Indian Journal of Traditional Knowledge
Vol 20(2), April 2021, pp 335-343

The practice of using medicinal plants by local herbalists in Cavite, Philippines

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Received 19 July 2019; revised 26 February 2021

Medicinal plants are widely spread all over the Philippines and the knowledge of their utilization is held by various distinct local groups. This study was conducted to document this oral tradition which is threatened to be lost due to rapid urbanization. This paper aims to provide a documentation of the local knowledge and practices on medicinal plant utilization in the urban province of Cavite, Philippines. Ninety-four informants were identified and interviewed. A total of 106 medicinal plants that belong to 50 families, mostly represented by Lamiaceae were documented. Most of these plants are cultivated herbs in which leaves are in the highest preference for the used plant organ. Also, medicinal preparations are usually employed internally as decoctions. This study demonstrates wide range of plant species of medicinal value in Cavite and the role that these traditional knowledge and practices are playing in supporting the local health care system. More importantly, the medicinal uses reported in this study could be scientifically tested for safety and efficacy for possible pharmaceutical applications in the future.

Keywords: Cavite, Ethnomedicine, Medicinal plants, Philippines, Traditional knowledge

IPC Code: Int Cl.[21]: A61K 36/00, A61K 36/185, A61K 45/00, F15B 21/047

Plants play an important role in the world's biodiversity. It is one of the most important resources in the world[1] as it provides a lot of ecological services including medicine—that between 50,000 to 80,000 of the total 422,000 angiosperms are being utilized worldwide for medicinal purposes[2,3]. It is primarily because of the natural abundance, easy access and cost-effectiveness of these medicinal plants[4,5].

As medicinal plants naturally thrive in areas of early human settlements including forests and even near aquatic environments, various communities over hundreds of years have learned to use these plants in combating diseases and disorders and sustaining good health conditions[3,4]. This was usually achieved through a trial and error method and was then considered as an art of religious or magical healing[6].

In this modern era, the use of medicinal plants still holds a significant part in supporting worldwide healthcare especially in developing countries, including the Philippines[7], where people in remote sites have inaccessibility to obtaining modern health services[8]. The World Health Organization[9] even has estimated that up to 80% of the world's population still depends on this traditional system of medical support. Documentation of this traditional medicinal knowledge, therefore, is necessary for its preservation especially because of the fact that industrialization causes the younger generation to be more exposed to the mainstream society leading to the gradual loss of such traditional cultures[10]. The problem becomes even worse as most studies concerning local medicinal knowledge focus more on rural areas where indigenous groups are most likely found and less on urbanized areas where this knowledge is more at threat of rapidly being lost. In response, this study was conducted to document the knowledge and practices of using medicinal plants by local herbalists in Cavite, a predominantly urban province in the Philippines. This is of huge significance not just to conserve this medicinal information, but to also help in improving local health care practices. It can also serve as a basis for further pharmacological studies that can ultimately lead to drug development.

Methodology

Study area

Cavite is a province in mainland Luzon, Philippines, that is characterized by having a shoreline that faces Manila Bay, central hilly upland areas and a rugged portion bordering the Batangas province[11]. It is a predominantly urban province divided into eight congressional districts comprised of seven cities and 16 municipalities. The study was performed in 15 randomly selected cities/municipalities,

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where each area was represented by three non-Poblacion Barangays as listed in Table 1.

Ethnomedicinal data collection

Prior to conducting the survey, proper permission for the research study was sought from the Ethics Review Board of Cavite State University and then from every concerned municipal and/or Barangay leaders for ethical and security purposes.

Data collection was done from August 2017 to February 2018. Snowball or chain referral sampling was used to identify the informants for the study. It is a non-probability sampling technique that identifies target participants who are difficult to locate[12]. These informants involved local herbalists in the Barangay who are conversant with the local medicinal uses of plants in the area.

