International Journal of Public Health Science (IJPHS)
Vol. 15, No. 2, June 2026, pp. 593~604
ISSN: 2252-8806, DOI: 10.11591/ijphs.v15i2.25845

Ethnomedicinal plants traditionally used in treating measles in the Philippines: a review

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Article Info

Article history:

Received Sep 4, 2024
Revised Mar 24, 2026
Accepted Apr 25, 2026

Keywords:

Ethnomedicine
Measles
Medicinal plants
Philippines
Traditional medicine

ABSTRACT

Measles, despite the continuous significant advancements in the field of science, still poses a major health threat worldwide. While vaccines have significantly reduced measles-related morbidity and mortality, access to alternative treatments remains critical for populations unable to receive immunization due to medical, cultural, or socioeconomic barriers. With that, looking into some readily available, cost-effective, and safe alternatives for the treatment of measles is necessary. Given the therapeutic potential of medicinal plants, the main objective of this study is to conduct an ethnobotanical review on the medicinal plants that have been traditionally used in the Philippines for measles treatment. In this review, findings reveal a wide array of plant species that have been traditionally used for measles treatment. A total of 45 medicinal plant species belonging to 25 families were found to have been used in the Philippines to traditionally treat measles. Moreover, data show that Poaceae has the highest number of plant species, which constitutes 11.11% of medicinal plant species in the Philippines, with therapeutic potential against measles. This consolidated data highlights potential low-cost alternatives to conventional therapies and underscores the need for further pharmacological validation of these remedies to enhance their integration into public health strategies.

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1. INTRODUCTION

Measles is a highly contagious infection that is caused by a virus from the *Morbillivirus* genus [1], [2]. The onset of this illness is characterized by cold-like symptoms, which are followed by a rash – a symptom that is commonly associated with measles- a few days after the individual is infected with the virus [3]. Nevertheless, in addition to the rash and cold-like symptoms, some infected individuals may experience coughing and the appearance of small white patches inside their cheeks, or worse, serious complications such as seizures, blindness, encephalitis, severe diarrhea, ear infections, or pneumonia [1], [3]. With the following complications that one could get from being infected by the virus, it is evident how measles is a significant health concern.

Nevertheless, it is good to note that immunizations have the potential to prevent the onset of numerous illnesses, such as measles, as a result of the accelerated advancements in science [1], [4]. In fact, with the collective efforts from the World Health Organization (WHO), the measles & rubella partnership (formerly the measles & rubella initiative), other international partners, as well as the accelerated immunization activities by countries, deaths from this disease have jointly contributed to a significant

reduction in the number of deaths from this disease to an estimated number of 761,000 deaths in year 2000, to 136,000 deaths in year 2022, which prevented an estimated 57 million deaths between year 2000 to 2022 [1].

But the problem now is that, despite these encouraging statistics, measles remains a significant cause of death in developing countries, particularly among non-immunized children [5], [6]. Factors that contribute to this burden, or this still high number of morbidity and mortality from measles, include poor immunization coverage, malnutrition, cultural and religious beliefs that cause some individuals to choose not to get vaccinated, some people having vaccine hesitancy due to misinformation [7], and even health restraints like severe allergic reaction to any component of vaccines, history of anaphylactic reactions to neomycin, as well as severe immunosuppression or altered immunocompetence due to serious diseases like HIV, which prevents many individuals from being vaccinated [8].

Aside from relying on herd immunity to protect individuals who are vulnerable to the disease and have no access to mainstream or conventional pharmaceuticals and vaccines, they must have access to readily available, cost-effective, and safe alternatives for the treatment of measles in case of exposure to the virus. Such alternatives are important in supporting the management of the disease among affected individuals. However, due to the variation in the manifestation of measles in infected individuals, treatment is mainly centered on the reduction and resolution of the disease's symptoms and sequelae [9].

It is crucial to acknowledge that antimicrobials, analgesics, and vitamin A are among the most frequently employed medications to alleviate and resolve the symptoms and complications associated with measles [1], and on a positive note, there are numerous potential alternatives to these medications, including medicinal plants. Medicinal plants are already recognized as a valuable source of drugs due to their effectiveness, affordability, and minimal side effects [10]. In light of the information mentioned above, the primary objective of this study is to conduct an ethnobotanical review of the medicinal plants used in the Philippines for measles treatment. This review will include the collection of information on plant species, families, plant parts, modes of preparation and administration, as well as some information on the claimants from whom the data was gathered. This unified knowledge can be employed as a valid collective source of information for specific successful and low-cost alternative remedies for the symptoms and severe complications of measles, a serious infectious disease.

2. METHOD

2.1. Data extraction and management

Previously published data in literature from various databases, specifically Google Scholar, ScienceDirect, and PubMed, were mined for ethnomedicinal information on the medicinal plants in the Philippines that have been used to traditionally treat Measles. The following necessary information: medicinal plant species, families, plant part used, mode of preparation, mode of administration, and the claimants were gathered. The specific search terms used for each database are presented in Table 1. The data collection was done within the whole month of June 2024, which provided the researchers with enough time to collect all the necessary data for this review. Moreover, ethnomedicinal data were collected based on specific inclusion-exclusion criteria that were carefully tailored by the researcher, which best suited the aim and objectives of the study.

