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Ethnomedicinal documentation of polyherbal formulations and other folk medicines in Aurora, Zamboanga del Sur, Philippines

JAYSON R. PUCOT[1,2,♥], CESAR G. DEMAYO[1]

[1]Department of Biological Sciences, College of Science and Mathematics, Mindanao State University-Iligan Institute of Technology. Bonifacio Ave., Tibanga, Iligan City 9200, Philippines

[2]Department of Arts and Sciences, Institute of Teacher Education, Arts, and Sciences, Davao del Sur State College. Brgy. Matti, Digos City 8002, Philippines. Tel. +82-293-9136, ♥email: jayson.pucot@g.msuiit.edu.ph

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Abstract. *Pucot JR, Demayo CG. 2021. Ethnomedicinal documentation of polyherbal formulations and other folk medicines in Aurora, Zamboanga del Sur, Philippines. Biodiversitas 22: 5331-5343.* In Aurora-a rural municipality in western Mindanao, Philippines, wide patronization of folk medicines has been observed, and polyherbal formulations are one of the treatments used. However, knowledge of these formulations has not been documented, imposing a threat that might lead to its eventual loss. The lack of baseline information on these formulations also stagnates its development, and the danger of possible herb-herb interactions might remain high. Therefore, this study aims to compile polyherbal formulations and other folk medicine used by the healers and locals of Aurora and assess the utilization and knowledge of these indigenous practices with implications for its conservation and strengthening localized folk medicine pharmacovigilance. Through purposive and snowball sampling, a total of 23 key informants volunteered and were interviewed using semi-structured questionnaires. Knowledge and practices about medicinal plants were analyzed using descriptive statistics. A total of 34 polyherbal formulations and ten other folk medicines were recorded. Most of the plant species used belonged to the Poaceae family (14 species), Arecaceae, and Musaceae families (10 species each) and were mainly utilized for *bughat*, *pasmo*, and *kabuhi*-illnesses linked with cultural beliefs. The concept of synergism was also observed when it comes to folk medicine usage. It is recommended that more surveys of polyherbal medicines be conducted along with chemical profiling and pharmacological investigations, especially in the rural areas where these folk medicines are still widely utilized.

Keywords: Ethnopharmacology, herbal medicines, medicinal plants, Mindanao, rural health, survey

INTRODUCTION

In the absence of modern therapeutics, people used herbal medicines to treat and prevent diseases (Yaniv 2014). The naturally occurring compounds found in these plants have been essential for discovering novel medicine candidates even to this day (Süntar 2020). Although western medicines are now widely available, the use of medicinal plants is still increasing because of numerous reasons, including a broad spectrum of cultural and socioeconomic factors (Rondilla et al. 2021). Many studies have already shown that plants, from *Abelmoschus esculentus* (L.) Moench to *Zingiber officinale* Roscoe have various biological activities that are widely beneficial to human health (Alima and Demayo 2018; Pucot et al. 2021). Many laboratory-based assessments were conducted as a result of different ethnobotanical surveys in various local communities and indigenous groups (Prastiyanto et al. 2020; Vo et al. 2015), reiterating the importance of bioprospecting folk medicine in the drug discovery and development processes.

In the Philippines, especially in the rural areas of Mindanao, herbal medicines are still widely used for the prevention and treatment of diseases (Alduhisa and Demayo 2019; Olowa and Demayo 2015; Pucot and Demayo 2021a; Pucot et al. 2019). A recent survey in Aurora-a rural municipality in western Mindanao, showed wide patronization of folk medicines (Pucot and Demayo 2021b). These have been attributed to many factors, including rich cultural diversity and a long history of using folk medicine (https://aurorazds.gov.ph). Traditional healers are often consulted when locals have health concerns and commonly prescribe plants either individually or in polyherbal formulations. These formulations, however, have not been documented, and the lack of information on this indigenous knowledge might result in its eventual loss. The development of the country's polyherbal formulations might also stagnate because of the lack of baseline data. The threat of possible herb-herb interaction and adverse effects might remain high without this baseline information.

Therefore, this study aims to compile polyherbal and other folk medicines used by the healers and locals of Aurora, Zamboanga del Sur, and assess their utilization and knowledge of this valuable indigenous knowledge with implications for its conservation and strengthening localized folk medicine pharmacovigilance.

MATERIALS AND METHODS

Study area

The research was conducted in Aurora, Zamboanga del Sur-a rural municipality in western Mindanao, Philippines

(7.9546° N, 123.5952° E). The municipality encompasses 18,095 hectares that are distributed unevenly among its 44 barangays. The geography of the municipality is exceedingly variable, ranging from highly plain along the coastlines and lowlands to extremely steep mountains with peaks of 1000 feet above sea level. Because of its high elevation, the municipality has a cooler climate, ranging from 22 to 35 degrees Celsius (Municipality of Aurora 2014). The municipality's vegetation is dominated by perennial trees and vine crops, followed by grazing pastures or grassland. The initial sampling was done in 14 barangays of Aurora. However, the availability of key informants was only recorded in eight barangays: (1) Acad, (2) Alegria, (3) Cabilinan, (4) Campo Uno, (5) Kahayagan East, (6) Inasagan, (7) Romarate, (8) San Jose (Figure 1).

Ethical considerations

The research was guided by the ISE codes of ethics (International Society of Ethnobiology 2006). The researcher also underwent a rapid COVID-19 antigen test before conducting the interviews with non-reactive results for both COVID-19 IgM and IgG tests (ACEH-RT: 2020-1533). All participants who volunteered for the study were assured that taking part or withdrawing would not affect them in any way, and their privacy and anonymity were maintained at all times, as reflected on the interview consent form. The interview was conducted in a location of the participant's choosing, and those who could not read or write were granted an oral interview.

Data and sample collection

The sampling was conducted from August 2020 to March 2021, observing the health protocols laid down by the Municipal Inter-Agency Task Force for COVID-19 prevention. The study was conducted in coordination with the local government unit (LGU) under the mayor's permit No. 3192179, the municipal Environment and Natural Resources Office (MENRO), and the Provincial Environment and Natural Resources Office (PENRO) of Zamboanga del Sur with gratuitous permit no. R9-04-2021. The sampling includes acquiring free prior informed consent, certifications, and permits, semi-structured interviews, focus group discussions, plant and field assessments, and medicinal plant identification.