A total of 94 informants (i.e*.,* 42 males and 52 females, aged 24 to 82 where 56 of them were 50 years and older) were identified. These informants were initially given a brief background of the study and were asked to read and sign an Informed Consent Form where the study procedures, benefits and risks and confidentiality were discussed. Overall, the informants have an average residential length of 52 years in their respective Barangays, making them credible enough to report the traditional health care knowledge and practices that mainly use the medicinal plants found in the study area. Their knowledge of using medicinal plants was mostly obtained from their ancestors through oral communication. This was reported by a total of 65 informants. Nineteen informants, on the other hand, obtained such knowledge from pieces of training, schooling and mass media, while six believed that their capacity to cure medical ailments is a supernatural gift that enabled them to find out how plants could be used as medicine. The remaining four further reported to possess such knowledge due to the influence of other herbalists.

With the use of a semi-structured questionnaire, informants were asked about their traditional health knowledge and practices. The following information were gathered: (a) vernacular names of local medicinal plants which they use, (b) ailments treated, (c) part of the plant being used, (d) plant habit, (e) plant type (i.e., cultivated or wild), (f) harvest time, (g) preparation methods, (h) other added ingredients and (i) administration routes.

Plant collection and identification

The interviews were performed in combination with a field visit to collect and take pictures of the reported medicinal plants. This was done accompanied by the informants. Using the standard practice in herbarium preparation[13], the collected plant samples were pressed, dried up and preserved. The identity of these herbarium specimens was then determined down to species level using the taxonomic accounts from various plant taxonomy websites (e.g., Philippine-plants.org, phytoimages.siu.edu, stuartx-change.com). Accepted scientific names were counter-checked from the plantlist.org and were used. Herbarium specimens were deposited in the Department of Biological Sciences, Cavite State University, Indang, Cavite.

Table 1 — Representative Barangays of each municipality/city of Cavite where surveys were conducted

MUNICIPALITY/ CITY	REPRESENTATIVE BARANGAYS
Amadeo	Maymangga, Minantok Kanluran, Pangil
Bacoor City	Molino II, Molino III, Molino IV
Carmona	Bancal, Lantic, Mabuhay
Cavite City	Lawin, Virgo, Taurus
Dasmariñas City	Burol, Paliparan I, San Jose I
General Trias City	Panungyanan, Pasong Kawayan I, Pinagtipunan
Imus City	Anabu I-C, Anabu II-B, Anabu I-F
Indang	Calumpang Cerca, Calumpang Lejos, Kayquit I
Kawit	Binakayan-Kanluran, Panamitan, Potol
Noveleta	San Jose II, San Rafael I, Santa Rosa II
Rosario	Bagbag II, Sapa I, Silangan II
Silang	Buho, Carmen, Hukay
Tagaytay City	Asisan, Neogan, Sambong
Tanza	Bunga, Capipisa, Mulawin
Trece Martires City	Aguado, Conchu, Lapidario

Data analysis

Gathered data were subjected to descriptive statistics such as mean, percentage, frequency and ranking to present the demographic profiles of respondents and some of the ethnomedicinal data.

Results and Discussion

Reported ethnomedicinal plants

The survey documented 106 medicinal plants that are being used by local herbalists in Cavite (Table 2). These belong to 50 families and 88 genera, out of which the Lamiaceae family with eight species has the largest reported medicinal plants (8.08%). This plant family is known for its cosmopolitan distribution[14] and is primarily used in traditional medicinal practices because of their rich and fragrant essential oils[15].

Following the Lamiaceae family are the Leguminosae and Compositae families having six (6.06%) and five (5.05%) reported species, respectively. Annonaceae, Euphorbiaceae and Poaceae then placed next having four species constituting individually to 4.04%. With three reported species each (3.03%) are the families Amaryllidaceae, Apiaceae, Apocynaceae, Cucurbitaceae, Euphorbiaceae, Malvaceae, Myrtaceae, Piperaceae, Rutaceae and Zingiberaceae. The use of plants belonging to these families as medicine was also mentioned in numerous ethnomedicinal studies in the Philippines[2,8,16-19] and internationally[20-26].

Table 2 — List of reported ethnomedicinal plants, the ailments they address, plant parts used, and their preparation and administration.

