



Ethnobotanical exploration and biodiversity conservation of Mt. Nacolod, Southern Leyte, Philippines

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Abstract

This study was conducted in Mt. Nacolod, Southern Leyte, Philippines, to document traditional healing potential and practices of medicinal plants. The knowledge of traditional healing practices in Southern Leyte is at risk of being lost due to lack of knowledge transfer and an aging population of traditional healers. Focus group discussions were used to document 55 plant species used in traditional healing. These plants have been used to treat various ailments such as hypertension, kidney and bladder problems, diabetes and anemia, bone-related and abdominal problems, stomach illnesses, and dengue fever. Among the 55 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 *Dipterocarpus grandiflorus* 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*, *Chrysophyllum caimito* and *Polyscias nodosa* for stomach illnesses; *Ananas comosus* as an anthelmintic; *Persea americana* and *Psidium guajava* for diarrhea. It is crucial to recognize the importance of traditional ecological knowledge and to promote sustainable conservation practices. The results of the study can help attain several Sustainable Development Goals, including good health and well-being by promoting traditional healing practices that can improve health outcomes, climate action by promoting biodiversity conservation, and life on land by promoting the conservation of medicinal plants and traditional ecological knowledge. Moreover, the study highlights the need for knowledge transfer to the younger generation and the importance of promoting sustainable practices for the well-being of local communities.

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Introduction

During ancient times, indigenous tribes in the Philippines successfully combated illnesses and diseases by relying on traditional healing practices that predate the advent of modern medicine. This invaluable knowledge has been passed down through generations and remains in use today for treating various ailments (Abe and Ohtani, 2013; Balinado and Chan, 2016). Despite the Philippines being recognized as a biodiversity hotspot with a wealth of traditional medicinal plants, there is a lack of comprehensive documentation regarding the specific plant species employed in traditional healing (Myers *et al.*, 2000; Olowa *et al.*, 2012; Tantengco *et al.*, 2018; Pinarok *et al.*, 2015).

The timely documentation and prioritization of traditional healing knowledge, specifically concerning the endemic plant species found in the Philippines, hold immense significance. Given that these plants are unique to the country and specific regions within it, it becomes crucial to record and conserve this valuable resource. This urgency arises from the rapid conversion of rural areas for alternative land use purposes, leading to habitat destruction, dwindling plant populations, and even the risk of species extinction. Additionally, the introduction of modern medicine in remote regions has contributed to the decline of traditional healing practices among younger generations (Gruyal *et al.*, 2014). Conducting ethnobotanical studies would greatly assist biomedical researchers in identifying targets for scientific investigation, which could ultimately result in the development of new plant-based medicines (Balangcod and Balangcod, 2015; Fiscal, 2017). An expedient ethnobotanical documentation process, along with the identification of suitable conservation initiatives and priority species, could help prevent further degradation of habitats, loss of species, and foster a more positive attitude towards plant conservation within local communities (Angagan *et al.*, 2013).

The objective of this research is to document the utilization of medicinal plants in traditional healing within the remote communities of Mt. Nacolod,

located in the rural municipality of Southern, Leyte, Philippines. It is noteworthy that these regions experienced severe devastation caused by typhoon Haiyan in November 2013, leading to the destruction of numerous plants and their natural ecosystems. This study holds the potential to shed light on lesser-known plant species that exhibit promising biomedical applications, deserving further scientific exploration. Moreover, the study also investigates the crucial factors that should be considered when planning conservation initiatives by gaining insights into the local communities' perceptions and attitudes towards the preservation of medicinal plants.

Materials and methods

Study Area

The study sites chosen for research were the remote barangays of Barangay, Katipunan, Catmon and Bobon in Mt. Nacolod, Silago Leyte, Philippines. These barangays were selected due to the presence of elderly residents who possess valuable knowledge about the traditional use of medicinal plants. Geographically, these villages are situated far from the main municipal town and lack paved roads. Additionally, the majority of the residents in these barangays are economically disadvantaged, which further promotes the practice of traditional healing. These three (3) barangays are a direct part of Mt. Nacolod and span a total land area of 14,000 hectares and is home to 197 households and 1,900 residents. Mt. Nacolod is a very high priority key biodiversity area (KBA). It is a prime location for the region's flora and fauna, being home to more than half of Leyte's known plant species. It harbors 134 birds, 111 herpetofauna species, and almost all known mammal species recorded in this area. A recent survey of this KBA also brought new discoveries of volant mammals, cinnamon, and two new frog species of the *Platymantis* family. However, the conservation of Mt. Nacolod is still challenged by illegal collection and poaching of wildlife, conversion to agricultural use, and conflicting land tenurialship, among others.

Data collection and analysis

Every household in the three (3) barangays was visited, and regardless of age and gender, residents

with knowledge of medicinal plants and traditional healing were personally invited to participate in a focus group discussion (FGD). The objectives of the FGD were explained during the initial house visits. To guide the discussion, an open-ended questionnaire was used, with 20 respondents actively providing information and considered as participants for the first FGD session. Other attendees who lacked knowledge were not actively engaged. Throughout the study, respondents freely shared their knowledge on medicinal plants and were not coerced in any manner. Interviews were conducted in the local dialect (kana) to facilitate comprehensive data collection. Local guides with expertise in plant identification assisted in collecting photographs and specimens of the plants mentioned during the FGD from the study areas.

To assess the villagers' perception towards the conservation of medicinal plants, a separate round of focus group discussions (FGDs) was conducted using a distinct open-ended questionnaire. However, only ten out of the original 20 respondents from the first village agreed to participate in this subsequent FGD session. To ensure consistency, ten respondents were also selected from the second village.

