

Determination of Use-Value, Informant Consensus Factor, and Fidelity Level of Medicinal Plants Used in Cavite, Philippines

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ABSTRACT

In developing countries like the Philippines, the use of plants as medicine plays an important role especially in providing affordable and accessible health care. However, studies to determine the use-value (UV) of these plants, the informant consensus factor (ICF), and the fidelity level (FL) have been scarce; hence, this study was conducted. This was performed in the province of Cavite, Philippines where 94 local herbalists served as informants, and were interviewed using a semi-structured questionnaire about their medicinal knowledge. Here, 106 plants of medicinal value were documented and were being used for curing 16 different categories of human ailments. Several medicinal plants were found to be commonly used in the entire province based on UV. There were countless agreements among the informants in terms of the plants to be used for every disease category with ICF values ranging from 0.25 to 1.00. It revealed that most informants agreed on the use against certain infectious and parasitic diseases of *Senna alata* (ICF=0.43), against metabolic diseases of *Mangifera indica* (0.68), against digestive system diseases of *Chrysophyllum cainito* (0.67), against musculoskeletal diseases of *Croton tiglium* (0.45), against genitourinary disease of *Lagerstroemia speciosa* (0.67), and against other diseases symptoms not elsewhere classified of *Premna odorata* (0.76) after all these plants showed an FL value of 100%. This study, therefore, demonstrates the rich medicinal knowledge in Cavite, and provides a basis for future pharmacological research.

Key words: Fidelity level, ICD-10, Informant consensus factor, Medicinal plants, Use-value.

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INTRODUCTION

Medicinal plants naturally thrive in areas of early human settlements like forests and even near aquatic environments.^[1,2] Through trial and error method,^[3] various communities over hundreds of years have learned using these plants in combating diseases and disorders, and sustaining good health conditions.^[2,4,6] How different cultures view, treat or prevent such diseases through traditional medicine is known as ethnomedicine.^[7]

In this modern era, the use of ethnomedicinal plants still holds a significant part in supporting worldwide healthcare.^[1,6,8] This remains true especially in developing countries, including the Philippines^[9] where people in isolated areas have lower access to modern health care services.^[10-12] In addition, this traditional practice still exists primarily due to the natural abundance of, easy access on, and cost-effectiveness of these medicinal plants.^[2,13]

The World Health Organization even has estimated that approximately 80% of the population worldwide depends on this traditional system of medical support. The Organization defined this traditional medicine as the summation of theoretical, belief- and experience-based cultural knowledge, skills, and practices that are used to maintain and support human health.^[14] Unfortunately, the ethnomedicinal knowledge and practices

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in the Philippines are continuously being threatened to be no longer passed on to younger generations as urbanization keeps on arising like in the situation of the Cavite province.^[15,16] This traditional medicinal knowledge could provide the remedy to several diseases; however, most of the studies that involve the country’s medicinal plants focus more on indigenous groups, and less on more urbanized communities whose traditional medicinal knowledge and practices are also under threat. This study generally described the importance and the diversity of traditional medicinal plant uses in Cavite, Philippines by determining the commonness of use of medicinal plant species in the province, the consensus among informants over the medicinal plant species to be utilized for a particular International Classification of Diseases (ICD-10) ailment category, and the most preferred medicinal plant to be applied under each ailment category.

MATERIALS AND METHODS

Study area

The study was conducted in Cavite (14° 16'N 120° 52'E), a predominantly urban province in southern Luzon, Philippines. It involved 15 randomly selected municipalities/cities (Figure 1), each represented by two non-poblacion barangays. The study municipalities/cities were the following: Amadeo, Bacoor City, Carmona, Cavite City, Dasmariñas City, General Trias City, Imus City, Indang, Kawit, Noveleta, Rosario, Silang, Tagaytay City, Tanza, and Trece Martires City.



Figure 1: A map of Cavite, Philippines. Areas marked with “★” are the municipalities/cities which served as study areas. (Source: The Official Website of the Province of Cavite).^[17]

Data collection

A snowball (or chain referral) method of sampling was employed for the identification of the informants of the study. These informants were local herbalists in each barangay who are well informed about the traditional uses of medicinal plants present in the locality. Ninety-four informants were identified and were asked to sign an Informed Consent Form before the conduct of the survey proper. Guided by a semi-structured questionnaire, the informants were asked about the medicinal plants they know, and the medical ailments for which these plants are being used. This research study was approved by the Ethics Review Board of Cavite State University, Indang, Cavite.

Data analysis

The gathered data were subjected to quantitative analysis to determine the following: plant use classification, use-value (UV), informant consensus factor (ICF), and fidelity level (FL).

Plant Use Classification

The ailments that could be addressed by the reported medicinal plants were categorized according to the International Classification of Diseases (ICD-10) version 2016. This is available in the World Health Organization website. The classification results were utilized in the calculation of ICF and FL.

