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Ethnobotanical Practices of Matigsalug Tribe on Medicinal Plants at Barangay Baganihan, Marilog District, Davao City

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Authors' contributions

This work was carried out in collaboration between both authors. Author CPBG designed the study, performed the statistical analysis, wrote the protocol and first draft of the manuscript. Author MMG managed the analyses of the study. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: The aim of this study was to determine the traditional medicinal plants used by the Matigsalug tribe in Barangay Baganihan, Marilog District, Davao City, and for the purpose of providing baseline data to enable future pharmacological and phytochemical studies of identified medicinal plants.
Place and Duration of Study: This study was conducted at Barangay Baganihan, Marilog District, Davao City with the following coordinates: 7º28'26"N and 125º14'36"E. Barangay Baganihan is inhabited by the Matigsalug tribe. The community also has the reputation of using alternative medicines in curing illnesses and is also known to have continually practised its indigenous tradition.
Methodology: The field sampling and documentation was made at Barangay Baganihan, Marilog District Davao City. It aims to determine the ethnobotanical practices and their ecological status of the medicinal plants used by Matigsalug Tribe. Respondents were randomly selected aging 18 to 60

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years old for the interview using validated survey questionnaires.
Results: Overall, there were 35 plants identified with 22 families. Family of Poaceae had the highest number of species. Matigsalug Tribe mostly used leaves (28.57%), while the method of preparation was decoction (51.43%) and utilisation of these medicinal plants was ingestion (57.1%). The study revealed 22 identified species with a Fidelity Value of 100%. The disease categories with the highest Informed Consensus Factor were dermatological diseases (0.9 ICF). Based on the field sampling, there was 36 species with 26 families identified. In terms of species diversity index, Shannon-Wiener Diversity Index was used and obtained its value H'=2.736177 which indicates a high species diversity in the area.
Conclusion: The study revealed that the Matigsalug tribe was dependent on medicinal plants for their primary health care need. Therefore, there should be an educational program for awareness of the community on how to improve their practices and protection and conservation of the medicinal plants.

Keywords: Ethnobotany; Matigsalug Tribe; traditional medicine; Marilog District; Davao City.

DEFINITIONS

Ethnobotany refers to the study of plants and identification of their benefits and the usage of these medicinal plants on the treatment of physical illnesses.
Plant Biodiversity refers to the different life forms of these plants found in the forest of Baganihan, Marilog District, Davao City.
Matigsalug refers to the ethnic group living in the Barangay Baganihan, Marilog District, Davao City.
Medicinal Plants refers to the plants growing in the locality that are being used by the Matigsalug community.

1. INTRODUCTION

Ethnobotany is considered the scientific study of the complex relationships and interactions that exist between humans and plants [1] and was coined by John Harshbarges, an American. Generally, for centuries humans have been using many species of plants for food and shelter, likewise, other species of plants found in the terrestrial areas in mountain ranges were used for medicinal purposes [2].

Moreover, through time, the experiences and knowledge gained by the IPs from generation to generation about the importance of keeping the medicinal plants have been taught, specifically those plant species that would help alleviate or cure the ailments of their family members, such as toothaches, inducing labor for pregnant women, or curing malaria and fever due to infection [3].

Thus, the use of medicinal plants has been gaining popularity worldwide and even experts in the Philippines have conducted research studies to know and identify potential plants for clinical utilization and those age-old alternative medicines adopted and used by Filipinos. Usually, the curative effects of these herbs were known and tested by traditional healers with their patients. The primitive practices and the skills were then passed on to the younger generations [4].

In Mindanao, there are 37 indigenous communities that have been identified, and one of these is the Manobo-Matigsalug Tribe with a population of 44,851 [5]. The tribe Matigsalug is described as the "people (*matig*) living along the river (*salug*)" and their home is at the boundaries of the provinces of Davao, Cotabato, and Bukidnon [6]. The documentation of the ethnobotanical knowledge of the Matigsalug is very important and necessary for them to:

a.) be able to conserve and to preserve their resources and to enhance their traditional knowledge of indigenous communities of the plants available in their surroundings, and;
b.) to preserve the culture of these indigenous plants for sustainable production as their major source of medicines.

The purpose of this study was to determine the traditional medicinal plants used by the Matigsalug tribe in Barangay Baganihan, Marilog District, Davao City, and to provide baseline data for future pharmacological and phytochemical studies of the identified medicinal plants.

2. MATERIALS AND METHODS

2.1 Research Design

A descriptive method was used in the conduct of the study. This design allows the gathering of the data through the use of self-made questionnaires that have been verified by the experts in the locality to determine the ethnobotanical study on medicinal plants beneficial to Matigsalug at Barangay Baganihan, Marilog District, Davao City.