During the second FGD session, plant specimens that had been collected earlier were presented to the respondents to verify their identification. The collected plant specimens were then taken to the Biology Laboratory of Leyte Normal University and were furtherly identified and confirmed by a botanist from Visayas State University. Scientific names of the plants with detailed classifications from family down to the species level were provided. After identification, the plant specimens were pressed for inclusion in the herbarium collection and stored at Biology Laboratory of Leyte Normal University, Leyte, Philippines. To complement the botanical data, the assistance of a local general physician was sought to identify the English names of the illnesses and diseases mentioned during the FGD. This collaboration helped bridge the gap between traditional knowledge and medical terminology.

The perception of the villagers regarding the conservation of medicinal plants was assessed by considering factors such as the supply of medicinal plants, the frequency of extraction, and cultivation practices. These aspects were explored during the FGD sessions to gain a comprehensive understanding of the villagers' attitudes and practices towards the preservation of medicinal plants.

Results and discussion

Plants in Mt. Nacolod used in traditional healing practice

Table 1 presents a comprehensive compilation of 55 medicinal plant species found in Mt. Nacolod that are utilized in traditional healing within the three (3) barangays. The prevalent plant components utilized in these practices encompass leaves, flowers, stems/barks, and roots. Among the various methods employed, the application of leaf and root poultice, as well as the consumption of fresh extract or decoction derived from leaves and roots, were most frequently reported. Respondents attested to the effectiveness of these plants in treating the specified ailments and diseases. They further expressed a reliance on medicinal plants for the treatment of common ailments, thus minimizing their visits to medical professionals.

As indicated in Table 1, many medicinal plant species identified in this study remain largely unexplored from a scientific perspective, with the majority of reported scientific investigations being carried out by researchers from overseas. There is still much work to be done in drawing attention to the lesser-known plants that hold tremendous potential for biomedical applications.

Based on their diverse reported uses in this study and various ethnobotanical studies conducted throughout the Philippines, the following plant species merit further investigation: *Acorus calamus*, *Annona muricata*, *Areca catechu*, *Artemisia vulgaris*, *Bambusa vulgaris*, *Bixa orellana*, and *Blumea balsamifera*. Notably, two plant species, known locally as gandi and kadna-kadna, have specific applications for paralysis and hemonausea, respectively. Due to their absence in the study area, these two species

should be prioritized for cultivation and conservation efforts, recognizing their potential value and the need to safeguard them. By focusing on these priority species, we can expand our understanding of their medicinal properties and contribute to their preservation for future generations.

Table 1. Ethnobotanical documentation in Mt. Nacolod, Southern Leyte.

1	SN: <i>Acorus calamus</i> L.; <i>Acoraceae</i> ; LN: <i>Lubigan</i> ; CN: Sweet flag. Cultivated. MU: Fever - drink a leaf decoction for colds, snakebite, flatulence, stomachache, urinary tract infection, digestive disorders, and dysentery.
2	SN: <i>Ageratum conyzoides</i> L.; <i>Asteraceae</i> ; LN: <i>Kurokanding</i> ; CN: Billy goat weed. Not cultivated. MU: apply leaf extract on the wound. Also use in treating diarrhea, headache, painful earache (otalgia), kidney disease, miscarriage, cervical cancer, ring worms, oral thrush, xiphoidalgia, diarrhea, colic pain, tonsillitis, cutaneous eruptions, diarrhea [and internal bleeding.
3	SN: <i>Allium sativum</i> L.; <i>Alliaceae</i> ; LN: <i>Lasuna</i> ; CN: Garlic. Not cultivated. MU: Hypertension, anti-oxidant, dog bite, ascariasis, body chills, toothache, abdominal pain, snake bites, toothache, intestinal worms in pigs, Urinary retention, conjunctivitis, allergy itching larynx, flatulence, sciatica, cardiovascular disorders, convulsions, diabetes, cataract, renal failure, ulcer, arthritis, rheumatism, cuts, toxic fish stings, insect bites, asthma, bronchitis, pneumonia and respiratory disorders, colds, earache, gastrointestinal disorders, and anthelmintic.
4	SN: <i>Ananas comosus</i> (L.) Merr.; <i>Bromeliaceae</i> ; LN: <i>Pinya</i> ; CN: Pineapple. Cultivated. MU, for fever - apply pound leaves as poultice on the forehead; Anthelmintic - consume unripe fruit, Constipation, fever, anthelmintic, diabetes, ringworm, hypertension, anthelmintic, yellow fever, ulcers, allergy, scoliosis, Anthelmintic, purgative, cystitis, diuretic, abortifacient, bladder problems, whooping cough in children.
5	SN: <i>Andropogon citratus</i> hort. <i>Poaceae</i> ; LN: <i>Tanglad</i> ; CN: Lemongrass. Cultivated. MU: Hypertension - use leaves as food ingredient, hypertension, toothache, hypertension, arthritis, anemia, swelling, joint pains, hypertension, cough, fresh wound, diarrhea, colds stomachache, UTI, abdominal pain, diarrhea, nervousness, difficulty in urinating, flu, nasal congestion, flatulence, for newborn child; diabetes, headache, low blood pressure, colds, post pregnancy.
6	SN: <i>Annona muricata</i> L.; <i>Annonaceae</i> ; LN: <i>Guanaba</i> ; CN: Soursop. Cultivated. MU: Diarrhea - drink a leaf decoction for diarrhea, cancer, diabetes, ascariasis, hypertension, hyperacidity, urination difficulty, cough, headache, hepatitis, flatulence, stomachache, cancer, diabetes, diarrhea, cough, arthritis, abdominal discomfort, stomachache, goiter, cyst, UTI, uric acid, cough, abdominal pain, wound infection, dizziness, fever, fish poisoning, epilepsy, febrifuge, headache, diarrhea, dysentery, wounds, mouth sores, respiratory illness, gastrointestinal and hypoglycemic problems.
7	SN: <i>Aralia balfouriana</i> hort.; <i>Araliaceae</i> ; LN: <i>Kapwa</i> ; CN: Balfours aralia. Cultivated. MU: Paralysis - apply heated and pound leaves on affected area.
8	SN: <i>Areca catechu</i> L.; <i>Arecaceae</i> ; LN: <i>Bunga</i> ; CN: Betel nut plant. Cultivated. MU: Muscle pain- drink a root decoction, ascariasis, abdominal pain, toothache, to strengthen teeth, skin diseases, eczema, wound, postpartum care, indigestion, flatulence, cough, astringent, anthelmintic, anti-hyperglycemic.
9	SN: <i>Artemisia vulgaris</i> L.; <i>Asteraceae</i> ; LN: <i>Herba maria</i> ; CN: Mugwort. Cultivated. MU: Fever, hemonausea - drink a root decoction; Anthelmintic - Drink a leaf decoction; Stomachache - drink a leaf decoction or use leaves as poultice on stomach, stomachache, Cough, fever, headache, abdominal and body pains, hyperacidity, colds, asthma, abdominal discomfort, flatulence, sprain, skin disease, hemorrhage, dyspepsia, dysmenorrhea, rubefacient, swollen muscles, skin disease Blood vomiting, lung disease, ringworm, sore throat, colds, phlegm, deworming agent, and leucorrhea.