Use-Value

The commonness of use of each plant in the entire province was calculated using the following formula: $UV = Nur/Ni$, where Nur refers to the number of plant use-reports in the study area, while Ni refers to the total number of informants surveyed.^[18]

Informant Consensus Factor

To determine the homogeneity among informants when it comes to the plants to be used per reported ailment category, the informant Consensus Factor (ICF) was calculated. The following formula was used: $ICF = (Nur - Nt) / (Nur - 1)$, where Nur refers to the number of the use-reports per ailment or plant-use classification, while Nt refers to the number of plant species or taxa that was reported to address a particular plant-use category.^[19] Here, every report of the use of a plant species was considered as one use-report. The ICF values ranged from 0 to 1, where “1” describes the highest level of informant agreement.

Fidelity Level

In determining the medicinal plant species highly preferred by the informants for the treatment of a

particular ailment category, the fidelity level (FL) was computed but only for those ailments with at least two reports per plant species. This index used the formula, $FL = (Np/N) \times 100$, where Np refers to the number of use-reports per plant-use category per plant species, and N refers the number of total use-reports per plant species.^[20] If values are near 100%, there is a high preference for a plant species to address a particular ailment category; otherwise, it indicates that the plant species had multiple uses.

RESULTS

A total of 106 plants as listed in Table 1 were documented to be used for medicinal purposes in Cavite. These were reported to be utilized to address a variety of medical ailments (Table 1).

Reported ailments and its categories

The reported ailments of the documented medicinal plants were categorized based on the International Classification of Disease (ICD-10) version 2016. This study has listed 16 different categories of the reported ailments (Table 2). These were the following: I (certain infectious and parasitic diseases): dengue, mumps, warts, athlete's foot, scabies, ringworms, tuberculosis, measles; II (neoplasms): breast cancer; III (diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism): low platelet count; IV (endocrine, nutritional and metabolic diseases): diabetes; VI (diseases of the nervous system): paralysis; VII (diseases of the eye and adnexa): sore eyes; IX (diseases of the circulatory system): heart problems, hypertension; X (diseases of the respiratory system): asthma, flu, common cold, sore throat; XI (diseases of the digestive system): diarrhea, gastritis, hyperacidity, hemorrhoids, constipation, gastric ulcer; XII (diseases of the skin and subcutaneous tissue): boils, skin irritation, dermatitis, eczema, skin allergy; XIII (diseases of the musculoskeletal system and connective tissue): arthritis, rheumatism, swollen muscles; XIV (diseases of the genitourinary system): dysmenorrhea, difficulty in urination, kidney problems, urinary tract infection, irregular menstruation; XV (pregnancy, childbirth and the puerperium): lactation problem; XVIII (symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified): lump, spasm, body pain, abdominal pain, epistaxis, cough, dizziness, fever, headache, hoarseness, *lamig*, *pasma*, XIX (injury, poisoning and certain other consequences of external causes): wound, sprain, cut, bruise; and XXI (factors influencing health status and contact with health services): relapse

after childbirth, infant care. Apparently, some of the reported ailments do not have a direct English translation.

Use-value (UV)

As shown in Table 1, the use-value (UV) of each medicinal plant was determined to assess the commonness in use of each plant in the entire province. This study resulted in the following plants having the highest UV: *Plectranthus amboinicus* (UV=0.54), *Vitex negundo* (0.47), *Blumea balsamifera* (0.39), *Rauwolfia serpentina* (0.29), *Psidium guajava* (0.23), *Lagerstroemia speciosa* (0.19), *Annona muricata* (0.18), and *Eleusine indica* (0.16).

Informant consensus factor (ICF)

The ICF was calculated to look into the level of homogeneity among informants for the plants to be used for each ailment category.^[19] This study has resulted in ICF values ranging from 0.25 to 1.00 (Table 2). The ICD-10 category VII (diseases of the eye and adnexa) had the highest ICF value (1.00) among all the ailment categories, while the lowest ICF value (0.25) was obtained for category X (diseases of the respiratory system). As also presented, ICF value was not determined for categories VI and XV as there is only one UR for these categories. For category XII, the ICF value was similarly not indicated as the number of UR matches with the number of plants used. This means that each informant mentioned a different plant species being utilized for that category; hence, there was no consensus at all.

Fidelity level (FL)

Fidelity level determines the most preferred medicinal plant species by informants to address a particular ailment category (Table 1). The maximum FL of 100% was recorded for 18 medicinal plant species, namely: *Allium tuberosum*, *Carica papaya*, *Chrysophyllum cainito*, *Citrus × microcarpa*, *Citrus sinensis*, *Cocos nucifera*, *Cordia dichotoma*, *Croton tiglium*, *Diospyros discolor*, *Hibiscus rosa-sinensis*, *Jasminum sambac*, *L. speciosa*, *Lantana camara*, *Mangifera indica*, *Pandanus tectorius*, *Piper retrofractum*, *Premna odorata*, and *Senna alata*.

