

# Analysis of Traditional Knowledge of Medicinal Plants from Residents Near Kalikasan Park, Albay, Philippines

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## Abstract

The study was conducted to document the traditional knowledge and utilization of medicinal plants from the locals residing near Kalikasan Park, Albay, Philippines. Data was collected using semi-structured questionnaires and informal interviews. The survey was participated by 24 informants, 50% of which had secondary education and 42% are aged 50 years old and above. The ethnobotanical importance of the surveyed plants was quantitatively analyzed in terms of 3 parameters: frequency (F), specificity (S), and reliability (R) in the citation of plant species used for specific ailments. A total of 21 plants from 17 families were surveyed to treat the 16 ailments having a cold and cough as the most cited. The leaves were the commonly used part of the plant, the decoction was the usual mode of preparation, and treatment was usually administered by drinking the herbal infusion (as tea). Of all the cited medicinal plants, 3 species consistently obtained 100% values in F, S and R namely: *Lagerstroemia speciosa* Linn. (banaba), *Piper betle* Linn. (buyo), and *Citrus maxima* (Burm.) Merr. (lukban) as a treatment for Urinary Tract Infection (UTI), muscle pain and insomnia, respectively. A 100% specificity was recorded in 9 species namely, *Persea americana* Mill. (abukado) for diabetes; *L. speciosa* against UTI; *P. betle* for muscle pain; *Kaempferia galangal* Linn. (dosol) for inflammation; *Psidium guajava* Linn. (bayawas) for wound; *Clerodendrum intermedium* Cham. (matang-kuwaw) for cold; *C. maxima* for insomnia; *Gendarussa vulgaris* Nees (puli) for inflammation; and *Cymbopogon citratus* (DC. ex Nees) Stapf. (tanglad) against diabetes. There is a wealth of information on medicinal plant and their applications available from Kalikasan Park communities. The study's results may provide useful information for pharmacological studies and sustainable conservation of Kalikasan Park's natural plant ecosystem.

**Keywords:** Frequency, Kalikasan Park, Medicinal plants, Reliability, Specificity

## Introduction

Medicinal plants are an important element of indigenous medical systems in many parts of the world, and these resources are usually regarded as part of the traditional knowledge of a culture. According to the World Health Organization (WHO), over 80% of the world's population use herbal plants. Literally, the use of indigenous plants in human medicine is well documented in other parts of the globe, like Europe (Pieroni *et al.*, 2013), Central and North America (Alonso-Castro *et al.*, 2016). In Asian and African countries, 85% of people rely on traditional medicine practitioners to meet their primary healthcare needs (WHO, 2019).

Ethnopharmacology studies natural medicines derived from plants (and other substances) that have been traditionally used by groups of people to treat various illnesses. This field of research initially conducts

an ethnobotanical survey of medicinal plants that are utilized as a treatment for specific ailments by people in a particular community. Due to an increasing loss of indigenous knowledge, especially in developing countries with rapid industrialization and loss of ethnic customs and culture, there is a need to increase research in this field. Further, traditional knowledge can provide valuable guidance in selecting and obtaining novel plant material of potential therapeutic interest for drug discovery.

The Philippines is one of the megadiverse countries in the world, having 75% of the world's biodiversity. Long before the influence of Western modern medicine, Filipinos have long utilized plants as a treatment for various illnesses. As per health data of the Philippine Traditional Knowledge Digital Library in 2017, there were 16,690 reported medicinal plants, 66 healing practices (rituals), 509 traditional healers and 43 research

sites in the country.

Kalikasan Park is a man-made urban forest situated at the back of the Bicol University main campus. It has a total area of 10 ha, and the border lies on the Sagumayon River. It is characterized by shrubs, ferns and endemic and non-timber forest trees such as bamboo and rattan. Border areas of the Park are lined with human settlements and agricultural lands (Membreve *et al.*, 2019).

The purpose of this study is to investigate and analyze the traditional knowledge and utilization of medicinal plants from the residents living near the vicinity of Kalikasan Park. In the forest grows various useful bio-resources for the residents as materials for medicine, food and other purposes. Previous similar works having residents within parks (national and man-made) as respondents highlighted these findings: the relationship between the natural conservation of a national park and the life of its residents is interconnected (Parotta & Troster, 2012); the traditional knowledge regarding the bio-resources of residents living in a national park affects the natural conservation of an ecosystem (Menzies, 2006), and particular species of medicinal plants need to be protected for a balanced plant ecosystem within the park (Song *et al.*, 2014). The findings of the present investigation will provide basic data regarding the sustainable conservation of Kalikasan Park's natural plant ecosystem, in addition to the inventory of the medicinal plant's utilization and of the people in the area.