PLANT NO.	SCIENTIFIC NAME	FAMILY	VERNACULAR NAME	AILMENTS TREATED	PLANT PART USED	PREPARATION	ROUTE OF ADMINISTRATION
1	*Abelmoschus esculentus* (Linn.) Moench.	Malvaceae	Okra	Body pain	Fruit	Decoction & Maceration	Internal
2	*Acorus calamus* L.	Acoraceae	Lubigan	Arthritis, rashes, hex, gout	Leaf, Stem, Bulk & Root	Decoction	Internal
				Heart problem	Leaf	Bathed	External
3	*Albizia saman* (Jacq.) Merr.	Leguminosae	Acacia	Diarrhea, headache, cough	Leaf	Decoction	Internal
4	*Allium ascalonicum* L.	Amaryllidaceae	Sibuyas tagalog	Diarrhea, dizziness, cough	Root	None	Internal
5	*Allium sativum* L.	Amaryllidaceae	Bawang	Breast cancer, cough, asthma	Root	None	Internal
6	*Allium tuberosum* Rottler ex Spreng	Amaryllidaceae	Kutsay	Abdominal pain, body pain	Leaf	Decoction	Internal
7	*Alpinia elegans* (C.Presl) K.Schum	Zingiberaceae	Tagbak	Paralyzed part of the body	Leaf	Poultice	External
				Relapse	Leaf	Bathed	External
8	*Ananas comosus* (L.) Merr.	Bromeliaceae	Pinya	Hypertension, breast cancer	Fruit	None	Internal
9	*Angelica keiskei* (Miq.) Koidz.	Apiaceae	Ashitaba	Constipation, hypertension	Leaf	Decoction	Internal
10	*Annona muricata* L.	Annonaceae	Guyabano	Hypertension, body pain, diabetes, UTI, breast cancer, kidney problems	Leaf	Decoction	Internal
11	*Annona reticulata* L	Annonaceae	Anonas	Relapse	Leaf	Decoction	Internal or External
12	*Annona squamosa* L.	Annonaceae	Atis	Menstrual cramps, hyperacidity	Leaf	Decoction or crushing	Internal
13	*Antidesma bunius* (L.) Spreng	Phyllanthaceae	Bignay	Anemia, hypertension	Leaf, Fruit	Decoction	Internal
14	*Ambrosia peruviana* Willd.	Compositae	Altamisa	Cleansing, cholesterol, hypertension	Leaf	Decoction	Internal
15	*Apium graveolens* L.	Apiaceae	Kintsay	Fever, menstrual cramps, body pain	Leaf	Decoction	Internal
16	*Artemisia vulgaris* L.	Compositae	Damong maria	Diabetes	Fruit	None	Internal
17	*Artocarpus heterophyllus* Lam.	Moraceae	Langka	Arthritis	Leaf	Crushing	External
18	*Asparagus officinalis* L.	Asparagaceae	Asparagus	Rashes	Leaf	Poultice	External
				Wounds, warts	Leaf	Crushing & bathed	External
19	*Averrhoa bilimbi* L.	Oxalidaceae	Kamias	Boils, swollen muscles	Leaf	Poultice	External

(*Contd*.)