- 10 SN: *Bambusa vulgaris* Schrad. ex J.C. Wendl.; Poaceae; LN: Kawayan; CN: Bamboo. Cultivated. MU: Hypertension - drink a leaf decoction, for allergy nervous breakdown, fish poisoning, hypertension, post-partum care, cough, colds
- 11 SN: *Bixa orellana* L.; Bixaceae; LN: Siyotes/ Achuete/ Annato; CN: Lipstick plant. Cultivated. MU: 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, burns, cough, sprain, headache, fever, arthritis, dysentery, and insomnia.
- 12 SN: *Blumea balsamifera* DC.; Asteraceae; LN: Gabon; CN: Blumea camphor. Cultivated. MU: Rheumatism, arthritis, osteoarthritis - use leaf decoction for a hot foot bath; Cough - drink leaf extract; stomachache - apply a leaf poultice on the stomach, cough, UTI, colds, fever, boils, headache, hypertension, urination difficulty, abdominal pain, body pains, sore throat, post-partum care, fever, kidney infection, rheumatism, famish, malaria, hypertension, arthritis, stomachache, body pain, diabetes, spasm, flatulence, overfatigue, diabetes, stomachache, asthma [renal stones, edema, muscle pain, rheumatism, kidney stones.
- 13 SN: *Carica papaya* L. (male); Caricaceae; LN: Kapaya; CN: Papaya. Cultivated. MU: 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.
- 14 SN: *Chrysanthemum indicum* L.; Asteraceae; LN: Herba mansanilla; CN: Chrysanthemum. Cultivated. MU: Stomachache - drink a leaf decoction or apply a warm leaf poultice on the stomach
- 15 SN: *Chrysophyllum cainito* L.; Sapotaceae; LN: Kayomito; CN: Star apple. Cultivated. MU: Diarrhea, tuberculosis - drink leaf decoction; Hemonausea - consume the fruit or drink a decoction of avocado, guava, and cainito leaves.
- 16 SN: *Citrus maxima* (Burm.) Merr.; Rutaceae; LN: Aslom/suha; CN: Pomelo. Cultivated. MU: Rheumatism, arthritis, osteoarthritis - use a leaf decoction for a hot foot bath
- 17 SN: *Citrus medica* L.; Rutaceae; LN: Sidra; CN: Citron. Cultivated. MU: Headache - crush all plant parts and apply directly on the forehead as poultice. Diphtheria, fever, rheumatism, cough, respiratory congestion, fever, colds, liver, gastrointestinal discomfort, nausea, ulcer, and antimicrobial.
- 18 SN: *Citrus x microcarpa* Bunge; Rutaceae; LN: Lemonsito/Kalamansi; CN: Citrus. Cultivated. MU: Colds, cough - drink warm fruit juice, cough, colds, hypertension, dandruff, infant care, sore throat, high fever, scurvy.
- 19 SN: *Clerodendrum minahassae* Teijsm. & Binn.; Lamiaceae; LN: Danata; CN: Tube flower. Cultivated. MU: Diarrhea - apply a warm leaf poultice on the stomach; Fever - apply a warm leaf poultice on the forehead, headache, swollen muscle.
- 21 SN: *Corypha elata* Roxb.; Arecaceae; LN: Buri; CN: Buri palm. Not cultivated. MU: Diarrhea - drink a root and leaf decoction; Wound - apply a leaf stalk extract on the wound.
- 22 SN: *Curcuma domestica* Valetton; Zingiberaceae; LN: Dulaw; CN: Turmeric. Cultivated. MU: Constipation, cytitis (UTI) - apply a warm leaf poultice on the stomach; Fever - apply a pound leaf poultice on the forehead; Arthritis, diarrhea, abdominal pain, flatulence, hypertension.
- 23 SN: *Cynodon dactylon* L. Pers.; Poaceae; LN: Bermuda; CN: Bermuda grass. Cultivated. MU: Hypertension - drink a leaf decoction, also use for kidney stones and hair fall.
- 24 SN: *Cyperus kyllingia* Endl.; Cyperaceae; LN: Baro-batones. Not cultivated. MU: fever - drink a leaf decoction. Use as analgesic, antidiabetic, antioxidant, antimicrobial, and hepatoprotective.
- 25 SN: *Cyperus rotundus* L.; Cyperaceae; LN: Sud-sod; CN: Cocogross. Not cultivated. MU: Hangover, stomachache, and Dyspepsia - drink a rhizome decoction.
- 26 SN: *Dioscorea hispida* Dennst.; Dioscoreaceae; LN: Kurot; CN: Asiatic bitter yam. Not cultivated. MU: Wound, dog bites and rabies - apply pound tuber directly on the wound and affected areas.

