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Short Communication: Botanical assessment and conservation status of medicinal plants in mountain range of Malinao Albay, Philippines

TERESA HAIDE R. BELGICA[1,2,♥], MARLON D. SUBA[3], GRECEBIO JONATHAN D. ALEJANDRO[1,4]

[1]Graduate School, University of Santo Tomas. España Blv., Sampaloc, Manila 1008, Philippines
[2]Sorsogon State University, Magallanes Campus. Magsaysay Str., Magallanes, 4705 Sorsogon, Philippines. Tel./fax.: +63-56-211-0103, [♥]email: thrbelgica@gmail.com
[3]College of Arts and Sciences, Angeles University Foundation. Angeles City, Pampanga 2009, Philippines
[4]College of Science and Research Center for the Natural and Applied Sciences, University of Santo Tomas. España Blv., 1015 Manila, Philippines

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Abstract. *Belgica THR, Suba MD, Alejandro GJD. 2024. Short Communitation: Botanical assessment and conservation status of medicinal plants in mountain range of Malinao Albay, Philippines. Biodiversitas 25: 1413-1419.* Mount Malinao in Albay Province, Philippines is considered to harbor a diverse array of medicinal plants that are invaluable to local communities and have potential global significance. Despite its ecological importance and diverse floral and faunal species, there is a lack of an extensive profile of medicinal flora in the area. Therefore, this study aims to catalog and evaluate the conservation status of these medicinal plants for conservation strategies and sustainable management. Sampling took place from April to June 2016 in the lower agroforest with diverse agricultural resources with elevation of 51 to 300 meters above sea level. The comprehensive inventory of medicinal plants involved a combining field surveys, available ethnobotanical studies, ecological assessments, and thorough research, resulting in the identification of 74 species of medicinal flora from 38 families and 72 genera. Based on the International Union for Conservation of Nature (IUCN) criteria, three species were identified as Data Deficient (DD), 24 species were categorized as Least Concern (LC), and 47 were marked as Not Evaluated (NE). Additionally, 72 medicinal plants were identified as Non-Endemic, while two species were considered endemic, including *Canarium ovatum* Engl, and *Voacanga globosa* (Blanco) Merr. By understanding the ecological importance and cultural significance of these medicinal plants, this assessment provides a foundation for conservation efforts aimed at maintaining biodiversity, supporting local livelihoods, and safeguarding traditional knowledge for future generations.

Keywords: Assessment, conservation status, medicinal plants, mountain range, Mt. Malinao

INTRODUCTION

The Philippine forest is a habitat for a great diversity of various animal and plant species (Mendoza et al. 2016), with some endemic and rare species restricted to specific locations (Kraus et al. 2023). Moreover, the Philippine forest resources provide a wide range of ecosystem goods such as fiber, food, medicine, regulation of hydrological cycles and sequestering carbon (Mendoza et al. 2016). However, the forests in the country face several threats including deforestation and environmental degradation, putting its rich biodiversity at risk (Hughes 2017). These threats have significant implications for the existence of medicinal plants, which are integral and vital components of this ecosystem. Due to the ongoing habitat loss and declining biodiversity, medicinal plant species in the Philippines face heightened vulnerability, potentially compromising their availability for traditional medicinal practices and future pharmaceutical exploration (Mendoza et al. 2016).

Globally, medicinal plants are crucial source of new drugs and up to 80% of people in developing countries rely on herbal drugs for primary healthcare (Ssenku et al. 2022). The increasing demand for herbal drugs and natural health products underscore the importance of identifying and conserving medicinal plant species (Chen et al. 2016; Hussein and El-Anssary 2019). The diverse array of medicinal plants found in the Philippine forests represents a valuable resource that has been central to traditional healing methods for many generations. However, despite laws and executive orders prohibiting the collection of plant species, rampant exploitation continues in the Philippines, fueled by various motives ranging from hobbyist interests to livelihood pursuits (Ani and Castillo 2020). Sustained plant collection would result in the collapse of ecosystem structure and the subsequent reduction of the quantity and quality of ecosystem services for the surrounding communities. Thus, there is an urgency to study this critically affected biota.