2.2 Research Setting

This study was conducted at Barangay Baganihan, Marilog District, Davao City with the following coordinates: 7º28'26"N and 125º14'36"E. Barangay Baganihan is inhabited by the Matigsalug tribe. The community also has the reputation of using alternative medicines in curing illnesses and is also known to have continually practiced its indigenous tradition.

Fig. 1. Map of the study area showing Barangay Baganihan, Marilog District, Davao City. (Source: Google Map, 2018)

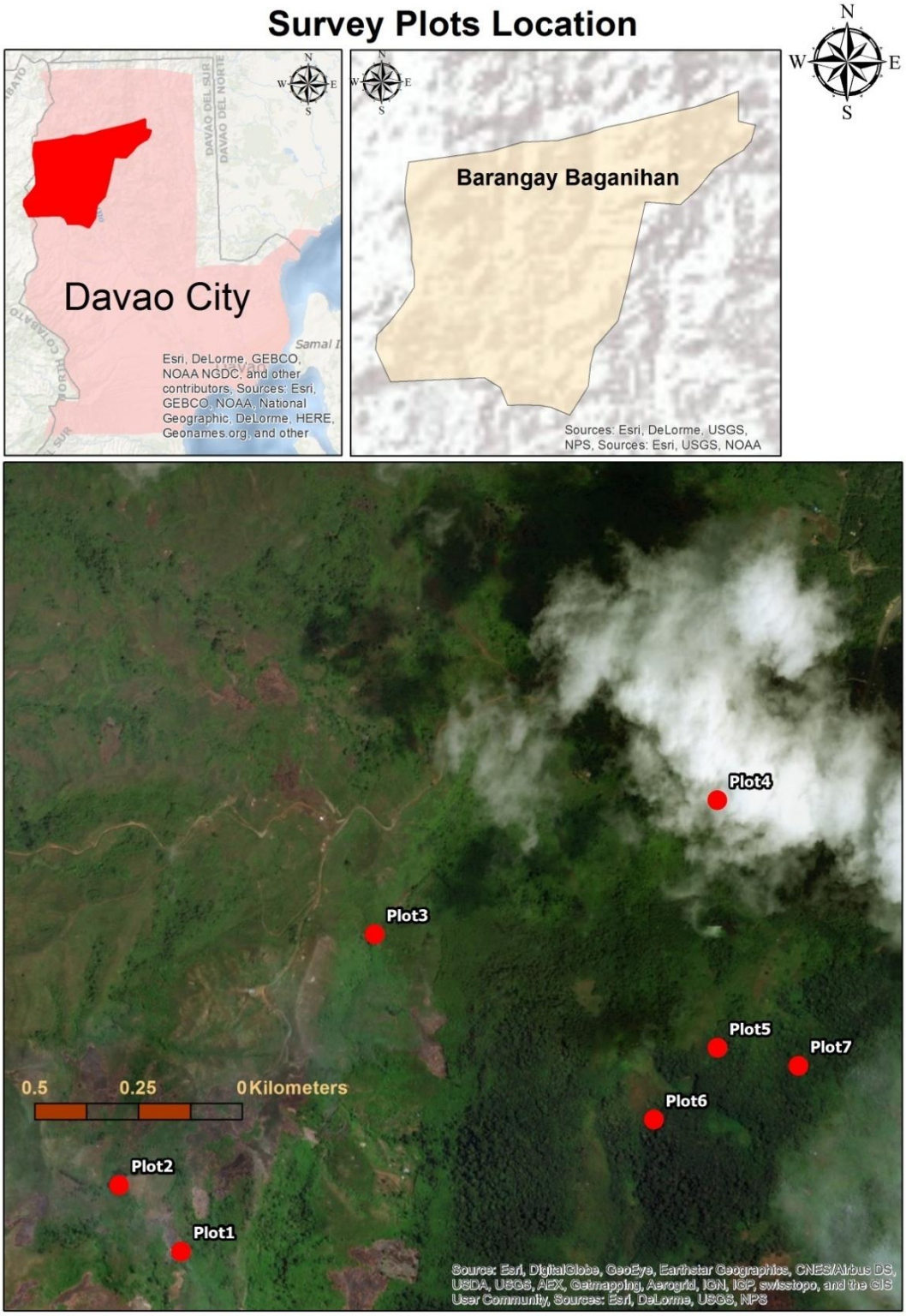
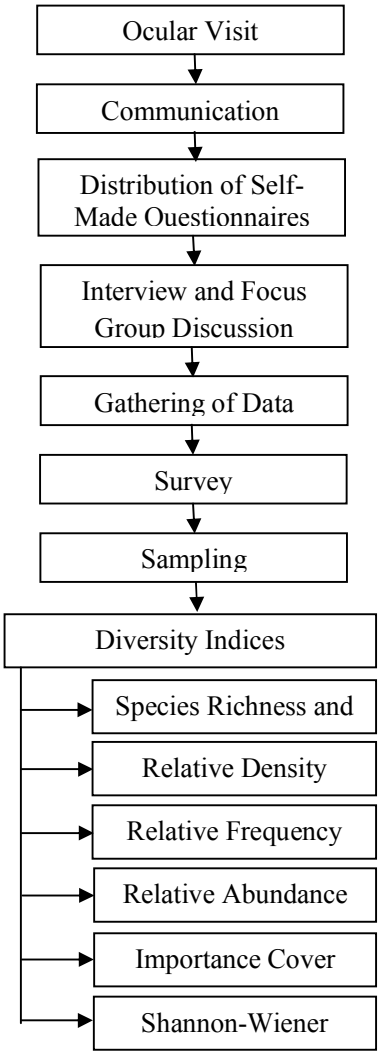