Table 1. Specific search terms or search queries that were used in the databases

Database	Search term or search query
Google Scholar	(measles) AND ("data collection" OR survey) AND (ethnomedicinal OR ethnobotanical OR "traditional medicine" OR "folk medicine") AND (Philippines)
ScienceDirect	("measles") AND ("ethnomedicinal" OR "ethnobotanical") AND ("Philippines")
PubMed	("measles") AND ("ethnomedicinal" OR "ethnobotanical") AND ("Philippines")

2.2. Inclusion/exclusion criteria

The data that were collected and utilized in this review were primary data from published original research. This review specifically excluded books, handbooks, and review articles. Furthermore, the data were collected without regard to the year of publication. Moreover, this review will immediately exclude articles that are not fully available or papers that do not contain all the necessary information for this review, research that is irrelevant to the study (i.e., not an ethnobotanical study), studies that do not contain Philippine ethnobotanical data, duplicates, and, lastly, those that are not written in English. The steps that were performed in the filtration of the literature sources to include/exclude in this review are visually represented in Figure 1.

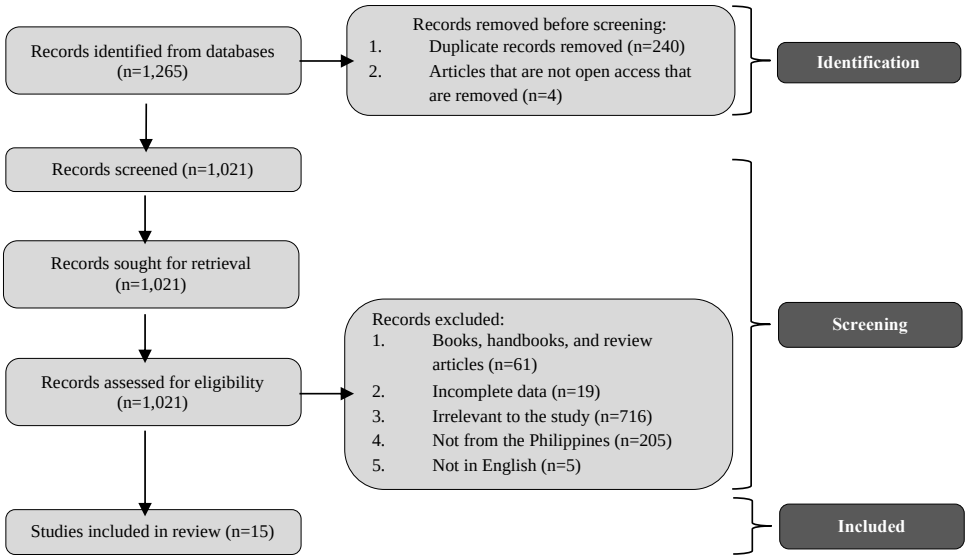

Figure 1. Literature screening flow chart in accordance with the Onyancha *et al.* [11] review article with necessary modifications

2.3. Ethnobotanical data analysis

After the identification of all the literature sources that can be included in this review, the researcher then generated a tabulated record of all the medicinal plants in the Philippines that have been traditionally used to treat measles with the use of spreadsheet software, specifically the Numbers version 14.1. Descriptive statistical methods, specifically, frequency and/or percentage, were then employed with the use of the same software. In addition, to further quantitatively analyze the ethnobotanical data gathered, the researchers used the frequency index (FI) – an ethnobotanical index that is determined using the formula $FI = \frac{FC}{N} \times 100$, where FC is the number of claimants who made use of a particular species to treat measles, and then N is the total number of claimants [12]. This ethnobotanical index aids in the identification of the highly cited medicinal plants in the Philippines that have been used to cure measles traditionally.

3. RESULTS AND DISCUSSION

3.1. Medicinal plants characteristics

Table 2 (see Appendix) presents all the data collected, which specifically includes the following: medicinal plant species, family, plant parts, mode of preparation, mode of administration, claimants, as well as references [13]-[33]. The present review identified 45 medicinal plant species across 25 families, traditionally utilized in various regions of the Philippines for measles treatment. Specifically in Figure 2, the 2D bar graph illustrates the distribution of medicinal plant families in the Philippines by species count for measles treatment, with each letter in the legend representing the families that are separated by long lines to have the same number of medicinal plant species that have been used for measles treatment.

