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Original Article

Ethnobotanical Study of Some Useful Medicinal Flora used by the Locals of Mount Manunggal, Barangay Sunog, Balamban, Cebu Island, Philippines

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ABSTRACT: This study surveyed the different medicinal plants found in Mount Manunggal, Bgy. Sunog, Balamban, Cebu, Philippines. A series of informal interviews, semi structured questionnaire, and discussions among the key informants was employed to acquire pertinent data. A total of 20 species belonging to 20 genera from 18 families were recorded to be present in Mt. Manunggal. The plants were either processed or directly consumed. Results showed that the ailments remedied varied from each plant species. Furthermore, this study revealed that most of the medicinal property of plants were used to address ailments concerning the digestive system, excretory system, and circulatory system. This study also showed that among the different plant component, the leaves (34%) were the most utilized, followed by the fruit (22%), roots (20%), milky exudate (7%), flowers (5%), shoots (5%), whole plant (3%), bark (2%) and seeds (2%). Identification of these medicinal plants and its associated ethnobotanical knowledge should be properly documented to prevent this information from being forgotten.

KEY WORDS: ethnobotany, traditional knowledge, man-environment interaction, medicinal plants

INTRODUCTION

The Philippines boasts a wide biodiversity of plants. According to Altovores and Borromeo (2007), there are about 1,500 medicinal plants found in the country. Some of these plants are used as herbal medicines by common people, and through time several herbal medicines have been commercialized and rebranded in the market; the common ones are the lagundi (*Vitex negundo*), and ampalaya (*Momordica charantia*). The importance of the utilizing plant materials in managing ailments cannot be overemphasized.

Traditional medicine is maintained and developed by all societies in the world including the locals found in the Philippines. Information regarding plant utilization is inherited from their ancestors through verbal communication (Olowa *et al.*, 2012). A number of ethnobotanical studies of cultural groups that rely on the oral tradition of passing on traditional medicinal plant

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knowledge from one generation to another. This indicates the great wealth of knowledge of economically useful plants that these cultural groups also have. These groups also have an extensive knowledge of economically useful plants and the traditional techniques used to manage, harvest and conserve these species (Soejarto *et al.*, 2011). According to Trivedi (2006), traditional medication is still one of the foundations of health care in developing countries since it is efficient, safe, cost effective and accessible to the poor and those living in remote areas. Traditional medicine was then adopted by local healers and passed down from generation to generation (Lui *et al.*, 2009).

There is growing threat of losing these plant species and its associated local knowledge due to various anthropogenic activity, such as land developments in order to cater to the equally growing human population. Deforestation, habitat destruction, overexploitation, expansion of agriculture, grazing in the forest, selective removal of species and environmental degradation pose as threats to the local occurrence of plant species (Khan and Khatoon, 2008). Ethnobotanical studies should be warranted in order to document useful information especially in relation to the preservation of knowledge on local medicinal plants.

There is a need to document and record the folk uses of biodiversity in Mt. Manunggal, Cebu, Philippines. Uses could range from food utilization, ornamental plants, and medicines among others and should be properly recorded in order to preserve such knowledge for the benefit of the generations to come. In addition, it is a rural area where houses are few and scattered in the area. Thus, documentation of local people's plant uses is equally important for the conservation and transmission of valuable of biocultural knowledge.

This study provides a list of plants that can serve as alternative medicines for certain illnesses. Documentation of medically importance can be utilized as a baseline data for studies in relation to plants biochemistry. It can also pave the way for researches in drug discovery resulting in economic development. The present study aims to 1) survey medicinal plants, and 2) list the different phytochemicals screened from the plants utilized by the locals of Mt. Manunggal, Bgy. Sunog, Balamban, Cebu, Philippines. The site was chosen due to a lack of documentation regarding the ethnobotanical uses of plants found in the area.

MATERIALS AND METHODS

Study site

The field study was conducted at Sitio Mt. Manunggal, Brgy. Sunog, Balamban, on the island of Cebu (Fig. 1). The site has an altitude of 3,083 m.a.s.l. Mt. Manunggal is one of the Sitios of Barangay Sunog, Balamban, Cebu (Abaquita and Buot, 2013). Sitio Mt. Manunggal and its adjacent areas have a population of about 1,897 with a total land area of 3798 hectares. In a study conducted by Abaquita and Buot (2013), settlers in the area are scattered and live far from each other. The area is far from nearby towns thus there is utilization of medicinal plants to augment healthcare services.