Mount Malinao, being part of the biodiverse landscape in the Philippines, hosts various ecosystems including montane forest and grasslands. This mountain is situated between the provinces of Albay and Camarines Sur provinces in the southeastern region of Luzon Island. It has an elevation of 1,548 meters (5,079 ft.) and has a diameter of 22.5 kilometers (14.0 mi) (Belgica et al. 2021). The forested mountain is considered as a dormant volcano and serves as the source of geothermal electricity in Tiwi Albay. It fosters unique plant species including medicinal ones like the newly discovered, *Amorphophallus caudatus*

(Thomsonieae, Araceae). The mountain is also less-explored, thus there is a great possibility to document species new to science such as *Begonia francisabuidii* C.J. P Dela Cruz, S.R.Concepcion & Y.P.Ang sp nov., a new species endemic in Albay where morphological comparison with allied species of Begonia do not belong to any known species (Dela Cruz et al. 2022). The richness and the numerous plant species in the mountain have been used as sources of building materials, food, ornamentals, and medicine. Local communities maintain deep connections with the flora which holds value in cultural practices and is essential in traditional healing methods, highlighting the significance conservation efforts (Bustamante et al. 2020). Preserving these plants is crucial not only for their cultural heritage value but also for their significant roles in indigenous healthcare practices.

Assessing the conservation status of medicinal plants is essential for identifying threats and prioritizing resources effectively. Also, initiating protection for these medicinal plants entails the assessment of their conservation status. This approach allows for the identification and mitigation of potential threats, and enabling the effective prioritization of resources (Hameed et al. 2021). Utilizing framework like the International Union for Conservation of Nature (IUCN) guidelines and considering local regulations ensure comprehensive conservation strategies (Betts et al. 2020). Currently, approximately 15,000 species, including medicinal plants, are facing extinction with habitat loss and exploitation being the most prevalent threats, highlighting the urgency to address such threats to halt the population decline (Asigbaase et al. 2023).

Recognizing the intricate interplay between environmental threats and the fate of medicinal plants underscores the urgency of conservation efforts. Through rigorous assessment and analysis, we aim to shine a spotlight on the pivotal role medicinal plants play in healthcare systems, not only within local communities but also on a global scale. Thus, the primary objective of this study is to comprehensively document and assess the status of medicinal plant species in Mount Malinao, the Philippines. By focusing on these plants, we also aim to illuminate their importance, evaluate their vulnerability, and advocate for their conservation as integral components of preserving traditional medicinal knowledge and potential future healthcare resources amidst escalating environmental pressures.

MATERIALS AND METHODS

Study area

Mount Malinao is situated within Malinao District in Albay Province on the southeastern side of Luzon Island. It lies approximately 20 km northwest of Mayon Volcano, positioned at 13° 24’ 34.6 N latitude and 123° 38’ 33.0 W longitude. This mountain forms part of a volcanic chain in the Bicol region, marking the eastern boundary of the Peninsula. Notably, it boasts an inner crater facing the coastal areas, nestled between Tiwi town and Tabaco City. While classified as a dormant volcano, Mount Malinao features a breached wall crater on its eastern flank (Knittel et al. 1990) (Figure 1) and records temperatures of up to 108°C (De Guzman et al. 2014). The mountain is a lush of diverse flora and fauna with an elevation of 1,548 m and a base circumference of 22.5 sq. km. The long and narrow thickly forested area of Mt. Malinao is often visited by mountaineers. The vegetation is characterized by the lower agroforest ecosystem, the rocky ascending and descending pathways and the secondary montane dipterocarps host interesting terrestrial fauna (De Guzman et al. 2014), including *Platymantis diesmosi* (Brown and Gonzalez 2007), *Pleionogaster albayensis* n. sp., *P. Bicolensis* n. sp., *P. Castilloi* n. sp., *P. Malinaoensis* n. sp., *P. tiwiensis* n. sp. (James 2006). The study was conducted at the base of the mountain to the upper part of Mt Malinao and overgrown with agroforestry type of vegetation with an elevation of 51-300 masl comprises of Barangay Bulang Tagoytoy, Tanawan, and Sugcad.

