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Ethnobotany and cultural significance of wild tea plants in Mountain Province, Philippines

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Abstract. *Nasungan LM, Garsi JP, Cue EG. 2025. Ethnobotany and cultural significance of wild tea plants in Mountain Province, Philippines. Asian J Ethnobiol 8: 258-270.* Ethnobotanical studies in the Philippines are crucial for understanding traditional plant uses and developing plant-based products. This study uniquely focuses on assessing the diversity and documenting the ethnobotanical knowledge of wild tea plants in Mountain Province, Philippines, a distinct category of culturally important flora often overlooked in regional research. A Rapid Ethnobotanical Appraisal employed semi-structured interviews with 220 key informants. The Cultural Importance (CI) Index was calculated for each species using frequency counts. The study successfully identified eighteen (18) distinct wild tea plant species, representing 13 taxonomic families. A thorough analysis of their conservation status using the IUCN Red List revealed a diverse profile: twelve (12) species are categorized as Least Concern, three (3) are classified as Vulnerable, and three (3) are Not Assessed. The documented uses of these plants are remarkably varied, including human food, medicine, food processing, condiments, and domestic applications. They are typically prepared by decoction or steeping from various plant parts. Notably, *Cinnamomum mercadoi* ranked first with the highest CI Index (0.57), underscoring its exceptional cultural significance and widespread use within the communities. This study fills a critical gap by going beyond simple lists of plants to provide a species-specific, use-oriented documentation. The findings of this research offer a critical baseline for crafting effective conservation policies and promoting the preservation of wild tea habitats through the active involvement of indigenous communities. The documented knowledge can be integrated into regional development strategies to support sustainable livelihoods. Furthermore, this study strongly encourages future scientific validation of the potential medical uses of these plants, particularly those with a high cultural importance index and those identified as vulnerable, to ensure their sustainable use and conservation.

Keywords: Cultural importance, diversity, ethnobotany, Mountain Province, wild tea plants

INTRODUCTION

Ethnobotanical research greatly helps in the development of more advanced plant-based remedies (Balangcod and Balangcod 2015; Fiscal 2017). Historical advancements in human life may have been influenced by the traditional knowledge of the indigenous peoples and rural communities, especially with regard to the use and conservation of natural resources. Numerous wild plants that are found all over the world are said to have a significant amount of nutrients and have long been traditionally utilized as natural treatments for a variety of illnesses (Ong and Kim 2014).

In the Philippines, wild plant species are used as folk medicine, processed into other food products, and as fresh food sources. In the Cordillera Central Range (CCR), Northern Philippines, 305 indigenous plant species are used for a variety of purposes, including medicine, food, clothing, shelter, and ceremonies (Magcale-Macandog et al. 2015). Furthermore, the indigenous peoples of Mountain Province have long been recognized to foster traditional ecological knowledge about their environment (Claudio and Abella 2024), more so with the use and management of wild plants.

Although the usage of wild tea has long been reported in other civilizations, such as China and Indonesia, the customs in the Philippines' Mountain Province are exceptionally connected to its distinct ecological and cultural environment. For millennia, the production and trading of tea have shaped economies and cultures around the world, making it the most consumed beverage after water (FAO 2022). Over 2,000 different types of tea are grown in China, the country where tea originated, and UNESCO has designated traditional processing methods as intangible cultural property (UNESCO 2021). In India, street vendors frequently sell *masala chai*, a staple beverage, while Japanese tea ceremonies, including the *cha no yu*, are praised for their artistic accuracy and awareness (Twinings 2025). Since many of these plant species are native to the Philippines and specific regions within the country, it is necessary that this essential resource be promptly documented using traditional methods of recovery and that these plants be given priority for preservation initiatives (Garcia et al. 2018).