Fig. 2. Location of the sampling plots

2.3 Procedure in the Conduct of the Study

This schematic diagram shows the flow of procedures done in this study:



2.4 Medicinal Plant Identification

All the plants that have been identified during sampling and the location site have been tagged using Global Positioning System (GPS) and pictures have been taken for plant documentation, considering that taking pictures of these plants will be done for proper taxonomic classification up to species level. The identification of plants up to species level at field will be aided by the Digital Flora of the Philippines by Leonard Co and verified by experts for proper taxonomic classification and identification up to species level.

2.5 Interview with Informants and Focus Group Discussion

In an interview, the researchers made a survey questionnaire or self-made questionnaire which was validated by three (3) experts and were given to the members of Matigsalug tribe which will be used for the Focus Group Discussion. This was also conducted after securing permits from the different government agencies such as National Commission for Indigenous People (NCIP), Department of Environment and Natural Resources (DENR), Local Government Unit of Barangay Baganihan, Marilog District and most especially the Chieftain of Matigsalug Tribe.

The level of homogeneity among information provided by different informants has been calculated by the Informants' Consensus Factor, ICF [7] using the following formula:

$$ICF = Nur – Nt / (Nur – 1)$$

Where, Nur = number of use reports from informants for a particular plant-use category;
Nt = number of taxa or species used for that plant of all informants.

ICF Values range between 0 and 1, where '1' indicates the highest level of informant consent. The fidelity level (FL), the percentage of informants claiming the use of a certain plant species for the same major purpose, was calculated for the most frequently reported diseases or ailments as: $FL (\%) = (Np / N) \times 100$ Where, Np = number of informants that claim the use of a plant species to treat a particular disease; N = number of informants that use the plants as a medicine to treat any given disease [8].

2.6 Scope and Limitation of the Study

The study was conducted in Barangay Baganihan, Marilog District, Davao City. This area is known to be the place of the Matigsalug Group. This study focuses on the plant species used, plant part used, and its significance to cure illness of the sick individual. An interview was done among the knowledgeable elders of the community as key informants, with respect of their tradition and rules in the community. The effectiveness of the said medicinal plants has not

been tested. The study was conducted from November 2017 to December 2017.

2.7 Species Diversity Data Analyses

The data was analysed using descriptive statistics and diversity indices. In finding the species composition the relative frequency, relative density, relative dominance, percentage cover, and importance values will be used and determined. In determining the species diversity indices, species richness will be used where it is the number of different species represented in an ecological community and in Shannon-Wiener Diversity Index computed as (H′=ΣPi*lnPi) where H′ is the index of diversity, Pi is the importance value of a species as proportion of all species [9].

2.8 Vegetation Data Were Measured Using the Following Parameters for Biodiversity Indices

Biodiversity, a multidimensional property of natural systems, is difficult to quantify partly because of the multitude of indices proposed for this purpose. Indices aim to describe general properties of communities that allow us to compare different regions, taxa, and trophic levels. Therefore, they are of fundamental importance for environmental monitoring and conservation, although there is no consensus about which indices are more appropriate and informative [10].

2.8.1 Species richness

It was determined by counting the different and identified types of species present in each sampling station.

2.8.2 Relative frequency

Relative Frequency will be used in getting the percentage (%) of the frequency value of a species in overall frequency value of all species in the area.

$$\text{Relative Frequency}=\left[\frac{\text{Frequency Value of species}}{\text{Total frequency value of all species}}\right]$$

2.8.3 Shannon-Weiner diversity index

The Shannon-Weiner Species Diversity Index was calculated by taking the number of each species, the proportion of each species is of the total number of individuals, and sums the proportion times the natural log of the proportion for each species. Since this is a negative number, then the negative was taken of the negative of this sum. The higher the number, the higher the species diversity will be. The formula is as follows:

$$H' = \sum_{i=1}^{s} (p_i)(\ln p_i)$$

Where H' is the species diversity index, s is the number of species, and π is the proportion of individuals of each species belonging to the i*th* species of the total number of individuals [11].

