Quantitative ethnobotany of medical plants in non-indigenous communities of Loboc, Bohol, Philippines

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Research

Abstract

Background: Ethnobotanical knowledge among non-indigenous populations remains underdocumented, limiting our understanding of the role traditional medicine plays in rural Philippine healthcare. This study aimed to quantitatively assess and compare ethnomedicinal plant knowledge in two non-indigenous barangays, Gon-ob and Buenavista, in Loboc, Bohol, Philippines.

Methods: Semi-structured interviews were conducted with 146 respondents to document the use of medicinal plants. Four quantitative ethnobotanical indices, Use Value (UV), Relative Frequency of Citation (RFC), Informant Consensus Factor (ICF), and Fidelity Level (FL), were calculated to determine cultural significance, agreement, and specificity of plant use within and between communities.

Results: From 146 informants, a total of 42 medicinal plant species belonging to 27 families were recorded, with *Euphorbiaceae* being the most represented. While several species were commonly used in both communities, differences were observed in use values, relative frequency of citation, preparation methods, and ailment-specific consensus between Gon-ob and Buenavista. **Halib-on** (*Blumea balsamifera*), **kalabo** (*Coleus amboinicus*), and **lagundi** (*Vitex negundo*) exhibited the highest UV and RFC values, underscoring their importance in community health traditions. Leaves were the most frequently used plant parts, and decoction was the predominant preparation method. High ICF values for respiratory and skin ailments indicated a strong, yet community-specific, consensus among informants.

Conclusions: The study provides baseline quantitative evidence of both shared and distinct ethnomedicinal practices between two non-indigenous rural communities in Bohol, highlighting culturally significant species that warrant prioritization in future research and conservation efforts. In particular, *B. balsamifera, C. amboinicus, and V. negundo*, identified as the most culturally important species, should be prioritized for focused documentation, sustainable management, and further pharmacological research.

Keywords: Bohol, Philippines, Ethnobotanical indices, Ethnomedicinal plant, Non-indigenous local communities, Traditional knowledge

Background

Herbal medicine remains an essential component of healthcare globally, with many communities continuing to rely on medicinal plants for disease prevention and treatment (WHO 2011; Thalia 2025). This enduring reliance reflects the accessibility, affordability, and cultural integration of plant-based remedies, particularly in rural settings across Southeast Asia, where herbal medicine complements modern health services and preserves empirical knowledge accumulated over generations (Khan and Ahmad 2019; Awoyemi *et al*. 2021). Beyond therapeutic uses, traditional medicine contributes to community well-being, biodiversity conservation, and the preservation of local heritage (Munusamy *et al*. 2024).

In the Philippines, medicinal plant use dates to pre-colonial times and has been shaped by indigenous healing practices and long-standing intercultural exchange. Historical records and ethnographies document the centrality of herbal medicine in Filipino daily life (Bantug 1954). Although national health initiatives have increasingly recognized the role of herbal remedies, scholarly documentation remains uneven: much of the ethnobotanical literature has focused on Indigenous Cultural Communities (ICCs), emphasizing their distinct knowledge systems (Viado 2024; Plang *et al*. 2024; Cordero and Alejandro 2022). Non-indigenous rural populations, the focus of this study, are communities whose members are not classified as ICCs but who have long-settled in rural landscapes (often through migration, intermarriage, or agricultural settlement). These communities may combine migrant, lowland, and local traditions and typically maintain a pragmatic ethnomedicinal repertoire transmitted through household networks, local markets, and health workers. Studying non-indigenous rural groups is important because they represent a large portion of rural Filipino society, often act as conduits between formal health systems and more isolated Indigenous groups, and may show different patterns of plant use and knowledge transmission due to variation in education, market access, and livelihood.

While many earlier ethnobotanical studies emphasized descriptive and qualitative accounts of medicinal plant use, quantitative ethnobotany has grown, applying indices such as Use Value (UV), Relative Frequency of Citation (RFC), Informant Consensus Factor (ICF), and Fidelity Level (FL) to assess cultural importance, consensus, and specificity (e.g., Phillips and Gentry 1993; Tardío and Pardo-de-Santayana 2008; Friedman *et al*. 1986). Nevertheless, quantitative assessments focusing specifically on non-indigenous rural populations in provinces such as Bohol remain limited, constraining efforts to identify which species are most valued and widely recognized across different rural social contexts. Traditional knowledge in many rural areas also faces growing threats. The adoption of modern medicine, reduced intergenerational knowledge transfer, and environmental degradation contribute to the erosion of traditional herbal practices (Cordero *et al*. 2022; Mbuni *et al*. 2020). As traditional healers age and habitats decline, both biological and cultural resources risk being lost. Ethnobotanical research therefore plays a critical role in documenting and validating practices, informing pharmacological investigation, conservation planning, and sustainable resource management (Teves *et al*. 2023; Fajardo *et al*. 2017).

This study addresses these gaps through a quantitative ethnobotanical assessment of medicinal plant knowledge among two non-indigenous rural communities, Barangay Gon-ob and Barangay Buenavista, Loboc, Bohol. We applied four indices (UV, RFC, ICF, FL) to evaluate cultural importance, consensus, and specificity of medicinal plant use. The objectives were to: (1) identify commonly used medicinal species; (2) determine frequently used plant parts and preparation methods; (3) assess consensus among informants by ailment category using quantitative indices; and (4) analyze variation in ethnomedicinal knowledge between the two barangays. By quantifying local knowledge in non-indigenous rural communities, this research contributes to the preservation of traditional healing practices, prioritization of species for pharmacological validation, and the promotion of sustainable management of culturally significant plants. It thus provides a more comprehensive view of how culture, ecology, and health intersect in rural Philippine settings.

Materials and Methods

Study Area

The study was conducted in two barangays- the smallest administrative and political units in the Philippines, comparable to villages- of the Municipality of Loboc, Bohol, namely **Barangay Gon-ob** and **Barangay Buenavista (Fig. 1)**. Loboc is a predominantly rural municipality composed of 28 barangays and is located within the central part of Bohol Island. **Barangay Gon-ob** is located at approximately 9.6164°N, 124.0403°E on the island of Bohol. It sits at an estimated **154.5 meters** (506.9 feet) above mean sea level. Based on the 2020 Census, its population was **284**, representing **1.63%** of the total population of Loboc. **Barangay Buenavista**, located at approximately 9.6242°N, 124.0626°E, lies at a higher elevation of about 321.4 m (1,054.4 feet) above sea level and has a population of **335 residents** (**1.92%** of the municipal population). Both communities are primarily inhabited by non-indigenous, long-settled rural populations whose residents are predominantly Cebuano-speaking and identify culturally with lowland Visayan society rather than Indigenous Cultural Communities (ICCs) recognized

under Philippine law. Historically, these barangays developed through agricultural settlement and gradual migration, with livelihoods centered on farming and household-based resource use. Traditional knowledge of medicinal plants in both communities is commonly transmitted through family members, neighbors, and local health practitioners rather than through formally recognized traditional healers. Despite these shared characteristics, the two barangays differ in important socio-ecological contexts relevant to ethnobotanical knowledge. Barangay Gon-ob is more closely situated to forest edges and less accessible by road, which facilitates greater interaction with wild vegetation and forest-derived plant resources. In contrast, Barangay Buenavista is relatively more accessible and lies at a higher elevation, with a greater proportion of cultivated and home-garden plant resources. The selection of Barangays Gon-ob and Buenavista was purposive, guided by both ecological and socio-cultural considerations. These sites were chosen for their proximity to the buffer and multiple-use zones of the Rajah Sikatuna Protected Landscape (RSPL), which enables frequent interaction between local communities and forest ecosystems. At the same time, differences in elevation, accessibility, and landscape charateristics provide a meaningful basis for comparative analysis of ethnomedicinal knowledge between two non-indigenous rural commnuties. Preliminary consultations with local officials and traditional healers confirmed the presence of knowledgeable informants and active practitioners, further supporting the selection of these sites for study.