The “wild tea" plants describe tea plants that are growing naturally in the wild rather than being grown on tea plantations. Wild tea plants play a crucial role in rural communities and undernourished regions due to their diverse applications and substantial nutritional value, providing essential micronutrients and bioactive compounds (Li et al. 2016). They can be utilized in various ways. However, the challenge lies in educating people

about the benefits of wild tea plants in their locality, helping them recognize the potential of these species, and understanding their value. Overharvesting and unsustainable harvesting practices have also contributed to the loss of species (Carter 2009), particularly wild plants.

The extensive documentation of edible wild fruits in Benguet (Chua-Barcelo 2014) and other general plant surveys (Pakipac 2010; Tacloy 2025) are ethnobotanical research in the Cordillera Administrative Region (CAR) that has shed light on the diverse plant uses of indigenous communities. However, there is still a critical knowledge gap regarding the specific ethnobotanical importance and multifaceted potential of wild tea plant species within the unique ecological and cultural landscapes of Mountain Province. The distinctive variety of wild plants that have historically been used to make beverages, as well as their particular cultural contexts and potential for sustainable economic development in various Mountain Province municipalities, were not the subject of these earlier foundational studies, despite their importance. Although there is evidence of the traditional use of these wild teas (such as *kumayo*, *tayugtog*, *gutmo*, mountain tea, and *itsa*, which were first identified in 2010 by Pakipac (2010) and later further described by Nasungan (2022) for their bioactive qualities), there is still a dearth of thorough ethnobotanical documentation on these beverage-producing species, the traditional ecological knowledge that goes along with them, and their potential and sustainability.

Despite its rich cultural heritage and biodiversity, the Philippine Cordillera has a substantial knowledge gap regarding its wild tea resources. In addition to the potential for the extinction of valuable plant species, this lack of action could also lead to the loss of the distinctive traditional ecological knowledge that is connected to these species. This research conducts an ethnobotanical investigation on wild tea plants discovered in Barlig and Bontoc, Mountain Province, in order to fill this important gap. In order to provide current, species-specific, and use-oriented documentation for these wild tea types, the strategy goes beyond simple plant inventories. The preservation of biological diversity and the region's distinctive cultural heritage depend on this specialized traditional knowledge, which also provides a strong ethnopharmacological basis that is critical for future product development and sustainable commercialization efforts.

MATERIALS AND METHODS

Study site

The study sites were selected based on ethnicity of the people, geographic location, climate type, and presence of forest areas; thus, the study was conducted in Barlig and Bontoc, Mountain Province, Philippines (Figure 1). Barlig is distinguished by its high elevation, remote location, and thick forest cover. The majority of people living in Barlig are Ifiallig, who represent the province's eastern region and are occasionally linked to the Balangao subgroup. The provincial capital, Bontoc, is more centrally located in Mountain Province at a slightly lower elevation, despite being mountainous as well. Bontoc is represented by the Ifontoks. Despite having a common Igorot identity, these discrete subgroups have localized knowledge systems, suggesting that traditional knowledge about plant resources may differ amongst municipalities because of their distinct cultural histories, localized environments, and ancestral practices (Prill-Brett 1987; Solang 2011).