2.8.4 Percentage cover

Percentage cover will be used to determine the total number of species covered in the total area covered.

$$\text{Percentage cover}=\left[\frac{\text{Total number of species covered}}{\text{Total length of quadrat}}\right]x100$$

2.8.5 Relative abundance

Relative Abundance will be used to determine the evenness of distribution of individuals among species in a community.

$$\text{Relative Abundance}=\left(\frac{\text{The abundance of one species}}{\text{Total of all species counted}}\right)\text{x } 100$$

2.8.6 Relative Density

Relative Density will be used to determine the numerical strength or species in the community.

$$\text{Relative Density}=\left[\frac{\text{Species density}}{\text{Total density for all species}}\right]x100$$

2.8.7 Relative Dominance

Relative Dominance will be used to determine the dominant species found in the community.

$$\text{Relative Dominance}=\left[\frac{\text{Basal area per species}}{\text{Total Basal Area}}\right]x\ 100$$

2.8.8 Importance Value

Importance Value is a measure of how dominant a species is in an area.

$$\text{IV}=\left[\frac{\text{Relative Density+Relative Frequency+Relative Dominance}}{3}\right]$$

3. RESULTS AND DISCUSSION

This chapter presents the analysis of data and the discussion of the research findings. Presented below are the research problems and their corresponding results. Data were analysed to determine the ethnobotanical practices on the different medically-important indigenous plants in Barangay Baganihan, Marilog District, Davao City.

Problem 1. What are the medicinal plants present in the locality and their species diversity indices in terms of species richness, relative abundance, percentage cover, relative frequency, relative density, and importance value?

Table 1. Raw data for abundance, percentage cover, density and frequency per plot

Scientific name	Abundance	% Cover
Mimosa pudica L.	294	1.28
Polygala paniculata L.	108	1.14
Bidens pilosa L.	54	0.57
Smilax bracteata C. Presl	20	0.86
Trema spp.	13	0.71
Ficus spp.	6	0.71
Paraserianthes falcataria (L.) I.C.Nielsen	5	0.71
Cyathea contaminans (Wall. ex Hook.) Copel.	4	1
Emelia sonchifolia L.	3	0.43
Cratoxylum sumatranum (Jack) Blume	3	0.57
Octomeles sumatrana Miq.	1	0.71
Coleus scutellarioides (L.) R. Br.	136	4.71
Chromolaena odorata (L.) R.M.King&H.Rob.	108	1.57
Lantana camera L.	79	2
Sida rhombifolia L.	29	1
Catharanthus roseus (L.) G.Don	26	0.71
Pennisetum purpureum Schumach.	24	1
Saurauia elegans Fern.-Vill	15	1.14
Psidium guajava L.	14	2.43
Laportea brunnea Merr.	9	2.42
Ficus septica Burm. F.	9	1.43
Ageratum conyzoides (L.) L.	42	1.71
Spilanthes acmella (L.) L.	130	2.29
Alpinia elegans (C. Presl) K. Schum	56	3.28
Heliotropium indicum L.	51	2.29
Palaquium obovatum (Griff.) Engl.	13	5.86
Bischofia javanica Blume	12	4.29
Omalanthus marcadenius	7	0.43
Paspalum africanum Poir.	561	6.14
Melastoma malabathricum Linn.	57	2
Rottboellia cochinchinensis (Lour.) Clayton	36	1.71
Musa textilis Née	34	6.28
Imperata cylinderica (L.) Raeusch.	526	5.28
Elephantopus scaber L.	492	6.86
Piper abbreviatum Opiz.	160	9.71
TOTAL	3295	87.28
Density	32.95 plants/m^2	-
Cover		87.28
Frequency		14.4 plant species/plot

A total of 37 species were found on seven samplings (10m x 10m) plots in Barangay Baganihan, Marilog District, Davao City. The species *P. africanum* Poir. ,*I. cylinderica*, and *E. scaber* had the highest number of individuals found in the area with a corresponding count of 561, 526, and 492, respectively. In contrast, the least number of species recorded was *O. sumatrana* which only had one individual count.

The total density of the sampling area was 32.95 plants/m^2 which covers 87.29% of the land area. A total of 14.4 plant species/plot was also recorded for the total species frequency. Table 1 showed the abundance, percentage cover, and number of plots for each species, where a total of 87.28% were covered by the plant species, and a total of 3,295 individuals were found in the area. *P. abbreviatum* had the highest percentage cover with a 9.71%, followed by *E. scaber* with a 6.86%, *M. textilis* with a 6.28% and *P. africanum* Poir. with a 6.14% of the area occupied, while the least species that were recorded were *A. conyzoides* Linn., and *O. marcadenius* had the lowest percentage cover with a 0.43 %.