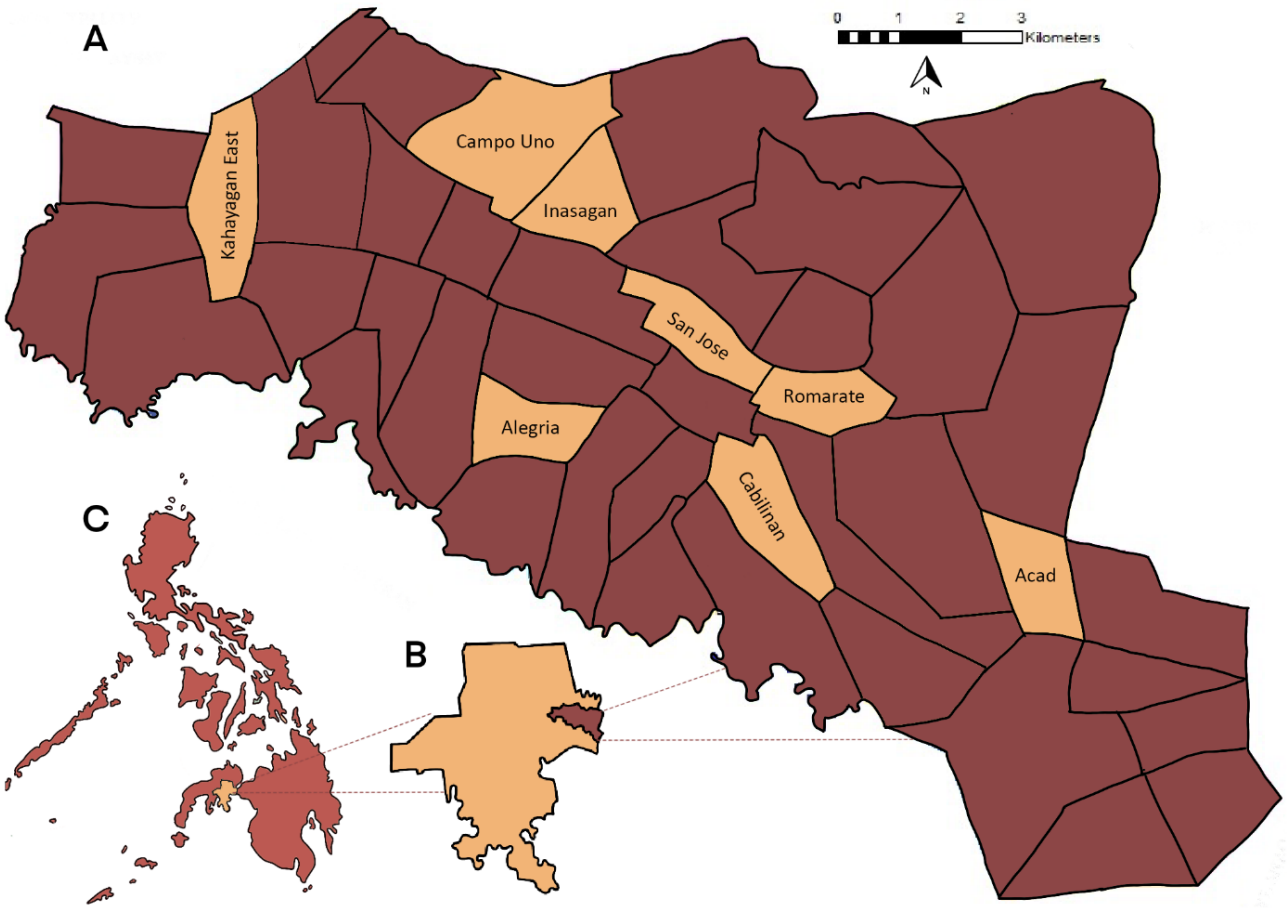

Figure 1. Sampling sites in Aurora (A), Zamboanga del Sur (B), Philippines (C)

Polyherbal and other folk medicine data were collected through semi-structured interviews with key informants through purposive and snowball sampling. All data were encoded and analyzed using Microsoft Excel Spreadsheet Software. Key informants are identified as (i) *Manambalay*, a shamanistic or traditional healer; (ii) *manghihilot*, a masseur or masseuse; and (iii) community members who are knowledgeable about polyherbal formulations. The semi-structured questionnaire was modified and adapted from previous ethnobotany surveys (Abe and Ohtani 2013; Alduhisa and Demayo 2019; Olowa and Demayo 2015; Ong and Kim 2014) with modifications and *Cebuano* translations (the local language widely used in the area). Briefly, the questionnaire comprises demographic information such as name, age, sex, educational background, civil status, occupation, and contact information. Additional details such as the composition of the polyherbal formulations and local name of the plants' used, purpose(s), the plant's part(s) used, modes of application, quantities, frequency of administration, and the origins of herbal medicinal usage were also noted.

Plant collection and identification

Plant specimens were photographed during supervised field walks with the help of the respondents. Notes on the plants' habits, habitat, vernacular names, and local names of their uses were also recorded. The samples were then processed for identification. The researchers initially identified the samples, and a botanist and taxonomist assisted in the final identification and validation. Plants were further validated by checking for spelling, synonyms, family classifications, and distribution using Co's Digital Flora of the Philippines (CDFP; www.philippineplants.org) and Plants of the World Online (POWO; www.plantsoftheworldonline.org).

RESULTS AND DISCUSSION

Characteristics and polyherbal knowledge of the locals

Twenty-three respondents from Aurora, Zamboanga del Sur, were interviewed about their polyherbal and other folk medicinal practices. Of these respondents, there were more females (60.87%) than males (39.13%) and were mainly on the primary education level (56.52%). Based on these results, it can be argued that females and those with lower educational attainment are more aligned to using polyherbal formulations. Other closely related ethnobotanical studies in the country also showed that females have more knowledge of medicinal plants (Abe and Ohtani 2013; Balinado and Chan 2017; Tantengco et al. 2018). Some have also correlated higher educational attainment with lesser folk medicine knowledge (Morilla et al. 2014; Ong and Kim 2014), while others have reported otherwise (Abe and Ohtani 2013; Tantengco et al. 2018). It is crucial that more research on the differences in sociodemographic factors be conducted to further understand factors affecting indigenous knowledge transmission. On the other hand, most of the informants are farmers (43.48%), while the rest are *manambalay* (healers) (30.43%), *manghihilot* (masseur or masseuse) (8.70%), and unemployed (13.04%). The complete demographic profile of the respondents is presented in Table 1.

Knowledge of polyherbal formulations and other folk medicine amongst informants mainly came from their parents (39%), while others acquired this knowledge from their community (22%), learned it themselves (17%), learned it through their relatives (9%), or through *tuga* (13%)-a healing or mystical power bestowed by gods or spirits. Alarmingly, most of the folk medicines were administered internally (i.e., through drinking) (74%). The prolonged oral consumption of some herbal medicines is often correlated with toxicity and poisoning (de Oliveira et al. 2011; Ghorani-Azam et al. 2018; Ozyigit et al. 2018; Pavlova and Karadjova 2013); thus, it is recommended that local consumers observe caution when orally administering herbal products.

The medicinal plant species used in the polyherbal formulation were mainly gathered from *lasang* (52.17%) (forest or woods where dense plants and trees are present), while others collect them from their vicinity (30.43%) and their community (17.39%). The collection of plant materials was primarily done when the need arises (48%); however, some collect them daily (22%), weekly (9%), monthly (4%), and annually (17%). A strict specific schedule is followed in the collection of plant materials (e.g., when plant materials are used for healing purposes, the collection should always be done early in the morning when the sun has not risen yet).