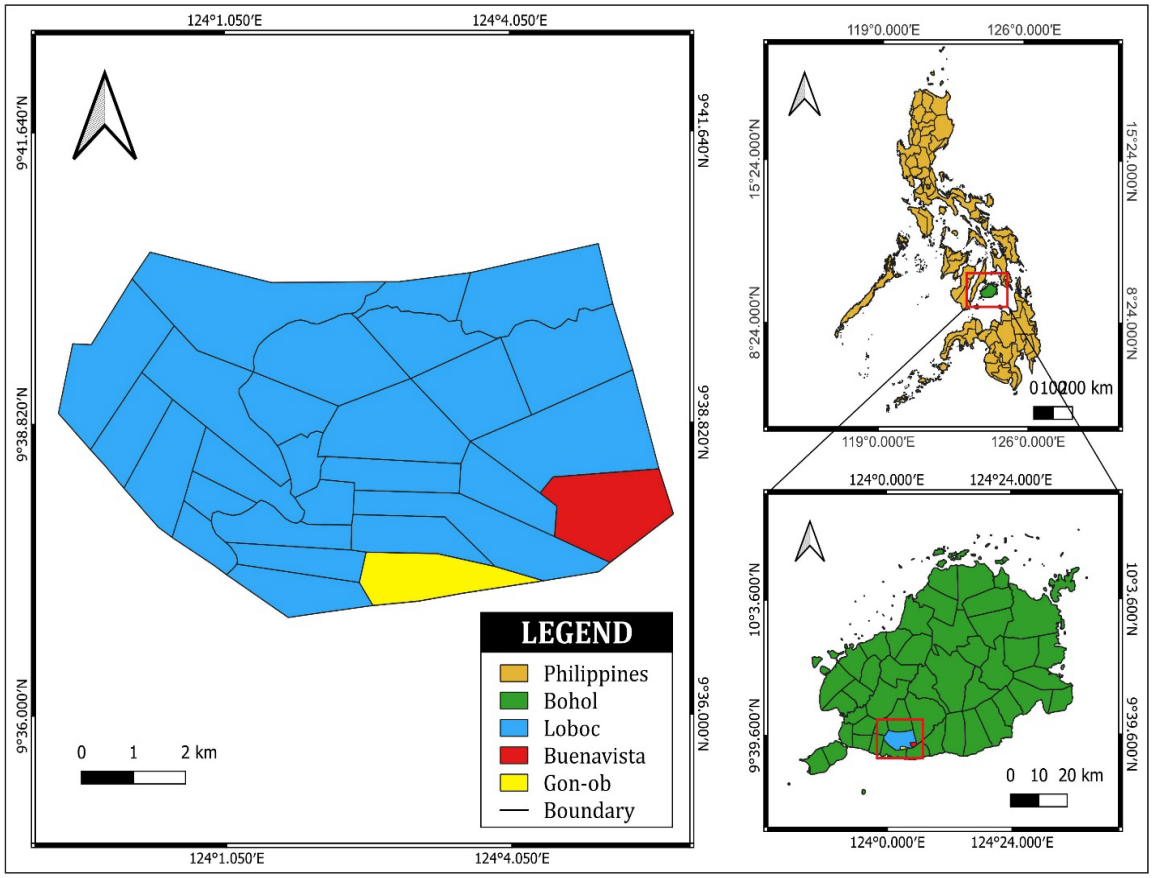

Figure 1. Map of Loboc, Bohol, Philippines, showing the two barangays (villages): Buenavista and Gon-ob.

Procedure

Sampling Methodology

A purposive sampling technique was used to identify residents recognized for their knowledge and use of medicinal plants in the community (Fig. 2). Eligible participants were residents of Barangay Gon-ob or Barangay Buenavista, aged 15 years or older, who were present during the study period and were willing to provide informed consent. Data were collected from September to December 2024. For participants aged 15-17, parental or guardian consent and participant assent were required. A total of 146 respondents participated in the study, 70 from Barangay Gon-ob and 76 from Barangay Buenavista, all of whom met the inclusion criteria and consented to participate. Local leaders and barangay health workers assisted the research team by introducing them to community members, fostering trust, and identifying knowledgeable informants across diverse age groups, occupations, and experiences in traditional medicine. Field teams conducted door-to-door household visits using barangay lists to invite eligible residents. Up to two follow-up visits were made to reach individuals who were initially absent. Refusals and non-contacts were systematically recorded in field rosters, and no further attempts were made

to persuade those who declined. Data collection was stratified by barangay (Gon-ob and Buenavista) for comparative analysis. Demographic variables such as age and sex were summarized descriptively to assess representativeness and ensure that the final sample reflected the diversity of ethnomedicinal knowledge within the two non-indigenous barangays.

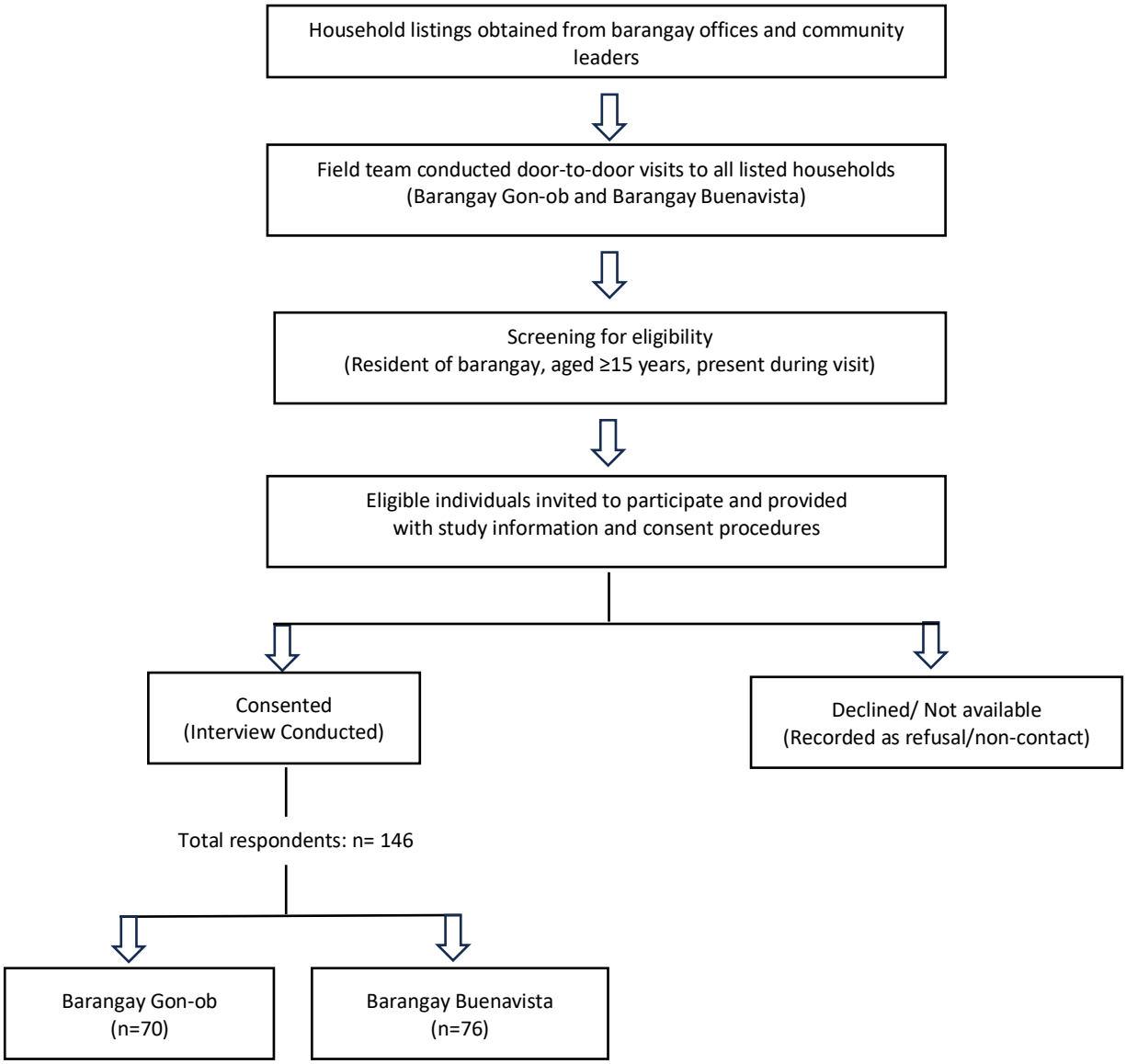

Figure 2. Sampling and recruitment flow of study participants in Barangay Gon-ob and Barangay Buenavista, Loboc, Bohol, Philippines

Prior Informed Consent and Ethical Considerations

Before data collection, informed consent was obtained from the chairpersons of Barangay Gon-ob and Barangay Buenavista, authorizing the researchers to approach and interview residents within their jurisdictions. Participation was entirely voluntary, and respondents were clearly informed of the study's objectives, scope, and procedures, as well as their right to withdraw at any time without penalty. Written consent was secured from all adult participants, while for those aged 15-17 years, both parental or guardian consent and participant assent were obtained. At the time of the study, no Institutional Review Board (IRB) or formal ethics committee was available. In accordance with the International Society of Ethnobiology (ISE) Code of Ethics (2006), ethical safeguards were ensured through transparency, community authorization, and respect for local autonomy. The study did not involve the collection of biological materials, and local plant names were recorded solely for documentation purposes. Demographic data (e.g., age, sex, marital status, and length of residency) were collected only to provide contextual understanding and promote inclusivity. All procedures adhered to established ethical standards for research involving human participants and complied with Republic Act 10173, also known as the Data Privacy Act of 2012, by maintaining strict confidentiality, anonymizing all personal identifiers, and restricting data access exclusively for academic purposes.