Documenting the medicinal uses of plants in Mt. Manunggal

The documentation of the ethnobotanical knowledge was collected through a series of informal interviews, semi-structured questionnaire, and discussions among the key informants. A total of 12 focused interviews were conducted. A mixture of quantitative and qualitative types of methodologies were

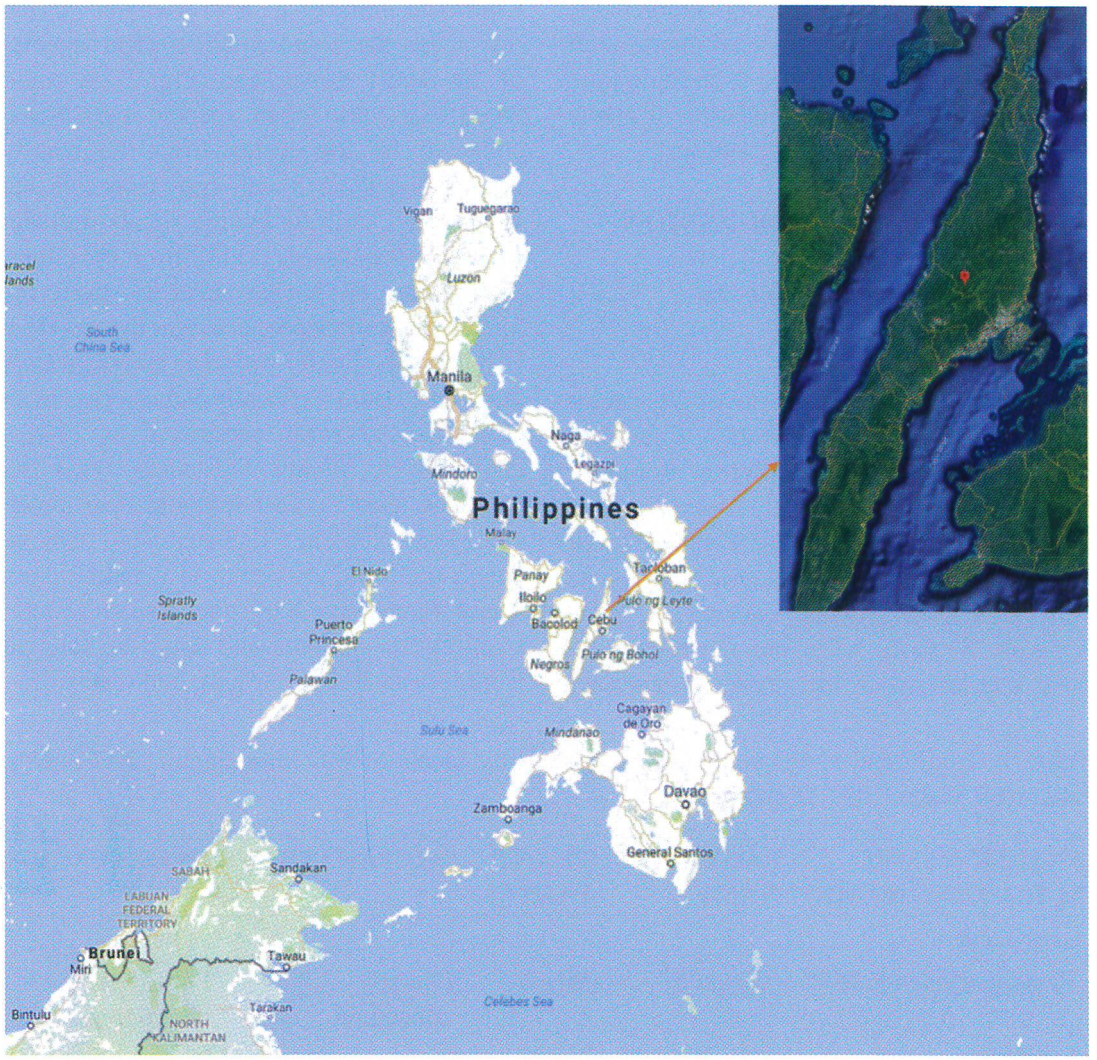


Figure 1. Mt. Manunggal, Bgy. Sunog, Balamban, Cebu, Philippines with the recorded coordinates 10°26'21.71"N, 123°48'48.03"E. Retrieved from: <https://www.google.com/maps/place/10°26'21.7%22N+123°48'48.0%22E/@10.3211105,123.3310981,9z/data=!4m5!3m4!1s0x-0:0x0!8m2!3d10.4393639!4d123.8133417 >.

utilized in order to asses and survey the different medicinal plants in the area. Quantitative data were the number of plants used for medicinal purposes, the plant components, and the number of ailments managed by these plants. Qualitative data on the other hand were the interviews. Ethnobotanical information and field description about the medicinal plants were recorded in a field notebook. Published journals were consulted regarding the phytochemical constituents of the plants identified from the site.