Table 1. Sociodemographic characteristics of key informants in Aurora, Zamboanga del Sur

Category	Subcategory	No. of informants	% of informants
Location	Acad	2	8.70
	Alegria	3	13.04
	Cabilinan	2	8.70
	Campo Uno	5	21.74
	Kahayagan East	2	8.70
	Inasagan	2	8.70
	Romarate	4	17.39
	San Jose	3	13.04
Education level	No formal education	2	8.70
	Primary	13	56.52
	Secondary	8	34.78
Gender	Male	9	39.13
	Female	14	60.87
Occupation	Employed	1	4.35
	Farming	10	43.48
	Mananambal (healer)	7	30.43
	Manghihilot (masseur or masseuse)	2	8.70
	None	3	13.04
Civil Status	Married	20	86.96
	Single	2	8.70
	Widowed	1	4.35
Age	35-49 years old	4	17.39
	50-65 years old	11	47.83
	> 65 years old	8	34.78

Moreover, the weekly collection must be done on Tuesdays and Fridays because these days are believed to have added powers to any act of shamanism and sorcery, medicinal practices, and materials used thereof. This practice was also observed in other parts of the country (Aparece 2006; Rebuya et al. 2020) and other cultures worldwide (Napoli 2008; Ugent 2000).

Furthermore, the annual collection of medicinal plants and other healing materials is usually done during the holy week. This practice is attributed to the belief that humans and gods or any spiritual entities can communicate with each other during this period; thus, prayers, healing practices, and materials conducted and collected during the holy week will be more efficacious. This practice is also heavily influenced by Christianity and its syncretism with elements of the Philippine precolonial beliefs and practices. The same practice was observed with the *Lunas* of Bohol (Aparece 2006), the power acquisition of local traditional healers (Necesito and Gaspan III 2019), the *pangalap* of Siquijor (Bucol 2008), and even in the making of Holy anointing oil or Holy Chrism in other countries (Toma et al. 2014).

Noticeably, the concept of synergism when it comes to using folk medicine was observed. This is attributed to their claims that one can combine all folk medicines as long as they are used for the same purpose. For example, a plant used as an antibacterial can be mixed with any other antibacterial plant, making it more effective and efficient in treating diseases. Further investigation should be conducted as there are possibilities of synergistic and antagonistic effects resulting from herb-herb interaction as observed in other studies (Guardo et al. 2017; Moussaoui and Alaoui 2016). Also, the concomitant use of herbal medicines with that of pharmaceutical drugs should also be investigated as it was also noted in rare cases, including the possible reactions of chemicals involved in making the herbal formulations.

Illnesses, polyherbal formulations, and other folk medicine

A total of 34 polyherbal formulations were collected in this study, as shown in Table 2. Most of the plant species used belong to the Poaceae family (14 species), followed by the Arecaceae and Musaceae families with ten species (Figure 2). Most formulations (45%) were made to treat relapse, fatigue, headache, body pain, fever, and migraine. These often simultaneously occurring illnesses are the symptoms of *bughat* (Unilab Incorporated 2019) and *pasmo* (Del Fierro and Nolasco 2013). Although *bughat* is usually experienced by females who have given birth (Unilab Incorporated 2019), according to the respondents, males can also experience the same, especially when they engage in highly physically demanding work shortly after or during the sickness recovery period. The same symptoms are experienced when someone is *napasmo* (from the root word *pasmo).* In the *Bisaya*-speaking areas, including Aurora, *pasmo* could have different causes and manifestations. For this study, *pasmo* is parallel to (Del Fierro and Nolasco 2013) definition, which is when one's eating habits are irregular. However, according to the locals, *pasmo* can also be experienced when one consumes cold food and beverages or eats food considered *makapasmo* (can cause *pasmo)* when hungry, *e.g.*, eating young coconut meat while experiencing hunger. Most of the polyherbal formulations for these illnesses are consumed internally and usually warm to attain a balance between hot and cold elements-roughly the same concept as *pasma* (Tan and Tan 2008). Another frequently mentioned illness is *kabuhi*. *Kabuhi* is described as having burning chest discomfort, bloating, burping, and sudden weakness that sometimes leads to syncope. Early reports have defined it as a pulsation that is found in the navel or hidden in the ribs and could indicate one's body state (Rubel et al. 1975), while others describe it as gastroesophageal reflux disease (GERD) (Abatayo 2015). Nevertheless, more research into these symptoms' clinical basis should be done to understand their causes and treatments.

Aside from polyherbal formulations, another folk medicine was also recorded in this survey, as shown in Table 3. Notably, eggs were used for treating dengue fever and symptoms of *pasmo* and *bughat*. Eggs have been considered both nutritional and functional foods with several active components, including the carotenoids lutein and zeaxanthin, which could act as antioxidants and various biological activities such as immunomodulatory and antihypertensive activities (Réhault-Godbert et al. 2019). These compounds might have caused the perceived alleviation of symptoms. The use of eggs for treatment was also recorded in other folk healers in the world, including the *curandero*s of the Mexican American people (Lopez 2005).

Moreover, roasting was also a popular method for preparing folk medicine, including the roasting of corn, coconut shells, and rice. Corn offers excellent health benefits, promoting postprandial glycemic or insulinemic responses, lipid metabolism, colon health, and mineral absorption (Ai and Jane 2016). Hot water with roasted corn or rice was also widely popular amongst locals as an alternative to coffee and was often promoted as a functional beverage. Compared to other belief systems, lixiviated ashes of coconut shells were also used during *parem baba* and after giving birth in Indonesia (Niehof 1988). It was also part of the healing practices of the *Malavedan* tribe (Rajasekharan 2013).