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PLANT NO.	SCIENTIFIC NAME	FAMILY	VERNACULAR NAME	AILMENTS TREATED	PLANT PART USED	PREPARATION	ROUTE OF ADMINISTRATION
20	*Basella alba* L.	Basellaceae	Alugbati	Fever, headache, swollen muscles	Leaf	Poultice	External
21	*Bixa orellana* L.	Bixaceae	Atsuete	Diabetes, cough, fever, abdominal pain	Leaf	Decoction	Internal
				UTI, *lamig*, relapse, wounds	Leaf	Bathed	External
22	*Blumea balsamifera* (L.) DC.	Compositae	Sambong	Abdominal pain	Leaf	Poultice	External
23	*Brassica juncea* (L.) Czern.	Brassicaceae	Mustasa	Eczema, sprain	Leaf	Poultice	External
24	*Bryophyllum pinnatum* (Lam.) Oken	Crassulaceae	Katakataka	Arthritis, fever	Bulk	Decoction	External
25	*Cananga odorata* (Lam.) Hook.f. & Thomson	Annonaceae	Ylang-ylang	Hyperacidity	Fruit	Poultice	External
26	*Capsicum annuum* L.	Solanaceae	Sili	Arthritis	Leaf	Poultice	External
27	*Carica papaya* L.	Caricaceae	Papaya	Cancer, cough	Leaf	Decoction	Internal
28	*Catharanthus roseus* (L.) G.Don	Apocynaceae	Tsitsirika	Diarrhea	Leaf	Decoction	Internal
29	*Chrysophyllum cainito* L.	Sapotaceae	Kaimito	Cough	Fruit	Decoction	Internal
30	*Citrus x microcarpa* Bunge	Rutaceae	Kalamansi	Cough, gas pain	Fruit	Decoction	Internal
31	*Citrus sinensis* (L.) Osbeck	Rutaceae	Orange	Cancer, hypertension	Fruit	None	Internal
32	*Citrus limon* (L.) Osbeck.	Rutaceae	Lemon	Diarrhea	Leaf	Poultice	Internal
33	*Clerodendrum intermedium* Cham.	Lamiaceae	Kasopangil	UTI	Fruit	None	Internal
34	*Cocos nucifera* L.	Arecaceae	Buko/Niyog	Asthma, arthritis	Leaf	Crushing	External
35	*Colocasia esculenta* (L.) Schott	Araceae	Gabi	Headache	Leaf	Poultice	External
36	*Combretum indicum* (L.) DeFilipps	Combretaceae	Niog-niogan	Sore throat	Leaf	Decoction	Internal
37	*Corchorus olitorius* L.	Malvaceae	Saluyot	Relapse	Leaf	Decoction	Internal or External
38	*Cordia dichotoma* G.Forst.	Boraginaceae	Anonang	Arthritis, swollen muscles, strain & bruises	Leaf	Heating	External
39	*Croton tiglium* L.	Euphorbiaceae	Tuba	Bruises	Fruit	Poultice	External
40	*Cucumis sativus* L.	Cucurbitaceae	Pipino	Diabetes, arthritis, body pain, cough, *lamig*	Root	Decoction	Internal
41	*Curcuma longa* L.	Zingiberaceae	Luyang dilaw	Hypertension	Leaf	Decoction	Internal
42	*Cymbopogon citratus* (DC.) Stapf	Poaceae	Tanglad/Salay	Cough, cancer	Root	None	Internal
43	*Daucus carota* L.	Apiaceae	Carrot	Allergy	Leaf	Poultice	External
44	*Dendrocnide meyeniana* (Walp.) Chew	Urticaceae	Lipa	Abdominal pain	Leaf, Bulk	Decoction	Internal
45	*Diospyros discolor* Willd.	Ebenaceae	Mabolo	Rashes	Leaf	Poultice	External
46	*Ehretia microphylla* Lam.	Boraginaceae	Tsaang-gubat	Cleansing of the body, tuberculosis, diabetes, body pain, UTI, cancer,dysmenorrhea, arthritis	Leaf, Stem, Bulk & Root	Heating	Internal
47	*Eleusine indica* (L.) Gaertn.	Poaceae	Paragis	Cough	Leaf	Decoction	Internal
48	*Eucalyptus globulus* Labill.	Myrtaceae	Eucalyptus	Diarrhea, dysmenorrhea	Root, Bulk	Decoction	Internal
49	*Euphorbia hirta* L.	Euphorbiaceae	Tawa-tawa	Dermatitis	Leaf	Decoction	External

(*Contd*.)