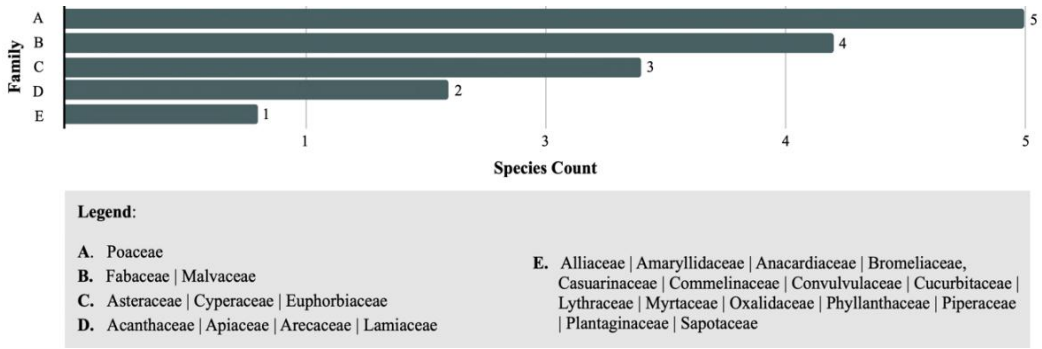

Figure 2. Distribution of medicinal plant families in the Philippines by species count for measles treatment

Among the 25 families, the Poaceae family, which is a grass family, has the highest representation, accounting for 11.11% of the medicinal plant species with therapeutic potential against measles. It is then followed by the Fabaceae and Malvaceae families, each contributing 8.89% of the species. Next are the *Asteraceae*, *Cyperaceae*, and *Euphorbiaceae* families, each comprising 6.67% of the species. Additionally, the Acanthaceae, Apiaceae, Arecaceae, and Lamiaceae families represent 4.44% each. Lastly, the following families each have one medicinal plant species (2.22%) with therapeutic potential against measles: Alliaceae, Amaryllidaceae, Anacardiaceae, Bromeliaceae, Casuarinaceae, Commelinaceae, Convolvulaceae, Cucurbitaceae, Lythraceae, Myrtaceae, Oxalidaceae, Phyllanthaceae, Piperaceae, Plantaginaceae, and Sapotaceae.

In the family Poaceae, the five plant species that have been traditionally used to cure measles that were mentioned include *Cymbopogon citratus* (DC.) Stapf, *Eleusine polydactyla*, *Imperata cylindrica* (L.) Raeusch, *Setaria italica* (L.), and *Zea mays* (L.). These plant species' potential to cure measles is further supported by published literature, as various sources have proved that these plant species have phytoconstituents with necessary biological activities that aid in the treatment of measles. Specifically, *Cymbopogon citratus* (DC.) Stapf, commonly known as Lemongrass or "*Tanglad*," is found to have anti-fever or analgesic, antitussive [34], and antimicrobial activity [35]-[37], which are crucial for the management and treatment of the symptoms and complications, such as pneumonia [37], that the said disease has been known to pose to infected individuals.

As for *Eleusine polydactyla*, or Wire grass, or "*Busikad*," much known for its heterotypic synonym *Eleusine indica* [38], has been discovered to possess therapeutic properties that are crucial for the treatment of measles. These properties include analgesic, antimicrobial, and antiviral activities [39]. The aforementioned activities were also observed and documented in other sources [40]-[42].

As for *Imperata cylindrica* (L.) Raeusch, also referred to as Cogongrass or simply as "*Kogon*," has been discovered to possess antimicrobial [43] and antibacterial [44] properties in its extract. These properties are crucial for the management and cure of measles symptoms, as antibiotics reduce the likelihood of post-measles complications such as ear infections, tonsillitis, or pneumonia [45], which can be life-threatening. In the case of *Setaria italica* (L.), instead of the usual biological activities that were observed on all the medicinal plants that were previously mentioned, a study has revealed that this plant is actually rich in vitamins such as vitamin B1, vitamin B2, vitamin E, and vitamin A [46], which significantly reduces the risk of serious complications and death from measles in those who are exposed to the virus [47].

Lastly, as for *Zea mays* L., various sources show that this plant actually possesses various health benefits, which include vitamin A [48], which is essential for the cure of measles, as well as antibacterial potential [49], and with that, from the family Poaceae alone, it can be deduced that medicinal plants are a reliable potential source for the treatment of measles in the Philippines. As for the highly cited species ($FI \geq 10$) in the Philippines, which has been traditionally used to treat measles in terms of their frequency index, data show that those medicinal plants are *Centella asiatica* (L.) Urb. = 19, *Vigna radiata* (L.) R. Wilczek = 14, *Allium cepa* L. = 10, *Antidesma bunius* (L.) Spreng = 10, *Cyperus kyllingia* Endl. = 10, *Imperata cylindrica* (L.) Raeusch = 10, and *Spondias pinnata* (L. f.) Kurz. = 10. This data shows how these species, out of the 45 medicinal plant species that have been traditionally used for measles treatment in the Philippines, are the ones that were most frequently utilized by various groups across the country.