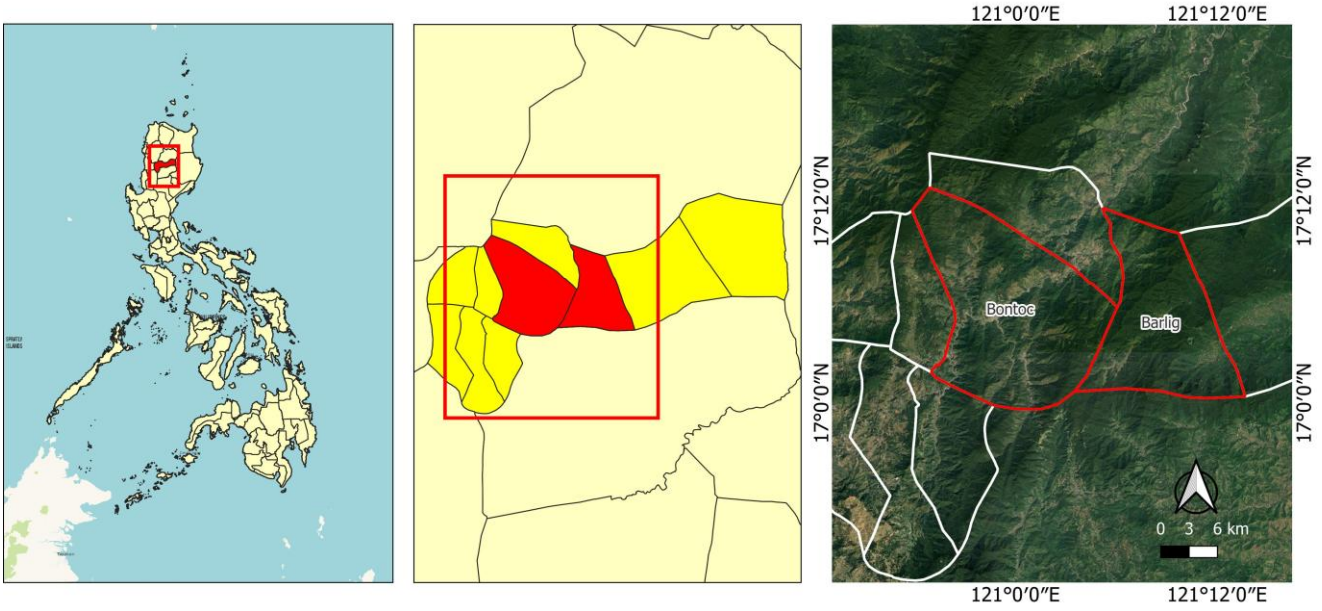

Figure 1. Map of the study sites in Barlig and Bontoc, Mountain Province, Philippines

The tea-use culture in Barlig and Bontoc, Mountain Province, is deeply ingrained and widespread. The practice of preparing and sharing wild teas is a frequent component of social interactions and daily routines, often serving as a comforting ritual and a remedy for common ailments.

As to climate, Bontoc is generally classified as type 1, which corresponds to Tropical Wet and Dry (Aw) climate in the Koppen classification system, while Barlig is type 3 (DOST-PAGASA 2019), which corresponds to the Tropical Rainforest (Af) climate in the Koppen classification system (Amfield 2025). The data were collected from January to June 2024.

Data collection

Prior to the conduct of the study, approval was first sought from the Institutional Research Ethics Committee of MPSU. A Wildlife Gratuitous Permit (DENR-CAR-01-2024) was acquired from the DENR-CAR Regional Office to gather and collect plant samples. Permits to conduct the study were also sought from the municipal mayors and barangay captains. An orientation for the barangay leaders and respondents was conducted in compliance with the National Commission on Indigenous Peoples Administrative Order No. 3 series of 2012, ensuring adherence to protocols for engaging with indigenous communities. Fieldwork was conducted from February to May 2024. A Rapid Ethnobotanical Appraisal was employed, utilizing both Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) to gather data. Data were recorded through detailed note-taking during interviews and FGDs, and with the aid of audio recordings (with explicit consent from participants) to ensure accuracy.

Before the study started, all participants were given an informed consent form that explained the goals, methods, possible risks and benefits, and their right to withdraw at any time. The participants (Table 1) were asked to read the consent form aloud and sign it.

The confidentiality and privacy of all provided information were strictly preserved. Additionally, throughout the study, local knowledge holders' invaluable inputs were recognized and valued. In order to guarantee that the research benefited the community and upheld its values of fair cooperation, their traditional ecological knowledge was handled with the highest respect, and their cultural heritage was respected.

The semi-structured method of conducting interviews was used to obtain precise information. Example questions are the following: "What plants do you use to make a tea?" and "How do you prepare the tea?". Questions about their traditional knowledge were asked, such as "How did you learn about these plants and their uses?"