- 27 SN: *Ehretia acuminata* R.Br.; Boraginaceae; LN: Anonang; CN: Koda. Cultivated. MU: Fever - apply pound leaves as poultice on the forehead or drink a leaf decoction.
- 28 SN: *Eleusine indica* (L.) Gaertn.; Poaceae; LN: Talab-angan; CN: Goose grass. Not cultivated. MU: metrorrhagia- drink a leaf decoction to stop bleeding after child birth; muscle pain - drink a root decoction. Use for newborn and post-partum care, hair loss, cuts and wounds, fracture, dislocation, internal bleeding, cramps, and spasm.
- 29 SN: *Erythrina orientalis* Murray; *Erythrina variegata* L.; Leguminosae; LN: Dapdap. Not cultivated. MU: Rheumatism, arthritis - use leaves for a hot foot bath; fever, cough - drink a cool leaf decoction.
- 30 SN: *Etlingera elatior* (Jack) R.M.Sm.; Zingiberaceae; LN: Tikala; CN: Torch ginger. Not cultivated. MU: 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: *Euphorbia hirta* L.; Euphorbiaceae; LN: Gatas-gatas; CN: Australian asthma weed. Not cultivated. MU: Dengue, fever - drink plant decoction; swelling lymph nodes - apply a pound leaf poultice on affected area.
- 32 SN: *Eurycles amboinensis* (L.) Lindl.; Amaryllidaceae; LN: Abod; CN: Brisbane Lily. Cultivated. MU: Boils and abscesses - apply pound leaves on the affected area.
- 33 SN: *Gossypium hirsutum* L.; Malvaceae; LN: Kapok; CN: Silk cotton tree. Cultivated. MU. For asthma - drink a root decoction. PH: flatulence [C]; postpartum care – drink a decoction
- 34 SN: *Hibiscus rosa-sinensis* L.; Malvaceae; LN: Takoranga; CN: Gumamela. Cultivated. MU: boils and abscesses - apply pound flowers on the affected area. swellings, bruises, anti-inflammatory
- 35 SN: *Homalomena philippinensis* Engl.; Araceae; LN: Payaw; CN: Payau. Cultivated. MU: 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, somahcache - 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: *Hyptis capitata* Jacq.; Lamiaceae; LN: Burunganon (red); CN: Ironwort. Not cultivated. TS: Fever, cytitis (UTI) - drink a root decoction; Blood in the stool - drink a leaf decoction. For Abdominal discomfort, stomachache, dyspepsia, diarrhea.
- 37 SN: *Jatropha curcas* L.; Euphorbiaceae; LN: Tuba; CN: Physic nut. Cultivated. MU: 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.
- 38 SN: *Justicia gendarussa* Burm. f.; Acanthaceae; LN: Kalampisaw; CN: Yellow-leaved justicia . Cultivated. MU: 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.
- 39 SN: *Kaempferia galanga* L.; Zingiberaceae; LN: Kusol; CN: Aromatic ginger; Cultivated. MU: 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.
- 40 SN: *Kalanchoe pinnata* (Lam.) Pers.; Crassulaceae; LN: Sampraviva; CN: Life plant. Cultivated. MU: 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.

- 41 SN: *Lagerstroemia speciosa* Pers.; Lythraceae; LN: Banaba; CN: Giant crepe-myrtle. Cultivated.MU: Kidney problem - drink a leaf decoction.
- 42 SN: *Lansium domesticum* Corr.; Meliaceae; LN: Lansones; CN: Langsat. Cultivated. MU : Blisters - cook the bark in coconut oil and apply on blisters.
- 43 SN: *Lantana camara* L.; Verbenaceae; LN: Baho-baho/Kantutay; CN: Lantana. Not cultivated.MU: Cough - drink a leaf/flower decoction. Use for headache, sleeplessness, fatigue, postpartum care, dysmenorrhea, delayed menstruation, scabies, and indigestion.
- 44 SN: *Luffa acutangula* (L.) Roxb.; Cucurbitaceae; LN: Patola; CN: Bath sponge. Cultivated.MU: Skin problems - apply a leaf extract on the skin area with discoloration, scar, sunburn, and pimples.
- 45 SN: *Mangifera indica* L.; Anacardiaceae; LN: Mangga; CN: Mango. Cultivated. MU: Cough - drink a leaf decoction. Use to treat diarrhea, sore throat, dysmenorrhea, wounds, and scabies.
- 46 SN: *Mentha sp.*; Lamiaceae; LN: Herba-ulot. Cultivated. MU: hypertension, stomachache - drink a leaf decoction.
- 47 SN: *Michelia champaca* L.; Magnoliaceae; LN: Tsampaka; CN: Champaca. Cultivated. MU: Boil and abscesses- apply pound leaves on the abscess; Glossitis - drop leaf extract on baby's tongue; Hemonausea - Drink a root decoction.
- 48 SN: *Mimosa pudica* L.; Mimosaceae; LN: Harupay; CN: Touch-me-not. Not cultivated.MU: Hemonausea, dysmenorrhea and irregular menstruation - drink a root decoction.
- 49 SN: *Momordica charantia* L.; Cucurbitaceae; LN: Marigoso; CN: Bitter gourd. Cultivated.MU: 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.
- 50 SN: *Moringa oleifera* Lam.; Moringaceae; LN: Malunggay; CN: Horse radish tree. Cultivated.MU: 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.
- 51 SN: *Musa paradisiaca* L.; Musaceae; LN: Baloy/ Bungan; CN: Banana. Cultivated.MU: Hemonausea - 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: *Peperomia pellucida* (L.) Kunth; Piperaceae; LN: Sinaw-sinaw; CN: Pepper elder. Not cultivated. MU: 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.
- 53 SN: *Persea americana* Mill.; Lauraceae; LN: Abukado; CN: Avocado. Cultivated. MU: 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 caimito.
- 54 SN: *Piper betle* L.; Piperaceae; LN: Buyo; CN: Betel leaf pepper. Cultivated. MU: Ptyalism, stomachache - apply a leaf poultice on the stomach.
- 55 SN: *Plectranthus amboinicus* (Lour.) Spreng.; Coleus aromaticus Benth.; Lamiaceae; LN: Kalabo; CN: Oregano. Cultivated. MU: Cough - drink leaf extract.