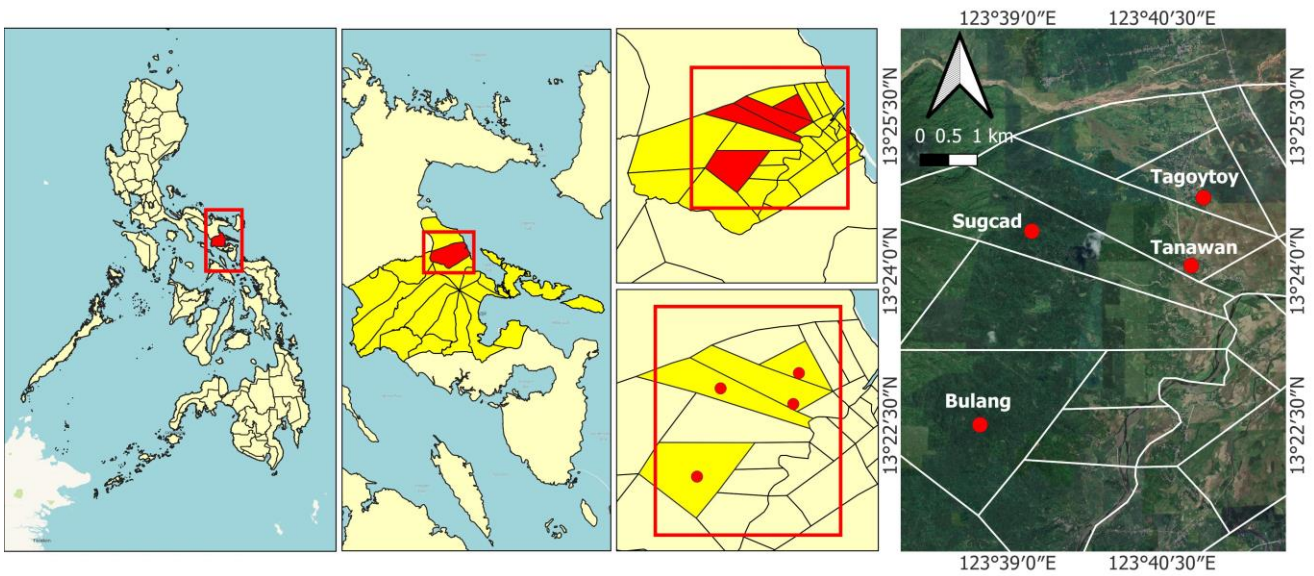

Figure 1. Map of the Philippines where Mt. Malinao is located and marked red in color. Municipalities surveyed are: Bulang, Tagoytoy, Tanawan, Sugcad, marked red

Sampling, collection, preparation, and identification of herbarium specimen

Fieldwork was carried out from April to June 2016. The work consisted of the acquisition of ethical approval from the Ethics Review Committee of the University of Santo Tomas. The certification and permits came from the Local Government Units of Malinao Albay before the actual interview, field survey, and collections in the Mountain Range of Malinao. Random sampling of key informants comprising of 350 traditional healers, local inhabitants was conducted in selected barangays. They were interviewed using semi-structured open-ended interview on medicinal values of sampled medicinal species.

The medicinal values of the collected specimens were then validated by reviewing published books by de Tavera and Hermenegildo (1892), Quisumbing (1951), and Tan (1980) (Suba et al. 2019). These published books include general entries for medicinal plants of the Philippines and accessibility in institution libraries and online sources (Carag and Buot 2017). Websites such as Philippine Alternative Medicine (2011-onwards) and Philippine Traditional Knowledge Digital Library on Health (2015-2016) were also used. Collected specimens were processed conventionally—dried, pressed, treated, and mounted then preserved as herbarium vouchers at the University of Santo Tomas Herbarium (USTH) in the Philippines. To ensure accuracy, scientific names were validated using various online databases like the International Plant Names Index (IPNI 2020), Plants of the World Online (POWO 2023), Co's Digital Flora of the Philippines (CDFP 2023), JSTOR Plants, Global Biodiversity Information Facility (GBIF), eFloras, and international resources such as Royal Botanic Gardens Kew (K) and Arnold Arboretum Harvard University (A). The USTH herbarium curator verified the collected plant vouchers. While the scientific names were cross-referenced with the World Checklist of Selected Plant Families (WCSP 2023) to ensure accuracy.