Table 2. Polyherbal medicines used by the healers and locals of Aurora, Zamboanga del Sur, Philippines

No.	Scientific name	Family	Local name	Disease or purpose	[1]PP	[2]Preparation and administration	Administration frequency/duration	Quantity or dosage
1	*Eleusine indica* (L.) Gaertn.	Poaceae	Bila-bila	Relapse, fatigue, headache, body pain, fever; migraine	St	I Drink infusion	Thrice a day before meal or as needed	½ glass
	Kyllinga nemoralis (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel	Cyperaceae	Busikad		St			
	Vigna radiata (L.) R.Wilczek	Leguminosae	Monggos		Fr			
2	*Persea americana* Mill.	Lauraceae	Abokado	Diarrhea, stomachache, stomach problems, peptic ulcer, gas pain, flatulence, stomach acidity, burning chest, discomfort, nausea	Lf	I Drink decoction	Twice a day or as needed	One glass
	Psidium guajava L.	Myrtaceae	Bayabas		Lf			
	Chrysophyllum cainito L.	Sapotaceae	Caymito		Lf			
3	*Musa acuminata x balbisiana*	Musaceae	Saging kardaba	Relapse, fatigue, headache, body pain, fever; migraine	Sp	I Drink the mixture of *Saging kardaba* petiole sap and Coconut liquid endosperm (Coconut water) with hot water.	Once a day until symptoms subside	All the sap from a palm-sized petiole and a coconut fruit
	Cocos nucifera L.	Arecaceae	Lubi (limbahon)		Fr			
4	*Ficus septica* Burm.f	Moraceae	Lagnob	Relapse, fatigue, headache, body pain, fever; migraine	Rt, Sh	I Drink decoction of roots and/or shoots of *kipi-kipi*, *lagnob*, and roasted *mais* seeds.	Every morning before breakfast and every night before sleeping/ until symptoms subside	1-2 glasses
	Mimosa pudica L.	Fabaceae	kipi-kipi		Rt, Sh			
	Zea mays L.	Poaceae	Mais		Se			
5	*Gmelina arborea* Roxb.	Lamiaceae	Gemelina	Gas pain, flatulence; arthritis, muscle pain, muscle knots, swellings, stomach acidity, burning chest discomfort, nausea	Lf	E Apply heated crushed *Gemelina* leaves, *Tuba-tuba* scraped bark, and pounded rhizomes of *luy-a* as poultice.	Every morning and every night before sleeping/ until symptoms subside	Entirely on the affected area
	Jatropha curcas L.	Euphorbiaceae	Tuba-tuba		Brk			
	Zingiber officinale Roscoe	Zingiberaceae	Luy-a		Rz			
6	*Citrus maxima* (Burm.) Osbeck	Rutaceae	Buongon	Relapse, fatigue, headache, body pain, fever; migraine	Lf	I Drink decoction	Once a day or as needed	1-2 glasses
	Blumea balsamifera (L.) DC.	Asteraceae	Gabon		Lf			
	Pseudelephantopus spicatus (B.Juss. ex Aubl.) Rohr ex Gleason	Compositae	Dila dila sa iro		Lf			
7	*Psidium guajava* L.	Myrtaceae	Bayabas	Diarrhea and stomachache	Brk	I Drink decoction	Twice a day or as needed	1-2 glasses
	Syzygium cumini (L.) Skeels	Myrtaceae	Lumboy		Brk			

8	*Musa textilis* Née *Corypha utan* Lam. *Musa acuminata x balbisiana* *Musa* sp.	Musaceae Arecaceae Musaceae Musaceae	Abaka Buli Saging kardaba Saging bulongan	Relapse, fatigue, headache, body pain, fever; migraine	Sp Sp Sp Sp	I	Drink sap from the heated center portion of three palm-sized petioles of each plant.	Once a day or as needed	All sap from one palm-sized petiole of each plant
9	*Momordica charantia* L. *Capsicum annuum* L. *Cocos nucifera* L.	Cucurbitaceae Solanaceae Arecaceae	Ampalaya Sili Lubi	Flatulence, fatigue, relapse, headache, body pain, fever, muscle knots, muscle spasm, muscle pain, swellings, stomach acidity. Burning chest discomfort, nausea	Lf Fr Fr	E	Mix *sili* fruit, *ampalaya* crushed and heated leaves, and coconut oil and apply as a massage oil	As needed	Entirely on the affected area
10	*Pseudelephantopus spicatus* (B.Juss. ex Aubl.) Rohr ex Gleason *Chromalaena odorata* (L.) R.M.King & H.Rob. *Blumea balsamifera* (L.) DC.	Compositae Asteraceae Asteraceae	Dila dila sa iro Hagonoy Gabon	Flatulence, stomachache, diarrhea, dysmenorrhea, stomach acidity	Rt, Sh Rt, Sh Rt, Sh	E	Apply heated and crushed roots and/or shoots of each plant as a poultice.	As needed	Entirely on the affected area
11	*Eleusine indica* (L.) Gaertn. *Vigna radiata* (L.) R.Wilczek *Kyllinga nemoralis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel *Euphorbia hirta* L.	Poaceae Leguminosae Cyperaceae Euphorbiaceae	Bila bila Monggos Busikad Tawa-tawa, mangagaw	Fever, teething child	St Se St Wh	I	Drink warm water infused with the respective plant's part	As needed	½ glass
12	*Jatropha curcas* L. *Zingiber officinale* Roscoe *Nicotiana tabacum* L. *Cocos nucifera* L.	Euphorbiaceae Zingiberaceae Solanaceae Arecaceae	Tuba-tuba Luy-a Tabako Lubi	Maternal care, postpartum recovery, labor enhancer	Brk Rz Lf Fr	E	Mix coconut oil with *tuba-tuba* scraped bark, *luy-a* crushed rhizome, and *tabako* pounded leaves, and apply as a poultice or as a massage oil	As needed	Entirely on the affected area
13	*Myristica simiarum* A. DC. *Musa acuminata x balbisiana* *Cocos nucifera* L. *Flemingia strobilifera* (L.) W.T.Aiton	Myristicaceae Musaceae Arecaceae Leguminosae	Duguan, dugusay Saging kardaba Lubi (limbahon) gaan-gaan	Relapse, fatigue, headache, body pain, fever; migraine	Brk Rt Fr Rt	I	Drink the mixture of decocted *Duguan* bark (1-3 palm-sized bark), *Saging kardaba* roots, and *gaan-gaan* roots with coconut water	Once a day or as needed	1-2 glasses

14	*Blumea balsamifera* (L.) DC. *Zingiber officinale* Roscoe *Piper nigrum* L.	Asteraceae Zingiberaceae Piperaceae	Gabon Luy-a Paminta	Cough, fever, chills	Lf Rz Lf	E	Apply as a poultice on the chest, forehead, and other parts of the body	As needed	Entirely on the affected area
15	*Corypha utan* Lam. *Musa acuminata* Colla *Musa textilis* Née	Arecaceae Musaceae Musaceae	Buli Saging murado Abaka	Relapse, fatigue, headache, body pain, fever; migraine	Sp Sp Sp	I	Drink the sap from the heated center portion of three palm-sized petioles of each plant.	Once a day or as needed	All extracted sap
16	*Corchorus olitorius* L. *Abelmoschus esculentus* (L.) Moench *Momordica charantia* L.	Malvaceae Malvaceae Cucurbitaceae	Saluyot Okra Paliya, Ampaliya, ampalaya	Diabetes	Lf Fr Lf	I	Drink water infusion	Once a day or as needed	½-1 glass
17	*Bidens pilosa* L. *Heliotropium indicum* L. *Corchorus olitorius* L. *Mimosa pudica* L. *Eleusine indica* (L.) Gaertn.	Asteraceae Boraginaceae Malvaceae Fabaceae Poaceae	Tuway-tuway, Tulay-tulay Elepanteng puti Saluyot Kipi-kipi, hibi-hibi, makahiya Bila-bila	Relapse, fatigue, headache, body pain, fever; migraine	Rt Rt Rt Rt Rt	I	Drink decoction	Once a day or as needed	One glass
18	*Imperata cylindrica* (L.) Raeusch. *Peperomia pellucida* (L.) Kunth *Bambusa bambos* (L.) Voss *Zea mays* L.	Poaceae Piperaceae Poaceae Poaceae	Kugon Sinaw-sinaw Kawayan buhok sa mais	kidney problems: kidney stones, infection	Wh Lf Lf Silk (Stigma maydis)	I	Drink decoction	Once-twice a day or as needed	1-2 glasses
19	*Senna tora* (L.) Roxb. *Ficus septica* Burm.f	Leguminosae Moraceae	Mani-mani Lagnob	Gastrointestinal problems, stomach acidity, acid reflux, burning chest discomfort, nausea	Lf Lf	E	Apply crushed and heated leaves as a poultice	As needed	Entirely on the affected area
20	*Persea americana* Mill. *Citrus maxima* (Burm.) Osbeck *Ficus septica* Burm.f	Lauraceae Rutaceae Moraceae	Abokado buongon Lagnob	Relapse, fatigue, headache, body pain, fever; migraine	Lf Lf Sh	I	Drink decoction	Once a day or as needed	1-2 glasses

