4]; amenorrhea, uterus contraction, constipation, to increase appetite, abortifacient [O2]
54	SN: <i>Piper betle</i> L.; Piperaceae; LN: <i>Buyo</i> ; CN: Betel leaf pepper. Cultivated. TS: Ptyalism, stomachache - apply a leaf poultice on the stomach. PH: fever [B]; cough, body pain, backache, fever, headache [A]; flatulence [I]; flatulence, fever, fracture, dislocation, arthritis, rheumatism, colds [K]; flatulence, asthma, cough, colic, ulcer, deafening [C]; cough, fresh wound [D]; fever, infection, skin disease, cough, rheumatism [E]; fever, cough, jaundice [F]; sprain [G]. OC: Cough, fever, diabetes, high cholesterol, asthma, cold, flu, bronchitis, respiratory disorders, reduce milk production in breastfeeding mothers, gums health [O2]; antibacterial [S19]
55	SN: <i>Piper</i> sp.; Piperaceae; LN: <i>Apurong</i> . Not cultivated. TS: Dandruff - apply pound leaves on the scalp.
56	SN: <i>Plectranthus amboinicus</i> (Lour.) Spreng.; <i>Coleus aromaticus</i> Benth.; Lamiaceae; LN: Kalabo; CN: Oregano. Cultivated. TS: Cough - drink leaf extract. PH: Abdominal pain [A]; cough [H]; cough [I]; cough, asthma [K]; cough, overfatigue, flatulence, diarrhea, fractures, colic, antibiotic, clogged vessels [C]; cough, colds, abdominal pain [E]; cough, colds [F]; cough, colds, headache [G]; cough, colds, asthma [M]. OC: Colic, kidney disease [O4]; Cough and flu, asthma, rheumatism, minor wounds [O2]
57	SN: <i>Plectranthus scutellarioides</i> (L.) R.Br.; <i>Coleus blumei</i> Benth., <i>Coleus scutellarioides</i> Benth., <i>Coleus aromaticus</i> Benth.; Lamiaceae; LN: <i>Maryapa/ Mayana</i> ; CN: coleus. Cultivated. TS: Boil, abscess - apply pound flowers on the affected area; Wound - apply leaf extract directly on the wound. PH: Skin burns [B]; Wounds, bruises, sinusitis [J]; Cuts and wounds [A]; Boils, swollen muscles, fracture and dislocation [K]; Inflammation [I]; Mumps [H]; Wound [D]; Wound, skin disease, cough, diarrhea/LBM, fever, swelling, splitting of blood, folliculitis, ulcer [C]; Bruises [E]; Boils [G]. OC: Leprosy, malaria, headache, cough [O3]
58	SN: <i>Pogostemon heyneanus</i> Benth.; Lamiaceae; LN: <i>Kadlum</i> ; CN: Indian patchouli. Cultivated. TS: Cough - drink leaf extract; Cystitis (UTI), blood in the stool - drink a leaf decoction or leaf extract.
59	SN: <i>Premna odorata</i> Bico.; Lamiaceae; LN: <i>Adgao/ Alagao</i> ; CN Fragrant premna. Cultivated. TS: Rheumatism, arthritis, osteoarthritis - use a leaf decoction for a hot foot bath; cough - drink cool leaf decoction. PH: gas pain [B]; cough, lice, fever, cuts, wounds, diarrhea, ulcer [A]; cough, rheumatism, postpartum care [K]; cough [H]; arthritis [C]; skin allergies [G]; cough, heart problem [E]; wounds [M]
60	SN: <i>Psidium guajava</i> L.; Myrtaceae; LN: <i>Mayabas</i> ; CN: Guava. Cultivated. TS: Diarrhea - drink a leaf decoction; Hemonausea - consume the fruit or drink leaf decoction from a combination of avocado, guava, and calamito; disinfectant - gargle with leaf decoction to disinfect gums with newly extracted tooth; wound - wash the wound with leaf decoction. PH: wound, scabies, post-partum care in women [J]; cuts, wounds, scabies, skin eruption, diarrhea [A]; cuts, wounds, scabies, abdominal pain, circumcision antiseptic [K]; Diarrhea [I]; Diarrhea, wound [H]; Wound, scabies, diarrhea, cough, skin allergy, fever, athlete's foot, asthma, toothache [D]; Wound, diarrhea, UTI [C]; Wound, diarrhea, ulcer [E]; Wound, diarrhea [G]; Diarrhea with vomiting [F]; Diarrhea, stomachache, dizziness, toothache, cleaning of the uterus after pregnancy, phlegm, colds, indigestion, oral sores and wounds [M]. OC: Measles, chicken pox, alcohol intoxication, rhinitis [O3]; diarrhea, cough, colic, stomachache, hernia, headache, influenza, anthelmintic, kidney disease [O4]; diarrhea, dysentery, stomachache [O2]. SS: antibacterial [S19]
61	SN: <i>Pterocarpus indicus</i> Willd.; Fabaceae; LN: <i>Naga</i> ; CN: Smooth Narra. Cultivated. TS: Diabetes - drink a bark decoction. PH: swollen gums [J]; herpes simplex [H]; boils [L]; mouth ulcer [D]; tuberculosis [M]. OC: toothache [O2]; dysentery, haematouria, centipede bite, anemia, wound [O3]
62	SN: <i>Rhoeo spathacea</i> (Sw.) Stearn; Commelinaceae; LN: <i>Hasmin</i> ; CN: Rhoeo. Cultivated. TS: Cough, menstrual problems - drink a flower decoction; headache - apply pound leaves on the forehead; hemonausea - drink a leaf and flower decoction. PH: overfatigue, cough, colds, fever [C]