Assessment of the conservation status and endemicity

Assessment of the conservation status was based on the combined international data of the IUCN Red List and the updated national list of threatened plants and their categories in the DENR - Administrative Order No. (DAO) 2017-01 (DAO 2017). Both listings follow the same criteria for monitoring and protecting threatened and endemic species within the mountain range and its vicinity. The two data sources were used to determine the conservation status of a medicinal plant into several classes, namely NE: Not Evaluated, DD: Data Deficient, LC: Least Concern, NT: Near Threatened VU: Vulnerable, EN: Endangered, CR: Critically Endangered, and N: Not Endangered. The endemicity of the documented medicinal plants was assessed based on their occurrence and distribution in the country using the updated online flora database of Co's Digital Flora of the Philippines. Both listings adhere to the same set of criteria when it comes to monitoring and protecting endangered and endemic species within the mountain range and its vicinity.

RESULTS AND DISCUSSION

Species richness

The field survey documented 74 medicinal plant species, representing 72 genera spanning 38 families (Table 1). Within these families, Lamiaceae emerged as the most prevalent, showcasing eight species, namely *Pogostemon cablin* (Blanco) Benth, *Vitex negundo* L., *Mentha arvensis* L., *Gmelina arborea* Roxb, *Ocimum tenuiflorum* L., *Plectranthus amboinicus* (Lour.) Spreng, and *Plectranthus scutellarioides* (L.) R.Br. Following closely, Compositae revealed six species, including *Blumea balsamifera* L. (DC), *Gynura procumbens* (Lour.) Merr., *Moringa oleifera* Lam. *Artemisia vulgaris* L., *Ageratum conyzoides* L., and *Chromolaena odorata* (L.) R.M.King & H.Rob. Additionally, Euphorbiaceae, Malvaceae, and Moraceae families each consisted of four species. The findings agreed with the study on medicinal plants in Laguna (Fiscal 2017), which similarly identified Lamiaceae possessing the greatest variety of plant species documented, followed by Compositae. Various research investigations have utilized plants from these families, establishing their significance due to the presence of vital chemical compounds. For instance, *P. cablin* Blanco (Benth), *V. negundo* L., *G. arborera* Roxb, *O. tenuiflorum* L. are belonging to the Lamiaceae family, can be used to cure coughs and colds. Phytochemical examinations of *V. negundo* L. have identified flavonoids, essential oils, terpenes, and other compounds. Additionally, this plant exhibits various pharmacological properties such as anti-inflammatory, antioxidant, antipyretic, and antibacterial activities (Suganthi and Dubey 2016). The plants were categorized into herbs (37%), shrubs (31%), trees (27%), and grasses (5%) (Figure 2). Notably, 44 species of the collected medicinal plants possessing therapeutic value were obtained from the wild, while 30 were cultivated (Figure 3). This suggests potential differences in active compounds between wild and cultivated populations, warranting further exploration into their chemical components (Petropoulos et al. 2020).

Beside the effect of environmental variables, species richness is also affected by human activities such as the conversion of forests to agricultural or industrial lands and pollution. For instance, the conversion of forests into agricultural or industrial lands diminishes the natural habitats of numerous species. When forests are cleared for farming or urban development, the original biodiversity is disrupted, leading to a loss of habitat for plants and animals (Hughes 2017). This alteration in the landscape can result in the displacement or extinction of certain species that rely on those habitats for survival. It can contribute significantly to the decline in species richness by altering habitats, causing direct harm to organisms, and disrupting the delicate ecological balance within ecosystems (Rogan and Lacher 2018). Consequently, the Earth's biodiversity is facing significant threats from human activities like deforestation, pollution, habitat destruction, and climate change. These actions have resulted in a drastic decline in numerous species, upsetting crucial ecological balances and posing a serious risk to our planet's ecosystems. Shockingly, wildlife populations have plummeted by 68% since 1970, highlighting the pressing need for immediate action to tackle this crisis (World Wildlife Fund 2001).