3.2. Plant part used, mode of preparation, and mode of administration

In Figure 3, the 2D bar graph shows the plant parts that are traditionally used for measles treatment, categorized by species count, from which the results show that, in the Philippines, twelve (12) distinct plant parts have been used to traditionally treat measles. The leaves were the most frequently used plant part for the cure and management of measles, comprising a total of 23 out of 45 (51.11%) plant species. A comparable outcome was observed in a similar assessment conducted in Northern Nigeria [50] and in Central-Southern Apennine, Italy [51]. Leaves were the most frequently employed plant part in these countries, as they were in the Philippines, for the treatment of measles. Some sources state that it is because it is more readily available in significant proportions than other plant parts [31], [50], [52], and harvesting them is more sustainable because it regenerates and grows easily [29]. In addition, another study asserts that the reason for its predominance is that the majority of traditional physicians use it because it contains active constituents such as alkaloids and tannins [52], which are actually recognized for their pharmacological activities [53], [54].

The second most commonly utilized plant parts are the root and whole plant, each used in over eight (17.78%) medicinal plant species. This is followed by the bark, branch, or stem, which are used in 6 (13.33%) species, the flower in 3 (6.67%) species, and the fruit and peel in 2 (4.44%) species each. Lastly, the aerial part, bulb, seed, shoot, and silk are each used in 1 (2.22%) species.

In Figure 4, the 2D bar graph shows the modes of preparation for medicinal plants that are traditionally used for measles treatment, categorized by species count. In here, boiling (A) is the most frequently employed method, with it making up 16 out of 45 (35.56%) plant species that are commonly used for treating measles. This is followed by infusion (B) with 8 (17.78%) species, pounding (C) with 5 (11.11%) species, and burning (Group D) with 3 (6.67%) species. Other methods include boiling with specific additives or using more complex techniques (E) with 2 (4.44%) species, and a variety of preparation methods, such as blanching, wrapping the medicinal plant in banana leaves, and even unique modes of preparation that include mixing medicinal plants with sawa gallbladder or roasted goat stool (F), with 1 (2.22%) species each.

It is important to note, however, that while these preparation methods reflect the rich cultural practices by various groups in the Philippines, the incorporation of sawa gallbladder and animal feces like goat stools, poses potential health risks including microbial contamination, zoonotic infection [55], and even intoxication like in the case in China where an individual suffered from acute hepatic injury and delayed-onset renal failure after ingesting snake gallbladders [56]. Therefore, before these methods can be recommended or integrated into broader therapeutic applications for measles treatment, they must undergo critical evaluation and be subjected to strict safety assessments.

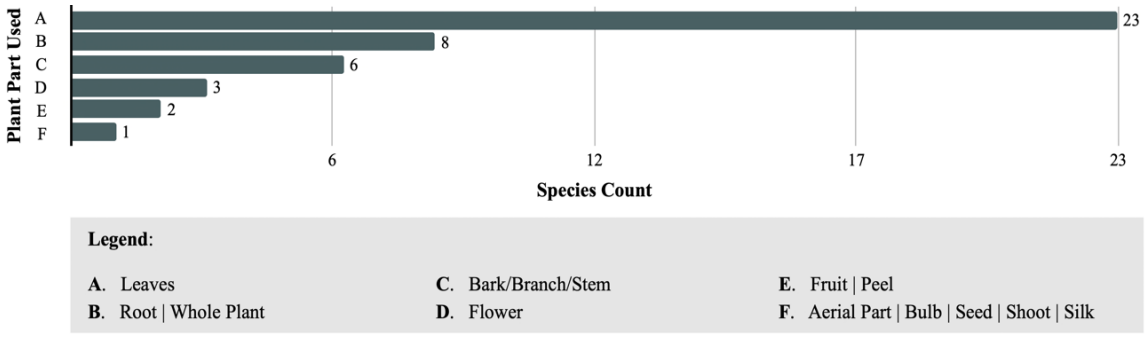

Figure 3. Plant parts used in the Philippines for treating measles, with the corresponding number of medicinal plant species