63	SN: <i>Sandoricum koetjape</i> Merr.; Meliaceae; LN: <i>Santol</i> ; CN: Red santol. Cultivated. TS: Diarrhea - drink a leaf decoction. PH: Diarrhea, hypertension, toothache [K]; Diarrhea, cough, ulcer, stomachache, fever [D]; Cough with phlegm, fever, headache, constipation [M]
64	SN: <i>Senna alata</i> (L.) Roxb.; Caesalpiniaceae; LN: <i>Sunting</i> ; CN: Ringworm bush. Not cultivated. TS: Lice infestation - apply leaf extract directly on the scalp. PH: Skin diseases, fungal infection [B]; White spot [K]; Antifungal, ringworm, skin eruption scabies, ascariasis, arthritis [A]; Antifungal, cyst [I]; Athlete's foot [H]; White fungal infection [C]; Acne, skin allergy [D]; Skin, eyes, ears, nose, throat diseases [L]; Skin diseases, wound [E]; Ringworm and other fungal infections [M]. OC: Tetters, eczema, anthelmintic [O2]; Skin fungus, herpes, eczema, ringworm, insect bites [O3]
65	SN: <i>Sesbania grandiflora</i> (L.) Poir.; Leguminosae; LN: <i>Gaway-gaway</i> ; CN: Vegetable hummingbird. Cultivated. TS: Mouth sore - apply pound leaves on the affected area. PH: Diarrhea, rheumatism [A]
66	SN: <i>Sophora tomentosa</i> L.; Leguminosae; LN: <i>Tambalagisa</i> ; CN: necklacepod. Cultivated. TS: Food poisoning, stomachache - ingest 2-3 pieces of sun-dried seeds.
67	SN: <i>Spondias pinnata</i> (L.f.) Kurz; Anacardiaceae; LN: <i>Libas</i> ; CN: Forest mango. Cultivated. TS: Chicken pox - bathe with a leaf decoction to restrict minimize blisters. PH: famish, fever [C]
68	SN: <i>Syzygium samarangense</i> (Blume) Merr. & L.M. Perry; Myrtaceae; LN: <i>Tambis</i> ; CN: Wax apple. Cultivated. TS: Cough - rub warm leaves with vinegar on the chest and back.
69	SN: <i>Tagetes erecta</i> L.; Asteraceae; LN: <i>Rosas de ahito</i> ; CN: Marigold. Cultivated. TS: Deworming agent - drink a leaf decoction; Boils [D]; Wounds [G]
70	SN: <i>Theobroma cacao</i> L.; Sterculiaceae; LN, CN: Cacao. Cultivated. TS: boils, abscess - apply pound fruit pericarp on affected area. PH: inflammation [I]; cough, colds [D]; measles, boils, swelling, external inflammation, abscess [C]
71	SN: <i>Tinospora rumphii</i> Boerl.; Menispermaceae; LN: <i>Palyawan</i> . Cultivated. TS: blisters - apply vine extract on blisters; diabetes, kidney trouble, stomachache - drink vine decoction. PH: malaria [B]; scabies [A]; eczema [I]; measles [C]; scabies, athlete's foot, diarrhea, dysmennorhea [D]; cancer [F]; diabetes, stomachache; sprain, sore eyes, fever, flatulence, headache [M]
72	SN: <i>Triumfetta bartramia</i> L.; Tiliaceae; LN: <i>Moropoto</i> ; CN: Burweed. Not cultivated. TS: Boils and abscesses - apply pound flowers on the affected area. PH: furuncle [I]; stomachache, headache, muscle pain, UTI, liver disease, and gall bladder stone [G]
73	SN: <i>Vitex negundo</i> L.; Lamiaceae; LN: <i>Lagundi</i> ; CN: Five-leaved chaste tree. Cultivated. TS: Rheumatism, arthritis, osteoarthritis - apply a warm leaf poultice on the affected area or use a leaf decoction for a hot foot bath; Cough, colds - drink a leaf decoction. PH: Malaria, UTI [B]; Cough, over fatigue or muscle pains [J]; Cough, colds [H]; Cough [I]; Cough, asthma, fever, hypertension, body pain [C]; Cough, asthma, fever, stomachache, skin allergy [D]; Cough, fever, lamig [E]; Muscle pain [F]; Cough, colds [G]; Cough, colds, fever [M]. OC: Mild fever, urinary disorders, anthelmintic [O1]
74	SN: <i>Xanthosoma sp.</i> ; Araceae; LN: <i>Kaong</i> . Cultivated. TS: Diarrhea - drink root decoction or apply a warm leaf poultice on the stomach.
75	SN: <i>Zingiber officinale</i> Roscoe; Zingiberaceae; LN: <i>Luy-a</i> ; CN: Ginger. Cultivated. TS: Muscle pain - apply a pound rhizome poultice on the affected area; Sore throat - drink rhizome extract or decoction. PH: Cough, sore throat [J]; Arthritis [A]; Stomach bloating [I]; Stomachache [H]; Cough, toothache, gingivitis, abdominal pain, headache, skin rashes [K]; Emollient [L]; Cough, sore throat [D]; Cough, sore throat, stomachache, gas pains, colic, hoarseness [C]; Rheumatism, body pain, abdominal pain [E]; Cough, colds [G]; Muscle pain [F]; Cough, stomachache [M]. OC: Colon health for animals [O5]; body cleanser, cough, flu [O4]; stomachache, carminative, diuretic, emmenagogue, flatulence, high cholesterol level, blood spitting, dyspepsia, pulmonary infection, cough, influenza, postpartum bleeding, labor pain, abdominal pain, sore throat, influenza, colds, nasal congestion, sore throat, diarrhea, vomiting, nausea [O2]
76	Family: Poaceae; LN: Gandi. Not cultivated. TS : Paralysis - mix leaves in cool drinking water.
77	Family: Zingiberaceae; LN: Kadna-kadna. Not cultivated. TS : Hemonausea - drink a leaf decoction