The most frequent species that were recorded in the area were *E. scaber* and *P. abbreviatum,* which were recorded in all sampling areas in the study, followed by *I. cylinderica* which was present in six sampling areas and *M. malabathricum* Linn., *M. textilis*, *P. africanum*Poir., and *R. cochinchinensis* which were present in the five sampling areas in the study.

Overall influence of a plant species in a community is measured by importance value. An Importance Value or IV for each species is derived from the combined contribution of the relative cover, relative density, and relative frequency of each species in the community. Because it combines relative cover, density, and frequency, importance values range from 0 – 300. One advantage of using IV is that it reduces the effects of single large individuals, or infrequent species which, when present, are very abundant [13].

Table 2 shows the Importance values with the corresponding relative density, cover, and frequency. The highest value for a certain species suggests that the species is dominant in the layers. The result showed that the *E. scaber*. had the highest number of IV which has 28.65 and had the highest relative density, followed by *P. africanum* Poir. which has 28.07, and *I. cylinderica* which has 27.13, which also had the highest relative cover and relative frequency among all species. The result indicates that these species were highly important in the area. Importance value was introduced as one of the most important indexes in forest management and the index can be useful in biodiversity preservation.

Shannon-Wiener Diversity Index does not only account for diversity; it is also for evenness and species richness in a certain study site. Evenness is a measure of species abundance or the proportion that each species comprises of the whole. The higher evenness value signifies that all species are evenly distributed within a study area or on the sample quadrant. Less value of evenness especially the one that is approaching to zero indicates that there is a large difference in the distribution and abundance of species whereas in the Shannon-Wiener diversity index, the higher the value, the more species is present in an area [14]. Pielou Evenness Index ranges from 0 to 1. If the value approaches closer to 1, the individuals are equally distributed. The mean value of species evenness is 0.33, which shows that the plants in the area were not equally distributed.

Problem2. What are the key informants most preferred medicinal plant used for treating certain ailments?

Fidelity Level (FL) values were also used to estimate the relative healing potential of each medicinal plant based on the proportion of informants who agreed on its use against a given ailment category where each species had its family with corresponding medicinal usage [13]. The percentage of informants claiming the use of a certain plant for the same ailment was calculated for the most frequently reported ailments to evaluate species consensus. Table 4 showed the fidelity level (FL) values that were claimed to be used by the informants against corresponding ailments. The highest FL of 100% recorded were *A. schoenoprasum*, *A. sanderiana*, *C. odorata*, *C. mindanense*, *C. maxima*, *C. australasica*, *C. longa*, *C. dactylon*, *I. cylinderica*, *L. speciosa*, *L. brunnea*, *M. malabathricum* Linn., *M. pudica*, *M. olifera*, *Musa* spp., *M. textilis*, *O. sumatrana*, *P. abbreviatum*, *P. guajava*, *R. cochinchinensis*, *S. acmella*, *T. rumphii*, *V. negundo*, and *Z. zerumbet*, followed by *P. falcataria* (67%), *F. septica* (60%),*C. contaminans*, *O. marcadenius* (50%). The highest FL value of 100% that was obtained was

under internal therapeutic category (cough, diabetes, toothache), and the lowest was on the animal bite categories (snake bite, centipede bite). There are 5 unidentified species which are Kalaw-kalaw, Nanagon, Tubona pula, Hapoy-hapoy and Manumbalay. According to Kuya Boyno, our local guide, these plants are hard to find in the forestland due to the forest fire on 1970's.

Problem 3. What are the common diseases treated by the medicinal plants used by the Matigsalug Tribe?