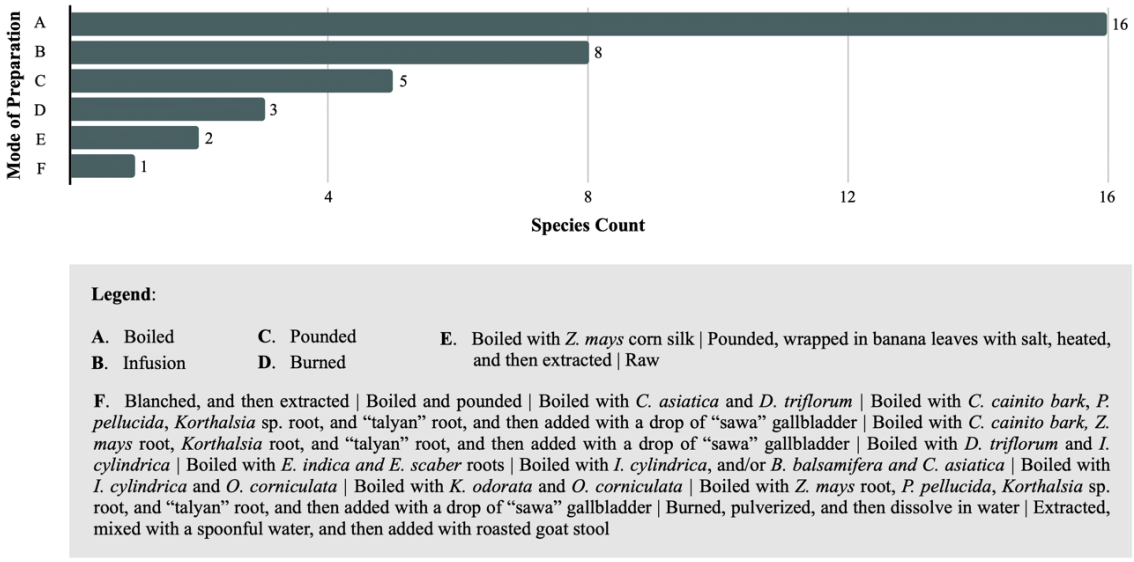

Figure 4. Mode of preparations used for measles treatment in the Philippines, with the corresponding number of medicinal plant species

Figure 5, it shows a 2D bar graph of the modes of administration for medicinal plants that are traditionally used for measles treatment, categorized by species count. Results show that A (taken orally) is the most commonly employed method, whether the plant is boiled, pounded, consumed raw, or prepared

through other means, accounting for 32 out of 45 species. It is then followed by B (use as a bath) with 8 species, and C (apply directly to the affected area) with 5 species. Less commonly used methods include D (sniff) with 3 species, E (use as incense) with 2 species, and F (apply as hot compress, poultice, or on the eyes) with only 1 species.

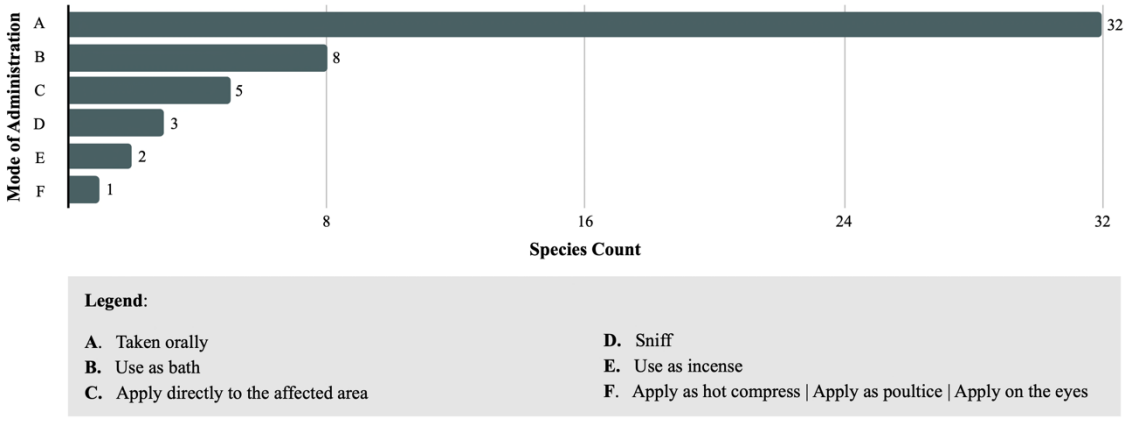

Figure 5. Mode of administration used for measles treatment in the Philippines, with the corresponding number of medicinal plant species.

Based on the data gathered, it was found that medicinal plants prepared by boiling and administered orally were predominantly used for measles treatment in the Philippines. This finding is similar to the results reported in a study conducted in Northern Kenya. In both studies, boiling and oral administration were identified as the most effective methods of preparing and administering botanicals for the traditional treatment of measles [50].

3.3. Claimants

Figure 6 presents a 2D bar graph showing the number of medicinal plant species used by various groups in the Philippines for the traditional treatment of measles. Each letter in the legend represents a specific group of claimants. Groups separated by long lines within the same letter indicate the use of the same number of medicinal plant species for measles treatment.