21	*Pterocarpus indicus* Willd. *Vitex parviflora* A.Juss. *Lagerstroemia speciosa* (L.) Pers.	Leguminosae Lamiaceae Lythraceae	Nara Tugas Banaba	Leukemia	Brk Brk Brk	I	Drink decoction	Every morning and every night before sleeping/ until symptoms subside	½ glass
22	*Cordia dichotoma* G. Forst. *Ficus septica* Burm.f	Boraginaceae Moraceae	Anonang Lagnob	Diarrhea, gastrointestinal problems, stomach acidity, burning chest discomfort, nausea	St Rt	I	Drink decoction	Twice a day or as needed	1-2 glasses
23	*Cordia dichotoma* G. Forst. *Ficus septica* Burm.f *Dendrocnide meyeniana* (Walp.) Chew *Leucosyke capitellata* (Poir.) Wedd. *Sonneratia caseolaris* (L.) Engl.	Boraginaceae Moraceae Urticaceae Urticaceae Lythraceae	Anonang Lagnob Alingatong kahoy Lagasi Pagatpat	Relapse, fatigue, headache, body pain, fever; migraine	Brk Rt Brk Rt Rt	I	Drink decoction	Twice a day or as needed	One glass
24	*Chrysopogon aciculatus* (Retz.) Trin. *Bambusa bambos* (L.) Voss *Mimosa pudica* L.	Poaceae Poaceae Fabaceae	Amorsiko Kawayan Kipi-kipi, hibi-hibi, makahiya	Hypertension	Wh Lf Rt	I	Drink decoction	Once a day or as needed	One glass
25	*Sida acuta* Burm.f. *Justicia gendarussa* Burm.f. *Blumea balsamifera* (L.) DC. *Nicotiana tabacum* L.	Malvaceae Acanthaceae Asteraceae Solanaceae	Iskobang mayawis Mandalusa Gabon Tabako	Muscle knots, muscle spasm; bruise, sprains, strains, fracture, and dislocation	Rt Fl Lf Lf	E	Apply crushed and heated plant parts as a poultice	As needed	Entirely on the affected area
26	*Imperata cylindrica* (L.) Raeusch. *Kyllinga nemoralis* (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel *Corypha utan* Lam. *Eleusine indica* (L.) Gaertn.	Poaceae Cyperaceae Arecaceae Poaceae	Kugon Busikad Buli Bila-bila	Relapse, fatigue, headache, body pain, fever; migraine	Lf Lf Lf Lf	I	Drink infusion	Once a day or as needed	1-2 glasses
27	*Cordia dichotoma* G. Forst. *Corypha utan* Lam. *Lygodium circinatum* (Burm. f.) Sw.	Boraginaceae Arecaceae Lygodiaceae	Anonang Buli Nito	Relapse, fatigue, headache, body pain, fever; migraine	Rt Rt Rt	I	Drink decoction	Once a day or as needed	1-2 glasses

28	*Blumea balsamifera* (L.) DC. *Vitex negundo* L. *Coleus amboinicus* Lour.	Asteraceae Lamiaceae Lamiaceae	Gabon Lagundi Kalabo	Cough, chills, fever	Lf Lf Lf	I	Drink decoction	Every morning or as needed	1-2 glasses
29	*Ficus minahassae* (Teijsm. & Vriese) Miq. *Ficus septica* Burm.f	Moraceae Moraceae	Hagimit Lagnob	Relapse, fatigue, headache, body pain, fever; migraine	Rt Rt	I	Drink decoction	Twice a day or as needed	1/2 glass
30	*Musa acuminata* Colla *Plectranthus scutellarioides* (L.) R.Br.	Musaceae Lamiaceae	Saging murado Mayana itum	Scabby lesion, scabies, skin diseases, itchiness, eczema, ringworms, dermatitis,	Pt Lf	E	Mix extracts and apply to the affected area	Thrice a day or as needed	Entirely on the affected area
31	*Zea mays* L. *Citrus maxima* (Burm.) Osbeck *Blumea balsamifera* (L.) DC. *Psidium guajava* L. *Artemisia vulgaris* L. *Eleusine indica* (L.) Gaertn. *Cocos nucifera* L.	Poaceae Rutaceae Asteraceae Myrtaceae Compositae Poaceae Arecaceae	mais (pinaig) Buongon gabon Bayabas hilbas Bila-bila Lubi (limbahon)	Relapse, fatigue, headache, body pain, fever; migraine	Se Lf Lf Lf Lf Wh Sh	I	Drink decoction of *buongon, gabon, bayabas* and *hilbas leaves* together with whole *bila-bila* plant and roasted *mais* seeds.	Once a day or as needed	One glass
32	*Musa acuminata* Colla *Thottea affinis* (Planch. ex Rolfe) ined. Sodium chloride or salt	Musaceae Aristolochiaceae	Saging murado Salimbagat Asin	Teething baby, gum problems	Pt Lf One teaspoon	I	Pound *saging murado* petiole, *salimbagat* leaves, and one teaspoon of salt and apply to affected gums	Every morning until symptoms subsides	Entirely on the affected area
33	*Corypha utan* Lam. *Musa* spp.	Arecaceae Musaceae	Buli Saging bulungan	Relapse, fatigue, headache, body pain, fever; migraine	Sp Sp	I	Drink the sap from the heated center portion of three palm-sized petioles of each plant	Once a day or as needed	All extracted sap
34	*Zea mays* L. *Ficus septica* Burm.f The starchy water from boiling or cooking rice	Poaceae Moraceae	Mais Lagnob Lawot sa nilung-ag na humay	Relapse, fatigue, headache, body pain, fever; migraine	Se Sh	I	Drink water infused with roasted corn, *lagnob* shoots, and starchy water from boiling rice	Every morning for three days/ until symptoms subside	1/2 glass