SN: Scientific name; LN: Local name (Waray); CN: Common name. TS: This study. PH: ethnobotanical studies in the Philippines. OC: Ethnobotanical studies in other countries. SS: Scientific studies. PH: [A] Abe and Ohtani, 2013; [B] Angagan et al., 2013; [C] Arquon et al., 2015; [D] Balangcod and Balangcod, 2015; [E] Balinado and Chan, 2017; [F] Fajardo et al., 2017; [G] Fiscal, 2017; [H] Gruyal et al., 2014; [I] Morilla et al., 2014; [J] Olowa et al., 2012; [K] Ong and Kim, 2014; [L] Pinarok et al., 2015; and [M] Tangtengco et al., 2018. OC: Ethnobotanical studies in other countries: [O1] Ahmad et al., 2014; [O2] Suroowan et al., 2019; [O3] Warurui et al., 2011; [O4] Gumisiriza et al., 2019; [O5] Lans et al., 2007; [O6] Yaseen et al., 2015. SS: [S1] Alonso-Amelot 2016; [S2] Chah et al., 2006; [S3] Coria-Téllez et al., 2018; [S4] Ghate et al., 2014; [S5] Gilani et al., 2005; [S6] Kadir et al., 2013; [S7] Luyen et al., 2015; [S8] Mabberley 2004; [S9] Meira et al., 2014; [S10] Montealegre et al., 2017; [S11] Panneerselvam et al., 2013 ; [S12] Radhika et al., 2010; [S13] Rahman et al., 2015 ; [S14] Raju et al., 2011; [S15] Sah et al., 2011; [S16] Seo et al., 2011; [S17] Singh and Kumar, 2013; [S18] Shouk et al., 2014; [S19] Valle et al., 2015.