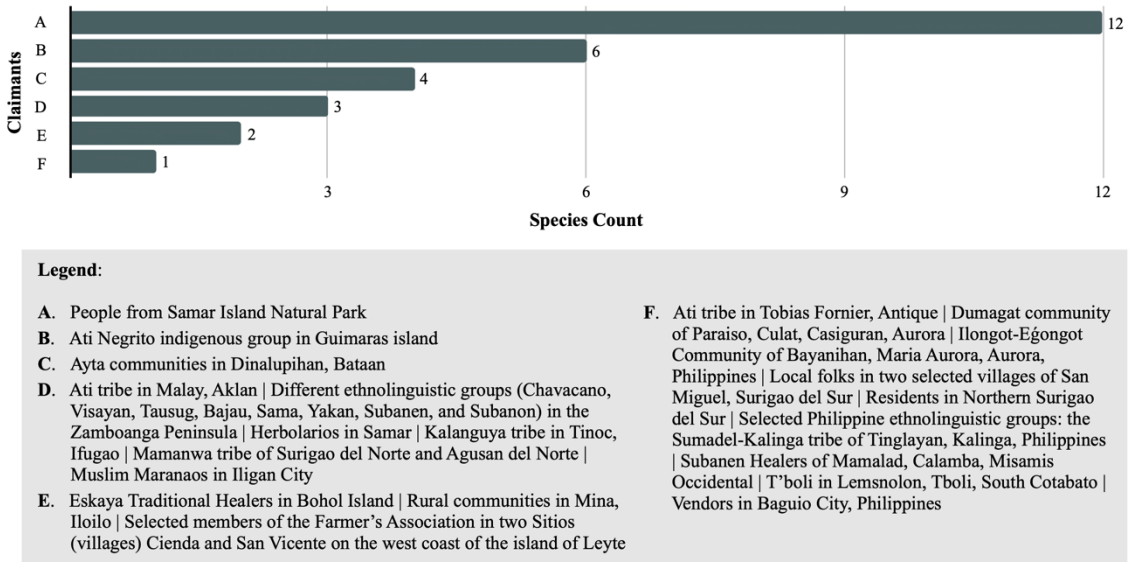

Figure 6. Claimants who provided information on the medicinal plant for measles treatment in the Philippines with the corresponding number of medicinal plant species, it utilizes

Group A, which includes the People from Samar Island Natural Park [14], utilizes the greatest number of medicinal plant species for measles treatment, making use of a total of 12 out of the 45 (26.67%) medicinal plant species for measles treatment. In addition, data also show that particular medicinal plant species (*i.e.*, *Areca catechu* L.) are exclusively used by this group of people in the Philippines for measles treatment, reflecting unique ethnopharmacological practices. However, while *A. catechu* is culturally significant; there are studies that show that it is actually a carcinogenic agent [57], which raises concerns about its safety.

As for Group B, which is represented by the Ati Negrito indigenous group in Guimaras Island, it uses 6 (13.33%) species, while Group C, consisting of the Ayta communities in Dinalupihan, Bataan, claims 4 (8.89%) species. Group D includes various ethnolinguistic groups and tribes, such as the Ati tribe in Malay, Aklan, and others, each using 3 (6.67%) species. Group E encompasses claimants like the Eskaya Traditional Healers of Bohol and rural communities in Mina, Iloilo, with 2 (4.44%) species each. Lastly, Group F comprises tribes and communities such as the Ati in Tobias Fornier, Antique, and others, each of which utilizes 1 (2.22%) species. These findings provide valuable insight for guiding public health interventions, as communities with extensive ethnobotanical knowledge for measles treatment may serve as important partners in bioprospecting and drug discovery initiatives. At the same time, results also highlight the need for rigorous pharmacological, as well as toxicological, assessments for all these medicinal plants that have been traditionally used for measles treatment by various groups in the Philippines, as some of these plants may pose more harm than good despite their long-standing use in folk medicine.

4. CONCLUSION

Given the ongoing negative impact of measles on populations, particularly those that are vulnerable to the disease, this study demonstrates that the Philippines has a plethora of medicinal plant species that are of great potential to save a significant number of lives, which are awaiting further investigation and utilization. With the 45 medicinal plant species belonging to 25 families that were now noted to have been used as traditional treatment for measles in the Philippines, this collective knowledge should serve as a reliable ethnopharmacological basis for further drug research discovery for an inexpensive and safe measles treatment alternative, though extensive pharmacological and toxicological investigations are needed before these interventions can be safely recommended for broader therapeutic use.

ACKNOWLEDGEMENTS

The author would like to express sincere gratitude to the Center for Integrative Health Laboratory of the Premier Research Institute of Science and Mathematics at the Mindanao State University – Iligan Institute of Technology for providing the opportunity and support to conduct this study, including assistance in research activities, brainstorming, and data mining.

FUNDING INFORMATION

The authors would like to express their gratitude to the Department of Science and Technology (DOST) of the Philippines for the financial support that it has provided for the accomplishment of this study.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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Cesar Guinanao Demayo	✓	✓	✓		✓		✓	✓		✓	✓	✓	✓	

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

DATA AVAILABILITY

No new data were generated or analyzed in this study; therefore, data availability is not applicable to this paper.

