

Medicinal Plants Utilized by the Traditional Healers and their Patients in Bicol Region, Philippines

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Abstract

The study determined the healing potential of the medicinal plants used by healers in the Bicol Region, Philippines. Data were gathered from 30 traditional healers and 300 patients. A traditional healer and ten of their patients were selected purposively per municipality from the four remote municipalities of each province in the region. Data were gathered employing interviews and Focus Group Discussions. Ethnobotanical indices such as Frequency index, Fidelity level, and Factor of Informant consensus were used to determine which medicinal plants are effective for a particular ailment and their relative importance. The study was able to identify 58 medicinal plants belonging to 33 families, which the herbolarios prescribed to their patients or were self-prescribed. The top three commonly used plant species having the highest frequency indices are *Plectranthus amboinicus* (oregano) with FI of 47%, *Blumea balsamifera* (lakadbulan) with FI of 39.1%, and *Psidium guajava* (bayawas) with FI of 25.8%. High healing potentials were obtained for *Sandoricum koetjape* (santol) with FL of 82.4%, *Momordica charantia* (ampalaya) with FL of 80%, and *Euphorbia neriifolia* (sorog-sorog) with FL of 75%. These medicinal plants were preferred by both the healers and their patients to treat coughs and colds. Respiratory disease (cough, colds, and asthma) obtained the highest Fic value of 0.92, among the 12 ailment categories. The medicinal plants were frequently prepared by decoction and were taken orally, but no standard measurements were observed. The lack of standardization in preparation can be attributed to the lack of formal training of the traditional healers, hence the need to address it through a training program. The healing potential of the medicinal plants is seen in the high number of informants who used the plants for treatment. The results can be used for phytochemical and pharmacological studies.

Keywords: Bicol, ethnobotany, Healing potential, Medicinal plants, *Momordica charantia*, Philippines, and *Sandoricum koetjape*

Introduction

Medicinal plants have been a part of traditional medicine worldwide for over 5,000 years (Rashrash, Schommer, & Brown, 2017). Approximately up to four billion people (80% of the global population) depend on them for primary healthcare (WHO, 2019). The medicinal plants are utilized for the health promotion and treatment of chronic diseases (Miranda, 2021; Van Wyk & Wink, 2018; Pan & Litscher, 2014). The use of medicinal plants has widely progressed across cultures and geographical regions (Fatemeh, Zahra, & Hossein, 2018; Pan & Litscher, 2014). Traditional medicine in the Philippines is anchored on a culture-based belief system handed from one generation to another. It is a holistic treatment process with physical, mental,

emotional, and spiritual aspects (Del Fierro & Nolasco 2013). The medicinal plants are prescribed by the traditional healers (locally called *herbolarios*, *albulario*, *manggagamot*, and *parabulong*), who are considered as the primary dispensers of healthcare in folk medicine (Zabala, Santos, & Peñol 2018).

The Bicol Region has a poverty incidence of 26.1% (Philippine Statistics Authority, 2021). Poverty is one of the reasons why herbolarios are sought for treatment. Their services are affordable, for they do not require a fixed amount but a donation within the patient's income. They are also accessible and respected as one of the health care providers in their communities (Zabala, Santos, & Peñol 2018; Berdon, Ragosta, Inocian, Manalag, & Lozano, 2016).

The use of medicinal plants in the Bicol Region is evident in the studies conducted in Albay and Camarines Sur. De Guzman et al. (2014) identified and collected 70 species of medicinal plants in Mount Malinao, Albay, eight of which were used by the locals. Mount Isarog, Camarines Sur is the source of *Pseudoelephantopus spicatus* (Juss), which had demonstrated antibacterial activity against both Gram-positive and Gram-negative bacteria (Quiming et al., 2019). In Camarines Sur, *Ficus pseudopalma*, locally known as *niog-niogan*, *lubi-lubi*, and *mili-bili* was popularly used for high blood pressure, urinary problems, diabetes, high cholesterol, and other medical conditions (Santiago et al., 2014). In Albay, *Blumea balsamifera*, *Psidium guajava*, and *Moringa oleifera* were identified as the most frequently used medicinal flora abundant in backyards and non-residential areas of the communities (Cajuday & Bañares, 2019).

In support of traditional medicine, the Philippine Institute of Traditional and Alternative Health Care (PITAHC) was established in 1997 under Republic Act 8423 as an avenue for the state to improve the quality and delivery of healthcare services through the development of traditional and alternative healthcare and its integration into the national healthcare delivery system (WHO, (2019); (Lagaya, 2005). To date, 10 medicinal plants are endorsed for utilization by the Philippine Department of Health (DOH, 2018); Principe & Jose 2002; & Ammakiw & Odiem, 2013). The studies conducted in the Bicol Region were mainly ethnobotanical surveys focusing on plants available and utilized in a particular province of the region. No studies regionwide explored the medicinal plants used by both the traditional healers and their patients. Considering the abundance of medicinal plants in the area and the practice of consulting the traditional healers by the Bicolanos, the study was conducted to determine the medicinal plants used by traditional healers and their patients. The study identified the medicinal plants, commonly used by the traditional healers and their patients; the ailments treated by the medicinal plants and the mode of preparation and administration used. On the policymaking front, the results can be used to develop guidelines for utilizing herbal plants, especially on the scope and limitation of their use and as the basis for phytochemical and pharmacological studies.