Legend: SN: Scientific name; LN: Local name (Waray); CN: Common name. MU: Medicinal use in this study.

The Significance of Ethnobotanical Documentation and Conservation Endeavors

The invaluable traditional healing knowledge is at risk of permanent disappearance, as the transfer of

generational wisdom has significantly declined. Notably, the majority of respondents who possessed knowledge were older residents, aged between 35 and 80 in Brgy. Ktipunan (with a mean age of 58) and

between 40 and 75 in Brgy. Catmon (with a mean age of 57). However, younger generations showed little interest in learning these practices, as villagers aged 10 to 38 were unable to provide information about traditional healing methods. This decline in knowledge acquisition among the younger population may be attributed to parents increasingly adopting modern treatment approaches, driven by factors such as affordability and convenience of readily available medicines. Additionally, improved accessibility through road infrastructure and transportation systems from the town center to the villages may have further reinforced the preference for modern treatments. Given the average life expectancy of Filipino farmers (57 years old), it is alarming to realize that this invaluable knowledge could be completely forgotten within the next few years. Compounding the situation is the rampant land use conversion, not only in the study area but throughout the country. Rapid human settlements are encroaching into remote areas, transforming vast farmlands into residential zones and converting forested areas into agricultural or residential spaces. Such land use conversion and associated human activities are undoubtedly causing alterations to natural ecosystems, disrupting and destroying plant habitats, reducing plant populations, and leading to species loss.

The convergence of declining interest in traditional healing practices, coupled with the rapid and extensive land use conversion, underscores the critical necessity for a comprehensive nationwide ethnobotanical documentation effort. It is imperative to identify appropriate conservation initiatives and prioritize species for conservation measures. Furthermore, conducting extensive scientific and biomedical studies on the identified medicinal plants holds promise in retaining traditional knowledge, safeguarding ecosystems, preserving plant habitats, and nurturing communities in the long term.

Alternative Applications, Availability, Cultivation, and Extraction Methods of Medicinal Plants

Fig. 1(a-c) presents the non-medicinal uses, supply, and extraction practices (both cultivated and non-

cultivated) of the identified medicinal plants, as perceived by the respondents. Fig. 1a illustrates that the majority of villagers cultivate plants primarily for food consumption (36%) and housing/medicinal purposes (24.0%). Among the 55 (76.9%) cultivated medicinal plant species, 36 (46.2%) are utilized as food and food ingredients (25 species), for housing and furniture materials (three species), as ornamental plants (six species), for cotton used in pillows (*Gossypium hirsutum* L.), and for weaning and abortion purposes (*Tinospora rumphii* Boerl.). Additionally, 24 medicinal plant species are exclusively cultivated for traditional healing practices, highlighting the significance villagers place on these plants. This may explain why a greater number of cultivated plants (25 species or 32.5%) have maintained or even increased their population in both study areas (Fig. 1b).

Moreover, the seasonality of certain plant species (24.0%) might have limited overharvesting (Fig. 1c). However, despite the cultivation of numerous plant species, the supply of 28 cultivated species has shown a decline (36.4%), with six species either maintaining their supply status or experiencing a decrease (7.8%). This suggests a diminishing trend in cultivation practices (Fig. 1b). Respondents cited a lack of time and interest in medicinal plant cultivation as the primary reasons for this decline in supply.

Additionally, Fig. 1a highlights that there are eighteen (18) medicinal plants that are not cultivated (23.1%), and among these, fourteen (7) plants are not utilized for any other purposes (13%). Within the uncultivated plant species, one species, *Michelia champaca*, is locally extinct, and three species, *Euphorbia hirta* L., *Piper sp.*, and *Senna alata* L., have shown a decline in supply in both study areas (Fig. 1b). Furthermore, the supply of the non-cultivated seasonal plant *Dioscorea hispida* is decreasing in one study area (Catmon). Although *Dioscorea hispida* serves as an alternative food source during times of food shortage, it is not widely appreciated in the area due to potential toxicity when not prepared correctly. The reduction in supply can be attributed to the lack of cultivation and

over-harvesting from the wild, which arises from the absence of formal ownership of wild medicinal plants.

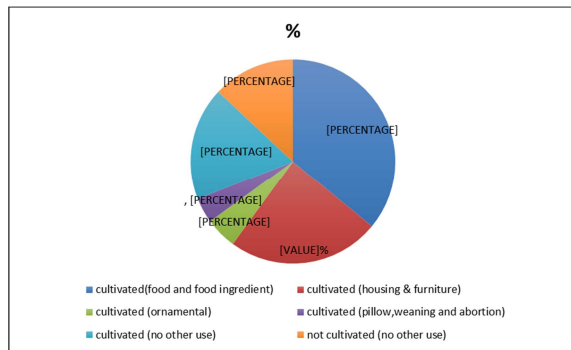


Fig. 1a. Cultivated and Non-cultivated Medicinal Plants.

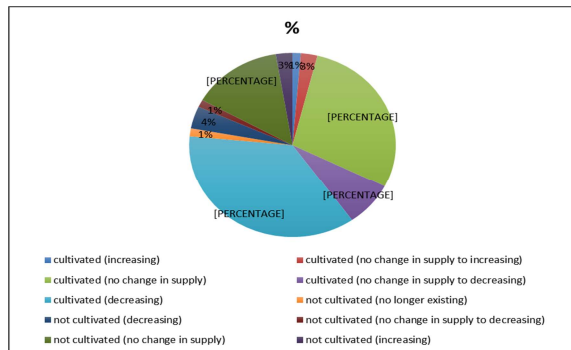


Fig. 1b. Availability of Medicinal Plants.