Other ethnobotanical studies conducted in the Philippines and in other countries, including scientific investigations, are also presented in Table 1. As a biodiversity hotspot and an archipelago with diverse cultures, the Philippines is expected to have a wealth of ethnobotanical knowledge and a variety of traditional healing practices to share to the world. Notably, only a few ethnobotanical surveys conducted in the Philippines have been published (Table 1). Many medicinal plant species identified in this study have not been investigated scientifically yet and most reported scientific investigations conducted were done by researchers from overseas. Much work is still needed to bring attention to lesser-known plants with great potential for biomedical applications.

Allium sativum and *Andropogon citratus* are widely used in regulating hypertension, both locally and in other countries, which is corroborated by a study on its antihypertensive effect (Shouk et al., 2014). Some studies also agree with the use of *Peperomia pellucida* in controlling hypertension (Fiscal, 2017; Balinado and Chan, 2017). In addition, *Peperomia pellucida* is reportedly effective in treating urinary tract infection (UTI) and in controlling gout and uric acid levels (Table 1). Ethnobotanical investigations from the Philippines cited the use of *Cocos nucifera* and *Lagerstroemia speciosa* in treating bladder- and kidney-related problems (e.g., UTI, increased uric acid levels, and kidney stones (Table 1). *Cynodon dactylon* is also used to dissolve kidney and urethral stones (Morilla et al., 2014; Yaseen et al., 2015).

Momordica charantia, *Annona muricata*, and *Moringa oleifera* are used to counter diabetes. Several studies also pointed to the use of *Momordica charantia* and *Moringa oleifera* for the treatment of anemia (Table 1).

The efficacy of *Moringa oleifera* as an herbal galactagogue was reported in several ethnobotanical surveys in the Philippines and was subjected to a number of scientific studies (Gopalakrishnan et al., 2016; King et al., 2013;

Raguindin et al., 2014). *Moringa oleifera* is now widely recognized for its efficacy in increasing breastmilk production in lactating mothers, as practiced in different parts of the Philippines and in some other countries.

Jatropha curcas, *Justicia gendarussa*, and *Curcuma domestica* were reportedly effective in alleviating bone-related (e.g., fractures/dislocations, sprain, arthritis, and rheumatism) and abdominal problems (e.g., flatulence, stomach-ache, ulcer, and colic) (Table 1).

The efficacy of *Carica papaya*, *Chrysanthemum indicum*, and *Chrysophyllum cainito* for stomach-related illnesses such as constipation, diarrhea, abdominal pain, bloating, and ulcer were likewise reported (Table 1). *Ananas comosus* could be investigated further for its anthelmintic properties. Other stomach-related problems (e.g., flatulence) were commonly treated with *Jatropha curcas* and *Piper betle* (Table 1).