Note: [1]PP: Plant-parts used: Brk: bark; Fr: fruit; Lf: leaves; Pt: petiole; Rt: roots; Rz: rhizome; Se: seeds; Sh: shoots; Sp: sap; St: stem; Wh: whole plant. [2]I: internal; E: external

Table 3. Other folk medicines used by the healers and locals of Aurora, Zamboanga del Sur, Philippines

No.	Scientific name/ English name or translation	Local name	Disease or purpose	[1]Preparation and administration		Frequency/duration	Quantity/dosage
1	Philippine native chicken undercooked egg	Malasadong itlog sa manok	Relapse, fatigue, headache, body pain, fever; migraine	I	Eat undercooked egg directly	Every morning before meal for three days/ until symptoms subside	One whole egg
2	Uncooked quail egg	Itlog sa pugo	Dengue fever	I	Ear raw egg directly	Every morning before meal for three days/ until symptoms subside	One whole egg
3	Roasted coconut shell	Bagol paigon	Relapse, fatigue, headache, body pain, fever; migraine	I	Drink water infused with roasted coconut shell	Every morning before a meal until symptoms subside	½-1 glass
4	Earthworm feces	Tae sa wati paigon	Relapse, fatigue, headache, body pain, fever; migraine	I	Drink water infused with earthworm feces	Only once or as needed	½ glass
5	Softdrinks	Softdrinks	Relapse, fatigue, headache, body pain, fever; migraine	I; E	Mix ice into a boiling hot mixture of soft drinks and roasted rice and inhale the steam; Apply the moisture from the boiling mixture of soft drinks and roasted rice on the patient's back	Every night before sleeping for three days; As needed	Entirely on the affected area
	Ice	Ice					
	Roasted rice	Pinaig na bugas humay					
6	Brown sugar	Sentral	Nausea, Diarrhea	I	Drink a mixture of 1-3 tablespoons of caramelized brown sugar and a cup of water.	As needed	One glass
7	Soil	Yuta	Goiter	E	Apply on the neck a handful of soil collected a foot deep from the ground.	Every morning thrice a week or as needed	The process is done to prevent goiter from developing, so it is a life-long treatment.
8	Three strands of human hair *Zea mays* L. (corn)	Tulo ka grano sa buhok Mais pinaig	Relapse, fatigue, headache, body pain, fever; migraine	I	Drink water infused with three strands of human hair and roasted corn	Every morning for three days or as symptoms subside	1/2 glass
9	*Artemisia vulgaris* L. *Zea mays* L. Philippine native chicken egg	Hilbas Mais pinaig Itlog bisaya	Relapse, fatigue, headache, body pain, fever; migraine	I	Drink decoction of *hilbas* leaves and roasted corn mixed with egg	Every morning for three days or as symptoms subside	1/2-1 glass
10	*Ceiba pentandra* (L.) Gaertn.	Doldol	Mental disorder or distress	E	Tie the person on the doldol tree	A week or as needed	

Note: [1]I: internal; E: external

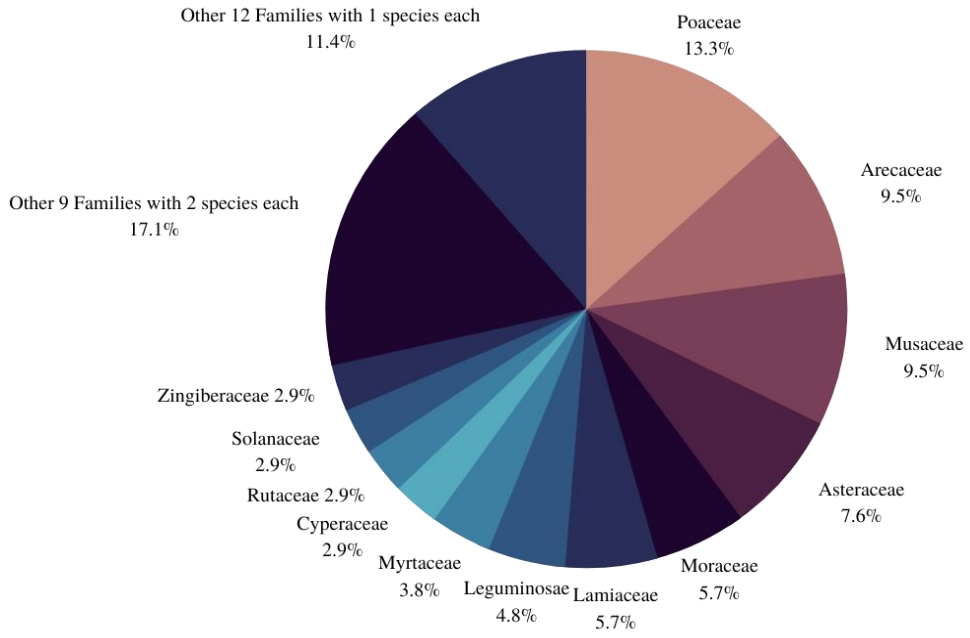

Figure 2. Most commonly used plant Families for the polyherbal medicines in Aurora, Zamboanga del Sur, Philippines

Bioprospecting and pharmacovigilance of polyherbal and other folk medicine

Previous studies have investigated individual plants' bioactive compounds, including their in vitro and in vivo pharmacological activities (He et al. 2007; Alima and Demayo 2018; Pucot and Demayo 2021a; Pucot et al. 2021). Polyherbal formulations, however, were not emphasized because of their complex synergistic and antagonistic effects and structural diversity (Li and Lou 2017; Abdalla and Mühling 2019). Nevertheless, some were able to utilize the enormous potential of polyherbal medicines, which have shown promising health benefits. An example is the polyherbal formulation Diasulin that is used for its anti-diabetic efficacy. Diasulin is a polyherbal drug composed of ethanolic extracts from ten medicinal plants, which shows a significant decrease in blood glucose, tissue lipids, lipid peroxide formation, and increased plasma insulin (Ghorbani 2014).

In this study, the most frequently mentioned polyherbal formulations were the ABC or the *Abokado* (*P. americana), Bayabas* (*P. guajava*), and *Caimito* (*C. cainito*) formulations. It is primarily used for problems of the digestive system. Previous reports have shown that *P. americana* and *P. guajava* have antidiarrheal activities (Adeniyi et al. 2020; Santhoshkumar et al. 2014) while *C. cainito* had antiulcer effects (da Rosa et al. 2019). However, there is currently no data on the effects of these plants when combined, and the mechanisms of action are still unknown. Thus, it is recommended that this polyherbal formulation be investigated further along with other formulations reported in this study.