Materials and Methods

The study used a mixed-method design. Concurrent triangulation using the two methods was used to confirm and cross-validate the findings within

the study. Qualitative phenomenology was utilized to describe the commonality of the lived experiences of the herbolarios and their patients in the use of herbal medicines from the perspective of the herbolarios and the patients (Creswell & Poth, 2018). This study was done in the Bicol Region, Philippines, one of the 17 regions of the country. It is comprised of six provinces: Albay, Camarines Norte, Camarines Sur, Sorsogon, Catanduanes, and Masbate (see Figure 1). Data were gathered from a total of 330 participants (30 traditional healers and 300 patients; see Table 1). A traditional healer and 10 patients were selected purposively per municipality based on the limited accessibility to DOH-provided health services in the area. In the Philippines, the majority of the rural poor, including the urban-suburban poor, consider health care unaffordable and accessed only as a debt-inducing last resort, hence utilizing alternative forms of treatment and consulting the albularyo (Apostol, 2007). It was ensured that the participants satisfy the inclusion criteria, such as 1) traditional healers who are using solely medicinal plants and/or in combination with other traditional modalities, are residents of the community for at least a year, and have been practicing indigenous healing for at least five years; and 2) their patients, aged 18 years and above, and were treated or have consulted for several occasions with the selected healer.

The ethical clearance for the project protocol was approved by the National Ethics Committee (NEC Code: 2016-024). Before the data gathering, approval was sought from the barangay captains where the study participants resided. A written informed consent form was secured from the participants (healers and patients). The purpose of the study and the data collection procedure was explained to the participants before conducting the interview and focus group discussion. The interview was conducted by the data collectors who were assigned to their home provinces. This is to address the issue of varied Bicol dialects all over the region. The results of the interview were presented in the FGDs for confirmation as to whether the data represented a reasonable account of the participants' experiences and to substantiate the data gathered during the interview. There was a 10% refusal rate from the healers because they did not want the treatment protocol to be shared with others for fear that the healing practices would be imitated. The refusal was also attributed to the disapproval of the metaphysical body whom the healers believed to assist them during the healing process. Those who refused to participate were replaced by another healer from the preliminary list. The study was conducted from July

2017 to July 2018.

Photographs of the medicinal plant specimens were taken in the field and were labeled with their local names. The photographs of the medicinal plants were matched with the names and illustrations in the book *Common Medicinal Plants of the Cordillera Region* (Co, 2011). The scientific names obtained from the book of Co were validated from The Plant List database (<http://www.theplantlist.org/>, 2013). The data were analyzed using quantitative ethnobotanical indices, namely: Frequency index (FI), Fidelity Level (FL), and Factor of Informant Consensus (Fic). Frequency index is the percentage of frequency of mentioning for a single plant species by informants. It was calculated using the formula: $FI = FC/N \times 100$, where FC is the number of informants who mentioned the use of the plant species, and N is the total number of informants (Madikizela et al., 2012). Fidelity level (FL) is the ratio between the number of informants who independently suggested the use of a species for the same major purpose and the total number of informants who mentioned the plant for any use. It is calculated using the formula: $FL = N_p/N$, where N_p is the number of informants who reported use of a plant species to treat a particular disease, and N is the number of informants who used the plants as a medicine to treat any given disease (Andrade-Cetto & Heinrich 2011). The remedies for frequently reported ailments have the highest FL value, and those with a low number of reports have the lowest FL values (Alexiades, 1996). Fic was used to select the categories of diseases for which the plant species are traditionally used. It identified the main diseases in a community grouped by category. The Fic was calculated using the formula: $Fic = (N_c - 1) / (N_c - N_s)$, where N_c is the number of use citations in each category, minus the number of species used (N_s), divided by the number of use citations in each category minus one (Heinrich et al., 1998). The methods of preparing the medicinal plants and the route of administration were analyzed using percentage.

Results and Discussion

The profile of the traditional healers shows that 42% were middle-aged to late adulthood, were primarily female, married, and are Roman Catholic. These herbolarios attained a primary level of education. More than half of the herbolarios have been practicing their craft for more than 10 years, which is a good length of time to gain experience and knowledge in the use of herbal plants and of treating patients of all ages. The profile of the herbolarios and their patients are similar in terms of age, sex, marital status, and religion.

Like the herbolarios, the majority of the patients were middle-aged adult women and were Catholic. Some of these patients have reached a secondary level of education. Their husbands were the breadwinners and were earning less than ₱7,890.00 a month. These patients have been consulting the herbolarios for more than 10 years (Galan, 2018).