Table 1. Checklist of collected medicinal plants, including the family, scientific name, habit, conservation status, endemicity and medicinal uses

Family	Scientific name	Habit	Status IUCN	Status DENR/CDFP	Endemi-city	Medicinal uses	Reference
Acanthaceae	*Andrographis paniculata* (Burm.f.) Nees	H	NE	NE	N	Stomach ache, Headache	1,3,4,5
	Justicia gendarussa Burm.f.	S	NE	NE	N	Dislocation of bones, rheumatism	1,2,3
Amaryllidiaceae	*Proiphys amboinensis* (L.) Herb.	H	NE	NE	N	Stomach ache, asthma, wounds	1,2,3
Anacardiaceae	*Spondias pinnata* (L.f.) Kurz	T	NE	NE	N	Anti-inflammatory, burns	1
Annonaceae	*Anona muricata* L.	T	NE	NE	N	Anti-cancer, stomach acidity, hypertension, cough	1,3,4,5
Apiaceae	*Centella abbreviata* (A. Rich.) Nannf	H	LC	LC	N	Colds, infection in babies, cancer, sore	1,2,3
Apocynaceae	*Voacanga globosa* (Blanco) Merr.	T	LC	LC	EN	Hernia, anti-inflammatory	1,3,4
	Asclepsias curassavica L.	H	NE	NE	N	Anti-inflammatory, athritis	1,2,3,4
Araceae	*Caladium bicolor* (Aiton) Vent	H	NE	NE	N	Cough	1,2
Asteraceae	*Cyanthillium cinereum* (L.) H.Rob.	H	NE	NE	N	Kidney disorder, urinary tract infection	1,2,3
Asparagaceae	*Sansevieria roxburghiana* (Schult. & Schult.f.) Merr.	H	NE	NE	N	Skin disease	1
Balsaminaceae	*Impatiens balsamina* L.	G	NE	NE	N	Goiter, arthritis, burns, insects bite, boils	2,3
Boraginaceae	*Ehretia microphylla* Lam.	H	NE	NE	N	Abdominal pain	6
	Cordia dichotoma G. Forst	S	LC	LC	N	Shingles, cough, headache, relapse	6
Burseraceae	*Canarium ovatum* Engl.	T	LC	OTS	EN	Indigestion, insect bites, skin allergies	1,3
Caricaceae	*Carica papaya* L.	T	DD	DD	N	Constipation	6
Compositae	*Blumea balsamifera* L.(DC)	S	LC	LC	N	Headache, skin disease, rheumatism	6
	Gynura procumbens (Lour.) Merr.	H	NE	NE	N	Lower blood pressure, blood sugar, anticancer, ulcer	2,3
	Artemisia vulgaris L.	H	LC	LC	N	Expectorants, skin disease, scabies, eczema, wounds	1
	Ageratum conyzoides L.	G	LC	LC	N	Wounds	1
	Chromolaena odorata (L.) R.M.King & H.Rob.	H	NE	NE	N	Wounds	1,2,3,4
Crassulaceae	*Bryophyllum pinnatum* (Lam) Oken	H	NE	NE	N	Athlete's foot, boils, arthritis	4,5
Euphorbiaceae	*Euphorbia hirta* L.	H	NE	NE	N	Dengue fever, sore eyes, cataract	6
	Jatropha curcas L.	S	NE	NE	N	Rheumatism, sprain, cough	1
	Croton tiglium L.	S	LC	LC	N	Eczema, rashes	3,4,5
	Manihot esculenta Crantz	S	NE	NE	N	Diarrhea	1
Fabaceae	*Crotalaria incana* L.	H	NE	NE	N	Skin disease	1
	Senna alata (L.) Roxb.	H	LC	LC	N	Ringworms, fungus infection	6
	Mimosa pudica L.	G	LC	LC	N	Toothache, insomnia	6
	Tamarindus indica L.	T	LC	LC	N	Aromatic bath, laxative, fever	1,2,4
Lamiaceae	*Pogostemon cablin* (Blanco) Benth	H	NE	NE	N	Anti-inflammatory, arthritis rheumatism	1
	Vitex negundo L.	T	LC	LC	N	High fever, cough, stomach ache, asthma	1,2,3
	Mentha arvensis L.	H	LC	LC	N	Cancer, colds	3,5
	*Gmelina arbor*ea Roxb. ex Sm.	T	LC	LC	N	Cough, ulcer	1,3
	Ocimum tenuiflorum L.	H	NE	NE	N	Stomach ache, fever, diarrhea	1
	Plectranthus amboinicus (Lour.) Spreng	H	NE	NE	N	Colds, abdominal pain	1,3.4
	Plectranthus scutellarioides (L.) R.Br.	H	NE	NE	N	Fresh wound	1,2.3
Leguminosae	*Lablab purpureus* (L.) Sweet	S	NE	NE	N	Stomach ache	1
Lauraceae	*Persea americana* Mill	T	NE	NE	N	stomach ache, cough, ulcer, diarrhea	2,3
Lythraceae	*Lagerstroemia speciosa* (L.) Pers.	T	NE	NE	N	Kidney, stomach ache, urinary tract infection, gallstone	1