Coordinates were recorded using a Global Positioning System (GPS) to establish location of samples sites where medicinal plants were documented. Medicinal plants in the field were photographed. Other literary texts were consulted regarding the plant preparation and its chemical constituent. Taxon information

whether the plant is endemic, indigenous, or exotic and region of greatest distribution and development were noted from Philippine taxonomic literature. Identification of plants were verified by consulting an expert.

RESULTS AND DISCUSSION

Identified medicinal plants in Mt. Manunggal

The informants reported a total of 20 species belonging to 20 genera from 18 families (Table 1). The plants were comprised of trees, herbs, and shrubs. The family Asteraceae and Solanaceae were the most represented family with 2 species per family. *Blumea balsamifera* (L.) DC and *Chromolaena odorata* (L.) R.M. King & H. Rob. were the representative plant species under the family Asteraceae. *Capsicum annuum* L. and *Solanum torvum* Sw. were the representative plant species of the family Solanaceae (Fig. 2). It could noted that these plant species were being collected by the locals from the nearby forests. Notable and well-known species that were being utilized by the locals include: *Blumea balsamifera* (L.) DC from the family Asteraceae, *Euphorbia hirta* L. from the family Euphorbiaceae, *Centella asiatica* (L.) Urb. from the family Apiaceae and *Capsicum annuum L.* from the family Solanaceae. In an ethnomedicial study conducted by Flores, *et al.* 2016), *Blumea balsamifera* (L.) DC could be used to treat inflammation, fever, UTI, heart ailments, diabetes, skin asthma, cough and could also serve as an antioxidant. These plants have been documented to treat a variety of ailments and could be sourced from forests, fields, gardens, and road sides.

Table 1. Traditional plant preparation identified by locals of Mt. Manunggal, Bgy. Sunog, Balamban, Cebu City, Philippines.

FAMILY NAME/ SCIENTIFIC NAME*	COMMON NAME	PLANT PART**	PREPARATION	USES
Lauraceae				
Persea americana Mill.	Abokado	ME, F	Directly consumed	For lowering blood pressure
Arecaceae				
Cocos nucifera L.	Lubi	F, R	Directly consumed (L), poultice (R)	Diarrhea, fever, headaches, and muscular aches
Poaceae				
Imperata cylindrica (L.) Raeusch.	Kogon	R, F	Decoction	For urinary tract infections, fever and wounds. Has antibacterial properties.
Musaceae				
Musa acuminata Colla	Saging	L, F, R	Directly consumed, decoction	Has antimicrobial activity
Zingiberaceae				

Table 1. (Continued).

FAMILY NAME/ SCIENTIFIC NAME*	COMMON NAME	PLANT PART**	PREPARATION	USES
Zingiber officinale Roscoe	Luy-a	F, L	**Poultice, decoction**	To treat bronchitis and diabetes, and young leaves are used as poultice on burns
Araceae				
Colocasia esculenta (L.) Schott	Gabi	L	Directly consumed	Anti-hepatotoxic
Fabaceae				
Mimosa pudica L.	Makahiya	R, LS	Poultice, decoction	Has wound healing activity, antidepressant action, hyperglycemic effect, diuretic effect, antivenom activity, antimicrobial and antifungal activity and may be used as an aphrodisiac.
Moraceae				
Ficus septica Burm.f.	Hauli	L, S, ME, R	Poultice, decoction	Has antimicrobial and antifungal properties. Leaves applied externally as antirheumatic and may be used as a diuretic.
Euphorbiaceae				
*Euphorbia hirt*a L.	Tawa-tawa	ME, W, P	Poultice	Has antibacterial and anti-inflammatory properties

Table 1. (Continued).