Interview Process

Data were gathered using semi-structured interviews guided by a questionnaire. The interviews were conducted in a conversational and respectful manner, encouraging open sharing of knowledge while adhering to ethical standards and data protection protocols (Andalan *et al*. 2024). The questionnaire covered key aspects of traditional medicinal plant use, including: local names of medicinal plants, parts of the plants used, methods of preparation, and ailments or health conditions treated. This approach provided a rich, community-based understanding of ethnobotanical practices.

Plant Documentation and Taxonomic Verification

Medicinal plant information was obtained through respondents' verbal reports; no physical plant materials were collected, and voucher specimens were not deposited. To ensure botanical accuracy, scientific names were verified using Plants of the World Online, World Flora Online, the Medicinal Plant Names Services, and Co's Digital Flora of the Philippines (all accessed on May 6, 2025). Species were identified through local names supported by field observations and photographic documentation of diagnostic features. The identification followed three steps: (1) matching vernacular names with potential scientific names using ethnobotanical references; (2) validating morphological characteristics through field photographs; and (3) confirming identities using authoritative botanical keys and literature. Although the absence of voucher specimens is methodological limitation, triangulation of ethnobotanical knowledge, photographic evidence, and verified taxonomic sources provides reasonable confidence in species identification. Future studies will include systematic voucher collection for deposition in a recognized herbarium to strengthen taxonomic reliability.

Data Analysis

The following quantitative parameters were analyzed to evaluate the results:

Use value

Use Value (UV) was used to determine the relative importance of the medicinal plants using the formula:

$$UVs=Ui/N$$

where Ui is the number of use reports, citations, or mentions by each informant for a particular species, and N is the total number of informants who participated in the study (Phillips and Gentry 1993). High values indicate a high number of use reports or citations from the informants, and low values indicate fewer citations or mentions.

Relative frequency citation

Relative frequency citation (RFC) was used to assess the relative frequency of citation or mention from the informants who participated in the study using the formula:

$$RFC=FCs/N$$

where FCs is the number of informants who cited or mentioned a medicinal plant species (frequency citation) and N is the total number of informants (Tardìo and Pardon-de-Santayana 2008). Range: 0-1. Higher = cited by more informants.

Informant consensus factor

Informant consensus factor (ICF) will be used to evaluate the consensus or homogeneity of the medicinal plant information from the informants using the following formula:

$$ICF= (Nur - Nt)/ (Nur - 1)$$

where Nur is the number of use reports or citations for each disease category and Nt is the number of species used in that particular category (Heinrich *et al*. 1998). Interpretation: ICF ranges from 0 to 1; values near 1 indicate few species are cited frequently for that category (high consensus), values near 0 indicate many species are cited infrequently (low consensus).

Fidelity level

Fidelity level (FL) was used to determine the percentage of the most preferred and valued medicinal plants for a particular disease or use category using the following formula:

$$FL = (Np/N) \times 100$$

where Np is the number of informants who cited species for the same particular ailment, and N is the total number of informants who mentioned species for any ailment (Friedman *et al*. 1986). High FL indicates strong specificity of use.

Statistical Analysis

Data collected from respondents were analyzed using descriptive statistics, including percentages and counts, particularly for variables such as demographic profile, plant parts used, mode of preparation, mode of application, and sources of medicinal plants. The association between demographic characteristics (e.g., sex, age group, civil status, educational attainment, occupation, and years of stay) and barangay of residence (Gon-ob and Buenavista) was assessed using the Chi-square (χ^2) test of independence. Uncertainty in Use Value (UV) and Relative Frequency of Citation (RFC) estimates was assessed using approximate methods, as individual informant-level data were unavailable for bootstrapping. Standard errors (SE) and 95% confidence intervals (CIs) were calculated to quantify uncertainty. For UV, SE was estimated assuming a Poisson distribution of total use reports, with 95% CIs computed as CI = UV ± 1.96 × SE. For the RFC, a proportion, SE was calculated under a binomial distribution, and 95% CIs were computed as: CI = RFC ± 1.96 × SE. RFC and its CI were calculated per barangay (Gon-ob, N = 70; Buenavista, N = 76), where 1.96 represents the z-score corresponding to a 95% confidence level under the normal distribution. Although this approach is less precise than nonparametric bootstrapping, it provides a reasonable preliminary representation of uncertainty. Future studies will retain informant-level data to enable bootstrapped confidence intervals through resampling, yielding more robust, distribution-free estimates of uncertainty. All analyses were performed using the Analysis ToolPak in Microsoft Excel (2023).

Results

Demographic characteristics

In Barangay Gon-ob, the majority (71%) of respondents were female, with 29% being male (Table 1). On the other hand, in Barangay Buenavista, most respondents (66%) were female, with 34% male. In this study, there were more female informants than males. Regarding age, 23 or 33% of the respondents in Barangay Gon-ob are 42-59 years old, while in Brgy. Buenavista, most respondents (32%) were in the 30-44 age range. Regarding marital status, most respondents (64%) are married in Brgy. Gon-ob. Similarly, most (80%) respondents in Brgy. Buenavista is married, followed by single, with 27% in Brgy. Gon-ob and 17% in Brgy. Buenavista and a few are widowed.

Regarding educational attainment, 15 (21%) respondents in Barangay Gon-ob had reached high school. Meanwhile, 23 (30%) respondents graduated from high school in Brgy. Buenavista. Regarding occupation, data indicates that most of the respondents in both barangays were housewives, with Barangay Gon-ob at 43% and Brgy. Buenavista at 42%. Jobless respondents followed it in Brgy. Buenavista (18%) and Brgy. Gon-ob (10%). The least reported occupation was self-employed, with 1% in Barangay Gon-ob and 4% in Buenavista. Most respondents have resided in their respective barangays for 35 to 64 years (Table 2). Thirty-three, or 47%, were from Brgy. Gon-ob, and thirty-eight or 50% were from Brgy. Buenavista. Of those who have stayed between 5 and 34 years, twenty-six or 37% were from Brgy. Gon-ob and twenty-five or 33% from Brgy. Buenavista. Meanwhile, respondents who have lived in the area for 65 to 94 years comprised 16% in Gon-ob and a slightly higher 17% in Buenavista.