Malvaceae	*Corchorus capsularis* L	S	NE	NE	N	Bowel constipation, cyst, cancer	6
	Theobroma cacao L.	T	NE	NE	N	Eczema, dry skin Boils	6
	Hibiscus rosa-sinensis L.	S	NE	NE	N	Boils	1
	Urena lobata L.	S	LC	LC	N	-	1
Melastomaceae	*Melastoma malabathricum* L.	S	NE	NE	N	Cough	1,3
Meliaceae	*Sandoricum koetjape* (Burm.f.) Merr.	T	NE	NE	N	Colds	1,3
Menispermaceae	*Tinospora* sp.	T	LC	LC	N	Scabies, ulcer	1
Moraceae	*Ficus nota* (Blanco) Merr	T	LC	LC	N	Sprain	6
	Ficus benjamina L.	T	NE	NE	N	Sprain	1,2,3
	Ficus pseudopalma Blanco	S	LC	LC	N	Hypertension	6
	Moringa oleifera Lam.	S	LC	LC	N	Lower blood pressure, blood sugar, anti-cancer	6
Moringaceae							
Myrtaceae	*Psidium guajava* L.	T	NE	NE	N	Diarrhea, wounds, stomachache	6
Oleaceae	*Jasminum sambac* (L.) Aiton	S	NE	NE	N	Wound	1
Oxalidaceae	*Averrhoa bilimbi* L.	T	NE	NE	N	Mumps	1,3,5
Phyllanthaceae	*Phyllanthus niruri* L.	H	NE	NE	N	Tonsillitis, kidney disease, wounds	1,3,5
	Antidesma ghaesembilla Gaertn.	T	NE	NE	N	Cough, kidney disease, colds, diabetes	1
Piperaceae	*Piper betle* L.	H	NE	NE	N	Headache, sprain, colds	1
	Peperomia pellucida L. Kunth	H	NE	NE	N	Diarrhea, kidney problem	6
Poaceae	*Imperata cylindrica* (L.) Raeusch	G	NE	NE	N	Kidney problem, colds, urinary tract infection	6
	Cymbopogon schoenanthus (L.) Spreng.	H	NE	NE	N	Hypertension, colds, stomach ache, wounds	1,2,3,4
Rubiaceae	*Ixora coccinea* L.	S	NE	NE	N	Wounds	1,2
	Mussaenda frondosa L.	S	NE	NE	N	Dysmenorrhea	1
	Morinda umbellata L.	T	NE	NE	N	Anti-inflammatory	1,3,4
Solanaceae	*Capsicum annuum* L.	H	NE	NE	N	Arthritis	1
	Datura metel L.	S	NE	NE	N	Headache, abdominal pain	1
Verbenaceae	*Premna odorata* Blanco	T	LC	LC	N	Head lice, cough, fever, wounds	1
	Stachytarpheta jamaicensis (L.) Vahl	S	LC	LC	N	Cuts, wound.	6
	Vitex negundo L.	S	LC	LC	N	Cough, stomach ache, asthma, sore throat	6
Xanthorrhoeaceae	*Aloe vera* (L.) Burm. f	S	NE	NE	N	Falling hair	6
Zingiberaceae	*Alpinia elegans* (C.Presl) K.Schum	S	NE	NE	N	Coughs	6
	Curcuma longa L.	H	DD	DD	N	Cancer, swelling, arthritis	
	Hedychium coronarium J.Koenig	S	NE	NE	N	Cough	1,2,4,5
	Kaempferia galanga L.	S	DD	DD	N	Anti-inflammatory, stomach ache	1