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50	*Garcinia x mangostana* L.	Clusiaceae	Mangosteen	Dengue fever, fever	Leaf	Decoction	Internal
51	*Gliricidia sepium* (Jacq.) Walp.	Leguminosae	Kakawate	Hemorrhoids, swollen muscles, boils, *lamig*	Leaf	Poultice or crushing	External
52	*Graptophyllum pictum* (L.) Griff.	Acanthaceae	Morado	Swollen muscles, flu	Leaf	Poultice	External
53	*Hibiscus rosa-sinensis* L.	Malvaceae	Gumamela	Wound, arthritis, diabetes	Leaf	Decoction	Internal
54	*Imperata cylindrica* (L.) Raeusch	Poaceae	Kogon	Diabetes	Leaf	None	Internal
55	*Ipomoea aquatica* Forssk.	Convolvulaceae	Kangkong	Dengue fever, mumps	Leaf	Decoction	Internal
56	*Jasminum sambac* (L.) Aiton	Oleaceae	Sampaguita	Arthritis, gas pain, swollen feet	Leaf, Root	Heating	External
57	*Jatropha curcas* L.	Euphorbiaceae	Mirasol	Boils	Leaf, Flower	Poultice	External
58	*Jatropha gossypiifolia* L.	Euphorbiaceae	Tuba-tuba	Headache, boils	Leaf, Fruit	Poultice & crushing	External
59	*Lagenaria siceraria* (Molina) Standl.	Cucurbitaceae	Upo	UTI, urinary problems, kidney problems	Leaf, Flower	Decoction	Internal
60	*Lagerstroemia speciosa* (L.) Pers.	Lythraceae	Banaba	Abdominal pain	Leaf, Stem & Root	Poultice & crushing	External
61	*Lantana camara* L.	Verbenaceae	Kantutay	Internal pain	Bulk	None	Internal
62	*Leucaena leucocephala* (Lam.) de Wit	Leguminosae	Ipil-ipil	Diabetes	Leaf	Decoction	Internal
63	*Mangifera indica* L.	Anacardiaceae	Mangga	Menstrual cramps, relapse	Leaf	Decoction	Internal
64	*Manilkara sapota* Van Royen	Sapotaceae	Tsiko	Bruises	Leaf	Poultice	External
65	*Mentha arvensis* L.	Lamiaceae	Yerba buena	Wounds, fever, asthma	Leaf	Bathed	External
66	*Mimosa pudica* L.	Leguminosae	Makahiya	Diabetes	Leaf	Decoction	Internal
67	*Momordica charantia* L.	Cucurbitaceae	Ampalaya/ Ampalayang-ligaw	Diabetes	Fruit	None	Internal
				Diarrhea	Leaf	Crushing	Internal
				Wounds, diabetes, irritation of eyes, sore eyes,	Leaf	Decoction or crushing	Internal
68	*Moringa oleifera* Lam.	Moringaceae	Malunggay	Diarrhea	Leaf	Decoction	Internal
69	*Muntingia calabura* L.	Muntingiaceae	Aratiles	Cough, cold	Leaf	Decoction	Internal
70	*Ocimum tenuiflorum* L.	Lamiaceae	Sulasi	Diabetes, cough, hypertension	Leaf, Flower	Decoction	Internal
				Body pain	Flower	Bathed	External
71	*Orthosiphon aristatus* (Blume) Miq.	Lamiaceae	Balbas Pusa/ Taheebo	Diabetes, cough, hypertension	Leaf, Flower	Decoction	Internal
				Body pain	Flower	Bathed	External
72	*Pandanus tectorius* Parkinson ex Du Roi	Pandanaceae	Pandan	Relapse	Leaf	Bathed	External
73	*Peperomia pellucida* (L.) Kunth	Piperaceae	Pansit-pansitan	Arthritis, difficulty of urination	Leaf, Bulk	Decoction	Internal
74	*Persea americana* Mill.	Lauraceae	Abokado	Abdominal pain, dysmenorrhea	Leaf	Decoction	Internal
75	*Phyllanthus niruri* L.	Phyllanthaceae	Sampa-sampalukan	Cough	Leaf	Decoction	Internal
76	*Piper betle* L.	Piperaceae	Ikmo	fever, arthritis	Leaf	Decoction	Internal
				Lamig	Leaf	Poultice	External
77	*Piper retrofractum* Vahl	Piperaceae	Litlit	Boils, wounds, asthma, skin irritation	Leaf	Decoction	External
78	*Plantago major* Linn.	Plantaginaceae	Lanting	Cough, fever & asthma	Leaf	Decoction	Internal
				Wounds	Leaf	Poultice or crushing	External

(*Contd*.)