## Materials and Methods

### Study area

The study was conducted in Barangay 2 EM's Barrio South (formerly Poblacion), Legazpi City, Albay, situated at approximately 13° 7' 52.68" N, 123° 43' 24.24" E, in the island of Luzon. The topography includes mountains, residential areas and roads. It has a tropical climate with wet and dry seasons. The area is a densely populated urban community beside Kalikasan Park having a population of 2, 044 per the latest census. This barangay borders Kalikasan Park along with barangays Sagpon and Bagumbayan.

### Data collection

The 24 informants were randomly selected and interviewed from September to October 2017 to know the plant-based ethnomedicine for the treatment of common ailments. The survey was conducted through face to face

interviews using a pre-established questionnaire and was assisted by local health workers for the distribution and retrieval of questionnaires. Prior to the conduct of the survey, proper coordination with the local administrative officers was secured. The questionnaire was divided into two parts: the first part focused on the demographic profile of the informants and the second part focused essentially on the local names of the plants, parts used, mode of preparation, administration, and disease or ailment treated.

### Ethnobotanical Importance

The ethnobotanical importance of the cited plant species was analyzed using three parameters: specificity, reliability and frequency, adopted from Tchouya and coworkers (2015).

Specificity pertains to the number of opportunistic diseases that is treated by a particular medicinal plant. Specificity (S) was calculated in terms of percentage (%) using the formula:

$$\text{Specificity} = \frac{1}{\text{No. of opportunistic diseases treated by a species}} \times 100$$

$$\text{Reliability} = \frac{\text{No. of citations of a species for treatment of a disease}}{\text{Total no. of citations for the treatment of the same disease}} \times 100$$

Frequency pertains to the absolute number of citation of a particular medicinal plant. Frequency (F) was calculated in terms of percentage (%) using the formula:

$$\text{Frequency} = \frac{\text{No. of citations of a species for treatment of a disease}}{\text{Absolute no. of citations of that species}} \times 100$$

## Results and Discussion

### Demographic characteristics of the informants

A total of 24 people were interviewed during the survey, among whom, all were married, 22 were female, and 2 were male (percentages of 92% and 8% respectively). The demographic characteristics of the informants are presented in Table 1. Majority of the respondents had secondary (50%) education; and fall above 50 years

of age (42%), this is because most of the herbal healers and traditional medicine practitioners are older people (Mahwasane *et al.*, 2013). Fifty percent (50%) of the respondents had a household monthly income range of ₱5,001-10,000 while 37.5% are earning ₱5,000 or less monthly, suggesting limited access to modern health care due to poverty notwithstanding the fact, that illness and traditional knowledge may also predict plant use in urban populations (van Andel & Carvalheiro, 2013). Also, the respondents tend to use herbal medicine because of the high cost of modern medical treatments. Most of the informant's knowledge about medicinal plants was of ancestral origin and passed down to generations. A few have also mentioned that they acquired knowledge from reading materials such as pamphlets and books or television.

**Table 1.** Demographic profile of informants (n=24)

	Respondents	Frequency (%)
Gender	Male	2(8.33)
	Female	22(91.66)
Age distribution	18-20 years	1(4.16)
	21-30 years	3(12.5)
	31-40 years	7(29.16)
	41-50 years	3(12.5)
	51 and above	10(41.66)
Educational status	No formal education	0(0.0)
	Primary education	8(33.33)
	Secondary education	12(50)
	Tertiary education	4(16.67)
Income (monthly)	Below Php 5,000	9(37.5)
	Php 5,001- 10,000	12(50)
	Php 10,001- 15,000	2(8.33)
	Php 15,000 above	1(4.16)

**Traditional knowledge and ethnobotanical importance of medicinal plants**

The plants' family names, scientific names, vernacular names, plant forms, plant parts used, specific ailment and methods of preparation and of administering treatments are presented in Table 2. The study revealed 21 plant species from 17 families comprising trees (38.1%), herb (33.33%), shrubs (14.29%), and vine (9.52%) used by the locals residing near Kalikasan Park for

medicinal purposes. The leaves were the commonly used part of the plant, and decoction was the usual mode of preparation (90.48%). Decoction is the most common form of administration and has the strongest action of all of the traditional types of preparation of herbal medicine (Yang & Ross, 2010). Treatment was usually administered by drinking the herbal infusion (as tea). Results indicate that most of the cited medicinal plants are edible and safe to be taken orally. In fact, several of the cited plants are considered as culinary herbs, while the locals consume few as vegetables. Four species from family Lamiaceae have been cited by the informants as a treatment for various ailments such as cough, cold, dizziness, headache, wound and "pasma". Lamiaceae is one of the most diverse and abundant plants in terms of ethnomedicine (Jardak *et al.*, 2017).