Most preferred plant species

Twelve plant species were documented as the most preferred ones for use in the ailment categories that were recorded (Table 2). These were the following: *S. alata* for certain infectious and parasitic diseases; *A. muricata* for neoplasms; *Moringa oleifera* (a) for diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism, (b) for diseases of the eye and adnexa, and (c) for injury, poisoning and certain other consequences of external causes; *M. indica* for endocrine, nutritional and metabolic

Table 1: List of reported medicinal plants, and its use-reports, use-values, ailments treated categorized according to ICD-10, and FL values.

| Plant No. | Scientific Name | Vernacular Name | UR | UV | Ailments Treated | Ur Per Ailment Category | FL (in %) |
|-----------|---|-----------------|----|------|---|-------------------------|---|
| | | | | | Categorized According to ICD-10 | | |
| 1 | <i>Abelmoschus esculentus</i> (Linn.) Moench. | Okra | 1 | - | XVIII: body pain | 1 | - |
| 2 | <i>Acorus calamus</i> L. | Lubigan | 2 | 0.02 | IX: heart problem XII: skin rashes XIII: arthritis, gout | 1 1 2 | - - 50.00 |
| 3 | <i>Albizia saman</i> (Jacq.) Merr. | Acacia | 2 | 0.02 | XI: diarrhea XVIII: headache, cough | 1 2 | - 66.67 |
| 4 | <i>Allium ascalonicum</i> L. | Sibuyas tagalog | 2 | 0.02 | XI: diarrhea XVIII: dizziness, cough | 1 2 | - 66.67 |
| 5 | <i>Allium sativum</i> L. | Bawang | 2 | 0.02 | II: breast cancer X: asthma XVIII: cough | 1 1 1 | - - - |
| 6 | <i>Allium tuberosum</i> Rottler ex Spreng | Kotchay | 2 | 0.02 | XVIII: abdominal pain, body pain | 2 | 100.00 |
| 7 | <i>Alpinia elegans</i> (C.Presl) K.Schum | Tagbak | 2 | 0.02 | VI: paralyzed part of the body XXI: relapse | 1 1 | - - |
| 8 | <i>Ananas comosus</i> (L.) Merr. | Pinya | 2 | 0.02 | II: breast cancer IX: hypertension | 1 1 | - - |
| 9 | <i>Angelica keiskei</i> (Miq.) Koidz. | Ashitaba | 1 | - | IX: hypertension XI: constipation | 1 1 | - - |
| 10 | <i>Annona muricata</i> L. | Guyabano | 17 | 0.18 | II: breast cancer IV: diabetes IX: hypertension XIV: urinary tract infection, kidney problems XVIII: body pain | 7 3 7 5 3 | 28.00 12.00 28.00 20.00 12.00 |
| 11 | <i>Annona reticulata</i> L. | Anonas | 1 | - | XXI: relapse | 1 | - |
| 12 | <i>Annona squamosa</i> L. | Atis | 2 | 0.02 | XI: hyperacidity XIV: menstrual cramps | 1 1 | - - |
| 13 | <i>Antidesma bunius</i> (L.) Spreng | Bignay | 2 | 0.02 | III: anemia IX: hypertension | 1 1 | - - |
| 14 | <i>Ambrosia peruviana</i> Willd. | Altamisa | 1 | - | XVIII: abdominal pain | 1 | - |
| 15 | <i>Apium graveolens</i> L. | Kintsay | 1 | - | IX: hypertension | 1 | - |
| 16 | <i>Artemisia vulgaris</i> L. | Damong maria | 7 | 0.07 | IX: hypertension XIV: menstrual cramps XVIII: fever, body pain | 1 3 3 | - 42.86 42.86 |
| 17 | <i>Artocarpus heterophyllus</i> Lam. | Langka | 1 | - | IV: diabetes | 1 | - |
| 18 | <i>Asparagus officinalis</i> L. | Asparagus | 1 | - | XIII: arthritis | 1 | - |
| 19 | <i>Averrhoa bilimbi</i> L. | Kamias | 3 | 0.03 | I: wart XII: skin rashes XIX: wound | 1 1 1 | - - - |
| 20 | <i>Basella alba</i> L. | Alugbati | 1 | - | XII: boils XIII: swollen muscles | 1 1 | - - |
| 21 | <i>Bixa orellana</i> L. | Atsuete | 2 | 0.02 | XIII: swollen muscles XVIII: fever, headache | 2 1 | 66.67 - |
| 22 | <i>Blumea balsamifera</i> (L.) DC. | Sambong | 37 | 0.39 | IV: diabetes XIV: urinary tract infection, menstrual cramps XVIII: cough, fever, abdominal pain XIX: wound XXI: relapse | 2 11 19 4 2 | 5.26 28.85 50.00 10.53 5.26 |
| 23 | <i>Brassica juncea</i> (L.) Czern. | Mustasa | 1 | - | XVII: abdominal pain | 1 | - |

Continued...