Commonly Used Medicinal Plants

A total of 58 medicinal plants belonging to 33 plant families were used by both the traditional healers and their patients (see Table 3). The most number of species were represented by the following families: Lamiaceae (seven species), Asteraceae (four species), Piperaceae, Crassulaceae, Poaceae, Crassulaceae, and Euphorbiaceae (three species each), and Moraceae, Cucurbitaceae, and Amaryllidaceae (two species each). The dominance of these families is in agreement with ethnomedicinal flora reported from other parts of the country (Fiscal, 2017; Gruyal, 2014; Morilla, 2014). The commonly used plant species indicating the highest frequency indices were *Plectranthus amboinicus* (oregano) with an FI of 47%, *Blumea balsamifera* (lakadbulan) with an FI of 39.1%, and *Psidium guajava* (bayawas) with an FI of 25.8% (see Table 4). These plant species were abundant in backyards and non-residential areas of the community (Cajuday & Bañares, 2019), hence the Bicolanos are familiar with these plants and their therapeutic uses. In terms of healing potential, the medicinal plants with the highest FL values were *Sandoricum koetjape* (santol) with an FL of 82.4%, followed by *Momordica charantia* (ampalaya) with an FL of 80%, and *Euphorbia neriifolia* (sorog-sorog) with an FL of 75%. The preference of the traditional healers and their patients of the three aforementioned plants to treat coughs and colds implies their effectiveness (Ong & Kim, 2014). According to the healers, the effectiveness of herbal medicines is seen in the change in the appearance, alleviation of symptoms, and the patients' feeling state. When the leaves of either santol, ampalaya, or sorog-sorog are used regularly for three days, the amount of phlegm lessens and its consistency loosens. Both the healers and the patients, attribute the plants' healing property to their substances. According to them these plants were created by God as health remedies. The other plant species with high healing potential for the cited major use were *Andropogon citratus* (tanglad) and *Bryophyllum pinnatum* (katakataka) for hypertension, *Orthosiphon aristatus* (balbas pusa) for urinary tract infection, *Artocarpus heterophylla* (langka) for relapse, *Impatiens balsamina* (kamantigi) for sinusitis, *Ficus septica* (hauili) for fever, and *Senna alata* (akapulko)

for ringworm. Eighteen of the identified plant species in the study were medicinal food plants, which are intended for nutrition and whose consumed parts are recognized as therapeutic (Siró et al., 2008; Ramalingum, 2014; Arquion, 2015). Ten of these identified medicinal food plants are common to the present study and the study of Cajuday & Bañares (2019). These are *Musa paradisiaca* (saging), *Psidium guajava* (bayawas), *Moringa oleifera* (kalunggay), *Cocos nucifera* (niyog), *Artocarpus heterophylla* (langka), *Persea americana* (abukado), *Zingiber officinale* (luya), *Tamarindus indica* (sampalok), *Momordica charantia* (ampalaya), and *Andropogon citratus* (tanglad). The study had also identified eight of the medicinal plants recommended by the Philippine DOH, being used by both the healers and their patients. These were *Vitex negundo*, *Blumea balsamifera*, *Psidium guajava*, *Momordica charantia*, *Allium sativum*, *Mentha arvensis*, *Clinopodium douglasii*, and *Peperomia pellucida* (Principe & Jose, 2002).

Ailment Categories in the Bicol Region

The 105 different ailments consulted by the patients with the traditional healers were grouped into 12 categories (see Table 4). The categories of the ailments were based on the organ system affected. (Villa-Forte, 2020). The study obtained the factor of informant consensus values (Fic) from 0.29 to 0.92 for these ailment categories. The highest Fic value of 0.92 was computed for respiratory ailments, which were treated with 17 plant species. They were followed by obstetrical problems (0.89) and muscular and joint problems (0.87), which were treated with six and 12 species, respectively. Categories with lower Fic values were obtained for ailments caused by unseen elemental forces (0.50) and diabetes mellitus (0.29). Unseen elemental forces can be any of the following: *sibang*, *barang*, *bati*, *nasino*, *kulam*, *tawak*, *palipad hangin*, and *naengkanto* or *naduwende*. Ailments secondary to unseen elemental forces present symptoms that are severe and do not respond to regular treatment. Patients with *lamig sa sikhmura* complain of severe stomach ache. Those with *lamig sa katawan* complain of headache and fever. *Nausog* is characterized by vomiting and abdominal pain. Certain procedures like *suob* and *santigwar* were performed by the healers to determine the cause of the ailment. Upon diagnosis, the healer uses medicinal plants and performs *orasyon* to drive the unseen elemental force from the patient's body. Artamisa leaves are used for *lamig sa sikhmura*; nino leaves or kalamansi leaves for *lamig sa katawan*, and talampunay or malunggay leaves for the treatment of *sibang* or *usog*. High Fic values were attained when one plant species

was mentioned by a high number of participants to treat a specific ailment category, whereas low Fic values indicate that the participants did not agree over which plant to use, hence different medicinal plants were used (Ong & Kim, 2014; Andrade-Cetto & Heinrich 2011).