Respondents' perspective on the preservation of medicinal plants

The majority of respondents exhibited a favorable outlook on the preservation of medicinal plants, as reflected in their agreement with various conservation statements outlined in Table 2. This encompassed several key aspects, including the protection of habitats

and species, advocating for sustainable harvesting and extraction methods, endorsing the establishment of home gardens, botanical gardens, and germplasm banks specifically for medicinal plants.

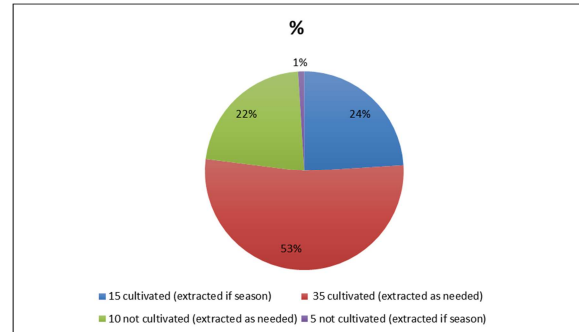


Fig. 1c. Extraction practices of Medicinal Plants.

Fig. 1. (a) Alternative application, (b) availability, and (c) extraction practices of cultivated and non-cultivated medicinal plants identified in the study areas of Mt. Nacolod, Southern Leyte.

Respondents also expressed support for prioritizing the utilization of cultivated medicinal plants over wild ones, integrating environmental sustainability, including biodiversity conservation, into the educational curriculum from primary to tertiary levels, implementing policies pertaining to biodiversity conservation, and involving local communities in the development of biodiversity conservation plans. The high percentage of agreement, ranging from 70 to 100 percent, underscores the respondents' positive stance towards the conservation of medicinal plants.

Table 2. Respondents' Perspective on the Preservation of Medicinal Plants.

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

Legend: 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 displays the respondents' evaluations of statements concerning human activities that impact the population of medicinal plants. The majority of respondents acknowledged the detrimental consequences of uncontrolled extraction or over-harvesting on medicinal plants, with 85% expressing agreement that such practices could lead to their extinction. Additionally, 70% of respondents recognized deforestation as a significant threat to medicinal plant populations.

However, opinions varied regarding the potential harm posed by increasing human settlements in or near the natural habitats of these plants, with 45% agreeing and 55% expressing uncertainty on the matter. Interestingly, most respondents did not perceive medicinal plant species as a lucrative income source. Notably, a significant proportion of respondents (85%) concurred that the protection of these medicinal plants should be the responsibility of the government.

Table 3. Respondents' evaluations concerning human activities.

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

Legend: ^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.

Table 4 illustrates a series of statements pertaining to the respondents' level of concern for medicinal plants and their preference for cultivated and wild varieties. A significant majority of respondents, 75%, expressed their willingness to participate in groups dedicated to the conservation of medicinal plants, whereas 25% displayed less interest. The perception that cultivated medicinal plants are of comparable quality and effectiveness to wild ones was prevalent among most respondents, with 90% expressing this viewpoint. Only a minority, 10%, preferred using plants sourced from the wild, primarily consisting of traditional faith healers.

community-led conservation initiatives may not be expected, as the communities rely on the government to initiate such activities.

Table 4. Respondents' level of concern and their preferences regarding 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

The data presented in Tables 2, 3, and 4 demonstrate the respondents' genuine concern for medicinal plants and their willingness to participate in various conservation efforts. The perceived effectiveness of these plants and the potential cost savings associated with their use could contribute to the positive attitude towards their conservation. However, at present,

To foster a greater appreciation for the value of medicinal plants, future conservation endeavors could prioritize addressing the lack of accountability and sense of ownership among the local community in managing and safeguarding these natural resources. This could involve information campaigns

that highlight the importance and potential benefits of medicinal plants to the local economy. The lack of appreciation may stem from the generally low prices for unprocessed medicinal plant materials. Future studies could explore ways to enhance the value of this natural resource by developing more economically valuable forms of these medicinal plants, similar to the case of *Moringa oleifera* and *Vitex negundo*, which are now being sold in pharmacies across the Philippines for their galactagogue and cough-relieving properties, respectively.

Conclusion and recommendations

This ethnobotanical investigation documented a total of fifty-five (55) plant species that are utilized in traditional healing practices within the study areas of Mt. Nacolod, Southern Leyte, Philippines. This study not only recorded unique uses of medicinal plants but also supplemented existing ethnobotanical research conducted in the Philippines. *Allium sativum* and *Andropogon citratus* are commonly employed for regulating hypertension. *Peperomia pellucida* is frequently used for hypertension control as well as for addressing kidney- and bladder-related issues, including urinary tract infections (UTI), gout, and high uric acid levels. *Cocos nucifera* and *speciosa* are utilized to treat similar problems, such as difficulties in urination, UTI, increased uric acid levels, and kidney stones. *Cynodon dactylon* is known for its ability to dissolve kidney and urethral stones. *Momordica charantia*, *Annona muricata*, and *Moringa oleifera* are used to combat diabetes. Anemia is also addressed using *Momordica charantia* and *Moringa oleifera*. Furthermore, *Moringa oleifera* is well-known for its use as a galactagogue. *Jatropha curcas*, *Justicia gendarussa*, and *Curcuma domestica* are employed to alleviate pain associated with bone-related and abdominal problems. *Carica papaya*, *Chrysanthemum indicum*, and *Chrysophyllum cainito* are used to address stomach-related ailments such as constipation, diarrhea, abdominal pain, bloating, and ulcers. *Ananas comosus* is commonly used as an anthelmintic, while *Jatropha curcas* and *Piper betle* are employed for relieving flatulence. *Persea Americana* and *Psidium guajava*, on the other hand,

are used for the treatment of diarrhea. Cough, colds, and sore throat are commonly treated with *Citrus microcarpa*, *Plectranthus amboinicus*, *Premna odorata*, *Vitex negundo*, and *Zingiber officinale*. *Euphorbia hirta* is increasingly recognized for its effectiveness against dengue fever, although *Carica papaya* is not widely acknowledged for its reported anti-dengue and anti-malarial properties.