Table 1: Cont'd

| Plant No. | Scientific Name | Vernacular Name | UR | UV | Ailments Treated | Ur Per Ailment Category | FL (in %) |
|-----------|---|-----------------|----|------|--|-------------------------|-----------|
| | | | | | Categorized According to ICD-10 | | |
| 24 | <i>Bryophyllum pinnatum</i> (Lam.) Oken | Katakataka | 1 | - | XII: eczema | 1 | - |
| | | | | | XIX: sprain | 1 | - |
| 25 | <i>Cananga odorata</i> (Lam.) Hook.f. and Thomson | Ilang-ilang | 2 | 0.02 | XIII: arthritis | 1 | - |
| | | | | | XVIII: fever | 1 | - |
| 26 | <i>Capsicum annuum</i> L. | Sili | 1 | - | XI: hyperacidity | 1 | - |
| 27 | <i>Carica papaya</i> L. | Papaya | 3 | 0.03 | XIII: arthritis | 3 | 100.00 |
| 28 | <i>Catharanthus roseus</i> (L.) G.Don | Tsitsirika | 1 | - | II: cancer | 1 | - |
| | | | | | XVIII: cough | 1 | - |
| 29 | <i>Chrysophyllum cainito</i> L. | Kaimito | 3 | 0.04 | XI: diarrhea | 3 | 100.00 |
| 30 | <i>Citrus x microcarpa</i> Bunge | Kalamansi | 4 | 0.04 | XVIII: cough | 4 | 100.00 |
| 31 | <i>Citrus sinensis</i> (L.) Osbeck | Orange | 2 | 0.02 | XVIII: cough, gas pain | 2 | 100.00 |
| 32 | <i>Citrus limon</i> (L.) Osbeck. | Lemon | 1 | - | II: cancer | 1 | - |
| | | | | | IX: hypertension | 1 | - |
| 33 | <i>Clerodendrum intermedium</i> Cham. | Kasopangil | 1 | - | XI: diarrhea | 1 | - |
| | | | | | XVIII: abdominal pain | 1 | - |
| 34 | <i>Cocos nucifera</i> L. | Buko/Niyog | 2 | 0.02 | XIV: urinary tract infection | 2 | 100.00 |
| 35 | <i>Colocasia esculenta</i> (L.) Schott | Gabi | 2 | 0.01 | X: asthma | 1 | - |
| | | | | | XIII: arthritis | 1 | - |
| 36 | <i>Combretum indicum</i> (L.) DeFilipps | Niog-niogan | 1 | - | XVIII: headache | 1 | - |
| 37 | <i>Corchorus olitorius</i> L. | Saluyot | 1 | - | X: sore throat | 1 | - |
| 38 | <i>Cordia dichotoma</i> G.Forst. | Anonang | 2 | 0.02 | XXI: relapse | 2 | 100.00 |
| 39 | <i>Croton tiglium</i> L. | Tuba | 5 | 0.05 | XIII: arthritis, swollen muscles, strain | 5 | 100.00 |
| 40 | <i>Cucumis sativus</i> L. | Pipino | 1 | - | XIX: bruise | 1 | - |
| 41 | <i>Curcuma longa</i> L. | Luyang dilaw | 5 | 0.05 | IV: diabetes | 5 | 50.00 |
| | | | | | XIX: arthritis | 1 | - |
| | | | | | XVIII: body pain, cough | 4 | 40.00 |
| 42 | <i>Cymbopogon citratus</i> (DC.) Stapf | Tanglad/Salay | 6 | 0.06 | IX: hypertension | 3 | 50.00 |
| | | | | | X: flu | 2 | 33.33 |
| | | | | | XVIII: fever | 1 | - |
| 43 | <i>Daucus carota</i> L. | Carrot | 2 | 0.02 | II: breast cancer: | 1 | - |
| | | | | | XVIII: cough | 1 | - |
| 44 | <i>Dendrocnide meyeniana</i> (Walp.) Chew | Lipa | 1 | - | XII: skin allergy | 1 | - |
| 45 | <i>Diospyros discolor</i> Willd. | Mabolo | 2 | 0.02 | XVIII: abdominal pain | 2 | 100.00 |
| 46 | <i>Ehretia microphylla</i> Lam. | Tsaang-gubat | 1 | - | XII: skin rashes | 1 | - |
| 47 | <i>Eleusine indica</i> (L.) Gaertn. | Paragis | 14 | 0.15 | I: tuberculosis | 1 | - |
| | | | | | II: breast cancer | 1 | - |
| | | | | | IV: diabetes | 6 | 42.86 |
| | | | | | XIII: arthritis | 1 | - |
| | | | | | XIV: urinary tract infection, dysmenorrhea | 3 | 21.43 |
| 48 | <i>Eucalyptus globulus</i> Labill. | Eucalyptus | 1 | - | XVIII: body pain | 2 | 14.29 |
| | | | | | XVIII: cough | 1 | - |
| 49 | <i>Euphorbia hirta</i> L. | Tawa-tawa | 9 | 0.10 | I: dengue | 7 | 70.00 |
| | | | | | XVIII: fever | 3 | 30.00 |
| 50 | <i>Garcinia x mangostana</i> L. | Mangosteen | 2 | 0.02 | XI: diarrhea | 1 | - |
| | | | | | XIV: dysmenorrhea | 1 | - |
| 51 | <i>Gliricidia sepium</i> (Jacq.) Walp. | Kakawate | 1 | - | XII: dermatitis | 1 | - |
| 52 | <i>Graptophyllum pictum</i> (L.) Griff. | Morado | 3 | 0.03 | XI: hemorrhoids | 2 | 40.00 |
| | | | | | XII: boils | 2 | 40.00 |
| | | | | | XIII: swollen muscles | 1 | - |
| 53 | <i>Hibiscus rosa-sinensis</i> L. | Gumamela | 11 | 0.12 | XII: boils | 11 | 100.00 |