FAMILY NAME/ SCIENTIFIC NAME*	COMMON NAME	PLANT PART**	PREPARATION	USES
Myrtaceae				
Psidium guajava L.	Bayabas	L	poultice	Primarily used as an antiseptic. Can also be used as mouth wash to treat teeth decay and gum infection.
Malvaceae				
Theobroma cacao L.	Kakao	B, R, Se, F	Directly consumed	Anti-ulcer, reduction in blood pressure
Caricaceae				
Carica papaya L.	Kapayas	L, F, FL	Directly consumed, decoction	Constipations, birth control and for uterine contractions
Rutaceae				
Citrus japonica Thunb.	Kalamansi	F, L	Ingestion, decoction	Cough remedy, antiphlogistic and laxative
Asteraceae				
Blumea balsamifera (L.) DC	Gabon	L	Decoction, poultice	Excretion of urinary stones. It can also be used as an edema.
Chromolaena odorata (L.) R.M.King & H.Rob.	Hagonoy	L	Decoction	Has anti-microbial activity against Staphylococcus aures, Escherichia coli and Candida albicans
Apiaceae				
Centella asiatica (L.) Urb.	Yahung-yahung	L	decoction	For hypertension, diarrhea, and

Table 1. (Continued).

FAMILY NAME/ SCIENTIFIC NAME*	COMMON NAME	PLANT PART**	PREPARATION	USES
				urinary tract infections. Also, for lowering blood pressure; brain and nervous system protective powers; memory-enhancer
Solanaceae				
Capsicum annuum L.	Sili	L	poultice	Anti-inflammatory drug; poultice for skin itches
Solanum torvum Sw.	Tawng-tawng	F	poultice	Cure fever, wounds, and tooth decay. Can be an antioxidant, cardiovascular, immunomodulatory and nephroprotective activity
Lamiaceae				
Hyptis capitate Jacq.	Hansawma	L, R	poultice	Reduce fever and colds
Apocynaceae				
Asclepias curassavica L.	Damaso	R, L, L Fl	Decoction, poultice	Kidney stones and asthma; gonorrhea; fever

* H=herb, S=shrub, T=tree; Parts Used: L=leaf, S=stem, F=fruit, Fl=flower, B=bark, MS=modified stem, ML=modified leaf, Se=seed, R=root, WP=whole plant, Fr=frond

** based on the Angiosperm Phylogeny Group Classification for the orders and families of flowering plants: APG IV (2016)

Results showed that one or more plants could be prepared in multiple ways but decoction was one of the most popular methods of preparation. This preparation included boiling of the plant materials for a longer period of time to soften the harder woody plant and release its active constituents. This process would result in the release of oils and other compounds adding to the plants' efficacy (Morilla *et al.*, 2014). Decoction was also one of the most common plant preparation by the local people of Agusan del Sur, Philippines (Arquion *et al.*, 2015). Other notable preparations would include external application, poultice, or direct consumption.

Ailments Managed by the Identified Medicinal Plants of Mt. Manunngal

The identified plant species by the locals from the area were found out to have one or more medicinal uses. A variety of ailments in different organs systems were also reported by the locals which could be treated using the identified medicinal plants. A number of the identified medicinal plants were reported to manage ailments that were connected to organs of the digestive system (21%), integumentary system (15%), circulatory system (13%), excretory system (13%), respiratory system (8%), nervous system (8%), muscular system (4%), and symptoms from other systems (12%) (Fig. 2).

Majority of the identified medicinal plants were used as remedies of the ailments in the digestive system, integumentary system, excretory system and circulatory system. The possible reason why the ailments of the digestive system were the widely treated ailments by the medicinal plants in Mt. Manunggal was because ailments of the digestive tract were easily acquired from