Table 1. Sex, Age, and Civil Status, Educational Attainment, Occupation, and Years of Stay of respondents in Barangay Gon-ob and Buenavista Loboc, Bohol

Variable	Gon-ob		Buenavista		Test	*p*-value
	No	%	No	%		
Sex						
Male	20	29	26	34		
Female	50	71	50	66		
Total	**70**	**100**	**76**	**100**	**χ^2= 0.54**	**0.46**
Age						
15-29	12	17	14	18		
30-44	14	20	24	32		
45-59	23	33	16	21		
60-74	18	26	16	21		
75-89	3	4	6	8		
Total	**70**	**100**	**76**	**100**	**χ^2= 4.92**	**0.30**
Civil status						
Single	19	27	13	17		
Married	42	64	61	80		
Widowed	6	9	2	3		
Total	**70**	**100**	**76**	**100**	**χ^2= 6.09**	**0.04***
Educational Attainment						
Elementary Level	13	19	7	9		
Elementary Graduate	8	11	9	12		

High School Level	15	21	9	12		
High School Graduate	11	16	23	30		
College Level	14	20	18	24		
College Graduate	9	13	10	13		
Total	**70**	**100**	**76**	**100**	**χ^2= 7.91**	**0.16**
Occupation						
Farmer	12	17	12	16		
Housewife	30	43	32	42		
Government Employee	10	14	9	12		
Jobless	7	10	14	18		
Laborer	6	9	5	7		
Private Employee	4	6	1	1		
Self-Employed	1	1	3	4		
Total	**70**	**100**	**76**	**100**	**χ^2= 5.10**	**0.53**
Years of Stay						
5-34	26	37	25	33		
35-64	33	47	38	50		
65-94	11	16	13	17		
Total	**70**	**100**	**76**	**100**	**χ^2= 0.29**	**0.86**

*(Significant at p=0.05)

Taxonomic Composition, Parts Used, Plant Sources, Mode of Administration, and Preparation of Medicinal Plants

A total of 42 plant species from 27 families were documented (Table 2A; Table 2B; Fig. 3), traditionally used in Barangays Gon-ob and Buenavista. Euphorbiaceae was the most represented family, with four species, followed by Fabaceae and Lamiaceae, each with three species. Eight families, including Amaryllidaceae, Annonaceae, Myrtaceae, Asteraceae, Rutaceae, Poaceae, Zingiberaceae, and Moraceae, were represented by two species each, while the remaining 16 families contributed a single species. Species such as *Annona muricata* L., *Annona squamosa* L.*, Blumea balsamifera* (L.) DC., *Cymbopogon citratus* (DC.) Stapf, *Zingiber officinale* Roscoe, *Curcuma longa* L., *Ficus septica* Burm.f., and *Moringa oleifera* Lam. were used to treat multiple ailments, demonstrating broad therapeutic versatility. Preparation methods differed between barangays. Respiratory remedies, such as *Vitex negundo* L. and *Coleus amboinicus* L., varied in extraction and infusion practices. Treatments for skin infections, using *Chromolaena odorata* (L.) R.M. King & H. Rob., *Aloe vera* L., and *Stachytarpheta jamaicensis* (L.) Vahl differed in the application of crushed, poulticed, or direct plant parts. Similarly, plants for circulatory and digestive ailments, including *Allium sativum* L., *Allium cepa* L., *Tinospora crispa* (L.) Hook.f. & Thomson, and *Momordica charantia* L., exhibited inter-barangay differences in preparation and administration. Species used in pregnancy and maternal care, such as *Melanolepis multiglandulosa* Rchb. & Zoll. and *Citrus maxima* (Burm.) Merr., also showed distinct preparation techniques.

Leaves were the most frequently used plant part in both communities, aligning with findings from other Philippine ethnobotanical studies (Fig. 4A). Roots and stems were also commonly used, reflecting their perceived potency for chronic or internal ailments. Other parts, such as bark, fruits, and flowers, were less commonly used and generally associated with specific treatments, including skin disorders, respiratory illnesses, or reproductive health concerns. Seeds and sap were rarely employed, suggesting specialized knowledge among traditional practitioners.

Decoction was the most common preparation method, reported by 37% of respondents in Gon-ob and 38% in Buenavista (Fig. 4B). This involves boiling plant parts to extract active compounds, mainly for gastrointestinal and respiratory ailments. Key species prepared as decoctions included *A. muricata*, *Psidium guajava* L., *Mangifera indica* L., *V. negundo*, *C. amboinicus*, and *C. microcarpa*. Crushing and heating for topical application was practiced by 26% of respondents in Gon-ob and 25% in Buenavista, primarily for pain, inflammation, and skin infections. Infusions were less frequent (12% in Gon-ob, 14% in Buenavista), while methods such as direct application, extraction, concoction, and poultice were rare. Internal administration accounted for 59% of medicinal plants in Gon-ob and 62% in Buenavista, including decoctions, extracts, infusions, and ingestion of plant parts such as seeds.

External administration accounted for 41% in Gon-ob and 38% in Buenavista, involving direct application, crushed or pounded plant materials, washing with decoctions, or heating leaves over a flame while avoiding burns (Fig. 4C). Wild species were the primary source of medicinal plants in both barangays, comprising 47% of the documented species (Fig. 4D).

Table 2. Medicinal plant species, parts used, ethnomedicinal uses, preparation methods, and administration routes in two barangays of Loboc, Bohol, Philippines

Scientific name	Family	Common name	Local name	Parts used	Ailment category	Preparation	Administration
Allium cepa L.	Amaryllidaceae	Onion	Bombay	Leaves	Respiratory; Digestive[a]	Direct use; Crush[b]	External
Allium sativum L.	Amaryllidaceae	Garlic	Ahos	Fruit	Circulatory	Crush	Internal; External[c]
Aloe vera L.	Asphodelaceae	Aloe	Aloe vera	Leaves	Skin infection	Extraction; Crush[b]	External
Annona muricata L.	Annonaceae	Soursop	Guyabano	Leaves	Circulatory; Respiratory[a]; Digestive[a]	Decoction	Internal
Annona squamosa L.	Annonaceae	Sugar apple	Atis	Leaves	Musculoskeletal; Digestive[a]; Respiratory[a]	Direct use	External; Internal[c]
Bixa orellana L.	Bixaceae	Annatto	Aswetis / Sawitis	Leaves	Musculoskeletal; Female genital system	Heat (application)	External
Blumea balsamifera (L.) DC.	Asteraceae	Sambong	Halib-on	Leaves	Urinary; Respiratory[a]; Digestive[a]	Infusion; Crush[b]; Poultice[b]	Internal
Carica papaya L.	Caricaceae	Papaya	Kapayas	Seeds	Digestive; Respiratory	Infusion; Direct use[b]	Internal
Centella asiatica (L.) Urb.	Apiaceae	Asiatic pennywort	Jahung-jahung	Leaves	Respiratory	Crush	External
Chromolaena odorata (L.) R.M. King & H. Rob.	Asteraceae	Siam weed	Hagonoy	Leaves	Skin infection	Crush; Poultice[b]	External
Citrus maxima (Burm.) Merr.	Rutaceae	Pomelo	Boongon	Leaves	Pregnancy; Respiratory[a]	Infusion; Decoction[b]	External; Internal[c]
Citrus × microcarpa Bunge	Rutaceae	Calamansi	Lemonsito	Fruit	Respiratory	Concoction; Extraction[b]; Infusion[b]	Internal
Cocos nucifera L.	Arecaceae	Coconut	Lubi	Fruit	Urinary	Direct use	Internal
Coleus amboinicus L.	Lamiaceae	Oregano	Kalabo	Leaves	Respiratory	Infusion; Extraction[b]	Internal
Curcuma longa L.	Zingiberaceae	Turmeric	Duwaw	Rhizome	Circulatory; Skin infection[a]; Musculoskeletal[a]	Decoction; Infusion[b]; Crush[b]	Internal; External[c]

Cymbopogon citratus (DC.) Stapf	Poaceae	Lemongrass	Tangad	Leaves, stem	Respiratory; Circulatory; Digestive[a]	Decoction; Poultice[b]	Internal; External[c]
Eleusine indica (L.) Gaertn.	Poaceae	Goosegrass	Bila-bila	Leaves	General; Urinary[a]	Poultice; Decoction[b]	External
Euphorbia hirta L.	Euphorbiaceae	Asthma plant	Tawa-tawa	Leaves	General	Decoction; Infusion[b]	Internal; External[c]
Ficus benjamina L.	Moraceae	Weeping fig	Dakít	Stem	Musculoskeletal	Poultice	External
Ficus septica Burm.f.	Moraceae	Hauili	Lagnob	Leaves	Digestive[a]; Musculoskeletal[a]	Crush; Extraction[b]; Poultice[b]	External
Gliricidia sepium (Jacq.)	Fabaceae	Madre de cacao	Madre de cacao	Leaves	General	Concoction; Extraction[b]; Poultice[b]	Internal; External[c]
Gmelina arborea Roxb.	Lamiaceae	Gmelina	Gmelina	Leaves	Digestive; Skin infection[a]; Musculoskeletal[a]	Direct use; Crush[b]	External
Hibiscus × rosa-sinensis L.	Malvaceae	Hibiscus	Gumamela	Leaves, flower	Skin	Crush	External
Ipomoea nil (L.) Roth	Convolvulaceae	Morning glory	Cobra vine	Leaves, roots	Skin; Digestive	Crush; Direct use	Internal; External
Jatropha curcas L.	Euphorbiaceae	Physic nut	Kasla	Stem, leaves	Musculoskeletal; Digestive[a]	Extraction	External
Justicia sp.	Acanthaceae	Lupo	Lupo	Leaves	Musculoskeletal	Heat (application)	External
Kyllinga brevifolia Diels	Cyperaceae	Short-leaf spikesedge	Busikad puti	Rhizome	Digestive; General	Infusion	Internal
Mangifera indica L.	Anacardiaceae	Mango	Mangga	Leaves	Digestive	Decoction	Internal
Melanolepis multiglandulosa Rchb. & Zoll.	Euphorbiaceae	Alom	Awom	Leaves, stem	Pregnancy	Decoction	Internal
Momordica charantia L.	Cucurbitaceae	Bitter gourd	Ampalaya	Fruit	Circulatory; Blood[a]	Concoction	Internal
Moringa oleifera Lam.	Moringaceae	Drumstick tree	Malunggai	Leaves, branch	Circulatory; Musculoskeletal; Digestive[a]; Skin infection[a]	Decoction; Crush[b]	Internal; External[c]