Continued...

Table 1: Cont'd.

| Plant No. | Scientific Name | Vernacular Name | UR | | Ailments Treated Categorized According to ICD-10 | Ur Per Ailment Category | FL (in %) |
|-----------|--|-------------------|----|------|--|----------------------------|--|
| | | | UR | UV | | | |
| 54 | <i>Imperata cylindrica</i> (L.) Rausch | Kogon | 1 | - | IV: diabetes XIII: arthritis XIX: wound | 1 1 1 | - - - |
| 55 | <i>Ipomoea aquatica</i> Forssk. | Kangkong | 1 | - | IV: diabetes | 1 | - |
| 56 | <i>Jasminum sambac</i> (L.) Aiton | Sampaguita | 2 | 0.02 | I: dengue, mumps | 2 | 100.00 |
| 57 | <i>Jatropha curcas</i> L. | Mirasol | 1 | - | X: flu XIII: swollen muscles | 1 1 | - - |
| 58 | <i>Jatropha gossypifolia</i> L. | Tuba-tuba | 2 | 0.02 | XIII: arthritis, swollen muscle XVIII: gas pain | 1 1 | - - |
| 59 | <i>Lagenaria siceraria</i> (Molina) Standl. | Upo | 2 | 0.02 | XII: boils XVIII: headache | 1 1 | - - |
| 60 | <i>Lagerstroemia speciosa</i> (L.) Pers. | Banaba | 18 | 0.19 | XIV: urinary tract infection, kidney problems | 18 | 100.00 |
| 61 | <i>Lantana camara</i> L. | Kantutay | 2 | 0.02 | XVIII: abdominal pain | 2 | 100.00 |
| 62 | <i>Leucaena leucocephala</i> (Lam.) de Wit | Ipil-ipil | 1 | - | XVIII: pain | 1 | - |
| 63 | <i>Mangifera indica</i> L. | Mangga | 4 | 0.04 | IV: diabetes | 4 | 100.00 |
| 64 | <i>Manilkara sapota</i> Van Royen | Tsiko | 1 | - | XIV: menstrual cramps XXI: relapse | 1 1 | - - |
| 65 | <i>Mentha arvensis</i> L. | Yerba buena | 1 | - | XIX: bruise | 1 | ? |
| 66 | <i>Mimosa pudica</i> L. | Makahiya | 2 | 0.02 | X: asthma XVIII: fever XIX: wound | 2 1 1 | 50.00 - - |
| 67 | <i>Momordica charantia</i> L. | Ampalaya | 1 | - | IV: diabetes | 1 | - |
| 68 | <i>Moringa oleifera</i> Lam. | Malunggay | 9 | 0.10 | III: anemia IV: diabetes VII: sore eyes XIV: difficulty in urination XV: lactation problem XIX: wound | 2 1 2 1 1 4 | 18.18 - 18.18 - - 36.36 |
| 69 | <i>Muntingia calabura</i> L. | Aratiles | 1 | - | XI: diarrhea | 1 | - |
| 70 | <i>Ocimum tenuiflorum</i> L. | Sulasi | 3 | 0.03 | X: common cold XVIII: cough | 2 1 | 66.67 - |
| 71 | <i>Orthosiphon aristatus</i> (Blume) Miq. | Taheebo | 3 | 0.03 | IV: diabetes IX: hypertension XVIII: cough, body pain | 2 2 3 | 28.57 28.57 42.86 |
| 72 | <i>Pandanus tectorius</i> Parkinson ex Du Roi | Pandan | 2 | 0.02 | XXI: relapse | 2 | 100.00 |
| 73 | <i>Peperomia pellucida</i> (L.) Kunth | Pansit-pansitan | 3 | 0.03 | XIII: arthritis, rheumatism XIV: difficulty of urination | 2 1 | 66.67 - |
| 74 | <i>Persea americana</i> Mill. | Abokado | 2 | 0.02 | XIV: dysmenorrhea XVIII: abdominal pain | 2 2 | 50.00 50.00 |
| 75 | <i>Phyllanthus niruri</i> L. | Sampa-sampalukan | 1 | - | XVIII: cough | 1 | - |
| 76 | <i>Piper betle</i> L. | Ikmo | 2 | 0.02 | XIII: arthritis XVIII: fever, gas pain | 1 2 | - 66.67 |
| 77 | <i>Piper retrofractum</i> Vahl | Litlit | 4 | 0.04 | XIII: rheumatism | 4 | 100.00 |
| 78 | <i>Plantago major</i> Linn. | Lanting | 1 | - | X: asthma XII: boils, skin irritation XIX: wounds | 1 1 1 | - - - |
| 79 | <i>Plectranthus amboinicus</i> (Lour.) Spreng. | Oregano/ Klabo | 51 | 0.54 | X: asthma XVIII: cough, fever XIX: wound | 1 51 1 | - 96.23 - |