Although many plants used for the treatment of diarrhea were recorded, several ethnobotanical studies pointed to *Persea americana* and *Psidium guajava* for this purpose (Table 1). In addition, *Psidium guajava* is commonly used for cuts and wounds. Skin diseases, such as fungal infection, ringworm, acne, and athlete's foot, are commonly treated with *Senna alata*.

Several studies cited *Musa x paradisiaca* and *Ageratum conyzoides* for cuts and wounds, as corroborated by a related scientific study by Chah et al. (2006). *Hibiscus rosa-sinensis* and *Plectranthus scutellarioides* are commonly used for skin-related problems such as wound, boils, and abscesses. *Plectranthus scutellarioides* was even reported to be used for the treatment of leprosy by an ethnobotanical investigation in Bougainville (Waruruai et al., 2011), a knowledge that may not be well-known among leprosy patients in the Philippines.

Cough, colds, and sore throat are commonly treated by *Citrus x microcarpa*, *Plectranthus amboinicus*, *Premna odorata*, and *Vitex ne-*

gundo (Table 1). Several ethnobotanical studies identified *Zingiber officinale* as a treatment for cough, sore throat, and muscle pain (Table 1).

Ethnobotanical studies conducted in the Philippines reported the use of *Ageratum conyzoides*, *Annona muricata*, *Curcuma domestica*, and *Tinospora rumphii* as anti-cancer agents (Table 1).

Another significant medicinal plant listed in this study is *Euphorbia hirta*, which is used in treating dengue and was in fact listed by Kadir et al. (2013) as a potential anti-dengue medicinal plant. It is also well-known to be effective in alleviating fever and in curing swollen lymph nodes.

Anti-malaria properties of several other plants, such as *Blumea balsamifera*, *Carica papaya*, *Moringa oleifera*, *Plectranthus scutellarioides*, *Tinospora rumphii*, and *Vitex negundo*, were also reported (Table 1).

For their varied uses as reported in this study and in several ethnobotanical studies conducted across the Philippines, the following plant species should be further investigated: *Acorus calamus*, *Annona muricata*, *Areca catechu*, *Artemisia vulgaris*, *Bambusa vulgaris*, *Bixa orellana*, and *Blumea balsamifera*. Two plant species, locally known as *gandi* and *kadna-kadna*, which are used for paralysis and hemonausea, respectively, could be listed as priority species for cultivation and conservation due to their absence in the study area.

The importance of ethnobotanical documentation and conservation initiatives

The valuable resource in the form of traditional healing knowledge is on the brink of being permanently forgotten, as generational knowledge transfer has significantly stalled. In fact, most respondents were older residents, with ages ranging from 39 to 77 in Brgy. San Roque (M=58) and from 40 to 75 in Brgy. Malobago (M=57). Interest in learning the craft have greatly diminished among the younger generations, as villagers aged 10 to 38 failed to provide information

about traditional healing. Younger generations are possibly given less chance to acquire this knowledge, as parents increasingly adopt modern treatment methods. Affordability and convenience brought about by readily-available medicines could have led villagers to prefer modern treatment methods over the traditional way. Accessibility due to road pavement and better transportation systems (e.g., from the town proper to the villages) are other factors that could explain this preference. Considering the average life expectancy of Filipino farmers (57 yrs. old), it is estimated that this precious knowledge could be completely forgotten over the next few years. Aggravating the situation is the massive land use conversion prevalent not just in the study area, but in the whole country. Human settlements are rapidly advancing to remote areas, where once vast farmlands are now converted into residential areas and forested areas are converted into either agricultural or residential areas. Land use conversion and its accompanying human activities are undoubtedly causing modifications of natural ecosystems, disturbance and destruction of plant habitats, reduction in plant population, and species loss.

The combined effects of diminishing interest in learning and practicing traditional healing and the widespread and rapid land use conversion support the urgent need for a nationwide ethnobotanical documentation. Identification of suitable conservation initiatives and priority species for conservation, as well as further scientific and biomedical study on identified medicinal plants, could potentially lead to the retention of traditional knowledge and preservation of ecosystems, plant habitats, and communities.