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PLANT NO.	SCIENTIFIC NAME	FAMILY	VERNACULAR NAME	AILMENTS TREATED	PLANT PART USED	PREPARATION	ROUTE OF ADMINISTRATION
79	*Plectranthus amboinicus* (Lour.) Spreng.	Lamiaceae	Oregano/Klabo	Menstrual cramps, headache, fever	Leaf	Decoction	Internal
				Wounds, boils, lumps	Leaf	Poultice	External
80	*Plectranthus scutellarioides* (L.) R.Br.	Lamiaceae	Mayana	Headaches, fever	Bulk	Poultice	External
81	*Plumbago indica* L.	Plumbaginaceae	Laurel	Cough	Leaf	Decoction	Internal
82	*Premna odorata* Blanco	Lamiaceae	Alagaw	Diarrhea, abdominal pain, allergy, headache	Leaf	Decoction	Internal
				Wounds	Leaf	Poultice	External
83	*Psidium guajava* L.	Myrtaceae	Bayabas	Diarrhea, abdominal pain, allergy, headache	Leaf	Decoction	Internal
				Wounds	Leaf	Poultice	External
84	*Raphanus raphanistrum* subsp. *sativus* (L.) Domin	Brassicaceae	Labanos	Diabetes, dengue fever, kidney problems, abdominal pain, dysmenorrhea	Leaf	Decoction	Internal
				Body pain	Leaf	Bathed	External
85	*Rauvolfia serpentina* (L.) Benth. ex Kurz	Apocynaceae	Serpentina/Likha	Diarrhea	Leaf	Decoction	Internal
86	*Rosa* spp.	Rosaceae	Rosas	Cuts, diarrhea	Flower	Decoction	External
87	*Sandoricum koetjape* (Burm.f.) Merr.	Meliaceae	Santol	Fever, rashes	Leaf	Bathed & poultice	External
88	*Senna alata* (L.) Roxb.	Leguminosae	Akapulko	Scabies, ringworm, athlete's foots	Leaf	Poultice or crushing	External
89	*Senna tora* (L.) Roxb.	Leguminosae	Katanda	Ringworm, scabies	Leaf	Crushing & poultice	External
90	*Smallanthus sonchifolius* (Poepp.) H.Rob.	Compositae	Yacon	Diabetes	Leaf	Decoction	Internal
91	*Sonneratia caseolaris* (L.) Engl.	Lythraceae	Hinlalayon/ Hikaw-hikawan	Fatigue, relapse	Leaf	Decoction	Internal
92	*Syzygium cumini* (L.) Skeels	Myrtaceae	Duhat	Diabetes	Fruit	Decoction	Internal
93	*Tabernaemontana pandacaqui* Lam.	Apocynaceae	Pandakaki	Menstrual cramps	Leaf	Bathed	External
94	*Taraxacum croceum* Dahlst.	Compositae	Dandelion	Wounds, cuts	Leaf	Poultice	External
95	*Terminalia catappa* L.	Combretaceae	Kapili	Arthritis, flu	Leaf	Decoction	External
96	*Tinospora crispa* (L.) Hook.f. & Thomson	Menispermaceae	Makabuhay	Delayed menstruation	Leaf	Decoction	Internal
97	*Vitex negundo* L.	Lamiaceae	Lagundi	Cough, fever, asthma	Leaf	Decoction	Internal
98	*Zea mays* L.	Poaceae	Mais	UTI	Leaf	Decoction	Internal
99	*Zingiber officinale* Roscoe	Zingiberaceae	Luya	Arthritis, sore throat	Root	Decoction	Internal

Note: Eight (8) of the 106 reported medicinal plants were unidentified and were not included in the list.

Ten plants included in the list of the reported medicinal plant species in this study are being endorsed by the Philippine Department of Health (DOH) after being scientifically proven safe and effective[2]; hence, this could have made an influence in the utilization of these medicinal plants in Cavite. These plants include the following: *A. sativum*, *B. balsamifera, C. indicum, C. retusa, M. arvensis, M. charantia*, *P. guajava, P. pellucida*, *S. alata* and *V. negundo*.