Peperomia pellucida L.	Piperaceae	Shiny bush	Sinaw-sinaw	Whole plant	Endocrine; Respiratory[a]; Urinary[a]; Musculoskeletal[a]	Infusion	Internal
Psidium guajava L.	Myrtaceae	Guava	Bayabas	Leaves	Digestive	Decoction; Crush[b]	Internal
Senna alata (L.) Roxb.	Fabaceae	Ringworm bush	Porsinas	Leaves	Skin infection	Crush	External
Stachytarpheta jamaicensis (L.) Vahl	Verbenaceae	Blue porterweed	Elepante	Leaves	Skin infection	Direct use; Poultice[b]	External
Symphytum officinale L.	Boraginaceae	Comfrey	Kompre	Leaves	General / unspecified	Decoction	Internal
Syzygium cumini L.	Myrtaceae	Java plum	Lomboy	Leaves	Digestive	Decoction; Crush[b]	Internal
Tamarindus indica L.	Fabaceae	Tamarind	Sampalok	Leaves	Musculoskeletal; Respiratory[a]	Decoction	Internal
Tinospora crispa (L.) Hook.f. & Thomson	Menispermaceae	Heart-leaved moonseed	Panjawan	Leaves	Circulatory; Digestive	Infusion; Extraction[b]	Internal
Triadica sebifera (L.) Small	Euphorbiaceae	Chinese tallow tree	Bante	Leaves	Musculoskeletal	Direct use; Decoction[b]	External
Vitex negundo L.	Lamiaceae	Five-leaved chaste tree	Lagundi	Leaves	Respiratory	Decoction	Internal
Zingiber officinale Roscoe	Zingiberaceae	Ginger	Luy-a	Rhizome	Digestive; Respiratory[a]; Musculoskeletal[a]	Decoction; Infusion[b]	Internal

Legend: [a] Ailment categories differ between Gon-ob and Buenavista, [b] Preparation methods differ between Gon-ob and Buenavista, [c] Administration routes differ between Gon-ob and Buenavista, [d] Plant parts used differ between Gon-ob and Buenavista

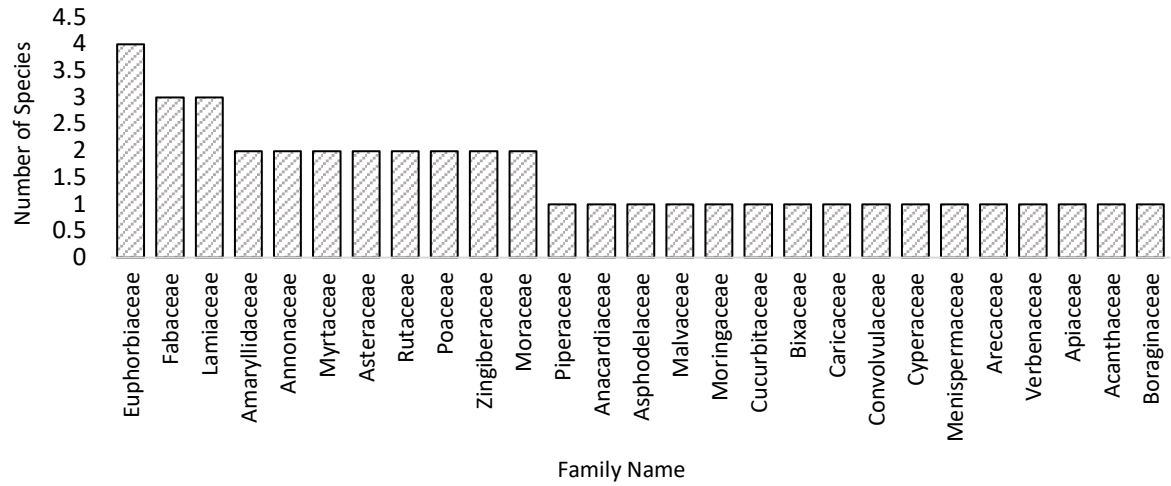

Figure 3. Number of medicinal plant species per family recorded from non-indigenous communities of Loboc, Bohol, Philippines.