Table 2. Relative cover, density, frequency and importance value index

Scientific name	Rci	Rdi	Rfi	IVI
Elephantopus scaber	6.85	14.93	6.86	28.65
Paspalum africanum Poir.	6.14	17.02	4.9	28.07
Imperata cylinderica	5.28	15.96	5.88	27.13
Cyathea contaminans	0.57	0.12	0.98	21.43
Piper abbreviatum	9.71	4.85	6.86	12.21
Mimosa pudica	1.28	8.92	0.98	11.18
Coleus blumei	4.71	4.12	1.96	10.8
Palaquium luzoniense	5.85	0.39	3.92	10.17
Spilanthes acmella	2.28	3.94	3.92	10.15
Alpinia elegans	3.28	1.69	3.92	8.9
Heliotropium indicum	2.28	1.54	4.9	8.73
Melastoma malabathricum Linn.	2	1.72	4.9	8.63
Bischofia javanica	4.28	0.36	3.92	8.57
Bidens pilosa	1.57	4.49	1.96	8.02
Rottboellia cochinchinensis	1.71	1.09	4.9	7.7
Chromolaena odorata	1.57	3.27	1.96	6.8
Lantana camara	2	2.39	1.96	6.35
Ageratum conyzoides	1.71	1.27	2.94	5.93
Polygala paniculata	1.14	3.27	0.98	5.4
Psidium guajava	2.28	0.42	1.96	4.67
Laportea brunnea	2.42	0.27	1.96	4.66
Omalanthus marcadenius	0.42	0.21	3.92	4.56
Sida rhombifolia	1	0.88	1.96	3.84
Pennisetum purpureum	1	0.72	1.96	3.68
Ficus septica	1.42	0.27	1.96	3.66
Saurauia elegans	1.14	0.45	1.96	3.55
Catharanthus roseus sp.	0.71	0.78	1.96	3.46
Bidens pilosa	0.57	1.63	0.98	3.19
Alocasia sanderiana	0.85	0.6	0.98	2.44
Cyathea contaminans	1	0.12	0.98	2.1
Trema spp.	0.71	0.39	0.98	2.08
Ficus spp.	0.71	0.18	0.98	1.87
Paraserianthes falcataria	0.71	0.15	0.98	1.84
Octomele ssumatrana	0.71	0.03	0.98	1.72
Cyathea contaminans	0.57	0.12	0.98	1.67
Cratoxylon sumatranum	0.57	0.09	0.98	1.64
Emelia sonchifolia	0.42	0.09	0.98	1.5

Table 3. Species richness and diversity of plants

	Values
Species richness (S)	37
Shannon-Wiener diversity index (H')	2.73
Evenness (E)	0.33

Table 4. Relationship of the taxa and their respective fidelity level values for medicinal use of Barangay Baganihan, Marilog District, Davao City.

Taxon (Family)	Medicinal use	Np	N	FL
Allium schoenoprasum (Amaryllidaceae)	for cough	1	1	100
Alocasia sanderiana (Araceae)	for toothache	1	1	100
Chromolaena odorata (Asteraceae)	Kidney Disease	1	1	100
Cinnamomum mindanense (Lauraceae)	for cough	3	3	100
Cucurbita maxima (Cucurbitaceae)	for blood vomiting	1	1	100
Curcuma australasica (Zingiberaceae)	for inflammation	1	1	100
Curcuma longa (Zingiberaceae)	for cough	1	1	100
Cynodon dactylon (Poaceae)	for high blood pressure	2	2	100
Imperata cylinderica(Poaceae)	for stomach ache	1	1	100
Lagerstroemia speciosa (Lytraceae)	for stomach ache	1	1	100
Laportea brunnea (Urticaceae)	for toothache	3	3	100
Melastoma malabathricum Linn. (Melastomataceae)	for relapse	1	1	100
Mimosa pudica (Fabaceae)	for fever	1	1	100
Moringa olifera (Moringaceae)	for open wound	3	3	100
*Musa spp.(*Musaceae)	for stomach ache	1	1	100
Musa textilis (Musaceae)	for relapse	3	3	100
Octomeles sumatrana (Datiscaceae)	for toothache	2	2	100
Rottboellia cochinchinensis (Poaceae)	for vomiting	5	5	100
Spilanthes acmella (Asteraceae)	for toothache	3	3	100
Tinospora rumphii (Menispermaceae)	for diabetes	1	1	100
Vitex negundo (Verbenaceae)	for cough	2	2	100
Zingiber zerumbet (Zingiberaceae)	for cough	4	4	100
Paraserianthes falcataria (Leguminosceae)	for open wound	2	3	67
Ficus septica (Moraceae)	for skin disease	3	5	60
Omalanthus marcadenius (Euphorbiaceae)	for blood vomiting	1	2	50
	for toothache	1	2	50
Cyathea contaminans (Cyatheaceae)	for inflammation	2	4	50
Artemisia vulgaris (Compositae)	the baby won't stop crying	1	3	33.3
Elephantopus scaber (Asteraceae)	for relapse	1	3	33.3
Gigantochloa levis Merr. (Poaceae)	for centipede bite	1	3	33.3
Piper abbreviatum (Piperaceae)	for snake bite	1	3	33.3
Psidium guajava (Myrtaceae)	for blood vomiting	1	3	33.3
Palaquium luzoniense (Sapotaceae)	for kidney disease	1	3	33.33
Persea americana (Lauraceae)	for stomach ache	1	4	25
Pterocarpus indicus (Fabaceae)	for blood vomiting	1	4	25
Biden spilosa (Asteraceae)	Blood clot during pregnancy	1	4	25
	for relapse	1	5	20

Legend: Np = the number of informants that suggested the use of a species for the same purpose; N = the total number of informants that mentioned a plant for any use; FL = the fidelity level.