Continued...

Table 1: Cont'd.

| Plant No. | Scientific Name | Vernacular Name | UR | UV | Ailments Treated | Ur Per Ailment Category | FL (in %) |
|-----------|--|---------------------------|----|------|--|-------------------------|-----------|
| | | | | | Categorized According to ICD-10 | | |
| 80 | <i>Plectranthus scutellarioides</i> (L.) R.Br. | Mayana | 5 | 0.05 | XII: boils | 1 | - |
| | | | | | XIV: menstrual cramps | 2 | 25.00 |
| | | | | | XVIII: headache, fever, lump | 4 | 50.00 |
| | | | | | XIX: wound | 1 | - |
| 81 | <i>Plumbago indica</i> L. | Laurel | 1 | - | XVIII: headache, fever | 1 | - |
| 82 | <i>Premna odorata</i> Blanco | Alagaw | 4 | 0.04 | XVIII: cough | 4 | 100.00 |
| 83 | <i>Psidium guajava</i> L. | Bayabas | 22 | 0.23 | XI: diarrhea | 12 | 52.17 |
| | | | | | XII: skin allergy | 1 | - |
| | | | | | XVIII: abdominal pain, headache, dizziness | 4 | 17.39 |
| | | | | | XIX: wound | 6 | 26.09 |
| 84 | <i>Raphanus raphanistrum</i> L. | Labanos | 1 | - | XI: diarrhea | 1 | - |
| 85 | <i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz | Serpentina/ Likha | 27 | 0.29 | I: dengue | 1 | - |
| | | | | | IV: diabetes | 13 | 44.83 |
| | | | | | IX: hypertension | 4 | 13.79 |
| | | | | | XIV: kidney problems, dysmenorrhea | 3 | 10.34 |
| | | | | | XVIII: abdominal pain, body pain, cough | 8 | 27.59 |
| 86 | <i>Rosa</i> spp. | Rosas | 1 | - | XI: diarrhea | 1 | - |
| | | | | | XIX: cut | 1 | - |
| 87 | <i>Sandoricum koetjape</i> (Burm.f.) Merr. | Santol | 2 | 0.02 | XII: skin rashes | 1 | - |
| | | | | | XVIII: fever | 1 | - |
| 88 | <i>Senna alata</i> (L.) Roxb. | Akapulko | 4 | 0.04 | I: ringworm, athlete's foot, scabies | 4 | 100.00 |
| 89 | <i>Senna tora</i> (L.) Roxb. | Katanda | 1 | - | I: ringworm, scabies | 1 | - |
| 90 | <i>Smallanthus sonchifolius</i> (Poepp.) H. Rob. | Yacon | 1 | - | IV: diabetes | 1 | - |
| 91 | <i>Sonneratia caseolaris</i> (L.) Engl. | Hinlalayan/ Hikaw-hikawan | 1 | - | XVIII: fatigue | 1 | - |
| | | | | | XXI: relapse | 1 | - |
| 92 | <i>Syzygium cumini</i> (L.) Skeels | Duhat | 1 | - | IV: diabetes | 1 | - |
| 93 | <i>Tabernaemontana pandacaqui</i> Lam. | Pandakaki | 1 | - | XIV: menstrual cramps | 1 | - |
| 94 | <i>Taraxacum croceum</i> Dahlst. | Dandelion | 1 | - | XIX: wound, cut | 1 | - |
| 95 | <i>Terminalia catappa</i> L. | Kapili | 1 | - | X: flu | 1 | - |
| | | | | | XIII: arthritis | 1 | - |
| 96 | <i>Tinospora crispa</i> (L.) Hook.f. and Thomson | Makabuhay | 1 | - | XIV: irregular menstruation | 1 | - |
| 97 | <i>Vitex negundo</i> L. | Lagundi | 44 | 0.47 | X: asthma | 1 | - |
| | | | | | XIV: difficulty in urination | 1 | - |
| | | | | | XVIII: cough, fever | 33 | 94.29 |
| 98 | <i>Zea mays</i> L. | Mais | 1 | - | XIV: urinary tract infection | 1 | - |
| 99 | <i>Zingiber officinale</i> Roscoe | Luya | 7 | 0.07 | X: sore throat | 2 | 28.57 |
| | | | | | XIII: arthritis, rheumatism | 5 | 71.43 |
| 100 | Unidentified | Apalya | 1 | - | XVIII: cough | 1 | - |
| 101 | Unidentified | Halang panulak | 1 | - | XIV: menstrual cramps | 1 | - |
| 102 | Unidentified | Oramisan | 1 | - | IX: hypertension | 1 | - |
| 103 | Unidentified | Viray | 1 | - | X: flu | 1 | - |
| 104 | Unidentified | Zambales | 1 | - | XIX: wound | 1 | - |
| 105 | Unidentified | - | 1 | - | XIII: arthritis | 1 | - |
| 106 | Unidentified | - | 1 | - | IX: heart problem, hypertension | 1 | - |
| | | | | | XI: hemorrhoid | 1 | - |
| | | | | | XIV: urinary tract infection | 1 | - |