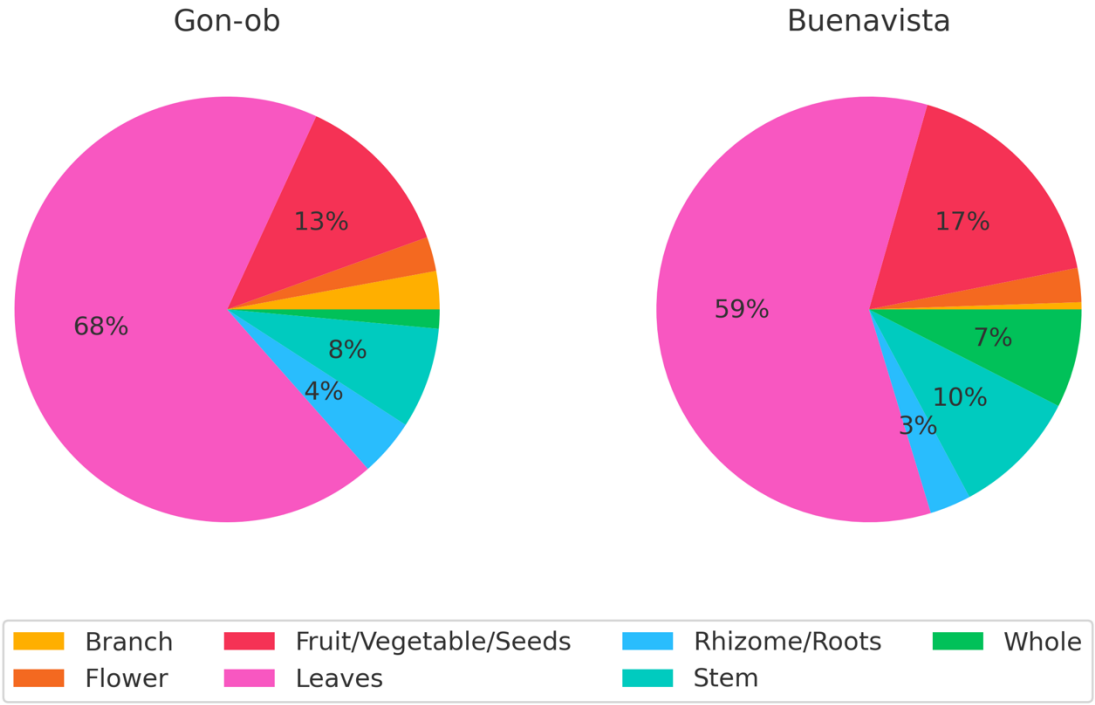

Figure 4A. Distribution of Medicinal Plant Parts Used

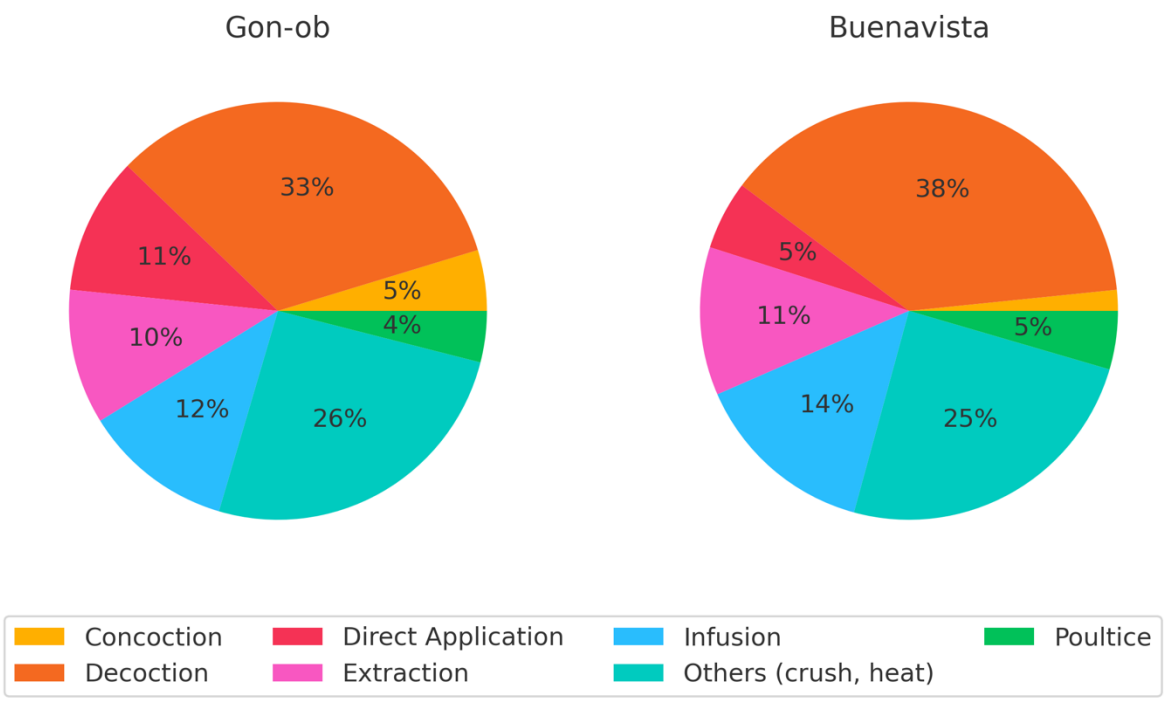

Figure 4B. Preparation Methods

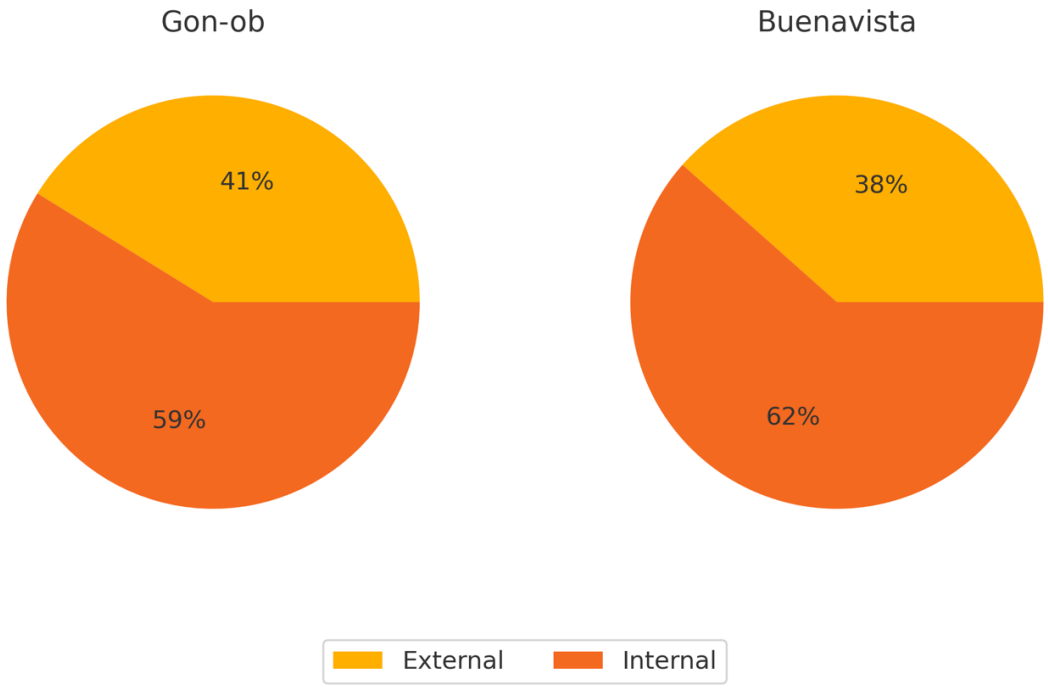

Figure 4C. Mode of Application

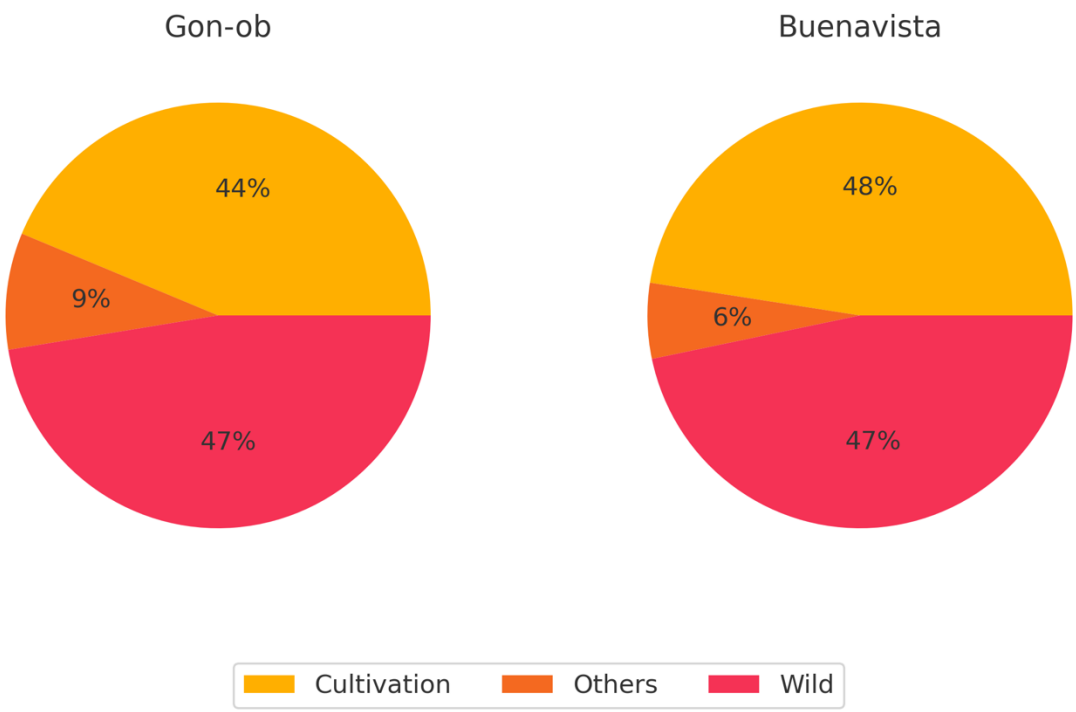

Figure 4D. Sources of Medicinal Plants

Use Values of Medicinal Plants

The Use Value (UV) provides insight into the cultural significance and frequency of use of medicinal plants within the non-indigenous communities of Loboc. As presented in Table 3, *B. balsamifera* exhibited the highest UV in both Barangays Gon-ob (1.11) and Buenavista (0.86). It was followed by *C. amboinicus* and *V. negundo,* ranked second and third, respectively, in both communities. The prevalence of *Jatropha curcas* L. and *M. oleifera* further reflects the communities' reliance on readily available, easily cultivated plants with broad therapeutic applications, including wound healing and nutritional support. The relatively narrow 95% confidence intervals for all UV estimates denote consistent citation patterns among respondents, suggesting strong agreement in plant use and cultural valuation.

Table 3**.** Use Values (UV) with approximate 95% confidence intervals (CI) for the most cited medicinal plants in non-indigenous communities of Loboc, Bohol.