The top five specific ailments commonly occurring in the community were cough and colds, diarrhea, relapse due to childbirth, fever, and hypertension. Coughs and colds were treated with *Sandoricum koetjape* (santol), *Momordica charantia* (ampalaya), and *Euphorbia neriifolia* (sorog-sorog). Other plants found beneficial for cough and colds were *Plectranthus amboinicus* (oregano), *Vitex negundo* (lagundi), *Blumea balsamifera* (lakadbulan), *Jatropha curcas* (tuba), *Moringa oleifera* (malunggay), *Citrus microcarpa* (kalamansi), and *Psidium guajava* (bayabas). For diarrhea, the most frequency used herbal plant was *Psidium guajava* (bayabas). Other plant species used for the management of diarrhea were *Jatropha curcas* (tuba), *Artemisia vulgaris* (artamisa), and *Vitex negundo* (lagundi). According to the patients, these plants also relieve abdominal cramps associated with diarrhea. Patients experiencing relapse after childbirth were managed by bathing using *Blumea balsamifera* (lakadbulan) and *Cordia dichotoma* (anonang). For fever, the leaves of *Jatropha curcas* (tuba), *Blumea balsamifera* (lakadbulan), *Moringa oleifera* (malunggay), *Artemisia vulgaris* (artamisa), and *Plectranthus amboinicus* (oregano), were found helpful to lower high body temperature. For hypertension (high blood), the most preferred plant species was *Andropogon citratus* (tanglad). Other plants found helpful for hypertension were *Zingiber officinale* (luya), *Andrographis paniculata* (serpentina), *Kaempferia galangal* (dusol), *Blumea balsamifera* (lakadbulan), and *Annona muricata* (guyabano).

Preparation and Mode of Administration of the Medicinal Plants

The medicinal plant species that the traditional healers prescribed were collected by the patients or their family members from backyards or non-residential areas in the community. The healers' assistants gathered the plants not available in the community from forests and along the rivers. The medicinal plants were either prepared by the healers or by the patients themselves. Seventy-two percent of the participants did not measure the medicinal plant part when preparing them. Those who measured the plant parts used local measuring units, for example, a piece, handful, drops, a sack, and kitchen utensils, like cups, glasses, tablespoons, and teaspoons. The patient's age was considered when preparing the plant; for example,

oregano for coughs and colds uses three small leaves for children and three big leaves for adults. The healers and their patients preferred to use the freshly collected leaves of the medicinal plants over the other plant parts. Forty-eight percent of the participants prepared the plant parts by boiling them in a kettle or an earthen pot (see Figure 2). The plant part is washed in running water and cut into pieces. Enough water is added to the kettle and then boiled for 15-20 minutes or until the water is halved. If the decoction is not consumed in one treatment, it is cooled, then placed in a tightly closed container, set aside or refrigerated, and is used within 24 hours. If the large and woody plant parts (e.g., twigs and branches) and the leaves are used, more water is added and boiled for a longer time. A longer boiling time is observed when preparing the decoction for a steam bath. The steam bath is a treatment procedure where the patient is immersed in a drum of lukewarm water boiled from medicinal plants comprised of sambong, sampalok, kamias, lukban, kalamansi, tagbak, alagaw, and two varieties of vines whose names were not revealed because, according to the healers, these were secret ingredients. One-half sack of the plant parts is used for a metal drum half-filled with water. The steam bath is indicated for patients with *binat* related to childbirth, kidney problem, paralysis secondary to stroke, dysmenorrhea, irregular menstruation, and headache (locally termed *lamig*). The collected fresh medicinal plants were also prepared by squeezing (19%). The leaves were wrapped in a new banana leaf steamed on top of the cooking rice or were pounded and then squeezed to extract the juice. Other modes of preparation were pounding (14%), bruising (8%), heating (8%), and infusion (3%). The medicinal plants were mainly administered via the oral route (58%), for example, by drinking, chewing, and eating. Thirty-five percent of the participants administered the medicinal plant by dermal route, applied by patch, washing, bathing after delivery, and topical application on the teeth and wounds. The nasal route (sniffing and inhaling) was the least used but was found suitable for coughs and colds (see Figure 3).

Traditional medicine using medicinal plants has been practiced in the Bicol Region for a long time. The abundance of the plant species known for their therapeutic effects and the poverty in the region contribute to the continued patronage of traditional medicine. The majority of the rural poor, and the urban-suburban poor, would consult the traditional healers, owing to the unaffordable and inaccessible health care services (Apostol, 2007). The traditional healers are respected as one of the health care providers

in their community (Zabala, Santos, & Peñol, 2018). The patients consult the healers for health reasons, ranging from symptomatic ailments to discomforts caused by human and elemental forces. The patients seek help to treat simple ailments, when the modern doctor fails, for spiritual healing, or herbal remedy (Islam, 2005). The study was able to document a total of 58 medicinal plants used by both the healers and their patients. Of the 58 plant species, *Sandoricum koetjape* (santol), *Momordica charantia* (ampalaya), and *Euphorbia neriifolia* (sorog-sorog) obtained the highest healing effects in the treatment of coughs and colds. The plant species identified in the study were known to be medicinal food plants. Functional foods were used in the treatment of diseases and were evident in the studies of Graziose, Green, Arora, and Prakash (2020); Hou and Jiang (2013); and Lila and Raskin (2010). The use of *Psidium guajava* and *Musa paradisiaca* were evident in the studies of Rakotoarivelo et al. (2015); Dixit, Kumar, and Shukla (2014); Imam and Akter (2011); and Prabha, Karpagam, Varalakshmi, and Packiavathy (2011). Medicinal plants endorsed by the Philippine Department of Health and other indigenous plants are found to be used in the region. Similar medicinal plants are used in Northern Surigao del Sur (Gruyal et al., 2013), in Batan Island (Abe & Ohtani, 2013), in Zamboanga del Sur (Morilla et al., 2014), in Agusan del Sur (Arquion, 2015), in Laguna (Fiscal, 2017), in Nueva Ecija (Santos & Penol, 2018), and in Zamboanga del Sur (Fabie-Agapin, 2020). *Piper abbreviatum* *opiz* and *Artemisia vulgaris* are being used in the Cordillera Region for treatment of fever and headache (Co, 2011).