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APPENDIX

Table 2. A summary of the ethnobiological applications of selected plant species traditionally used to treat measles in the Philippines

Family	Scientific name	Plant parts	Mode of preparation	Mode of administration	Fi*	Claimants	Reference
Acanthaceae	*Blechum pyramidatum*	Leaves	Boiled and pounded	Taken orally	5	HS	[13]
				Apply directly to the affected area		HS	[13]
	Hemigraphis alternata (Burm f) T Anders	Leaves	Pounded, wrapped in banana leaves with salt, heated, and then extracted	Taken orally	5	PS	[14]
Alliaceae	*Allium odoratum* L.	Leaves	Pounded	Apply as poultice	5	AM	[15]
Amaryllidaceae	*Allium cepa* L.	Peel	Raw	Sniff	10	AD	[16]
		Bulb	Pounded	Apply directly to the affected area		SG	[17]
Anacardiaceae	*Spondias pinnata* (L. f.) Kurz.	Leaves	Squeezed and then soaked in water	Use as bath	10	MM	[18]
			Boiled	Taken orally		FA	[19]
			Infusion	Taken orally		FA	[19]
			Boiled	Use as bath		FA	[19]
			Infusion	Use as bath		FA	[19]
Apiaceae	*Centella asiatica* (L.) Urb.	Leaves	Infusion	Taken orally	19	MT	[20]
		Stem	Infusion with *C. kyllingia*	Taken orally		MT	[20]
		Whole plant	Boiled	Taken orally		AM	[21]
			Boiled with *D. triflorum* and *I. cylindrica*	Taken orally		AM	[21]
			Boiled	Use as bath		IE	[22]
		Aerial part	Soaked in water with *Mentha* sp. and *S. aqueum*, and then added with phyton gallbladder	Taken orally		PS	[14]
	Coriandrum sativum (L.)	Stem	Boiled	Use as bath	5	VB	[23]
Arecaceae	*Cocos nucifera* L.	Flower	Infusion	Use as bath	5	EG	[24]
	Areca catechu L.	Root	Soaked in water with *S. scrobiculata* and *C. intermedium* roots	Taken orally	5	PS	[14]
Asteraceae	*Cyanthillium cinereum* (L.) H. Rob.	Root	Heated	Sniff	5	AD	[16]
	Elephantopus scaber L.	Root	Infusion	Taken orally	5	MT	[20]
	Blumea balsamifera (L.) DC	Leaves	Boiled	Taken orally	5	EG	[24]
Bromeliaceae	*Ananas comusus*	Leaves	Boiled	Taken orally	5	TL	[25]
Casuarinaceae	*Casuarina equisetifolia* Linn.	Bark	Burned, pulverized, and then dissolved in water	Taken orally	5	PS	[14]
Commelinaceae	*Rhoeo discolor*	Leaves	Pounded, wrapped in banana leaves with salt, heated, and then extracted	Taken orally	5	PS	[14]
Convulvulaceae	*Ipomoea batatas* (L.) Lam.	Leaves	Boiled	Taken orally	5	HS	[13]
Cucurbitaceae	*Momordica charantia* Linn	Leaves	Blanched and then extracted	Taken orally	5	SH	[26]
Cyperaceae	*Cyperus kyllingia* Endl.	Whole plant	Boiled	Taken orally	10	MT	[20]
			Infusion	Taken orally		MM	[18]
	Scleria scrobiculata Nees and Meyen	Fruit	Boiled	Taken orally	5	PS	[14]
			Boiled with *Z. mays* corn silk	Taken orally		PS	[14]
	Kyllinga odorata Vahl	Whole plant	Boiled with *I. cylindrical* and *O. corniculata*	Taken orally	5	AN	[27]

Table 2. A summary of the ethnobiological applications of selected plant species traditionally used to treat measles in the Philippines (continued)