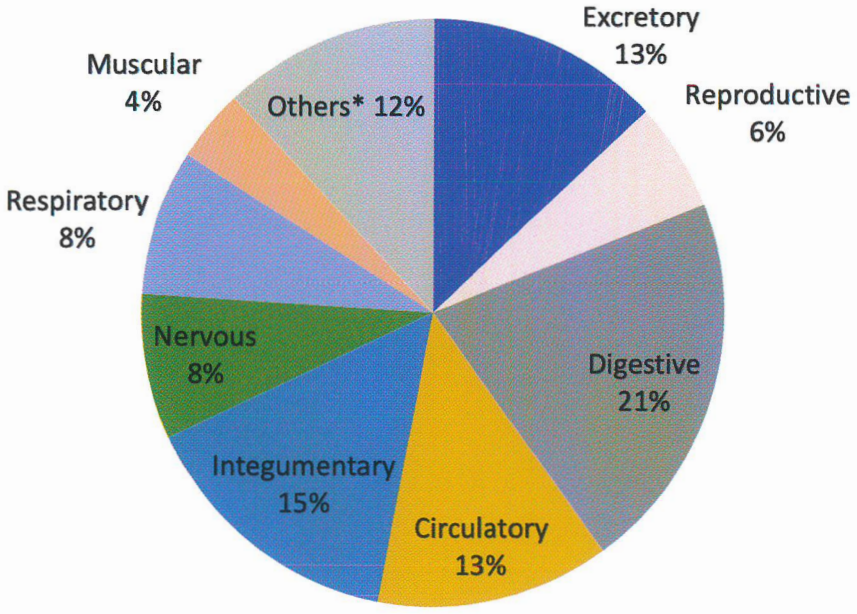


Figure 2. Percent Distribution of the ailments by organ system remedied by the medicinal plants in Mt. Manunggal, Bgy. Sunog, Balamban, Cebu, Philippines. (*= symptoms from other systems)

food and drinking water. Furthermore, according to the results the integumentary system was the next commonly treated ailment. This may be due to the fact that the skin is the most exposed organ of the body or the first line of defense. The skin is very susceptible to diseases which are usually caused by increased exposure to heat, parasites, infections, cell dysfunction, stress, wind, dampness, and dryness (Liu and Gong, 2011).

Plant components used

This study also showed that among the different plant component, the leaves (34%) were the most utilized, followed by the fruit (22%), roots (20%), milky exudate (7%), flowers (5%), shoots (5%), whole plant (3%), bark (2%) and seeds (2%) (Fig. 3). Leaves contained several secondary metabolites that had medicinal properties. The leaves were the main site of the production and storage of many chemical compounds through the process of photosynthesis. Some of the compounds included tannins, coumarines, flavonoids, essential oils, and inulins which were the active component of most herbal preparation in high concentration (Okoewale and Omefezi, 2001). Similar studies have also reported that the most common remedies utilize leaves which includes modified leaves and young shoots of the plants (Olowa *et al.*, 2012: Abaquita and Buot, 2013). Leaves are the most abundant organ of the plant which are easy to collect and have a faster rate of regeneration (Morilla *et al.*, 2014).

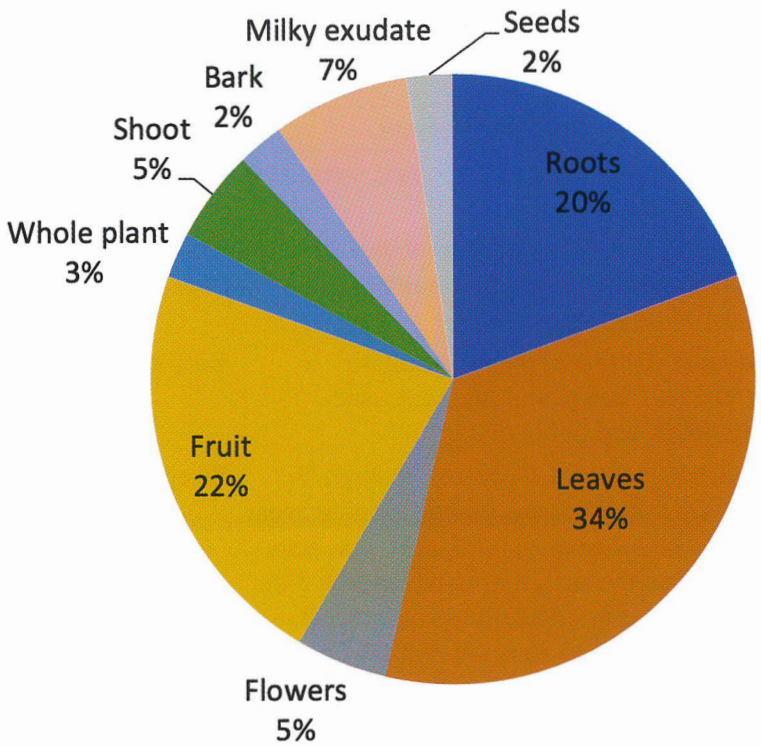


Figure 3. Percent distribution of utilized medicinal plant component found in Mt. Manunggal, Bgy. Sunog, Balamban, Cebu, Philippines.