Non-medicinal uses, supply, cultivation, and extraction of medicinal plants

Non-medicinal uses of the identified medicinal plants and their observed supply and extraction practices (cultivated and non-cultivated) as perceived by the respondents are presented in Figure 1(a-c). Figure 1a shows that most villagers cultivate plants primarily for food consump-

tion (32%) and medicinal purposes (31.0%). Out of the 60 (76.9%) medicinal plant species being cultivated, 36 (46.2%) are used as food and food ingredients (25 species), housing and furniture materials (three species), ornamental plants (six species), cotton for pillows (*Gossypium hirsutum* L.), and for weaning and abortion (*Tinospora rumphii* Boerl.). Twenty-four (24) medicinal plant species are cultivated but are not used for any other purpose, which emphasizes the value that villagers put on these plants for traditional healing practices. This could explain why in both study areas, more cultivated plants (25 species or 32.5%) have maintained their population or are even increasing (Figure 1b). Furthermore, seasonality of some plant species (24.0%) may have inhibited overharvesting (Figure 1c). Although most plant species are being cultivated, a decreasing supply of 28 cultivated species were observed (36.4%) and six either maintained their supply status or are decreasing (7.8%), suggesting a decline in cultivation practices (Figure 1b). Lack of time and interest in medicinal plant cultivation was the primary reason given by the respondents for this diminishing supply.

Furthermore, Figure 1a shows that eighteen (18) medicinal plants are not cultivated (23.1%) and fourteen (14) of these are not used for any other purpose (18.2%). Out of the uncultivated plant species, one is locally extinct (*Michelia champaca*) and three have a declining supply (*Euphorbia hirta* L., *Piper* sp., and *Senna alata* L.) in both study areas (Figure 1b). Moreover, the supply of the non-cultivated seasonal plant *Dioscorea hispida* is declining in one study area (Malobago). Although *Dioscorea hispida* serves as an alternative food source to rice during seasons of food shortage, this root crop is not well appreciated in this area due to its potential toxicity when not properly prepared. Reduction in supply could be attributed to non-cultivation and over-harvesting from the wild due to lack of formal ownership of wild medicinal plants.

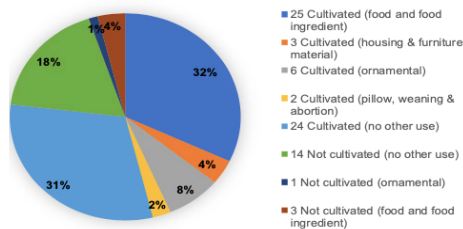


Figure 1a

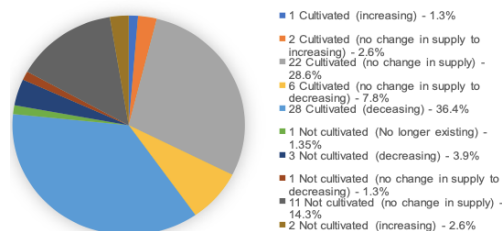


Figure 1b

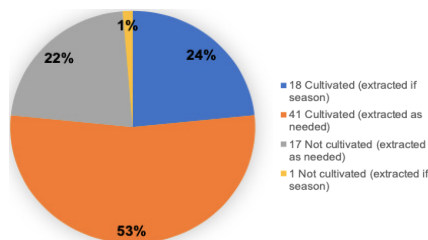


Figure 1c

Figure 1. (a) Non-medicinal uses, (b) observed supply, and (c) extraction practices of cultivated and non-cultivated medicinal plants identified in the study areas in Jaro, Leyte.

Respondents' attitude towards conservation of medicinal plants

Most respondents displayed positive attitude towards conservation of medicinal plants, with 70 to 100 percent agreeing to various conservation statements indicated in Table 2, including the following: habitat and species protection; the use of sustainable methods of harvesting/extraction; establishment of home gardens, botanical gardens, and germplasm banks for me-

dicinal plants; utilization of cultivated medicinal plants over the wild ones; integration of environmental sustainability, including biodiversity conservation, in the curriculum of primary to tertiary

level students; implementation of policies related to biodiversity conservation; and involvement of local communities in drafting biodiversity conservation plans.