Note: Families are arranged alphabetically, followed by species for each family; Habit (T: Tree, S: Shrub, H: Herb, G: Grass); Conservation status based on IUCN Red List of Threatened Species or *DENR Administrative Order 2017-11 (NE: Not Evaluated, DD: Data Deficient, LC: Least Concern, EN: Endangered, N: Not Endangered, Other Threatened Species); Endemicity based on IUCN and Pelser et al. (2011-onward) or Co's Digital Flora (E: Philippine endemic, N: Non-endemic), and medicinal values (1: www.stuartxchange.org/CompleteList.html, 2: www.tkdlph.com, 3: Quisumbing, 4: Tan, 5: de Tavera, 6: all authors and online sources)

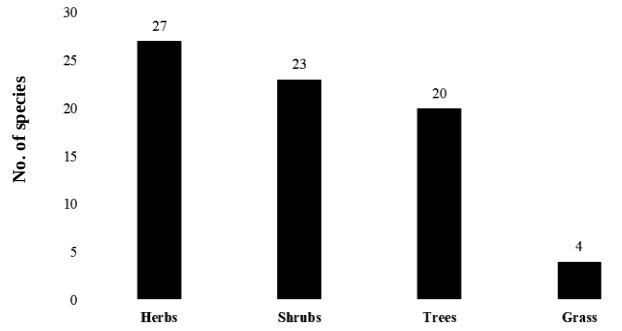

Figure 2. Habitus of medicinal plants in Mount Malinao, Albay Province, the Philippines