In a study conducted by Peteros & Uy's (2010), four medicinal plants, which were not documented in our study, found in the Philippines all had anthrones in their methanol extracts. Anthrones can be used as treatment for psoriasis and it also prevents uncontrolled production of plasma cholesterol and triglyceride levels. Aside from anthrones, the methanol extracts also contained anthraquinones which possess antiparasitic properties. This shows that the medicinal properties of plants depend upon the chemical compounds found in the plants' parts.

Chemical constituents

Numerous studies have been conducted to isolate and determine phytochemicals present in the different plant species identified by the locals. Numerous studies were used to screen the plant species that were consolidated in this study. These plant species were found to contain various chemical compounds and metabolites known to have medicinal properties (Table 2).

Plants utilized as medicine contain an array of substances that can be used in treating chronic as well as infectious diseases. They are rich in secondary metabolites and essential oils of therapeutic importance (Ayyanar *et al.*, 2010). The most important biologically active constituents found in plants are alkaloids, flavonoids, tannins, and phenolic compounds (Kiruba, *et al.*, 2011).

Table 2. Chemical constituents of some medicinal flora used by the locals of Mt. Manunggal, Bgy. Sunog, Balamban, Cebu Island, Philippines with reference to other studies.

Plant	Chemical constituents present	Referenced study
Persea americana Mill. (Abokado)	alkaloids, flavonoids, sapponins, steroids, tannins, and phenol	Omadamiro *et al.*, 2016
Cocos nucifera L. (Lubi)	phenols, tannins, leucoanthocyanidins, flavonoids, triterpenes, steroids, and alkaloids, and saponins	Matos, 1997 and (Costa *et al.*, 2010)
Imperata cylindrica (L.) Raeusch (Kogon)	α-cellulose (40.22%), holoselulosa (59.62%), hemicellulose (pentosane-18.40%), and lignin (31.29%)	Kartikasari, 2013
Musa acuminata Colla (Saging)	1,2,3-Propanetriol, 5-(hydroxymethyl)-2-Furaldehyde, Diphenyl sulfone, Hexadecanoic acid and Methyl ester, n-Hexadecanoic acid, 1-Heptatriacotanol, 9,19-Cyclolanostan-3-ol, acetate, (3.beta)-, Metyl 16-oxo-cleroda-3, 13(14)-E-dien-15-oate, 1H-Pyrrole-2,4-dicarboxyluc acid and 3,5-dimethyl-, diethyl ester, 19,21-Tetracontadiyne, Dihydro-neotigogenin dibenzoate, Allopregnane-3beta.,7alpha.,11alpha.-triol-20-one, n-Propyl 9,12,15-octadecatrienoate, Trilinolein, and 1,2-Epoxy-5,9-cyclododecadiene	Sreejith *et al.*, 2016

Table 2. (Continued).

Plant	Chemical constituents present	Referenced study
Zingiber officinale Roscoe (Luy-a)	Monoterpene, sesquiterpene hydrocarbons, α-zingiberene, geranial, ar-curcumene, β-bisabolene, β-sesquiphellandrene, neral, gingereol and shogaol	Pushpanathan *et al.*, 2008; Singh *et al.*, 2008; Nampoothiri *et al.*, 2012; Singh *et al.*, 2005; Wang *et al.*, 2006; and Lin *et al.*, 2014
Colocasia esculenta (L.) Schott (Gabi)	flavones, apigenin, luteolin, and anthocyanins	Khare, 2007
Mimosa pudica L. (Makahiya)	terpenoids, flavonoids, glycosides, alkaloids, quinines, phenols, tannins, saponins, and coumarins, Mimosine	Gandharaja *et al.*, 2009; Chauhan *et al.*, 2009: Agharkar, 1991
Ficus septica Burm.f. (Hauli)	β-sitosteryl-3β-glucopyranoside-6'-O-fatty acid esters, α-amyrin fatty acid ester, β-sitosterol, stigmasterol, β-amyrin, and long chain saturated fatty alcohols	Ragasa *et al.*, 2016
Euphorbia hirta L. (Tawa-tawa)	flavonoids, ternpenoids, phenols, and essential oil, hentriacontane and myricyl alcohol, inositol, taraxerol, friedelin, β-sitosterol, ellagic acid, kaempferol, quercitol, and quercitin	(Huang *et al.*, 2012)
Psidium guajava L. (Bayabas)	triterpenoid guajanoic acid, β-sitosterol, uvaol, oleanolic acid, and ursolic acid.	Begum *et al.*, 2004
Theorboma cacao L. (Kakao)	are alkaloid, saponin, phenol, glycoside, flavonoid, and carboxylic acid.	Nwokonkwo and Okeke, 2014
Carica papaya L. (Kapayas)	Decylene, Trans-Germanylacetone, Methyl tridecanoate, Palmitic acid, Myristic acid and methyl ester, Palmitic acid and methyl ester, Hexadecanoic acid, Linolelaidic acid and methyl ester, Methyl cis-6-octadecenoate, stearic acid and methyl ester, Oleic acid, Stearic acid, 15-Tetracosenoic acid, Methyl heptacosanoate, trans-13-Docosenoic acid, Methyl erucate, Methyl behenate, Heneicosanoic acid and methyl ester, and Farnesyl cyanide	Oche *et al.*, 2017
Citrus japonica Thunb. (Kalamansi)	monoterpene hydrocarbons.	Nouri and Shafaghatlonbar, 2015