Plant habit and type

In terms of plant habit, the majority of the reported medicinal plants are herbs (36.63%). Similar findings are also revealed in some other studies[27-29]. It is then followed by trees (34.65%), shrubs (20.79%) and vines (7.92%) (Fig. 1).

Moreover, out of the 106 reported medicinal plants, 86.92% are being cultivated in the study area (Fig. 2). This means that these plants are intentionally planted by the informants for a variety of uses. Fourteen

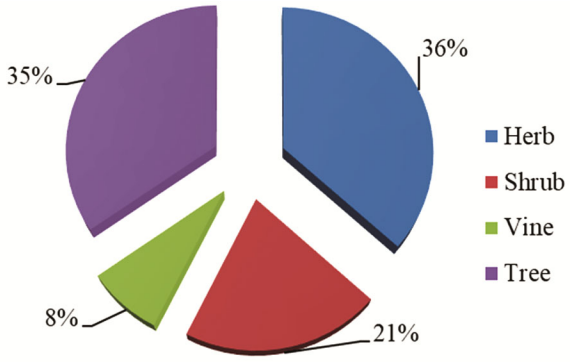

Fig. 1 — Percentage composition of reported medicinal plants in Cavite based on plant habit.

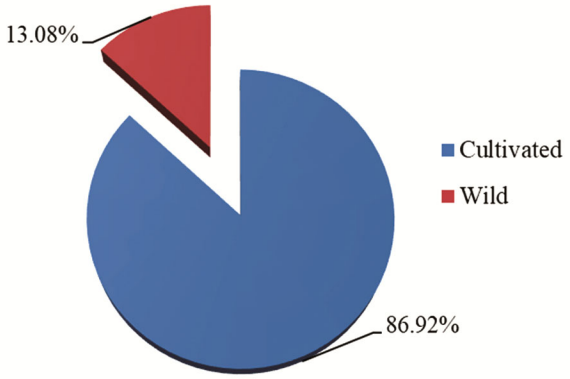

Fig. 2 — Percentage composition of reported medicinal plants in Cavite based on plant type.

medicinal plants, on the other hand, were reported to be of wild types (13.08%) as they naturally grow in the area without the need for human intervention. With this practice, those medicinal plants which are largely found in their natural habitats are facing a major survival threat in addition to the combined effects of continued mass habitat destruction, cultivation of marginal lands and agricultural expansion[29]. This, therefore, implies that cultivating medicinal plants in gardens and backyards significantly helps in their conservation while supplying the locals with their needs to address several medical problems[30].

Plant parts used

The parts of the reported medicinal plants that are used for health treatment were also recorded (Fig. 3). The majority of the reported plant based treatments are prepared using leaves (70.15%) followed by fruits, roots, barks, flowers and stems constituting individually to 8.96%, 7.46%, 5.97% and 3.73% of the total 106 documented medicinal plants, respectively. Also, seed and sap had the least reports constituting to 0.75% each only.

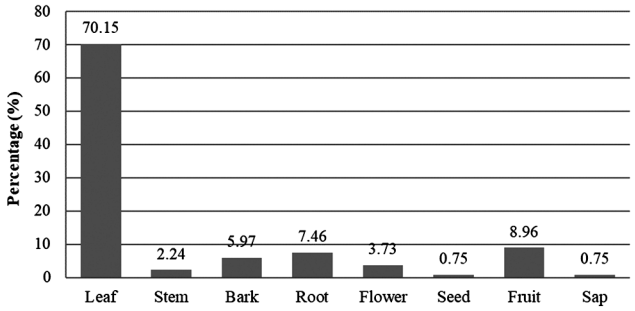

Fig. 3 — Percentage composition of reported medicinal plants in Cavite based on plant parts used.