The method of preparing the medicinal plants in the study varied among the six provinces in the region. The variation of the dosages depended on the experience of the herbolario and other factors, like the client's age. Similar to these findings, informants in Northern Ethiopia considered the same characteristics in addition to the power of the medicinal plants (Meragiaw, Asfaw, & Argaw, 2016; Teklehaymanot & Giday, 2007). The approximation of the amount or dosage in this study, which lacks precision, and the variation and standardization is considered a weakness (Meragiaw, Asfaw, & Argaw, 2016; Sachan, Vishnoi, & Kumar, 2016; Kunle, Egharevba, & Ahmadu, 2012; Teklehaymanot & Giday, 2007; Sofowora, 2008). Standardization of herbal medicines refers to the utilization and adherence of technical standards, including but not limited to parameters, definitive qualitative and quantitative values that guarantee quality, efficacy, safety, and reproducibility (Kunle, 2012). The lack of standardization in the preparation

poses risks to the safety of consumers (Sachan, Vishnoi, & Kumar, 2016; Kunle, Egharevba, & Ahmadu, 2012). Despite the weakness in the preparation of the medicinal plants by the healers and their patients, the claims of being effective and “can heal” cannot be discounted, for this evidence is based on the concept of “social validation” through successive generations (Crellin, 2001).

Conclusion

Ten of the 58 medicinal plants widely used by both the traditional healers and their patients were found to have the most healing effects in the treatment of the 12 ailment categories. The results of the study were complemented by the social validation by both the traditional healers and their patients. The preparation and administration of the medicinal plants were not standardized due to the traditional healers’ lack of formal training. There is a need to address the lack of standardization in the healers’ preparation and utilization of herbal plants through a training program. The healing potential of the medicinal plants identified in the study is seen in the high number of informants who used the plants to treat a particular ailment. The results of the study can be used for phytochemical and pharmacological studies.

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Table 1 Study participants

Province	Traditional Healers	Patients
Albay	4	40
Camarines Sur	3	30
Camarines Norte	5	50
Sorsogon	6	60
Catanduanes	6	60
Masbate	6	60
Total	30	300

*10 Patients per Traditional Healer

Table 2 Socio-demographic profile of the Traditional Healers and their Patients (Adapted from Galan, 2018)

Profile	Healers (N=30)	Percent	Patients (N=300)	Percent
Age	40-60 (Middle-age Adult)	42	40-60 (Middle-age Adult)	51
	65 and above (Late Adult)	42		
	Female	65	Female	85
Marital Status	Married	71	Married	72
Religion	Roman Catholic	100	Roman Catholic	92
Educational Attainment	Primary Level	55	Secondary Level	39
Occupation	Self- employed/ Skilled worker	42	Housewife	40
Monthly Income	Did not disclose	48	<7,890.00	43
Length of Practice as Herbolario	More than 10 years	65	N/A	

Table 3 Frequency Index of medicinal plants in Bicol Region

Scientific Name	Local Name	FC	FI (%)
1. <i>Plectranthus amboinicus</i> (Lour.) Spreng.	klavo clavo oregano	155	47.0
2. <i>Blumea balsamifera</i> (L.) DC	lakadbulan sambong	129	39.1
3. <i>Psidium guajava</i> L.	Bayawas bayabas	85	25.8
4. <i>Jatropha curcas</i> L.	tuba	75	22.7
5. <i>Artemisia vulgaris</i> L.	artamisa, damong maria	70	21.2
6. <i>Moringa oleifera</i> Lam.	Kalungay mallungay	67	20.3
7. <i>Piper betle</i> L.	buyo	46	13.9
8. <i>Vitex negundo</i> L.	lagundi	43	13.0
9. <i>Annona muricata</i> L.	guyabano	41	12.4
10. <i>Zingiber officinale</i> Roscoe	Laya, luya	37	11.2