Hibiscus rosa-sinensis and *Plectranthus scutellarioides* are frequently utilized for various skin-related issues such as wounds, boils, and abscesses. *Musa paradisiaca*, *Ageratum conyzoides*, and *Psidium guajava* are employed for the treatment of cuts and wounds. Meanwhile, *Senna alata* is used to address fungal infections, ringworm, acne, and athlete's foot.

The transmission of knowledge to younger generations and the continued practice of traditional healing involving medicinal plants have significantly declined, primarily as a result of the widespread adoption of modern treatment approaches. With the remaining traditional healing practitioners being advanced in age, there is a real risk that this valuable resource, consisting of centuries-old traditional knowledge, may be completely lost in the near future. Therefore, it is imperative to conduct a comprehensive and timely ethnobotanical survey across the country. Moreover, numerous plant species identified in this study hold the potential to undergo scientific investigations aimed at validating their medicinal efficacy.

References

- Abe R, Ohtani K.** 2013. An ethnobotanical study of medicinal plants and traditional therapies on Bataan Island, the Philippines. *Journal of Ethnopharmacology* **145**, pp. 554-565.
- Ahmad M, Sultana S, Fazl-i-Hadi S, Ben Hadda T, Rashid S, Zafar M, Alonso-Amelot ME.** 2016. Multitargeted bio-active materials of plants in the *Curcuma* genus and related compounds: Recent advances. *Studies in Natural Products Chemistry* **47**, pp. 111-200.

- Angagan JS, Buot JrIE, Relox RE, Rebanco CM.** 2013. Ethnobotany of the plant resources in Conner, Apayao, Northern Luzon, Philippines. *Journal of Nature Studies* **9**, pp. 31-38.
- Arquion RD, Galanida CC, Villamor B, Aguilar HT.** 2015. Ethnobotanical study of indigenous plants used by local people of Agusan del Sur, Philippines. *Asia Pacific Higher Education Research Journal* **2(2)**.
- Balangcod TD, Balancod KD.** 2015. Ethnomedicinal plant in Bayabas, Sablan, Benguet Province, Luzon, Philippines. *Electronic Journal of Biology* **11**, pp. 63-73.
- Balinado L, Chan MA.** 2017. An ethno- medicinal study of plants and traditional health care practices in District 7, Cavite, Philippines. Paper presented at the International Conference on Chemical, Agricultural, Biological and Medical Sciences (CABMS-17). Manila, Philippines.
- Chah KF, Eze A, Emuelosi CO, Es imone CO.** 2006. Antibacterial and wound healing properties of methanolic extracts of some Nigerian medicinal plants. *Journal of Ethnopharmacology* **104**, pp. 164-167.
- Coria-Télez AV, Montalvo-González E, Yahia EM, Obledo-Vázquez EN.** 2018. *Annona muricata*: A comprehensive review on its traditional medicinal uses, phytochemicals, pharmacological activities, mechanisms of action and toxicity. *Arabian Journal of Chemistry* **11**, pp. 662-691.
- Fajardo WT, Cancino LT, Dudang EB, De Vera IA, Pambid RM, Junio AD.** 2017. Ethnobotanical study of traditional medicinal plants used by indigenous Sambal-Bolinao of Pangasinan, Philippines. *PSU Journal of Natural and Allied Sciences* **1**, pp. 52-63.
- Fiscal RR.** 2017. Ethnomedicinal plants used by traditional healers in Laguna, Philippines. *Asia Pacific Journal of Multi- disciplinary Research* **5**, pp. 132-137.
- Ghate R, Patil VP, Hugar S, Matha NH, Kalyane NV.** 2014. Antihyperglycemic activity of Areca Catechu flowers. *Asian Pacific Journal of Tropical Disease* **4**, pp. 148-152.
- Gilani AH, Yacesh S, Jamal Q, Ghayur MN.** 2005. Hepatoprotective activity of aqueous-methanol extract of *Artemisia vulgaris*. *Phytotherapy Research* **19**, pp. 170-172.
- Gopalakrishnan L, Doriya K, Kumar DS.** 2016. *Moringa oleifera*: A review on nutritive importance and its medicinal application. *Food Science and Human Wellness* **5**, pp.49-56.
- Gruyal GA, del Rosario R, Palmes ND.** 2014. Ethnomedicinal plants used by residents in Northern Surigao del Sur, Philippines. *Natural Products Chemistry & Research* **2(4)**.
- Gumisiriza H, Birungi G, Olet EA, Sesaazi CD.** 2019. Medicinal plant species used by local communities around Queen Elizabeth National Park, Maramagambo Central Forest Reserve and Ihimbo Central Forest Reserve, Southwestern Uganda. *Journal of Ethnopharmacology* **239**, pp. 1119-26.
- Kadir SLA, Yaakob H, Zulkifli RM.** 2013. Potential anti-dengue medicinal plants: A review. *Journal of Natural Medicines* **67**, pp. 677-689.
- Khan MA, Khan MP, Yaseen G.** 2014. An ethnobotanical study of medicinal plants in high mountainous region of Chail valley (District Swat-Pakistan). *Journal of Ethnobiology and Ethnomedicine* **10(36)**.
- King J, Raguindin PF, Dans LF.** 2013. *Moringa oleifera* (Malunggay) as a galactagogue for breastfeeding mothers: A systematic review and metaanalysis of randomized controlled trials. *The Philippine Journal of Pediatrics* **61**, pp. 34-42.
- Lans C, Turner N, Khan T, Brauer G.** 2007. Ethnoveterinary medicines used to treat endoparasites and stomach problems in pigs and pets in British Columbia, Canada. *Veterinary Parasitology* **148**, pp. 325-340.