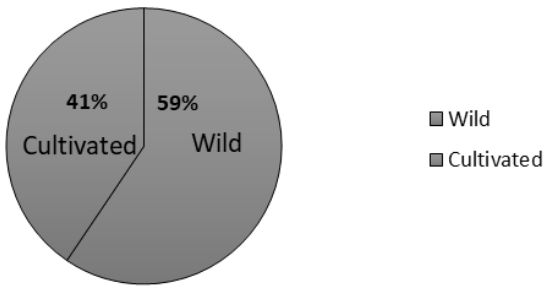

Figure 3. Sources of medicinal plants from the study area

Medicinal species conservation status and endemicity

Based on the IUCN Red List database (2023), three species have conservation status of DD-Data Deficient, 24 species were LC-Least Concern and 47 were NE-Not Evaluated. Three plant species namely, *Carica papaya* L., *Curcuma longa* L., and *Kaempferia galangal* L. were classified as DD. The species classified as DD are directly targeted for monitoring and likely to slide towards extinction if unnoticed. Taking into account information on DD species may therefore help tackle data gaps in biodiversity indicators and conserve the earth's poorly-known biodiversity. However, *Centella abbreviata* (A. Rich.) Nannf., *Voacanga globosa* (Blanco) Merr, *Cordia dichotoma* G. Forst., *Canarium ovatum* Engl., *Blumea balsamifera* L. (DC), *Moringa oleifera* Lam., *Artemisia vulgaris* L., *Ageratum conyzoides* L., *Croton tiglium* L., *Senna alata* (L.) Roxb., *Mimosa pudica* L., *Tamarindus indica* L., *Vitex negundo* L., *Mentha arvensis* L., *Gmelina arbore*a Roxb ex Sm, *Urena lobata* L., *Tinospora* sp., *Ficus nota* (Blanco) Merr., *Ficus pseudopalma* Blanco, *Ficus fistulosa* Reinwardt ex Blume Merr., *Premna odorata* Blanco, *Stachytarpheta jamaicensis* (L.) Vahl, *Vitex negundo* L. were identified as LC which indicates that the species are not currently facing a significant risk of extinction. However, some species categorized as "Least Concern" are invasive alien species which may still pose a threat to native species. An invasive alien species is a non-native species that has been introduced to an ecosystem and has the potential to cause harm to the environment, economy, or human health. Therefore, while a species may be classified as "Least Concern" in terms of its own conservation status, it's essential to consider its potential invasiveness and its impact on native ecosystems when assessing overall conservation priorities and management strategies (Milanović et al. 2020). The national list of threatened species (Pelser et al. 2011 onwards; DENR Administrative Order 2017; CDFP 2023) revealed one species as Other Threatened Species (OTS), namely *Canarium ovatum* Engl., three species were identified as DD-Data Deficient, 24 species were LC-Least Concern and 47 were NE-Not Evaluated.

Regarding the endemicity, 72 medicinal plants were identified as Non-Endemic and two were identified as endemic, namely *Canarium ovatum* Engl. (Pili nut) and *Voacanga globosa* (Blanco) Merr. Recognizing endemic species as a subset within the medicinal plant diversity highlights the need for focused conservation efforts. Endemic plants often face higher extinction risks due to their limited geographic range, making their conservation a priority to safeguard unique genetic diversity. Concurrently, the center of diversity is in the Bicol region in the rainforests around Mount Bulusan in Sorsogon province. Pili nut cultivation is a significant economic activity in the Bicol region. Recognizing *C. ovatum* Engl. as an endemic species emphasizes the local importance of preserving this resource. Conservation endeavors can be directed at preserving the pili nut, establishment of protected areas, promotion of sustainable harvesting practices, and implementation of biodiversity conservation programs. Sustainable harvesting practices ensure that pili nut production remains viable in the long term while minimizing negative impacts on the environment and local communities (Coronel 1996). Furthermore, conservation initiatives can empower local communities by providing them with the necessary tools and knowledge to manage and conserve their natural resources effectively. By engaging stakeholders, including farmers, government agencies, non-profit organizations, and research institutions, conservation efforts can be tailored to address local needs and priorities while fostering sustainable development.

In response, environmental planning emerges as a crucial tool for biodiversity conservation, steering efforts towards a sustainable development approach where economic growth and environmental preservation are intertwined. This planning relies on scientific analysis and strategic decision-making to ensure the lasting health of ecosystems and their inhabitants. It involves the restoration of degraded habitats, creating conducive environments for endangered species to recover and reestablish ecological harmony. Targeted measures, including captive breeding, reintroduction programs, and anti-poaching initiatives, are implemented to safeguard and manage vulnerable species. The primary goal of environmental management is to protect and improve the state of the environment while also ensuring that economic and social benefits derived from ecosystems are sustained (Laurila-Pant et al. 2015). The shift towards more comprehensive decision-making processes, (O'Hagan 2020), involves recognizing ecological systems as intricate networks of interacting elements, while also factoring in their social and economic dimensions. This approach underscores the importance of considering diverse aspects of ecosystems when making management decisions.

In conclusion, this study serves as a crucial step towards understanding and safeguarding the medicinal flora in Mt Malinao Albay Philippines. By assessing the conservation status of these plants, valuable insights have been gained. This assessment provides a foundation for conservation efforts aimed at preserving and sustainably utilizing these vital plant resources, maintaining biodiversity, supporting local livelihoods, and safeguarding traditional knowledge for future generations. A comprehensive inventory of endangered and threatened plant species should be conducted before they become extinct due to some anthropogenic activities in the area.

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