Table 2: Fidelity (FL) and informant consensus factor (ICF) to identify the most frequently used species in each ailment category.

| ICD -10 | Disease Category | No. Of use-reports | No. Of plants used | ICF | Most Frequently Used Species | FL (%) In This Category |
|---------|---|--------------------|--------------------|------|--|-------------------------|
| I | Certain infectious and parasitic diseases | 17 | 7 | 0.43 | <i>Senna alata</i> | 100.00 |
| II | Neoplasms | 13 | 7 | 0.50 | <i>Annona muricata</i> | 28.00 |
| III | Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism | 3 | 2 | 0.50 | <i>Moringa oleifera</i> | 18.18 |
| IV | Endocrine, nutritional and metabolic diseases | 42 | 14 | 0.68 | <i>Mangifera indica</i> | 100.00 |
| VI | Diseases of the nervous system | 1 | 1 | - | - | - |
| VII | Diseases of the eye and adnexa | 2 | 1 | 1.00 | <i>Moringa oleifera</i> | 18.18 |
| IX | Diseases of the circulatory system | 25 | 13 | 0.50 | <i>Cymbopogon citratus</i> | 50.00 |
| X | Diseases of the respiratory system | 17 | 13 | 0.25 | <i>Ocimum tenuiflorum</i> | 66.67 |
| XI | Diseases of the digestive system | 40 | 14 | 0.67 | <i>Chrysophyllum cainito</i> | 100.00 |
| XII | Diseases of the skin and subcutaneous tissue | 14 | 14 | - | - | - |
| XIII | Diseases of the musculoskeletal system and connective tissue | 34 | 19 | 0.45 | <i>Croton tiglium</i> | 100.00 |
| XIV | Diseases of the genitourinary system | 60 | 20 | 0.67 | <i>Lagerstroemia speciosa</i> | 100.00 |
| XV | Pregnancy, childbirth and the puerperium | 1 | 1 | - | - | - |
| XVIII | Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified | 183 | 44 | 0.76 | <i>Premna odorata</i> | 100.00 |
| XIX | Injury, poisoning and certain other consequences of external causes | 27 | 16 | 0.42 | <i>Moringa oleifera</i> | 36.36 |
| XXI | Factors influencing health status and contact with health services | 10 | 7 | 0.33 | <i>Cordia dichotoma</i> <i>Pandanus tectorius</i> | 100.00 100.00 |

diseases; *Cymbopogon citratus* for diseases of the circulatory system; *Ocimum tenuiflorum* for diseases of the respiratory system; *C. cainito* for diseases of the digestive system; *C. tiglium* for diseases of the musculoskeletal system and connective tissue; *L. speciosa* for diseases of the genitourinary system; *P. odorata* for symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; and *C. dichotoma* and *P. tectorius* for factors influencing health status and contact with health services.

DISCUSSION

According to the Philippine Department of Health,^[21] ICD-10 represents the universe of diseases, disorders, injuries and other related health conditions. The classification of ailments based on this ICD-10 has already been used in several local,^[22-24] and international studies^[25-28] that aimed to analyze gathered ethnomedicinal data. This approach could guide institutions in making relevant policies and in the development of medical drugs. The 16 different categories of ailments that were reported in this study, therefore, reflect the

wide variety of uses of plants in the province of Cavite that can be tested for safety and efficacy for possible pharmacological applications.