Studies concerning polyherbal formulations, including surveys and laboratory assays, should be done not only for bioprospecting but also for strengthening herbal medicines' pharmacovigilance. With this, various parameters, including the pharmacokinetic (PK)-pharmacodynamics (PD) of the interaction between polyherbal medicines and pharmaceutical drugs, should also be conducted as there are instances where these medicines are used concomitantly (e.g., warfarin and herbal medicine (Choi et al. 2017)). Adverse drug reactions have become a significant global public health problem which comprises 6.7% of all hospitalizations in selected regions of the world, and the number is still rising (Gromek et al. 2015). This calls for a systematic and more detailed ADME/Tox and chemical profiling of herbal medicines along with surveys in many rural areas like Aurora and indigenous people-inhibited areas where these folk medicines are still widely utilized.

The study reported the first survey of polyherbal medicines in western Mindanao, Philippines. In conclusion, It recorded 34 polyherbal formulations and ten other folk medicines utilized by healers and locals to prevent and treat diseases. These medicines were commonly used to treat *bughat, pasmo*, and *kabuhi*, which might imply that these diseases are currently widespread in the area; thus, should be further investigated. Through this survey, a snippet of the country's indigenous knowledge of plant utilization and knowledge of folk medicine has been documented, which offers vast opportunities for further pharmacological research and leads to discovering novel bioactive compounds with implications for its conservation. The survey's output also reiterates the need to document folk medicines in rural-most areas and indigenous people-inhabited areas where pharmacovigilance should also be given importance to avoid detrimental effects of toxic components of some herbal medicines on human health.

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REFERENCES

Abatayo PM. 2015. Ang kabuhi. https://www.philstar.com/banat/opinyon/2015/02/20/1425586/ang-kabuhi [9-6-2021].

Abdalla MA, Mühling KH. 2019. Plant-derived sulfur containing natural products produced as a response to biotic and abiotic stresses: A review of their structural diversity and medicinal importance. J Appl Bot Food Qual 92: 204-215. DOI: 10.5073/JABFQ.2019.092.029.

Abe R, Ohtani K. 2013. An ethnobotanical study of medicinal plants and traditional therapies on Batan Island, the Philippines. J Ethnopharmacol 145 (2): 554-565. DOI: 10.1016/j.jep.2012.11.029.

Adeniyi O, Tion D, Ako M, Bamise O. 2020. Ameliorative effects of aqueous extract of avocado pear seed on castor oil induced diarrhea in experimental animals. West J Med Biomed Sci 1 (2): 125-131.

Ai Y, Jane J. 2016. Macronutrients in corn and human nutrition. Compr Rev Food Sci Food Saf 15 (3): 581-598. DOI: 10.1111/1541-4337.12192.

Alduhisa GU, Demayo CG. 2019. Ethnomedicinal plants used by the Subanen tribe in two villages in Ozamis City, Mindanao, Philippines. Pharmacophore 10 (4): 28-42.

Alima Z, Demayo CG. 2018. Antioxidant and cytotoxic activities of selected plant extracts against human non-small cell lung adenocarcinoma (A549), human colon carcinoma cells (HCT116) and Chinese hamster normal ovary cells (AA8). Intl J Pharm Sci Res 9 (11): 4562-4571.

Aparece UB. 2006. Lunas: The "Mother" of all Sukdan Shamans' curing rituals. Philippine Q Cult Soc 34 (2): 135-187.

Balinado LO, Chan MA. 2017. An ethnomedicinal study of plants and traditional health care practices in District 7, Cavite, Philippines. DOI: 10.17758/uruae.ae0117622.

Bucol AA. 2008. Toothache relief using toob: An investigation of folk medicine in Siquijor Island, Philippines. Silliman J 49 (2): 125.

Choi S, Oh D-S, Jerng UM. 2017. A systematic review of the pharmacokinetic and pharmacodynamic interactions of herbal medicine with warfarin. PLoS One 12 (8): e0182794. DOI: 10.1371/journal.pone.0182794.

da Rosa RL, de Almeida CL, Somensi LB, Boeing T, Mariano LNB, Krueger CMA, de Souza P, Filho VC, da Silva LM, de Andrade SF. 2019. *Chrysophyllum cainito* (apple-star): A fruit with gastroprotective activity in experimental ulcer models. Inflammopharmacology 27 (5): 985-996. DOI: 10.1007/s10787-017-0427-z.

de Oliveira RB, de Paula DAC, Rocha BA, Franco JJ, Gobbo-Neto L, Uyemura SA, dos Santos WF, da Costa FB. 2011. Renal toxicity caused by oral use of medicinal plants: The yacon example. J Ethnopharmacol 133 (2): 434-441. DOI: 10.1016/j.jep.2010.10.019.

Del Fierro RS, Nolasco FA. 2013. An exploration of the ethno-medicinal practices among traditional healers in Southwest Cebu, Philippines. ARPN J Sci Technol 3 (12): 1182-1188.

Ghorani-Azam A, Sepahi S, Riahi-Zanjani B, Ghamsari A, Mohajeri S, Balali-Mood M. 2018. Plant toxins and acute medicinal plant poisoning in children: A systematic literature review. J Res Med Sci 23: 26. DOI: 10.4103/jrms.JRMS_629_17.

Ghorbani A. 2014. Clinical and experimental studies on polyherbal formulations for diabetes: current status and future prospective. J Integr Med 12 (4): 336-345. DOI: 10.1016/S2095-4964(14)60031-5.

Gromek K, Drumond N, Simas P. 2015. Pharmacovigilance of herbal medicines. Int J Risk Saf Med 27: 55-65. DOI: 10.3233/JRS-150643.

Guardo NI, Sainz P, González-Coloma A, Burillo J, Martínez-Díaz RA. 2017. Trypanocidal effects of essential oils from selected medicinal plants. Synergy among the main components. Nat Prod Commun 12 (5): 1934578X1701200516. DOI: 10.1177/1934578X1701200516.

He L, Wang Y-S, Wang Q-J. 2007. In vitro antitumor activity of triterpenes from *Ceriops tagal*. Nat Prod Res 21 (14): 1228-1233. DOI: 10.1080/14786410701369516.

International Society of Ethnobiology. 2006. ISE Code of Ethics (with 2008 additions).

Li G, Lou H. 2017. Strategies to diversify natural products for drug discovery. Med Res Rev 38 (4): 1255-1294. DOI: 10.1002/med.21474.

Lopez RA. 2005. Use of alternative folk medicine by Mexican American women. J Immigr Health 7 (1): 23-31. DOI: 10.1007/s10903-005-1387-8.

Morilla LJG, Sumaya NHN, Rivero HI, Madamba RSB. 2014. Medicinal plants of the Subanens in Dumingag, Zamboanga del Sur, Philippines. Intl Conf Food Biol Med Sci. DOI: 10.15242/iicbe.c0114577.