Family	Scientific name	Plant parts	Mode of preparation	Mode of administration	Fi*	Claimants	Reference
Euphorbiaceae	*Euphorbia hirta* L.	Whole plant	Boiled with *E. indica and E. scaber* roots	Taken orally	5	MM	[18]
	Jatropha curcas	Leaves	Infusion	Taken orally	5	HS	[13]
	Manihot esculenta Crantz	Leaves	Boiled	Use as bath	5	NS	[28]
Fabaceae	*Cajanus cajan* (L.) Millsp.	Leaves	Raw	Apply on the eyes	5	AD	[16]
		Peel	Raw	Apply on the eyes		AD	[16]
	Desmodium triflorum (L.) DC.	Whole plant	Boiled with *I. cylindrica*, and/or *B. balsamifera and C. asiatica*	Taken orally	5	AM	[21]
	Tamarindus indica L.	Leaves	Boiled	Use as bath	5	EG	[24]
	Vigna radiata (L.) R. Wilczek	Seed	Pounded, and then soaked in water	Taken orally	14	RM	[29]
		Branch	Boiled	Taken orally		EH	[30]
		Flower	Boiled	Taken orally		EH	[30]
		Leaves	Boiled	Taken orally		EH	[30]
		Seed	Infusion	Taken orally		AT	[31]
			Soaked in water with *A. bunius*	Taken orally		AT	[31]
Lamiaceae	*Clerodendrum intermedium* Cham	Root	Soaked in water with *A. catechu and S. scrobiculata* roots	Taken orally	5	PS	[14]
	Mentha arvensis Linn	Leaves	Soaked in water with *C. asiatica* and *S. aqueum*, and then added with phyton gallbladder	Taken orally	5	PS	[14]
			Extracted, mixed with a spoonful water, and then added with roasted goat stool	Taken orally		PS	[14]
Lythraceae	*Lagerstroemia speciosa* (L.) Pers.	Leaves	Pounded	Apply directly to the affected area	5	AG	[27]
			Burned	Use as incense		AG	[27]
Malvaceae	*Hibiscus rosa-sinensis* L.	Leaves	Pounded	Apply directly to the affected area	5	KT	[15]
	Malvaviscus penduliflorus DC.	Leaves	Pounded	Apply directly to the affected area	5	KT	[15]
		Flower	Pounded	Apply directly to the affected area		KT	[15]
	Sida acuta Burm.f.	Whole plant	Boiled	Taken orally	5	AG	[27]
			Burned	Use as incense		AG	[27]
	Urena lobata L.	Leaves	Burned	Sniff	5	FA	[19]
Myrtaceae	*Syzygium aqueum* (Burm f) Alston	Root	Soaked in water with *Mentha* sp. and *C. asiatica*, and then added with phyton gallbladder	Taken orally	5	PS	[14]
Oxalidaceae	*Oxalis corniculata* L.	Root	Boiled with *K. odorata* and *I. cylindrica*	Taken orally	5	AG	[27]
Phyllanthaceae	*Antidesma bunius* (L.) Spreng	Leaves	Boiled	Apply as hot compress	10	AG	[27]
			Mixed with muscovado sugar, and then burned	Use as bath		RM	[29]
Piperaceae	*Peperomia pellucida* (L.)	Whole plant	Boiled with *C. cainito bark, Z. mays* root, *Korthalsia* root, and "talyan" root, and then added with a drop of "sawa" gallbladder	Taken orally	5	PS	[14]
Plantaginaceae	*Scoparia dulcis* L.	Leaves	Boiled	Taken orally	5	AD	[16]
Poaceae	*Cymbopogon citratus* (DC.) Stapf	Whole plant	Boiled	Taken orally	5	DC	[32]
				Use as bath		DC	[32]
	Eleusine polydactyla	Stem	Infusion	Taken orally	5	LF	[33]
		Leaves	Infusion	Taken orally		LF	[33]

Table 2. A summary of the ethnobiological applications of selected plant species traditionally used to treat measles in the Philippines (continued)

Family	Scientific name	Plant parts	Mode of preparation	Mode of administration	Fi*	Claimants	Reference
	Imperata cylindrica (L.) Raeusch	Root	Boiled with *K. odorata* and *O. corniculata*	Taken orally	10	AG	[27]
		Shoot	Boiled with *C. asiatica* and *D. triflorum*	Taken orally		AM	[21]
	Setaria italica L.	Fruit	Boiled	Taken orally	5	EH	[30]
	Zea mays L.	Silk	Boiled with *Z. mays* corn silk	Taken orally	5	PS	[14]
		Root	Boiled with *C. cainito bark*, *P. pellucida*, *Korthalsia* sp. root, and "talyan" root, and then added with a drop of "sawa" gallbladder	Taken orally		PS	[14]
Sapotaceae	*Chrysophyllum cainito* L.	Bark	Boiled with *Z. mays* root, *P. pellucida*, *Korthalsia* sp. root, and "talyan" root, and then added with a drop of "sawa" gallbladder	Taken orally	5	PS	[14]

Frequency index **(FI); **HS** – Herbolarios in Samar; **PS** – People from Samar Island Natural Park; **AM** – Ati tribe in Malay, Aklan; **AD** – Ayta communities in Dinalupihan, Bataan; **SG** – Selected Philippine ethnolinguistic groups: the Sumadel- Kalinga tribe of Tinglayan, Kalinga, Philippines; **KT** – Kalanguya tribe in Tinoc, Ifugao; **MM** – Muslim Maranaos in Iligan City; **FA** – Selected members of the Farmer's Association in two Sitios (villages) Cienda and San Vicente on the west coast of the island of Leyte; **MT** – Mamanwa tribe of Surigao del Norte and Agusan del Norte; **IE** – Ilongot-Egongot Community of Bayanihan, Maria Aurora, Aurora, Philippines; **VB** – Vendors in Baguio City, Philippines; **EG** – Different ethnolinguistic groups (Chavacano, Visayan, Tausug, Bajau, Sama, Yakan, Subanen, and Subanon) in the Zamboanga Peninsula; **TL** - T'boli in Lemsnolon, Tboli, South Cotabato; **SH** – Subanen Healers of Mamalad, Calamba, Misamis Occidental; **AN** – Ati Negrito indigenous group in Guimaras Island; **NS** - Residents in Northern Surigao del Sur; **RM** – Rural communities in Mina, Iloilo; **EH** – Eskaya Traditional Healers in Bohol Island; **AT** – Ati tribe in Tobias Fornier, Antique; **AG** – Ati Negrito indigenous group in Guimaras Island; **DC** – Dumagat community of Paraiso, Culat, Casiguran, Aurora; **LF** – Local folks in two selected villages of San Miguel, Surigao del Sur.*

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