Additionally, eleven FGDs were conducted per municipality, each comprising five senior citizen participants, further enriching the qualitative data collected.

Plant collection and identification

The informants assisted with field collections, as they knew where to find specific plants. Photographs of plants were also taken for documentation. Three to five branches, preferably with reproductive components (fruits and flowers), were used to create voucher specimens, which were then placed on white cartolina paper in a manner that best reflected the plant in the wild. The gathered wild tea plants were submitted to botanists, subjected to their taxonomic classifications, and, for verification of family and scientific names and conservation status, various online databases, namely Co's Digital Flora of the Philippines (Pelser et al. 2011-onwards) and World Flora Online (WFO 2022), were used. The voucher specimens were kept in MPSU Baang Campus.

Ethnobotanical quantitative analysis

The taxonomic diversity, used parts, preparation methods, conservation status, and categories of uses were counted and analyzed. Moreover, two indices were applied to furtherly estimate the importance of particular species to the local community of Barlig and Bontoc, which were named the Relative Importance Index (RI) and the Cultural Importance (CI) Index.

Cultural Importance Index (CI)

CI can be seen as the sum of the proportion of informants that mention each species use (Tardío and Pardo-de-Santayana 2008) and can be mathematically expressed as:

$$CI_s = \sum_{u=u_1}^{U_{NC}} \sum_{i=i_1}^{i_N} UR_{ui/N}$$

The highest CI Index indicates the most important species/family for a given category of usage. WTP species with the lowest CI Index were the least used or were of low importance.

Use Report (UR)

The Use Report (UR) was obtained using the formula by Tardío and Pardo-de-Santayana (2008):

$$UR_s = \sum_{u=u_1}^{U_{NC}} \sum_{i=i_1}^{i_N} UR_{ui}$$

Where:
i : Varies from only one use to the total number of uses
NU : Number of Uses
N : Total informants in the survey
UR: Use Report

Table 1. Informant demographics

Category	Description
Total number	220 key informants
Age range	40-94 years old
Gender	Male and Female
Selection Criteria	Residency of at least 10 years with experience with wild tea plants
Participant Roles	Barangay officials, hunters, farmers, homemakers, village elders

Relative Importance Index (RI).

Created by Pardo-de-Santayana (2003), this index takes into account only the use-categories— not the subcategories—using the following formula:

$$RI_s = \frac{RFC_{s(max)} + RNU_{s(max)}}{2}$$

Where $RFC_{s(max)}$ is the Relative Frequency of Citation over the maximum, i.e., it is obtained by dividing FCs by the maximum value in all the species of the survey [$RFC_{s(max)}$= FC_s/max (FC)] and $RNU_{s(max)}$ is the relative number of use- categories over the maximum, obtained by dividing the number of uses of the species by the maximum value in all the species of the survey [$RN_{s(max)}$= NU_s/max (NU)].

Statistical tools

Microsoft Excel was used in the computation and analyses of the RI and CI.

RESULTS AND DISCUSSION

Plant taxonomic diversity

A total of eighteen (18) wild tea plants (Figure 3) belonging to 13 families were documented in Barlig and Bontoc, Mountain Province (Table 2). Among the identified wild tea plant families, Ericaceae is the most represented with three species, followed by Chloranthaceae, Myrtaceae, Lauraceae, and Rutaceae with two species each (Figure 2). Also, one species belongs to the families Primulaceae, Asteraceae, Gesneriaceae, Urticaceae, Winteraceae, Rubiaceae, and Symplocaceae.

Among these wild tea species, the study found important conservation patterns. IUCN Red List of Threatened Species lists twelve of the 18 wild tea plants that have been identified as "Least Concern" (IUCN 2022). This is encouraging since it shows that their numbers are constant right now. Three species are listed as "Vulnerable," and three more are listed as "Not Assessed" because of insufficient data, highlighting the urgent need for conservation. These results highlight how crucial it is to concentrate conservation efforts, particularly for species that are at risk of extinction in the area. The existence of native and endemic species emphasizes the necessity of local preservation techniques to preserve this distinctive botanical heritage.