Table 2. Respondents' rating on statements related to plant conservation.

Item	Rating ^a					Agree (%) ^b
	1	2	3	4	5	
1. Natural landscape and habitat protection.	0	0	0	8	12	100
2. Protection of medicinal plants in their natural habitat.	0	0	0	16	4	100
3. Control extraction so that it will not exceed the natural plant regeneration rate.	0	0	6	9	5	70
4. Use of sustainable harvesting methods	0	0	0	10	10	100
5. Establishment of home gardens for medicinal plants.	0	0	2	14	4	90
6. Use of home-grown medicinal plants so that it will not go extinct in the wild.	0	0	0	2	18	100
7. Cultivation of medicinal plants in botanical gardens.	0	0	0	10	10	100
8. Establishment of germplasm bank.	0	0	0	13	7	100
9. Conduct public information campaigns on plant conservation	0	0	0	9	11	100
10. Integration of environmental sustainability and conservation courses in student's curriculum.	0	0	0	17	3	100
11. Strong implementation of local and national policies protecting these plants and their habitats.	0	0	0	12	8	100
12. Work with local communities to develop appropriate management strategies.	0	0	0	9	11	100
13. Support research programs on plant conservation	0	0	0	7	13	100

^a 5 = strongly agree; 4 = moderately agree; 3 = neutral; 2 = moderately disagree; 1 = strongly disagree

^b Percentage of those who agreed were taken from those who answered 5 and 4.

Table 3 presents the respondents' rating on statements related to identified human activities affecting medicinal plant population. Most respondents agreed that uncontrolled extraction or over-harvesting of medicinal plants may lead to their extinction (85%) and that deforestation is a major threat to medicinal plant populations (70%). However, opinions were split on whether increasing human settlements in and near the

natural habitat of plants poses harm to medicinal plants, with 45 percent agreeing and 55 percent stating that they are uncertain. Medicinal plant species are also not viewed as a potential source of good income by most respondents. It is notable that a greater number of respondents (85%) agreed that protection of these medicinal plants should be the government's responsibility.

Items	Rating ^a					Percentage (%)		
	1	2	3	4	5	disagree ^b	uncertain ^b	agree ^b
1. Unsustainable method of plant extraction may lead to its extinction	0	0	3	15	2	0	15	85
2. Deforestation is a major threat to medicinal plant population	0	0	6	12	2	0	30	70
3. Increasing human settlements in and near the plants' natural habitat threatens medicinal plant populations	0	0	11	7	2	0	55	45

4. Protecting these medicinal plants is the government's responsibility.	0	1	2	9	8	5	10	85
5. Medicinal plants are a good source of income.	3	7	6	3	1	50	30	20

^a 5 = strongly agree; 4 = moderately agree; 3 = uncertain; 2 = moderately disagree; 1 = strongly disagree.
^b Percentage of those who: disagreed were taken from those who answered 1 and 2; uncertain from those who answered 3; agreed from those who answered 4 and 5.

Another set of statements related to the respondents' concern for medicinal plants and preference for cultivated and wild ones were rated (Table 4). Seventy-five percent (75%) of respondents expressed willingness to join groups aiming for their conservation while the rest cared

less (25%). Most respondents do not think that cultivated medicinal plants are of inferior quality and efficacy compared to the wild ones (90%). Only 10% preferred taking from the wild, most of whom are traditional faith healers.

Table 4. Villagers' concern and preference for wild and cultivated medicinal plants.