There were 16 specific ailments reported during the survey (Figure 1) with cold and cough as the most frequently cited ailments, having several numbers of medicinal plants being used as treatment (total number 7 and 6, respectively). There were 7 ailments having only 1 particular plant species cited as treatment. These species include the following: *C. dichotoma* (*anonang*) for relapse; *P. betle* (*buyo*) for muscle pain; *C. fruticosa* (*tali-unod*) for sprain; *C. maxima* (*lukban*) against insomnia; *M. spicata* (*kamangkaw*) for dizziness; *B. balsamifera* (*lakadbulan*) for fever; and *L. speciosa* (*banaba*) against urinary tract infection (UTI).

Of all the cited plants, 9 species exhibited 100% specificity (Figure 2). These were *P. americana* (*abukado*); *L. speciosa* (*banaba*); *P. betle* (*buyo*); *K. galanga* (*dosol*); *P. guajava* (*bayawas*); *C. intermedium* (*matang-kuwaw*); *C. maxima* (*lukban*); *G. vulgaris* (*puli*); and *C. citratus* (*tanglad*) (as a specific treatment for diabetes, UTI, muscle pain, inflammation, wound, cold, insomnia, inflammation, and diabetes, respectively). There were 5 species with 50% specificity, suggesting that these plants were cited twice during the survey as a medicinal treatment for 2 different ailments. It can be noted that *B. balsamifera* (*lakad-bulan*) had the lowest percentage specificity (20%) because of the 5 medicinal uses of the plant against, cold, fever, cough, stomach pain, and hypertension. As listed in the database of Plant Resources of Southeast Asia, *B. balsamifera* is a common and widely used medicinal plant for a number of ailments (Aguilar & Alonzo, 2016).

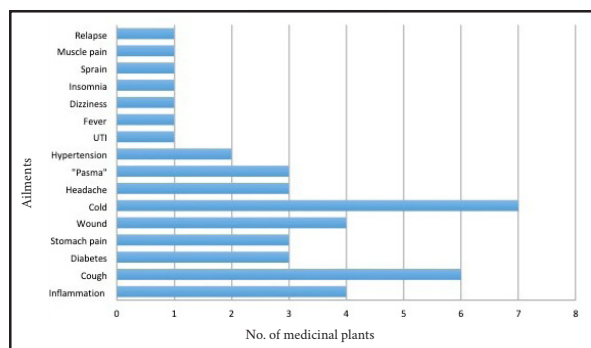
Table 3 summarizes the ethnobotanical importance of all the medicinal plants cited during the survey. These are expressed in terms of indices as percentage (%) frequency (F), reliability (R) and specificity (S). The higher