- Luyen BTT, Tai BH, Thao NP, Cha JY, Lee HY, Lee YM, Kim YH.** 2015. Anti-inflammatory components of *Chrysanthemum indicum* flowers. *Bioorganic & Medicinal Chemistry Letters* **25**, 266-269.
- Mabberley DJ.** 2004. *Citrus* (Rutaceae): A Re-view of recent advances in etymology, systematics and medical application. *Blumea* **49**, pp. 481-498.
- Meira NA, Klein Jr LC, Rocha LW, Quintal ZM, Monache FD, Cechinel Filho V, Quintão NL.** 2014. Anti-inflammatory and anti-hypersensitive effects of the crude extract, fractions and triterpenes obtained from *Chrysophyllum cainito* leaves in mice. *Journal of Ethnopharmacology* **151**, pp. 975-983.
- Montealegre CM, De Leon RL.** 2017. Effect of *Blumea balsamifera* extract on the phase and morphology of calcium oxalate crystals. *Asian Journal of Urology* **4**, pp. 201-207.
- Morilla LJ, Sumaya NHN, Rivero HI, Madamba MRS.** 2014. Medicinal plants of the Subanens in Dumingag, Zamboanga del Sur, Philippines. Paper presented at the International Conference on Food, Biological and Medical Sciences (FBMS-2014). Bangkok, Thailand.
- Myers N, Mittermeier RA, Mittermeier CG, da Fonseca GAB, Kent J.** 2000. Biodiversity hotspots for conservation priorities. *Nature* **403**, pp. 853-858.
- Olowa LF, Torres MAJ, Aranico EC, Demayo CG.** 2012. Medicinal plants used by the Higaonon Tribe of Rogongon, Iligan City, Mindanao, Philippines. *Advances in Environmental Biology* **6**, pp. 1442-1449.
- Ong HG, Kim YD.** 2014. Quantitative ethnobotanical study of the medicinal plants used by the Ati-negrigo indigenous group in Guimaras Island, Philippines. *Journal of Ethnopharmacology* **157**, pp. 228-242.
- Panneerselvam C, Murugan C, Kovendan K, Kumar PM, Subramaniam J.** 2013. Mosquito larvicidal and pupicidal activity of *Euphorbia hirta* Linn. (Family: Euphorbiaceae) and *Bacillus sphaericus* against *Anopheles stephensi* Liston. (Diptera: Culicidae). *Asian Pacific Journal of Tropical Medicine* pp. 102-109.
- Pinarok NAA, de Guzman DQ, Ale-jandro GJ.** 2015. Inventory and ethnobotanical study of medicinal plants at Samar Island Natural Park, Philippines. *International Journal of Pure and Applied Bioscience* **3(4)**, pp. 101-108.
- Radhika B, Begum N, Srisailam K.** 2010. Pharmacognostic and Preliminary Phytochemical Evaluation of the leaves of *Bixa orellana*. *Pharmacognosy Journal* **2**, pp. 132-136.
- Raguindin PFN, Dans LF, King JF.** 2014. *Moringa oleifera* as a galatogogue. *Breastfeeding Medicine* **9(6)**, pp. 323-324.
- Rahman MS, Akter R, Mazumdar S, Islam F, Mouri NJ, Nandi NC, Mahmud ASM.** 2015. Antidiabetic and antidiarrhoeal potentials of ethanolic extracts of aerial parts of *Cynodon dactylon* Pers. *Asian Pacific Journal of Tropical Biomedicine* **5(8)**, pp. 658-662.
- Raju S, Kavimani S, Uma MRV, Sreeramulu RK.** 2011. *Kyllinga nemoralis* (Hutch & Dalz) (Cyperaceae): Ethnobotany, phytochemistry and pharmacology. *Pharmacognosy Journal* **3(24)**, pp. 7-10.
- Sah AN, Juyal V, Melkani AB.** 2011. Anti-microbial activity of six different parts of the plant *Citrus medica* Linn. *Pharmacognosy Journal* **2(21)**, pp. 80-83.
- Seo EJ, Lee DU, Kwak JH, Lee SM, Kim YS, Jung YS.** 2011. Antiplatelet effects of *Cyperus rotundus* and its component (+)-nootkatone. *Journal of Ethnopharmacology* **135(1)**, pp. 48-54.
- Shouk R, Abdou A, Shetty K, Sarkar D, Eid AH.** 2014. Mechanisms underlying the antihypertensive effects of garlic bioactives. *Nutrition Research* **34(2)**, pp. 106-115.
- Singh G, Kumar P.** 2013. Phytochemical study and screening for antimicrobial activity of flavonoids of *Euphorbia hirta*. *International Journal of Applied and Basic Medical Research* **3(2)**, pp. 111-116.

Suroowan S, Pynee KB, Mahomoodally MF. 2019. A comprehensive review of ethnopharmacologically important medicinal plant species from Mauritius. *South African Journal of Botany* **122**, pp. 189-213.

Tantengco OAG, Condes MLC, Estadilla HHT, Ragragio EM. 2018. Ethnobotanical survey of medicinal plants used by Ayta communities in Dinalupihan, Bataan, Philippines. *Pharmacognosy Journal* **10(5)**, pp. 859-870.

Valle DL, Andrada JI, Puzon JJM, Cabrera EC, Rivera WL. 2015. Antibacterial activities of ethanol extracts of Philippine medicinal plants against multidrug-resistant bacteria. *Asian Pacific Journal of Tropical Biomedicine* **5 (7)**, pp. 532-540.