Table 2. (Continued).

Plant	Chemical constituents present	Referenced study
Blumea balsamifera (L.) DC (Gabon)	monoterpenes, sesquiterpenes, diterpenes, flavonoids, organic acids, esters, alcohols, dihydroflavone, and sterols	Pang, *et al.*, 2014
Chromolaena odorata (L.) R.M.King & H.Rob. (Hagonoy)	tannins, steroids, terpenoids, flavonoids, and cardiac glycosides.	Akinmoladun *et al.*, 2007
Centella asiatica (L.) Urb. (Yahung-yahung)	polyacetylenes, triterpenoids, and asiticosides, centellin, asiaticin, and centellicin.	Siddiqui *et al.*, 2007
Capsicum annuum L. (Sili)	essential oils, waxes, coloured materials (mainly capsanthin, capsorubinm zeaxanthinm cryptoxanthin, and lutein)	Hui and Barta, 2006
Solanum torvum Sw. (Tawng-tawng)	alkaloids, flavonoids, saponins, tannins, and glycosides	Zubaida *et al.*, 2013 and Chah *et al.*, 2000
Hyptis capitata Jacq. (Hansawma)	alkaloids, terpenoids (limonene, eugenol, farnesol isomers A, d-nerolidol, hexahydrofarnesol, neophytadiene and dodeca- 1,6-dien-12-ol, 6,10-dimethyl), fatty acids, and phenolic compounds	Rupa *et al.*, 2017
Asclepias curassavica L. (Damaso)	flavonols, flavonol glycosides, amino acids, carohydrates, triterpenes, flavonoids, phenols, quinines, tannin, terpenoid, sugars, xanthoprotein, saponin, and steroids	Al-Snafi, 2015

Conclusions and recommendations

A total of 20 species belonging to 20 genera from 18 families were recorded to be present in Mt. Manunggal, Bgy. Sunog, Balamban, Cebu. The family Asteraceae and Solanaceae were the most represented family with 2 species per family. It can be noted that these plant species are being collected by the locals from the nearby forests. The plants were either processed or directly consumed.

Results showed that the ailments remedied vary from each plant species. Majority of the plants are used to address ailments concerning the digestive system, excretory system and circulatory system. Furthermore, it can also be noted that, among the different plant components, the leaves (34%) were the most utilized, followed by the fruit (22%), roots (20%), milky exudate (7%), flowers (5%), shoots (5%), whole plant (3%), bark (2%) and seeds (2%). The leaves were the main site of the production and storage of many chemical compounds through the process of photosynthesis. Some of the compounds

include tannins, coumarines, flavonoids, essential oils, and inulins which are active component of most herbal preparation in high concentration (Okoewale and Omefezi, 2001). Identification of these medicinal plants and its associated ethnobotanical knowledge should be properly documented to prevent these information from being forgotten. Furthermore, the recorded knowledge could be used as a basis for plant diversity conservation and biochemical research that could lead to modern drug development. Some of these medicinal plants were traditionally used and effective but are scarce in location. Thus, further studies with regard to their conservation and/or cultivation is recommended by the researchers.

In light of anthropogenic threats, the researchers recommend the generation of more ethnobotanical studies among the scientific community to document and increase awareness as well as appreciation regarding the potentials of plants as alternative medicines. Further studies should be conducted to in other parts of the country in order to preserve and give a higher premium on this valuable local ethnobotanical knowledges.

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