In terms of the calculated UV, the high values obtained for many reported plants indicate the wide utilization, high availability, huge importance, and high perceived efficacy of these plants for medicinal purposes,^[29,30] but does determine whether or not the plant is used to address single or several ailments.^[31] In the study of Dapar *et al.*^[31] with the Manobo tribe of Agusan del Sur, the three medicinal plants with the highest UV were *Anodendron borneense*, *Piper decumanum*, and *Micromelum minutum*. The medicinal plants included in its top 20 which are also mentioned in this study were *Jatropha gossypifolia*, *Tinospora crispa*, *P. odorata*, *C. papaya*, and *Orthosiphon aristatus*. Abe and Ohtani,^[1] on the other hand, reported *H. rosa-sinensis*, *C. nucifera*, *Piper betle*, *S. alata*, and *M. oleifera* as the medicinal plants with the highest UV in Batan Island, Batanes. As high UV indicates a possible high harvesting pressure,^[29-32] these medicinal plants, therefore, need to be conserved for continued medicinal use and for possible scientific studies in the future.

For the ICF, a high value means that the informants have a consensus for a specific plant that may be used for a particular category, which in the case of category VII (ICF=1.00) is *M. oleifera*. The lowest ICF value (0.25), on the other hand, was obtained for category X. This suggests a lower level of consensus among informants on the use of a plant species to address this disease category. In addition, with the availability of commercial medicines that provide modern alternatives to herbal medicine, a low ICF value reflects the reduced use of some traditional remedies.^[2] The ICF values may vary from culture to culture reflecting the differences in medicinal plants found and used in these areas, and the ailments that these plants are being used for. For instance, the study of Ong and Kim^[33] involving the Ati Negritos group in Guimaras reported the highest consensus (ICF=1.00) for the ‘diseases of the ear’ and ‘factors that influence health status and services’. The Ayta informants from the study of Tantengco *et al.*^[34] in Dinalupihan, Bataan, on the other hand, had the highest ICF value for the ‘diseases of the eye and the adnexa’ (ICF value=0.905) and for the ‘diseases during the postpartum period’ (ICF value=0.858).

Next, the high FL values suggest the relative importance of the species in the locality, and their relative medicinal potential to treat the ailments for which they are being used. Similar to the findings of this study, several local studies also reported a 100% FL value for *C. papaya*,^[1,31] *C. cainito*,^[23] *C. x microcarpa*,^[23] *H. rosa-sinensis*,^[33] *P. odorata*,^[31] and *S. alata*.^[33] A 100% FL value indicates that almost all the use-reports for these plants refer to same purpose.^[35] This could also indicate the presence of valuable phytochemical compounds in these plants that could be investigated for possible pharmacological use. Low FL values, on the other hand, indicate a lesser preference for a plant species to treat a particular ailment. This is due to the report that these plants are being utilized to treat ailments belonging to many ailment categories. However, having multiple therapeutic applications could also suggest the presence of a wide range of potent phytochemicals in these medicinal plants; hence, can also be subjected to further studies.

Lastly, the findings of this study on the most preferred plant species used to address a particular ailment category are supported by a number of publications: the use against certain infectious and parasitic diseases of *S. alata* is supported by its reported antifungal and antihelmintic properties;^[36,37] the use to treat eye-related ailments and wounds of *M. oleifera* is supported by its reported antimicrobial, antiviral, and antioxidant properties;^[38-40] the efficacy of *M. indica* to specifically treat

diabetes is supported by its antidiabetic property;^[41,42] the utilization of *O. tenuiflorum* to treat common colds is attributed to a variety of its pharmacological properties;^[43] the use to treat diarrhea of *C. cainito* could be due to its antimicrobial and astringent properties;^[44] the use of *C. tigilium* in addressing muscle problems could be related to its reported smooth muscle relaxant activity;^[45] the efficacy against urinary problems of *L. speciosa* is supported by its described diuretic effect;^[46] the use of *P. odorata* in specifically treating cough could be due to its reported antitubercular constituents;^[47] and the effective use of *C. dichotoma* and *P. tectorius* in addressing relapse could be due to their antipyretic and analgesic properties.^[48,49]

CONCLUSION

This study reveals that the province of Cavite in the Philippines remains rich in medicinal knowledge as reflected by the considerable number of plants that were reported to be of medicinal importance. These plants can treat several human related ailments belonging to 16 ICD-10 categories, and given the reported UV, ICF, and FL values, this study, therefore, gives information on a wide variety of plants that can be tested for possible pharmacological use in the future, and that can further be preserved for more sustainable use by the local communities.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

FL: fidelity level; **ICD:** International Classification of Diseases; **ICF:** informant consensus factor; **UV:** use-value

SUMMARY

This study describes the importance and diversity of traditional uses of medicinal plants in Cavite, Philippines using quantitative indices. The use-values revealed a number of medicinal plants widely utilized in the province. ICF values, based on the agreement among informants, determined the plants that could be used in addressing a particular ailment category. Further, 18

medicinal plants had an FL value of 100% indicating that all the use-reports for these plants refer to the same purpose.

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