Items	Frequency	Percent-age
I do care for these plants and I am willing to join plant conservation efforts	15	75
I do care, but I am not willing to do the work	4	20
I do not care for these plants	1	5
I prefer wild medicinal plants	2	10
I prefer cultivated medicinal plants	7	35
I can use both	11	35

Data presented in Tables 2, 3, and 4 show that respondents do care for these plants and are willing to participate in various conservation efforts. The plants' proven efficacy and the associated cost savings could be among the contributory factors to a positive attitude towards medicinal plant conservation. Currently, however, conservation initiatives could not be expected to emanate from the communities, as they rely on the government to initiate such activities. To increase appreciation of the value of medicinal plants, future conservation efforts may focus first on changing the lack of accountability or sense of ownership by the local community in managing and protecting these natural resources, which may take the form of information campaigns on their importance and potential benefits to the local economy. Such lack of appreciation may be attributed to the generally low price for unprocessed medicinal plant material. Succeeding studies could focus on enhancing the value of this natural resource by producing

more economically-valuable forms of these medicinal plants, as in the case of *Moringa oleifera* and *Vitex negundo*, which are now being sold in pharmacies across the Philippines as a galactagogue and as a remedy for cough, respectively.

CONCLUSION AND RECOMMENDATIONS

This ethnobotanical study documented seventy-seven (77) plant species used in the traditional healing practice in the study areas in Leyte, Philippines. This study both documented unique uses of medicinal plants and supplemented other ethnobotanical studies in the Philippines. *Allium sativum* and *Andropogon citratus* are commonly used for the regulation of hypertension. *Peperomia pellucida* is commonly used for controlling hypertension, kidney- and bladder-related problems, including UTI, gout, and

heightened uric acid levels. *Cocos nucifera* and *Lagerstroemia speciosa* are used for the treatment of similar problems, which include urination difficulty, UTI, increased uric acid levels, and kidney stones. *Cynodon dactylon* is also used to dissolve kidney and urethral stones. *Momordica charantia*, *Annona muricata*, and *Moringa oleifera* are used to counter diabetes. Anemia is also treated with *Momordica charantia* and *Moringa oleifera*. In addition, *Moringa oleifera* is a well-known plant used as a galactagogue. *Jatropha curcas*, *Justicia gendarussa*, and *Curcuma domestica* are used to reduce pain from bone-related and abdominal problems. *Carica papaya*, *Chrysanthemum indicum*, and *Chrysophyllum cainito* are used for stomach-related illnesses, such as constipation, diarrhea, abdominal pain, bloating, and ulcer. *Ananas comosus* is commonly used as anthelmintic, while *Jatropha curcas* and *Piper betle* are used for flatulence. *Persea Americana* and *Psidium guajava*, meanwhile, are used for diarrhea. Cough, colds, and sore throat are commonly treated with *Citrus x microcarpa*, *Plectranthus amboinicus*, *Premna odorata*, *Vitex negundo*, and *Zingiber officinale*. *Euphorbia hirta* is increasingly known for its efficacy against dengue fever, while *Carica papaya* is not widely known for its reported anti-dengue and anti-malarial properties. *Hibiscus rosa-sinensis* and *Plectranthus scutellarioides* are commonly used for skin-related problems (e.g., wounds, boils, and abscesses). *Musa x paradisiaca*, *Ageratum conyzoides*, and *Psidium guajava* are utilized for the treatment of cuts and wounds. Meanwhile, fungal infections, ringworm, acne, and athlete's foot are treated with *Senna alata*.

Two plant species, locally known as *gandi* and *kadna-kadna*, are locally extinct and could be considered as priority species for conservation. Respondents acknowledged that deforestation and unsustainable methods of plant extraction are among the major threats to plant survival. Generally, they have a positive attitude towards conservation of medicinal plants. However, there is a lack of ownership and accountability

for these resources. Hence, it is crucial that environmental planners align the attitude of communities in close proximity to medicinal plants and their perception on plant conservation efforts to ensure success in their future endeavors.

Knowledge transfer to younger generations and the actual practice of traditional healing using medicinal plants have stalled primarily due to the adoption of modern treatment methods. Considering the advanced age of the remaining traditional healing practitioners, this important resource in the form of traditional knowledge, acquired through several centuries, could be completely forgotten in the very near future. Hence, a timely and widespread ethnobotanical survey across the country is warranted. Finally, many plant species identified in this study could potentially be subjected to scientific investigations to confirm their medicinal efficacy.

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