The organ systems that these species act upon were observed by analysing the contribution of the medicinal plant with regard to the Matigsalug tribe. The ailments were grouped into eight categories, which were: (1) bite and bleeding, (2) dermatological, (3) digestive system disorder, (4) internal disease, (5) kidney disease, (6) oral and pharyngeal, (7) respiratory, and (8) others. ICF Values range between 0 and 1, where '1' indicates the highest level of informant consent.

According to the Informants Consensus Factor (ICF) in terms of the medical potential of the medicinal plant species recorded by the respondents from the Matigsalug tribe, the ailment category with the most consensus was related to dermatological with 0.9 ICF value, followed by digestive system disorder (0.75), bite and bleeding (0.68), kidney disease and others (0.67), respiratory (0.6), oral and pharyngeal (0.57), and internal disease (0.33).

Table 5. Informants consensus factor (ICF) values for eight ailment categories

Ailments	Nt	Bur	ICF
Dermatological	2	11	0.9
Digestive system disorder	2	5	0.75
Bite and Bleeding	7	20	0.68
Kidney disease	2	4	0.66
Neurological	7	19	0.66
Respiratory	5	11	0.6
Oral and Pharyngal	4	8	0.57
Internal disease	3	4	0.33

Legend: nur = the sum of uses recorded by each informant for a category; nt = the number of species indicated in the category; ICF = the informant consensus factor.

Problem 4. What are the most widely used plant parts by Matigsalug Tribe in treating diseases?

Table 6 showed the plant parts used for medical usage in Matigsalug tribe. It showed that the most common and the highest percentage of usage in the area were leaves which have 27.57%, followed by the roots which has 25.71%, next is the stem which has 17.14%. Bark has 14.28%, whole plant usage where also recorded which had 11.42% of the population and the least plant part usage was the flower, which only had 2.85% of the total population. Similar to the study of Morilla et al. [15] showed that the leaves were the most plant part used for ethnomedicinal medicine because of its abundance and can also be replenished. Leaves has high storage of chemical compounds through photosynthesis including alkaloids, coumarines, essential oils, flavonoids, and tannins, which are active component of most herbal preparation in high concentrations.

Problem 5. What are the modes of preparation made by Matigsalug Tribe for plant based drugs that can cure certain diseases?

Table 7 shows the mode of preparation of which decoction (51.43%) and poultice (28.57%) were the most common preparation of medicinal plants followed by chewing (8.57%) and infusion (5.71%) and the least preparation recorded was direct usage and charred (2.86%). Decoction and poultice of medicinal plants for the preparation of ethnomedicines are the most commonly used by the Matigsalug Tribe could be due to its high effectiveness for the treatment of diseases compared with the other preparations.

Problem 6. Which among the identified medicinal plants are classified in the categories of utilisation?

a. Topical
b. Ingestion

Table 6. Plant parts used for remedy preparation

Plant part used	Medicinal plants	Number of medicinal plants	Percentage
Leaves	*Bidens pilosa, Alocasia sanderiana, Laportea brunnea, Omalanthus marcadenius, Persea americana, Artemisia vulgaris, Psidium guajava, Moringa olifera, Paraserianthes falcataria*	9	28.57%
Roots	*Bidens pilosa, Musa textilis, Cucurbita maxima, Melastoma malabathricum Linn., Giganto chloa levis* Merr*., Elephantopus scaber, Chromolaena odorata*	7	25.7%
Stem	*Lagerstroemia speciosa, Tinospora rumphii, Zingiber zerumbet, Curcuma australasica, Cyathea contaminans, Octomeles sumatrana*	6	17.1%
Bark	*Omalanthus marcadenius, Pterocarpus indicus, Cinnamomum mindanense,Palaquium luzoniense, Ficus septica.*	5	14.2%
Whole Plant	*Allium schoenoprasum, Cynodon dactylon, Mimosa pudica, Piper abbreviatum.*	4	11.42%
Flower	*Spilanthes acmella*	1	2.85%