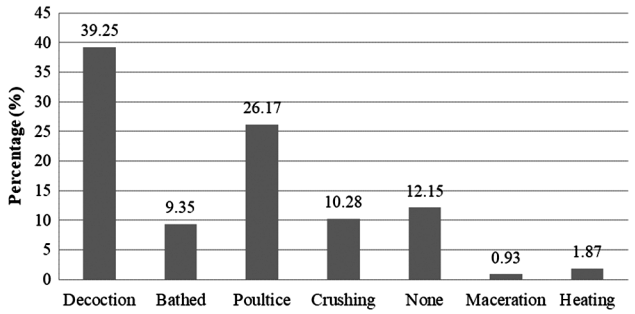

Fig. 4 — Percentage composition of reported medicinal plants in Cavite based on the method of preparation.

Similar results in which leaves are the most frequently used plant part in medicinal preparation were reported in various ethnomedicinal studies in Asia[10,31-33] and other regions of the world[34-40]. The high medicinal utilization of leaves then suggests its high active ingredients composition[6,10]. This practice is also important as it ensures sustainability in the utilization of the plant in comparison to the use of other plant parts which could threaten the continued survival of the mother plant[8]. Leaves are rich in a variety of compounds, many of which are secondary metabolites that play a role in various plant bioactivities and are active components of most herbal preparations[2,6]. As the main photosynthetic plant organ, the resulting photosynthates in the leaves are also translocated to other plant parts such as the barks, roots, seeds and fruits, where these can act as toxins against predators and as source of products with medicinal value to humans[2].

Methods of preparation

Several ways of preparing medicinal plants for use were identified in the study (Fig. 4). Two of the most common medicinal plant preparations are decoction (39.25%) and poultice (26.17%). It is followed by using the plant part intact (12.15%), crushing or pounding (10.28%), preparation for bathing (9.35%),

directly heating the herb before application (1.87%) and by maceration (0.93%).

The decoction is one of the simplest forms of herbal preparation and undoubtedly the oldest. This is made by placing the fresh medicinal plants or dried herbs in water and bringing it to a boil until it is softened. After boiling, the liquid serves as the treatment for different ailments depending on the medicinal plant to be used. Poultice, on the other hand, is used as a herbal first aid for some ailments like burns, cuts, wounds and bruises, in which the plant part used is directly applied to the affected skin either fresh or heated[10].

Route of administration

Medicinal preparations are administered to patients either externally or internally. Out of the 106 reported medicinal plants, 63.41% are prepared to be administered internally while 45.53% are for external use. From these values, some medicinal preparations followed both routes. This constitutes 8.94% of the total number of medicinal plant preparation reports. Between these two routes, internal administration requires the plants used to be tested more for efficacy and safety as this can directly target delicate organs[21]. According to Abe and Ohtani[2], external administration is considered safer as it simply results in indirect yet immediate localized effects.

Use of plant combinations

It was observed that most of the documented medicinal plant species are being used singly in treating different ailments; but in addition to this, the use of plant combinations was also noted. Some examples of the reported plant combinations include the use of decocted leaves of *B. balsamifera* with leaves of *P. guajava* to treat cough; steamed leaves of *P. amboinicus* with *C. microcarpa* to treat cough; decocted leaves of *A. muricata* with leaves of *P. tectorius* to treat kidney problems; and decocted leaves of *M. oleifera* and *C. citratus* to help heal wounds.

Moreover, some informants include other ingredients in preparing medicinal plants for use. Leaves of *P. betle*, for instance, are applied with oil as a poultice to address gastritis and fever. Leaves of *G. pictum* are also oiled and administered as a poultice to treat hemorrhoids. The same procedure is also followed for *A. reticulata* to prevent *baynat* or relapse.

Conclusion

This study contributes to the preservation of the rich traditional knowledge and practices of using medicinal plants that are followed by local herbalists in the urban province of Cavite in the Philippines. It reveals the considerable number of plant species that give an immense support to the local health care system. This study, therefore, provides significant information on a wide variety of plants that can further be analyzed for their safety and efficacy of use.

Acknowledgment

The authors would like to acknowledge the local herbalists of Cavite who whole-heartedly participated in this study.

Conflict of Interest

The authors declare no conflict of interest.

Author's Contribution Statement

Caunca E: Performed the survey part of the study and the writing of the manuscript; Balinado L: Performed the conceptualization, writing, editing, and review of the manuscript.

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