11.	<i>Andropogon citratus</i> (DC.) Stapf	tanglad	32	9.7
12.	<i>Morinda umbellata</i> L.	lipod nino	29	8.8
13.	<i>Momordica charantia</i> L.	marigoso pariya ampalaya	25	7.6
14.	<i>Cordia dichotoma</i> G.Forst.	anonang	25	7.6
15.	<i>Euphorbia hirta</i> L.	gatas-gatas tawa-tawa	24	7.3
16.	<i>Lagerstroemia speciosa</i> (L.) Pers.	banaba	22	6.7
17.	<i>Clinopodium douglasii</i> (Benth.) Kuntze	yerba buena herba buena	20	6.1
18.	<i>Chrysanthemum indicum</i> L.	manzanilya	19	5.8
19.	<i>Citrus microcarpa</i> (Bunge) Wijnands	suha limon kalamansi	18	5.5
20.	<i>Eleusine indica</i> (L.) Gaertn.	bag-angan paragis	18	5.5
21.	<i>Sandoricum koetjape</i> (Burm.f.) Merr.	santol	17	5.2
22.	<i>Gmelina arborea</i> Roxb.	gemilina	17	5.2
23.	<i>Ageratum conyzoides</i> L.	kulong-kogong tagulinaw	17	5.2
24.	<i>Cocos nucifera</i> L.	niyog	17	5.2
25.	<i>Acorus calamus</i> L.	lubigan	16	4.8
26.	<i>Tinospora crispa</i> (L.) Hook. f. & Thomson	panyawan makabuhay	14	4.2
27.	<i>Peperomia pellucida</i> Kunth	pansit pansitan taliunod ulasimang bato	14	4.2
28.	<i>Clerodendrum intermedium</i> Cham.	matang-kuwaw alibagta dasmagang-aswang	13	3.9
29.	<i>Piper nigrum</i> L.	paminta	12	3.6
30.	<i>Persea americana</i> Mill.	abukado	11	3.3
31.	<i>Andrographis paniculata</i> (Burm.f.) Nees	serpentina maravillosa	10	3.0
32.	<i>Datura metel</i> L.	kalampunay talampunay talong punay	9	2.7
33.	<i>Musa paradisiaca</i> L.	batag saging	9	2.7
34.	<i>Kaempferia galangal</i> L.	dusol gisol	9	2.7
35.	<i>Averrhoa bilimbi</i> L.	lba, kamyas	9	2.7
36.	<i>Orthosiphon aristatus</i> (Blume) Miq.	balbas pusa	8	2.4
37.	<i>Bryophyllum pinnatum</i> (Lam.) Oken	aritana katakataka	8	2.4
38.	<i>Mimosa pudica</i> L.	panaoli panhaule	8	2.4
39.	<i>Tamarindus indica</i> L.	sampalok	8	2.4

40.	<i>Ocimum sanctum</i> L.	kamangkaw sulasi	8	2.4
41.	<i>Citrus maxima</i> (Burm.) Merr.	lukban	7	2.1
42.	<i>Pseuderanthemum reticulatum</i> Radlk.	pasaw pasaw-na-hapay	7	2.1
43.	<i>Annona squamosa</i> L.	Atis	7	2.1
44.	<i>Hibiscus rosa-sinensis</i> L.	gumamela	6	1.8
45.	<i>Imperata cylindrica</i> (L.) P.Beauv.	kugon gogon	6	1.8
46.	<i>Theobroma cacao</i> L.	kakaw	5	1.5
47.	<i>Pandanus amaryllifolius</i> Roxb.	pandan	5	1.5
48.	<i>Centella asiatica</i> (L.) Urb.	gotu kola takip-kohol	5	1.5
49.	<i>Euphorbia neriifolia</i> L.	soro-soro sorog-sorog	4	1.2
50.	<i>Artocarpus heterophylla</i> Lam.	langka	4	1.2
51.	<i>Proiphys amboinensis</i> L.	abod tambal	4	1.2
52.	<i>Barringtonia speciosa</i> J.R.Forst. & G.Forst.	buro-bituon botong	4	1.21
53.	<i>Nauclea orientalis</i> L.	bangkal	4	1.21
54.	<i>Gliricidia sepium</i> (Jacq.) Walp.	madre de kakaw kakawate	4	1.21
55.	<i>Impatiens balsamina</i> L.	kamantigi	3	0.91
56.	<i>Ficus septica</i> Burm f.	labnog hauili kauili	3	0.91
57.	<i>Senna alata</i>	kasitas akapulko	3	0.91
58.	<i>Allium sativum</i> L.	bawang	2	0.61

$FI = FC / N \times 100$

FC = number of informants who mentioned the use of the species

N = total number of informants (330)