Table 7. Modes of medicinal plants preparation

Mode of preparation	Medicinal plants	Number of medicinal plants	Percentage
Decoction	*Bidens pilosa*, *Musa textilis*, *Omalanthus marcadenius*, *Pterocarpus indicus*, *Tinospora rumphii*, *Curcuma longa*, *Vitex negundo*, *Zingiber zerumbet*, *Persea americana*, *Psidium guajava*, *Melastoma malabathricum* Linn., *Elephantopus scaber*, *Cynodon dactylon*, *Chromolaena odorata*, *Mimosa pudica*, *Palaquium luzoniense*, *Ficus septica*, *Imperata cylinderica*, *Moringa olifera*, *Paraserianthes falcataria*	19	51.43%
Poultice	*Bidens pilosa*, *Lagerstroemia speciosa*, *Curcuma australasica*, *Cyathea contaminans*, *Alocasia sanderiana*, *Laportea brunnea*, *Omalanthus marcadenius*, *Artemisia vulgaris*, *Allium schoenoprasum*, *Musa* spp., *Piper abbreviatum*	11	28.57%
Chew	*Octomeles sumatrana*, *Cucurbita maxima*, *Elephantopus scaber*.	3	8.57%
Infusion	*Cinnamomum mindanense*, *Rottboellia cochinchinensis*	2	5.71%
Direct Usage	*Spilanthes acmella*	1	2.86%
Charred	*Gigantochloa levis* Merr.	1	2.86%

Table 8. Categories of utilisation of medicinal plants

Manner of Administration	Medicinal plants	Number of medicinal plants	Percentage
Ingestion	*Bidens pilosa*, *Musa textilis*, *Omalanthus marcadenius*, *Pterocarpus indicus*, *Cinnamomum mindanense*, *Tinospora rumphii*, *Curcuma longa*, *Vitexnegundo*, *Octomeles sumatrana*, *Cucurbita maxima*, *Zingiber zerumbet*, *Persea americana*, *Psidium guajava*, *Melastoma malabathricum* Linn., *Rottboellia cochinchinensis*, *Spilanthes acmella*, *Elephantopus scaber*, *Cynodon dactylon*, *Chromolaena odorata*,*Mimosa pudica*, *Palaquium luzoniense*, *Ficus septica*, *Imperata cylinderica*, *Moringa olifera*, *Paraserianthes falcataria*.	25	57.1%
Topical	*Bidens pilosa*, *Lagerstroemia speciosa*, *Curcuma australasica*, *Cyathea contaminans*, *Alocasia sanderiana*, *Laportea brunnea*, *Omalanthus marcadenius*, *Artemisia vulgaris*, *Allium schoenoprasum*, *Musa* spp., *Piper abbreviatum*.	11	42.9%

The current study indicated that the highest number of plant utilisation of medical plants was ingestion, having 57.1% of the total usage, followed by Topical type of utilisation with a

42.9% of the total survey. This result corresponds to the study of Cortuna, et al. [16] in which 80.36% preferred oral drinking as a route of administration of the medicinal plants.

4. CONCLUSION

Based on the data gathered through the interview, there were 35 plants identified that belong to 22 families used by the Matigsalug Tribe. Among the 35 species of medicinal plants identified, the most common plant part used were leaves having 28.57% due to its availability and high effectiveness, while the utilisation of these medicinal plants was ingestion having 57.1% of the total usage.

The highest recorded FL of 100%, there were 22 identified species The highest FL value of 100% that was obtained was under internal therapeutic category (cough, diabetes, toothache), and the lowest was on the animal bite categories (snake bite, centipede bite). According to the Informants Consensus Factor (ICF) in terms of medical potential of the medicinal plant species recorded by the respondents of Matigsalug tribe, the ailment category with the most consensuses was related to dermatological with 0.9 ICF value, while the least consensus was internal disease (0.33).

From the species that were identified *Paspalum africanum* Poir had the highest number of individuals found in the area with a corresponding count of 561. In contrast, the least number of species recorded was *Octomeles sumatrana* which only had one count individual.

In terms of species diversity index, the Shannon-Wiener Diversity Index was used and obtained its value H'=2.736177 which indicates a high species diversity in Barangay Baganihan, Marilog District, Davao City.

Based on the gathered results in this study, it can be concluded that in terms of species richness and species diversity index, the existence of medicinal plants were not as rich as the researcher had expected. The researcher also concluded that the area needs to be preserved because there are medicinal plants that are hard to find such as Kalaw-kalaw.

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CONSENT

All authors declare that written informed consent was obtained from the Matigsalug tribe and especially from their Chieftain or Datu of Barangay Baganihan, Marilog District, Davao (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

ETHICAL APPROVAL

In securing the ethical approval for this research, the authors submitted all the necessary results of the study especially the written informed consent and other requirements needed by the ethics committee. Before the research was conducted the authors sought the ethical approval as a protocol before the research started.

The ethics committee of Davao Doctors College followed the Ethical Guidelines for Herbal research as written published in 2017 of National Ethical Guidelines for Health and Health Related Research. The ethics committee as well see to that it's clearly and thoroughly reviewed and followed the appropriate ethical standards and guidelines as stated or in accordance of the Ethics Manual of Davao Doctors College.

All authors hereby declare that all necessary measures have been examined and approved by the appropriate ethics committee of Davao Doctors College.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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