Top five species by CI/RI

Figure 4 shows the wild tea plants with their corresponding use value using two indices, which are the Cultural Importance Index (CI) and the Relative Importance Index (RI). *Cinnamomum mercadoi* and *Gaultheria leucocarpa* var. *cumingiana* ranked first and second, respectively. *Cinnamomum mercadoi* was mentioned by a total of 125 respondents as applicable, which is the maximum mention among all the plant species. It was employed in three different use-categories (food, medicine, and industrial/ household). The maximum number of use categories (NU_s max) mentioned for a species in the survey was three. *Cinnamomum mercadoi* topped the maximum both in the use report and in the number of use categories; thus, its rank as number one is justified. It is important to note that in the computation of the CI, the number of informants mentioning each species' use is considered. Meanwhile, RI also placed *C. mercadoi* and *G. l.* var. *cumingiana* at first and second rank. *Cinnamomum sandkuhlii* and *Dendrocnide venosa* are placed at the number three by RI and CI, respectively. RI gives more importance to *D. venosa* mainly because of its three different use-categories as previously mentioned; RI takes into account only the use-categories. Compared to *D. venosa* (3rd place- CI), although it only has two categories of uses, it has a higher Use Report and Frequency of Citation than *C. sandkuhlii.*

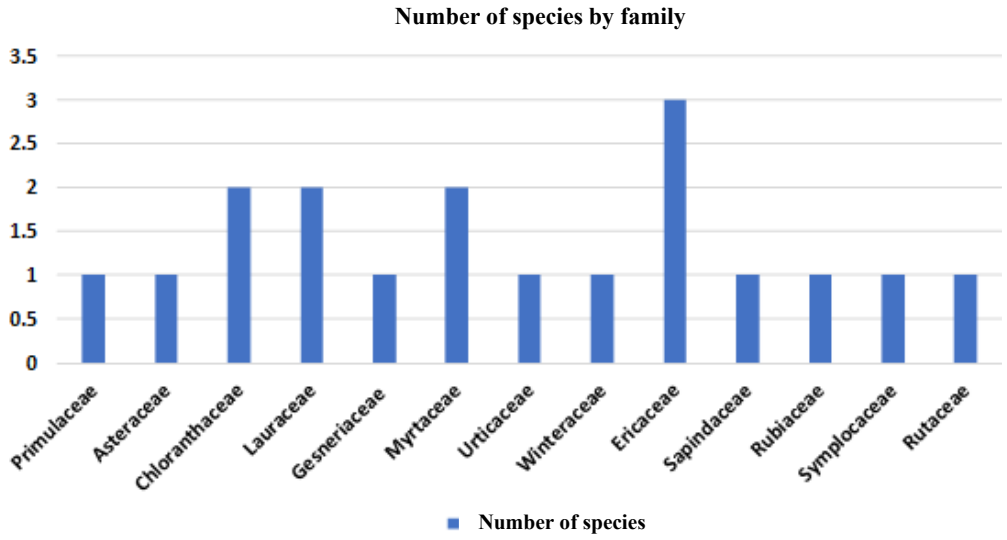

Figure 2. Number of species of wild tea plants by family in Barlig and Bontoc, Mountain Province, Philippines

Figure 3. Wild tea plants in Barlig and Bontoc, Mountain Province, Philippines. A. *Ardisia polysticta*, B. *Aster philippinensis*, C. *Chloranthus officinalis*, D. *Cinnamomum sandkuhlii*, E. *Cinnamomum mercadoi*, F. *Cyrtandra parviflora*, G. *Decaspermum blancoi*, H. *Decaspermum fruticosum*, I. *Vaccinium cumingianum*, J. *Dendrocnide venosa*, K. *Drimys piperita*, L. *Gaultheria leucocarpa* var. *Cumingiana*, M. *Murraya* sp., N. *Mussaenda benguetensis*, O. *Rhododendron quadrasianum* var. *Rosmarinifolium*, P. *Sarcandra glabra*, Q. *Symplocos whitfordii*, R. *Zanthoxylum asiaticum*