Table 4 Medicinal Plants showing their major uses and fidelity level

Scientific Name	Family	Major Use	SF	TF	FL
1. <i>Sandoricum koetjape</i> (Burm.f.) Merr.	Meliaceae	Cough and Colds	14	17	82.4
2. <i>Momordica charantia</i> L.	Cucurbitaceae	Cough and Colds	20	25	80.0
3. <i>Euphorbia nerifolia</i> L.	Euphorbiaceae	Cough and Colds	3	4	75.0
4. <i>Andropogon citratus</i> (DC.) Stapf	Poaceae	Hypertension	24	32	75.0
5. <i>Orthosiphon aristatus</i> (Blume) Miq.	Lamiaceae	UTI	6	8	75.0
6. <i>Artocarpus heterophylla</i> Lam.	Moraceae	Relapse	3	4	75.0
7. <i>Impatiens balsamina</i> L.	Balsaminaceae	Sinusitis	2	3	66.7
8. <i>Ficus septica</i>	Moraceae	Fever	2	3	66.7
9. <i>Burm.f.</i>					
10. <i>Senna alata</i> (L.) Roxb.	Leguminosae	Skin itch Ringworm	2	3	66.7
11. <i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	UTI/Kidney stone	14	22	63.6
12. <i>Andrographis paniculata</i> (Burm.f.) Nees	Apocynaceae	Hypertension	6	10	60.0
13. <i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	Hypertension	7	12	58.3
14. <i>Piper nigrum</i> L.	Piperaceae	Cough	7	12	58.3
15. <i>Citrus maxima</i> (Burm.) Merr.	Rutaceae	Fever and Headache	4	7	57.1
16. <i>Vitex negundo</i> L.	Lamiaceae	Cough and Colds	24	43	55.8
17. <i>Gmelina arborea</i> Roxb.	Lamiaceae	Body Pains	9	17	52.9
18. <i>Chrysanthemum indicum</i> L.	Asteraceae	Cough and Colds	10	19	52.6
19. <i>Proiphys amboinensis</i> L.	Amaryllidaceae	Gastric Pain	2	4	50.0
20. <i>Allium sativum</i> L.	Amaryllidaceae	Hypertension	1	2	50.0
21. <i>Barringtonia speciosa</i> J.R.Forst. & G.Forst.	Lecythidaceae	Menstrual Cramps	2	4	50.0
22. <i>Nauclea orientalis</i> L.	Rubiaceae	Swelling	2	4	50.0
23. <i>Mimosa pudica</i> L.	Fabaceae	Swelling	4	8	50.0
24. <i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Boil	3	6	50.0
25. <i>Gliricidia sepium</i> (Jacq.) Walp.	Leguminosae	Skin itch	2	4	50.0
26. <i>Plectranthus amboinicus</i> (Lour.) Spreng.	Lamiaceae	Cough and Colds	73	155	47.1
27. <i>Clinopodium douglasii</i> (Benth.) Kuntze	Lamiaceae	<i>Pasma</i>	9	20	45.0
28. <i>Datura metel</i> L.	Solanaceae	<i>Kulibra</i> /swelling	4	9	44.4
29. <i>Musa paradisiaca</i> L.	Musaceae	Diarrhea	4	9	44.4
30. <i>Annona muricata</i> L.	Annonaceae	Hypertension	18	41	43.9
31. <i>Tinospora crispa</i> (L.) Hook. f. & Thomson	Menispermaceae	Body pain due to gas	6	14	42.9
32. <i>Pseuderanthemum reticulatum</i> Radlk.	Acanthaceae	Body Pains	3	7	42.9
33. <i>Euphorbia hirta</i> L.	Euphorbiaceae	Dengue Fever	10	24	41.7
34. <i>Morinda umbellata</i> L.	Rubiaceae	Sprain with swelling Muscle pain	12	29	41.4
35. <i>Cordia dichotoma</i> G.Forst.	Boraginaceae	Relapse	10	25	40.0

36.	<i>Theobroma cacao</i> L.	Malvaceae	Pasma	2	5	40.0
37.	<i>Pandanus amaryllifolius</i> Roxb.	Pandanaceae	Swelling, Arthritis	2	5	40.0
38.	<i>Citrus microcarpa</i> (Bunge) Wijnands	Rutaceae	Cough and Colds	7	18	38.9
39.	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	UTI	7	18	38.9
40.	<i>Tamarindus indica</i> L.	Fabaceae	Bathing	3	8	37.5
41.	<i>Ocimum sanctum</i> L.	Lamiaceae	Rashes	3	8	37.5
42.	<i>Jatropha curcas</i> L.	Euphorbiaceae	Fever	28	75	37.3
43.	<i>Kaempferia galangal</i> L.	Zingiberaceae	Swelling, Abscess	3	9	33.3
44.	<i>Imperata cylindrica</i> (L.) P.Beauv.	Poaceae	UTI	2	6	33.3
45.	<i>Acorus calamus</i> L.	Acoraceae	Bloated stomach	5	16	31.3
46.	<i>Clerodendrum intermedium</i> Cham.	Lamiaceae	Parasites	4	13	30.8
47.	<i>Ageratum conyzoides</i> L.	Asteraceae	Cough	5	17	29.4
48.	<i>Peperomia pellucida</i> Kunth	Piperaceae	Urinary tract infection (UTI)	4	14	28.6
49.	<i>Annona squamosa</i> L.	Annonaceae	Parasites	2	7	28.6
50.	<i>Persea americana</i> Mill.	Lauraceae	Anemia	3	11	27.3
51.	<i>Piper betle</i> L.	Piperaceae	Fever	12	46	26.1
52.	<i>Cocos nucifera</i> L.	Arecaceae	UTI and Kidney stones	4	17	23.5
53.	<i>Blumea balsamifera</i> (L.) DC	Asteraceae	Menstrual Cramps	29	129	22.5
54.	<i>Averrhoa bilimbi</i> L.	Oxalidaceae	Pasma	2	9	22.2
55.	<i>Artemisia vulgaris</i> L.	Asteraceae	Gastric Pain	14	70	20.0
56.	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Body Pains	7	37	18.9
57.	<i>Psidium guajava</i> L.	Myrtaceae	Disinfecting wounds	16	85	18.8
58.	<i>Moringa oleifera</i> Lam.	Moringaceae	Gastric problem	12	67	17.9
59.	<i>Centella asiatica</i> (L.) Urb.	Umbelliferae	UTI	2	5	40