Scientific Name	**Local Name**	**Use Value (UV)**			
		Gon-ob		**Buenavista**	
		Ui	**UV (95% CI)**	**Ui**	**UV (95% CI)**
Blumea balsamifera (L.) DC.	Halib-on	78	1.11 (0.86-1.36)	65	0.86 (0.65-1.07)
Coleus amboinicus L.	Kalabo	59	0.84 (0.62-1.06	58	0.76 (0.56-0.96)
Vitex negundo L.	Lagundi	56	0.80 (0.59-1.01)	54	0.71 (0.52-0.90)
Jatropha curcas L.	Kasla	52	0.74 (0.54-0.94)	41	0.54 (0.37-0.71)
Moringa oleifera Lam.	Malunggai	42	0.60 (0.42-0.78)	37	0.49 (0.33-0.65)

Most Frequently Cited Medicinal Plants Based on Relative Frequency of Citation (RFC)

Table 4 presents the most frequently cited medicinal plants in Barangays Gon-ob and Buenavista based on their Relative Frequency of Citation (RFC) values and corresponding 95% confidence intervals (CIs). The results indicate that lagundi *(V. negundo)* had the highest RFC in Barangay Gon-ob (0.97; 95% CI: 0.93-1.00), followed by kalabo *(C. amboinicus)* (0.91; 0.84-0.98) and halib-on *(B. balsamifera*) (0.90; 0.83-0.97). The narrow confidence intervals suggest strong consensus among respondents regarding the medicinal importance. In Barangay Buenavista, kalabo showed the highest RFC (0.83; 95% CI: 0.75-0.92), followed by lagundi (0.71; 95% CI: 0.61-0.81) and halib-on (0.70; 95% CI: 0.60-0.80). Although slightly lower than in Gon-ob, these values still indicate widespread recognition and frequent use. The modest variations between the two barangays may reflect differences in knowledge transmission, plant availability, or reliance on traditional healing systems. Meanwhile, malunggai *(M. oleifera)* and Kasla *(J. curcas)* exhibited moderate RFCs in both communities. Species reported exclusively in one barangay, such as lemonsito *(C. microcarpa)* and guyabano *(A. muricata)* in Gon-ob, and Acapulco *(Senna alata* (L.) Roxb.*)* and bayabas *(P. guajava)* in Buenavista.

Table 4. Relative Frequency of Citation (RFC) with 95% Confidence Intervals (CI) for the Most Cited Medicinal Plants in Barangay Gon-ob and Barangay Buenavista

Family	Plants	Relative Frequency Citation (RFC)	
		Gon-ob (95% CI)	Buenavista
Lamiaceae	*Vitex negundo*	0.97 (0.93-1.00)	0.71 (0.61-0.81)
	Coleus amboinicus	0.91 (0.84-0.98)	0.83 (0.75-0.92)
Asteraceae	*Blumea balsamifera*	0.90 (0.83-0.97)	0.70 (0.60-0.80)
Moringaceae	*Moringa oleifera*	0.87 (0.80-0.94)	0.43 (0.32-0.54)
Euphorbiaceae	*Jatropha curcas*	0.69 (0.58-0.80)	0.47 (0.36-0.58)
Annonaceae	*Annona muricata*	0.53 (0.41-0.65)	0.47 (0.36-0.58)
Rutaceae	*Citrus x microcarpa*	0.53 (0.41-0.65)	NR
Fabaceae	*Senna alata*	NR	0.42 (0.31-0.53)
Myrtaceae	*Psidium guajava*	NR	0.39 (0.28-0.50)

Note: NR means Not Reported

Informant Consensus Factor (ICF) Across Disease Categories

Table 5 presents the number of use reports, corresponding medicinal plants, and Informant Consensus Factor (ICF) values across disease categories in Barangays Gon-ob and Buenavista. The ICF quantifies the degree of agreement among informants on plant use within each ailment category, with values approaching 1 indicating a high level of shared knowledge and consistent utilization. In both barangays, the respiratory category exhibited the highest consensus (ICF = 0.94 in Gon-ob; 0.91 in Buenavista). Similarly, high ICFs were recorded for skin (0.90-0.91) and urinary (0.94-0.87) ailments, reflecting the widespread reliance on *S. alata* and *B. balsamifera* for managing common infections and inflammatory disorders. The musculoskeletal category also demonstrated strong agreement (ICF = 0.84 in both barangays), with *Gmelina arborea* Roxb. and *B. balsamifera* frequently cited for body pain and rheumatism. A perfect consensus was observed for neurological disorders in Gon-ob (ICF = 1.00), where *J. curcas* was consistently identified as a treatment for nerve-related ailments. In contrast, consensus in Buenavista was moderate (0.71), suggesting local variation in treatment practices. Lower ICFs were noted for pregnancy, childbearing, and female genital system disorders (0.00-0.60), indicating limited shared knowledge and potential cultural sensitivity surrounding reproductive health. A moderate consensus was observed for the digestive (0.75-0.77) and endocrine/metabolic (0.69-0.76) categories, possibly reflecting the presence of diverse medicinal options for these conditions.

Table 5**.** Use reports and informant consensus factors for various disease categories in Barangay Gon-ob and Barangay Buenavista

Disease categories	No. of use reports		Used Medicinal Plants		Informant Consensus Factor (ICF)	
	Gon-ob	Buenavista	Gon-ob	Buenavista	Gon-ob	Buenavista
General and unspecified	99	53	*Euphorbia hirta*	*Euphorbia hirta*	0.81	0.83
Blood, blood forming organs, and immune mechanism	4	3	*Momordica charantia*	*Momordica charantia*	0.67	1.00
Digestive	79	78	*Annona muricata*	*Moringa oleifera*	0.77	0.75
Eye	2	1	*Euphorbia hirta*	*Euphorbia hirta*	1.00	0.00
Circulatory	41	48	*Cymbopogon citratus*	*Cymbopogon citratus*	0.78	0.79
Musculoskeletal	101	70	*Gmelina arborea*	*Blumea balsamifera*	0.84	0.84
Neurological	6	8	*Jatropha curcas*	*Jatropha curcas*	1.00	0.71
Respiratory	202	188	*Coleus amboinicus*	*Coleus amboinicus*	0.94	0.91

Skin	140	130	*Senna alata*	*Chromolaena odorata*	0.90	0.91
Endocrine/metabolic and nutritional	17	18	*Annona muricata*	*Annona muricata*	0.69	0.76
Urinary System	35	40	*Blumea balsamifera*	*Blumea balsamifera*	0.94	0.87
Pregnancy, childbearing, family planning	6	1	*Citrus maxima*	*Citrus maxima*	0.60	0.00
Female Genital System	13	1	*Bixa orellana*	*Bixa orellana*	0.92	0.00

Fidelity Level (FL) of Medicinal Plants Used for Specific Ailments

Table 6 presents the Fidelity Levels (FL) of the most cited medicinal plant species across various disease categories in Barangays Gon-ob and Buenavista. The FL represents the proportion of informants who consistently associate a plant species with a particular ailment, thereby indicating the degree of specialization or reliability attributed to that species for a specific therapeutic use. High FL values (100%) were observed for *Momordica charantia* L. in treating anemia and *Euphorbia hirta* L. for blurred vision, signifying unanimous agreement among informants regarding their effectiveness and specific medicinal roles. Similarly, *Boongon* and *Aswetis* in Buenavista both achieved full fidelity for postpartum care and menstrual regulation, respectively. In contrast, moderate to low FL values were recorded for categories such as digestive, musculoskeletal, and skin ailments, where several plant species were cited for the same condition.

Table 6. Fidelity Level of the most cited species in Barangay Gon-ob and Barangay Buenavista.