**Table 2.** Ethnobotanical information of medicinal plants

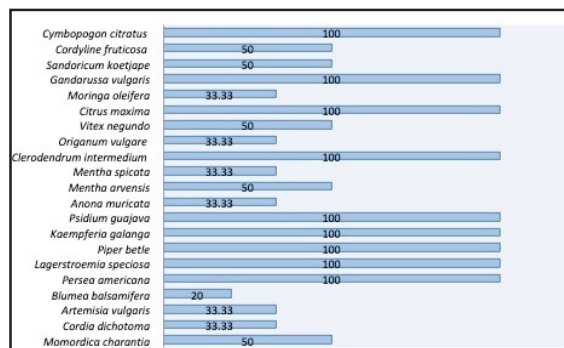
Family	Scientific Name	Vernacular Name	Form	Part Used	Ailment	Preparation and Administration
Acanthaceae	<i>Gendarussa vulgaris</i> Nees	<i>puli</i>	shrub	leaves	inflammation	Decoction, taken orally; Maceration, as poultice
Annonaceae	<i>Anona muricata</i> Linn.	<i>guyabano</i>	tree	leaves	headache hypertension diabetes	Decoction, taken orally
Asparagaceae	<i>Cordyline fruticosa</i> Linn.	<i>tali-unod</i>	herb	leaves	inflammation sprain	Decoction, taken orally Leaf blade as plaster
Asteraceae	<i>Artemisia vulgaris</i> Linn.	<i>artamisa</i>	herb	leaves	wound inflammation “pasma”	Decoction, taken orally; maceration, as poultice
	<i>Blumea balsamifera</i> (L.) DC	<i>lakad-bulan</i>	herb	leaves	stomach pain hypertension cold fever cough	Decoction, taken orally; maceration, as poultice
Boraginaceae	<i>Cordia dichotoma</i> G. Frost.	<i>anonang</i>	tree	leaves	relapse ( <i>binat</i> ) stomach pain “pasma”	Decoction, taken orally; leaf blade as plaster
Cucurbitaceae	<i>Momordica charantia</i> Linn.	<i>marigoso</i>	vine	leaves	cold cough	Decoction, taken orally
Lamiaceae	<i>Mentha arvensis</i> Linn.	<i>herba buena</i>	herb	leaves	headache “pasma”	Decoction, taken orally; maceration, as poultice
	<i>Mentha spicata</i> Linn.	<i>kamangkao</i>	herb	leaves	dizziness headache stomach pain	Decoction, taken orally; leaf blade as plaster
	<i>Clerodendrum intermedium</i> Linn.	<i>matang kuwaw</i>	shrub	leaves	cold	Decoction, taken orally; maceration, as poultice
	<i>Origanum vulgare</i> Linn.	<i>oregano</i>	herb	leaves	cold cough wound	Decoction, taken orally; maceration, as poultice
Lauraceae	<i>Persea americana</i> Mill.	<i>abukado</i>	tree	leaves	diabetes	Decoction, taken orally
Lythraceae	<i>Lagerstroemia speciosa</i> (L.) Pers.	<i>banaba</i>	tree	leaves	urinary tract infections (UTI)	Decoction, taken orally
Meliaceae	<i>Sandoricum koetjape</i> (Burm.f.) Merr.	<i>santol</i>	tree	leaves fruits	cough cold	Decoction, taken orally
Moringaceae	<i>Moringa oleifera</i> Lam.	<i>malunggay</i>	tree	leaves flowers	wound cough cold	Decoction, taken orally
Myrtaceae	<i>Psidium guajava</i> Linn.	<i>bayawas</i>	tree	leaves	wound	Decoction, applied as cleansing agent; maceration, as poultice

**Table 2 (continuation).** Ethnobotanical information of medicinal plants

Piperaceae	<i>Piper betle</i> Linn.	buyo	vine	leaves	muscle pain	Leaf blade as plaster
Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	tanglad	grass	leaves	diabetes	Decoction, taken orally
Rutaceae	<i>Citrus maxima</i> (Burm.) Merr.	lukban	tree	leaves fruit rind	insomnia	Decoction of leaves, taken orally, fruit rind, squeeze near nostrils to inhale
Verbenaceae	<i>Vitex negundo</i> Linn.	lagundi	shrub	leaves	cough cold	Decoction, taken orally
Zingiberaceae	<i>Kaempferia galanga</i> Linn.	dosol	herb	leaves, rhizomes	inflammation	Young leaves eaten or macerated, as poultice; decoction of rhizomes, use as gargle



**Figure 1.** Number of medicinal plants cited as treatment for various ailments



**Figure 2.** Specificity (%) on the utilization of the cited medicinal plants

the value of the index (%), the greater the ethnobotanical importance of the plant. Of all the cited plants, 3 species consistently obtained 100% values in F, R and S namely; *L. speciosa* (*banaba*), *P. betle* (*buyo*), and *C. maxima* (*lukban*) as treatment for UTI, muscle pain and insomnia, respectively. Previous studies validated the folkloric use of these plants. *L. speciosa* possessed diuretic activity (Tthambi *et al.*, 2013); *P. betle* was reported to exhibit antinociceptive activity in gastric-pain induced mice (Al-Arefin *et al.*, 2012); and *C. maxima* leaf ethanol extract increased the duration of sleep when administered to mouse models (Singh & Navneet, 2017). However, due to very limited published available article on the research field, more studies are warranted in order to further validate the bioactivity of these plants.

There were 6 species with 100% rating in both F and S specifically, *P. americana* (*abukado*) against diabetes, *K. galanga* (*dosol*) for inflammation, *P. guajava* (*bayabas*,

*bayawas*) as a treatment for wound, *C. intermedium* (*matangkuwaw*) for cold, *G. vulgaris* (*puli*) for inflammation, and *C. citratus* (*tanglad*) against diabetes. Four plants obtained 100% R and these were *B. balsamifera* (*lakad-bulan*), *M. spicata* (*kamangkaw*), *C. fruticosa* (*tali-unod*) and *C. dichotoma* (*anonang*) proposing that the aforementioned plants are constantly and accurately used as treatment for fever, dizziness, sprain, and relapse (*binat*), respectively. The folkloric uses of these plants were in consonance with earlier scientific findings (Hossain *et al.*, 2016; Tayarani-Najaran *et al.*, 2013; Aziz *et al.*, 2019) except the application of *C. dichotoma* for relapse ("*binat*") which has not been scientifically validated so far but this indication was already listed in the Philippine Traditional Knowledge Digital Library (2017).