$FL (\%) = SF/TF (100)$

SF = frequency of citation of a given species for a specific ailment

TF = total number of citations of the species

Table 5 Factor of informant consensus for ailment categories

Ailment Category	Number of Species (ns)	Number of Use Reports (nuc)	F _{ic}
Respiratory (cough and colds, asthma)	17	206	0.92
Obstetrical/ Menstrual Problems	6	46	0.89
Muscular and Joint Problems	12	83	0.87
Fever	15	91	0.87
Pain (headache and body pains)	14	89	0.85
Gastrointestinal (stomachache, diarrhea, ulcer)	25	111	0.78
Cardiovascular (heart disease, hypertension)	12	52	0.77
Dental problems	2	5	0.75
Urinary problems (UTI, kidney stones)	12	44	0.74
Dermatological (wound, rash, itchiness, scabies)	17	60	0.723
Elemental forces	2	3	0.50
Diabetes Mellitus	6	8	0.29

$$F_{ic} = (nuc - ns) / (nuc - 1)$$

nuc = number of use citations

ns = number of species used for each use citation

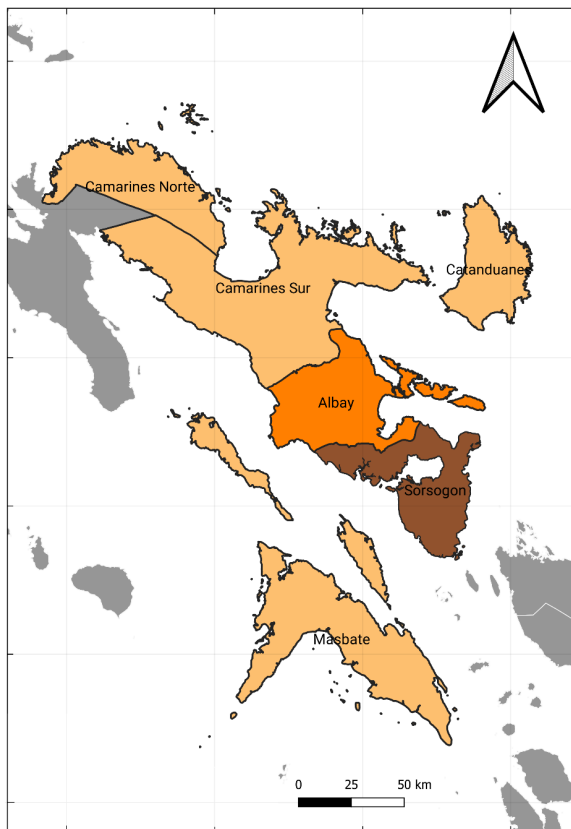


Figure 1 Map of Bicol Region, Philippines (QGIS)

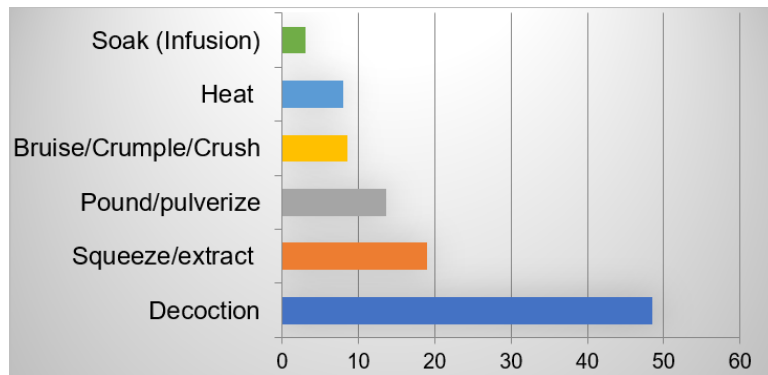


Figure 2 Preparation of the medicinal plants

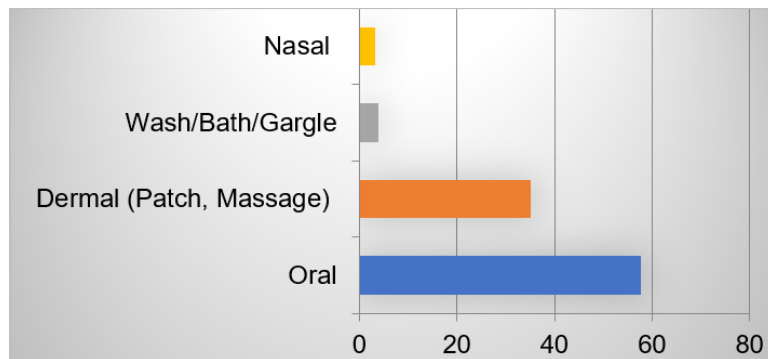


Figure 3 Mode of administration of medicinal plants
Keywords: foodborne parasites, washing, open air market, crops, Legazpi, Daraga