Disease Categories	**Most cited species**		**Use or purpose of the most cited species**		**Fidelity Level (%)**	
	Gon-ob	**Buenavista**	**Gon-ob**	**Buenavista**	**Gon-ob**	**Buenavista**
General and unspecified	*Euphorbia hirta*	*Euphorbia hirta*	Fever	Fever	30	37
Blood, blood forming organs, and immune mechanism	*Momordica charantia*	*Momordica charantia*	Anemia	Anemia	100	100
Digestive	*Annona muricata*	*Moringa oleifera*	Diarrhea	Ulcer	28	14
Eye	*Euphorbia hirta*	*Euphorbia hirta*	Blurred vision	Blurred vision	100	100
Circulatory	*Cymbopogon citratus*	*Cymbopogon citratus*	Hypertension	Hypertension	43	25
Musculoskeletal	*Gmelina arborea*	*Blumea balsamifera*	Bone Fracture	Arthritis	18	7
Neurological	*Jatropha curcas*	*Jatropha curcas*	Headache	Headache	50	89
Respiratory	*Coleus amboinicus*	*Coleus amboinicus*	Cough	Cough	78	31
Skin	*Senna alata*	*Chromolaena odorata*	Ap-ap	Wounds	18	19
Endocrine/metabolic and nutritional	*Annona muricata*	*Annona muricata*	Diabetes	Diabetes	50	38
Urinary System	*Blumea balsamifera*	*Blumea balsamifera*	Kidney problem	Kidney problem	44	43
Pregnancy, childbearing, family planning	*Citrus maxima*	*Citrus maxima*	Postpartum care	Postpartum care	57	100
Female Genital System	*Bixa orellana*	*Bixa orellana*	Menstrual problem	Menstrual problem	68	100

Discussion

Euphorbiaceae, Fabaceae and Lamiaceae emerged as the most represented families, reflecting their chemical diversity and long-standing integration into Philippine ethnomedicine (Maddhesiya *et al*. 2024; Santhanapandi *et al*. 2022). Their prominence in both barangays suggests reliance on species that are abundant in the local landscape and culturally embedded. Leaves remained the dominant plant part harvested, a trend consistent with other Philippine studies and linked to ease of collection, rapid regrowth, and high concentrations of therapeutically relevant metabolites (Cordero and Alejandro 2022; Buragohain *et al*. 2024). This preference also promotes sustainable plant use by minimizing destructive harvesting of roots or bark. Decoction was the most common preparation method in both Gon-ob and Buenavista, likely due to its simplicity, accessibility, and cultural familiarity with boiling as a household practice (Parba and Demayo 2025). Its efficiency in extracting compounds for respiratory and digestive ailments explains its association with species such as *Annona muricata*, *Psidium guajava*, *Blumea balsamifera*, and *Vitex negundo*. Other methods, such as crushing, heating, or infusion, demonstrate adaptive adjustments in preparation techniques based on perceived potency or intended mode of use.

Both barangays used internal and external modes of administration. Internal routes targeted systemic conditions, whereas external applications addressed musculoskeletal and dermatological concerns. These practices demonstrate a holistic understanding of plant functions and align with ethnomedicinal patterns documented across Southeast Asia (Buragohain *et al*., 2024; Tantengco *et al.,* 2018). Wild species constituted nearly half of all documented medicinal plants, reflecting strong ecological knowledge and dependence on surrounding vegetation for primary healthcare. Although home gardens and agroforestry plots supplement wild harvesting, the latter raises sustainability concerns. While these similarities highlight shared cultural practices, notable differences in species prominence, preparation techniques, and fidelity levels emerge between the barangays. Buenavista's higher proportion of married individuals may facilitate greater intergenerational transfer of postpartum and midwifery-related herbal knowledge, which may account for higher fidelity values for *Citrus maxima* and *Bixa orellana*. Its higher proportion of high school graduates may also influence the integration of information from external sources, shaping perceptions of efficacy.

In contrast, Gon-ob's closer proximity to forested areas and limited accessibility appear to encourage reliance on wild-harvested species. This ecological context likely contributes to higher fidelity values for *Coleus amboinicus* and *Jatropha curcas* in treating respiratory and neurological conditions. Occupational patterns also influence species use: although both barangays include many housewives who maintain domestic herbal knowledge, Gon-ob's larger farming population may interact more frequently with forest edges, shaping availability and familiarity with certain plants. These demographic and ecological factors help explain differences in FL and RFC values across communities. Variation in plant use therefore reflects not only preference but adaptive responses to environmental access, livelihood strategies, and knowledge systems. Several high-use species, *Blumea balsamifera*, *Coleus amboinicus*, *Vitex negundo*, *Jatropha curcas*, and *Moringa oleifera*, showed strong alignment between cultural preference, reported efficacy, and pharmacological evidence. *C. amboinicus* remains a primary remedy for respiratory conditions, supported by studies confirming antimicrobial and bronchodilatory properties (Kumar *et al*. 2020; Arumugam *et al*. 2016). *B. balsamifera*'s use for urinary and inflammatory conditions aligns with its diuretic and anti-inflammatory activities (Fan and Ma 2010; Arman *et al*. 2024). *V. negundo* is widely used for cough and pain relief and is supported by its antitussive activity (Adesina *et al*. 2017). *J. curcas* is used for musculoskeletal discomfort, consistent with its anti-inflammatory effects (Tyagi and Chaudhary 2022). *M. oleifera*, valued for both medicinal and nutritional roles, contributes to community health and food security (Laude *et al*. 2022).

Consensus measures provide further insight into therapeutic priorities. High ICF values for respiratory, urinary, and musculoskeletal ailments indicate strong agreement on plant efficacy, particularly for *C. amboinicus* and *B. balsamifera*. Moderate ICF values for digestive and circulatory ailments suggest a broader range of remedies or ongoing experimentation. Low ICF values for pregnancy-related conditions may reflect restricted knowledge transfer or declining reliance on traditional birth attendants. FL values further emphasize the specificity of use: complete fidelity for *Momordica charantia* in anemia and *Euphorbia hirta* in eye ailments reflects strong cultural trust in these species. Differences in fidelity between barangays again point to the influence of ecological access and demographic characteristics on medicinal practices. Overall, these findings highlight the importance of ethnobotanical knowledge as both a cultural resource and a foundation for community health and conservation. Documenting these patterns supports the integration of traditional practices into local healthcare initiatives and biodiversity strategies. Species with high FL and RFC values should be prioritized for sustainable management, cultivation, and potential pharmacological validation. Promoting home-garden cultivation can reduce pressure on wild populations while sustaining access to essential remedies. Recognizing plants with both medicinal and nutritional functions also reinforces community resilience and contributes to sustainable resource management in rural areas.

Conclusion

This study documents the diversity of medicinal plants used by two non-indigenous rural communities in Loboc, Bohol, and highlights the continued significance of traditional knowledge in local healthcare systems. The findings reveal clear variations in the plant parts used, preparation methods, and modes of administration between the two barangays, reflecting distinct cultural preferences and knowledge transmission pathways. The predominance of leaves as the main plant part used also aligns with sustainable harvesting practices commonly observed in ethnomedicinal traditions. By quantifying Use Value (UV), Relative Frequency of Citation (RFC), and Fidelity Level (FL), the study identifies culturally important species such as *Coleus amboinicus*, *Vitex negundo*, and *Blumea balsamifera*, which are consistently recognized by community members for specific therapeutic roles. These species represent promising candidates for further phytochemical and pharmacological investigation. The documentation of these practices contributes to preserving local ethnobotanical knowledge and highlights the importance of protecting medicinal plant resources, particularly those collected in the wild. Strengthening conservation initiatives and supporting community-based cultivation efforts can help maintain access to key medicinal species while reducing pressure on natural populations. Continued research is recommended to explore the pharmacological validity of culturally significant species and to examine how traditional knowledge adapts as communities experience demographic, environmental, and healthcare changes.

Declarations

List of abbreviations: UV - Use Value; RFC - Relative Frequency of Citation; ICF - Informant Consensus Factor; FL - Fidelity Level

Ethics approval and consent to participate: Prior informed consent was obtained from the chairpersons of Barangay Gon-ob and Barangay Buenavista, allowing researchers to interview residents. Participation was voluntary, with all adult respondents providing written consent, and parental consent with participant assent secured for minors. No formal ethics committee was available at the time of the study; however, all procedures adhered to the *International Society of Ethnobiology (ISE) Code of Ethics (2006)* and the *Data Privacy Act of 2012 (RA 10173)*, ensuring confidentiality, transparency, and respect for community autonomy.

Consent for publication: Not applicable.

Availability of data and materials: The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The author declares no competing interests.

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Author contributions: I. Beloy assisted in data collection, plant identification, and validation of ethnomedicinal information. J.B. Oclarit conceptualized the study, designed the methodology, conducted data analysis, and led the manuscript writing. J. Naypa contributed to data gathering, field coordination, and statistical tabulation. N. Lomosbog supported community coordination, data verification, and manuscript review. All authors read and approved the final manuscript.

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