Moussaoui F, Alaoui T. 2016. Evaluation of antibacterial activity and synergistic effect between antibiotic and the essential oils of some medicinal plants. Asian Pac J Trop Biomed 6 (1): 32-37. DOI: 10.1016/j.apjtb.2015.09.024.

Municipality of Aurora. 2014. Comprehensive Land Use Plan: 2014-2024. Zamboanga del Sur, Philippines.

Napoli M. 2008. The plants, rituals and spells that "cured" helminthiasis in Sicily. J Ethnobiol Ethnomed 4 (1): 1-19. DOI: 10.1186/1746-4269-4-21.

Necesito R, Gaspan III WS. 2019. The power of healing: Decolonizing feminist reading of Luke 9: 49-50 and the traditional healers in the Philippines. SDCA Asia-Pac Multidisciplinary Res J 1 (1): 57.

Niehof A. 1988. Traditional medication at pregnancy and childbirth in Madura, Indonesia. The Context of Medicines in Developing Countries. Springer Netherlands, Dordrecht. DOI: 10.1007/978-94-009-2713-1_12.

Olowa L, Demayo C. 2015. Ethnobotanical uses of medicinal plants among the Muslim Maranaos in Iligan City, Mindanao, Philippines. Adv Environ Biol 9 (27): 204-216.

Ong HG, Kim YD. 2014. Quantitative ethnobotanical study of the medicinal plants used by the Ati Negrito indigenous group in Guimaras island, Philippines. J Ethnopharmacol 157: 228-242. DOI: 10.1016/j.jep.2014.09.015.

Ozyigit II, Yalcin B, Turan S, Saracoglu IA, Karadeniz S, Yalcin IE, Demir G. 2018. Investigation of heavy metal level and mineral nutrient status in widely used medicinal plants' leaves in Turkey: Insights into health implications. Biol Trace Elem Res 182 (2): 387-406. DOI: 10.1007/s12011-017-1070-7.

Pavlova D, Karadjova I. 2013. Toxic element profiles in selected medicinal plants growing on serpentines in Bulgaria. Biol Trace Elem Res 156: 288-297. DOI: 10.1007/s12011-013-9848-8.

Prastiyanto ME, Wardoyo FA, Wilson W, Darmawati S. 2020. Antibacterial activity of various extracts of *Averrhoa bilimbi* against multidrug resistant bacteria. Biosaintifika J Biol Biol Educ 12 (2): 163-168. DOI: 10.15294/biosaintifika.v12i2.23600.

Pucot J, Demayo C. 2021a. Medicinal plants used by the indigenous people of the Philippines: A systematic review of ethnobotanical surveys and bioactive compounds. J Complement Med Res 12 (2): 107-131. DOI: 10.5455/jcmr.2021.12.02.15.

Pucot JR, Dapar MLG, Demayo CG. 2021. Qualitative analysis of the antimicrobial, phytochemical and GC-MS profile of the stem ethanolic extract from *Anodendron borneense* (King and Gamble). J Complement Med Res 12 (2): 231-239. DOI: 10.5455/jcmr2021.12.02.27.

Pucot JR, Demayo CG. 2021b. Traditional and poly-herbal formulations of medicinal plants in Aurora, Zamboanga del Sur: Implications to healthcare-seeking behavior and safety. Mindanao State University-Iligan Institute of Technology, Philippines.

Pucot JR, Manting MME, Demayo CG. 2019. Ethnobotanical plants used by selected indigenous peoples of Mindanao, the Philippines as cancer therapeutics. Phamacophore 10 (3): 61-69.

Rajasekharan S. 2013. Traditional and folk practices-contemporary relevance and future prospects. Erala Environ Congr 141.

Rebuya NR, Lasarte ES, Amador MMA. 2020. Medical pluralism, traditional healing practices, and the partido albularyo: Challenge in inclusion. Open J Soc Sci 8 (6): 72-79. DOI: 10.4236/jss.2020.86007.

Réhault-Godbert S, Guyot N, Nys Y. 2019. The golden egg: Nutritional value, bioactivities, and emerging benefits for human health. Nutrients 11 (3): 684. DOI: 10.3390/nu11030684.

Rondilla NAO, Rocha ICN, Roque SJR, Lu RMS, Apolinar NLB, Solaiman-Balt AA, Abion TJJ, Banatin PBP, Javier CVM. 2021. Folk medicine in the Philippines: A phenomenological study of health-seeking individuals. Intl J Med Stud 9 (1): 25-32. DOI: 10.5195/ijms.2021.849.

Rubel AJ, Weller-Fahy K, Trosdal M. 1975. Conception, gestation, and delivery according to some Mananabang of Cebu. Philipp Q Cult Soc 3 (2/3): 131-145.

Santhoshkumar T, Rahuman AA, Jayaseelan C, Rajakumar G, Marimuthu S, Kirthi AV, Velayutham K, Thomas J, Venkatesan J, Kim S-K. 2014. Green synthesis of titanium dioxide nanoparticles using *Psidium guajava* extract and its antibacterial and antioxidant properties. Asian Pac J Trop Med 7 (12): 968-976. DOI: 10.1016/S1995-7645(14)60171-1.

Süntar I. 2020. Importance of ethnopharmacological studies in drug discovery: role of medicinal plants. Phytochem Rev 19: 1199-1209. DOI: 10.1007/s11101-019-09629-9.

Tan ML, Tan MT. 2008. Revisiting Usog, Pasma, Kulam. The University of the Philippines Press, Diliman, Quenzon City, Philippines.

Tantengco OAG, Condes MLC, Estadilla HHT, Ragragio EM. 2018. Ethnobotanical survey of medicinal plants used by ayta communities in Dinalupihan, Bataan, Philippines. Pharmacogn J 10 (5): 859-870. DOI: 10.5530/pj.2018.5.145.

Toma C-C, Cotoraci CA, Caruntu S-A, Morgovan C, Neag TA, Olah N. 2014. The new concept of "clerically healing" the holy Chrism. Eur J Sci Theology 10 (5): 185-197.

Ugent D. 2000. Medicine, myths and magic the folk healers of a mexican market. Econ Bot 54 (4): 427-438. DOI: 10.1007/BF02866542.

Unilab Incorporated. 2019. Bughat is Real. https://www.unilab.com.ph/rexidol-forte/articles/articles/bughat-is-real [8-6-2021].

Vo QH, Nguyen PH, Zhao BT, Ali MY, Choi JS, Min BS, Nguyen TH, Woo MH. 2015. Protein tyrosine phosphatase 1B (PTP1B) inhibitory constituents from the aerial parts of *Tradescantia spathacea* Sw. Fitoterapia 103: 113-121. DOI: 10.1016/j.fitote.2015.03.017.

Yaniv Z. 2014. Introduction: Medicinal plants in ancient traditions. Medicinal and Aromatic Plants of the Middle-East. Springer, Dordrecht. DOI: 10.1007/978-94-017-9276-9_1.