**Table 3.** Ethnobotanical importance of the medicinal plants for specific ailments

Family	Scientific and Local Names	Ailment	Frequency (%)	Reliability (%)	Specificity (%)
Acanthaceae	<i>Gandarussa vulgaris</i> Nees ( <i>puli</i> )	inflammation	100	14.29	100
Annonaceae	<i>Anona muricata</i> Linn. ( <i>guyabano</i> )	headache	42.86	30	33.33
		hypertension	28.57	66.67	
		diabetes	28.57	33.33	
Asparagaceae	<i>Cordyline fruticosa</i> Linn. ( <i>tali-unod</i> )	inflammation	66.67	28.57	50
Asteraceae	<i>Artemisia vulgaris</i> Linn. ( <i>artamisa</i> )	wound	50	10	33.33
		inflammation	33.33	28.57	
		“pasma”	16.67	25	
	<i>Blumea balsamifera</i> (L.) DC ( <i>lakad-bulan</i> )	stomach pain	33.33	50	20
		hypertension	22.22	33.33	
		cold	22.22	9.09	
		fever	11.11	100	
		cough	11.11	11.76	
Boraginaceae	<i>Cordia dichotoma</i> G. Frost. ( <i>anonang</i> )	relapse (binat)	57.14	100	33.33
		stomach pain	28.58	16.67	
		“pasma”	14.29	25	
Cucurbitaceae	<i>Momordica charantia</i> Linn. ( <i>marigoso</i> )	cold	66.67	9.09	50
		cough	33.33	5.88	
Lamiaceae	<i>Mentha arvensis</i> Linn. ( <i>herba buena</i> )	headache	50	20	50
		“pasma”	50	50	
	<i>Mentha spicata</i> Linn. ( <i>kamangkaw</i> )	dizziness	45.45	100	33.33
		headache	36.36	40	
		stomach pain	18.18	33.33	
	<i>Clerodendrum intermedium</i> Linn. ( <i>matang-kuwaw</i> )	cold	100	4.55	100
	<i>Origanum vulgare</i> Linn. ( <i>oregano</i> )	cold	75	54.55	33.33
		cough	18.75	17.65	
		wound	6.25	10	
Lauraceae	<i>Persea americana</i> Mill. ( <i>abukado</i> )	diabetes	100	33.33	100
Lythraceae	<i>Lagerstroemia speciosa</i> (L.) Pers. ( <i>banaba</i> )	urinary tract infections	100	100	100
Meliaceae	<i>Sandoricum koetjape</i> (Burm.f.) Merr. ( <i>santol</i> )	cough	66.67	23.33	50
		cold	33.33	9.09	
		sprain	33.33	100	
Moringaceae	<i>Moringa oleifera</i> Lam. ( <i>malunggay</i> )	wound	66.67	30	33.33
		cough	16.67	5.88	
		cold	16.67	4.55	



**Table 3 (continuation).** Number of medicinal plants cited as treatment for various ailments

Myrtaceae	<i>Psidium guajava</i> Linn. ( <i>bayawas</i> )	wound	100	50	100
Piperaceae	<i>Piper betle</i> Linn. ( <i>buyo</i> )	muscle pain	100	100	100
Poaceae	<i>Cymbopogon citratus</i> Merr. ( <i>tanglad</i> )	diabetes	100	33.33	100
Rutaceae	<i>Citrus maxima</i> Linn. ( <i>lukban</i> )	insomnia	100	100	100
Verbenaceae	<i>Vitex negundo</i> Linn. ( <i>lagundi</i> )	cough	75	35.29	50
Zingiberaceae	<i>Kaempferia galanga</i> Linn. ( <i>dosol</i> )	inflammation	100	28.57	100
		cold	25	9.09	

## Conclusion

The study identified 21 medicinal plants used by local residents near the Kalikasan Park to treat various ailments. With the changing time and the fast-paced modernization of society, the need to document traditional knowledge on medicinal plants' utilization before it becomes lost or forgotten by future generations should be accounted for. The dearth of scientific record on the medicinal uses of few plant species cited during the survey, including *Cordia dichotoma* (*anonang*), *Lagerstroemia speciosa* (*banaba*), *Piper betle* (*buyo*), and *Citrus maxima* (*lukban*) warrants further pharmacological investigations into the beneficial medicinal properties of such plants. Moreover, this study obtained the basic data regarding the natural conservation of a plant ecosystem by analyzing and investigating traditional knowledge for medicinal plants used by Kalikasan Park residents.

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