Based on the computed CI and RI index, *C. mercadoi* is the overall most important wild tea species in Mountain Province with a total of three uses (food, medicine, and industrial). It is further concluded that *C. mercadoi*, which is a tree in a life form, has many uses. *Gaultheria leucocarpa* var. *cumingiana* is the second most important, with two uses. Most species identified have 2-3 uses, which indicates that the wild tea plants have various uses. This makes these species important not only as components of forest biodiversity but also as a natural resource.

Added to the species mentioned above, *D. venosa, Sarcandra glabra*, *Chloranthus officinalis, C. sandkuhlii,* and *Drimys piperita* were also noted to be of importance in both study areas. Other tea species identified were of lower importance since these were utilized only in either of the study areas. The distribution of these species in the study areas where they are readily accessible may have further encouraged their utilization.

Table 2. Taxonomic classification and conservation status of wild tea plant species

Scientific name	Local name	Common name	Family	Plant parts used	Preparation	Health/ Culture value	Distribution status	Conservation status
Ardisia polysticta Miq.	*No local name*	Aunasin/ Tagpo	Primulaceae	Leaves	Decoction	Food (tea)/ ornament	Indigenous	Least Concern
Aster philippinensis S. Moore	*Gipas*	Philippine Aster	Asteraceae	Leaves	Decoction	Food (tea)	Endemic	Least Concern
Chloranthus officinalis Blume	*Itsa*	Tall chloranthus	Chloranthaceae	Leaves	Decoction	Food (tea), medicine	Endemic	Least Concern
Cinnamomum mercadoi S. Vidal	*Kumayu/ timpo*	Mindanao Cinnamon	Lauraceae	Leaves Bark	Decoction	Food (tea), medicine, industrial	Endemic	Vulnerable
Cinnamomum sandkuhlii Merr	*Timpo/ tungpoan*	kalingag	Lauraceae	Leaves bark	Decoction	Food (tea), medicine, industrial	Endemic	Vulnerable
Cyrtandra parviflora C.B. Clarke	*Alipo-ok*	No common name	Gesneriaceae	Leaves	Decoction	Food (tea), medicine	Endemic	Least Concern
Decaspermum blancoi S.Vidal	*Kasengseng*	Patalsik-pula	Myrtaceae	Leaves	Decoction	Food (tea)	Endemic	Least Concern
Decaspermum fruticosum (Lam.) A.J.Scott	*Mountain tea*	Brown Myrtle	Myrtaceae	Leaves	Decoction	Food (tea)	Endemic	Least Concern
Dendrocnide venosa (Elmer) Chew	*Itsa*	Silky Myrtle/ patalsik	Urticaceae	Leaves	Decoction	Food (tea), medicine	Endemic	Least Concern
Drimys piperita Hook.f.	*Tukfu/ tukbo*	No common name	Winteraceae	Roots	Decoction	Food (tea), medicine	Endemic	Least Concern
Gaultheria leucocarpa var. *cumingiana* (S.Vidal) T.Z.Hsu	*Sapal/ shupur*	Tasmannia piperita	Ericaceae	Leaves fruits	Decoction	Food (tea), medicine, condiment	Endemic	Least Concern
Murraya sp.	*Tarugcho/ talogtog/ talubatub*	Idsa/ wintergreen	Rutaceae	Leaves	Decoction	Food (tea), medicine	Endemic	Least Concern
Mussaenda benguetensis Elmer	*Anis*	Salab/ alahabi/anayen/ alahan	Rubiaceae	Leaves	Decoction	Food (tea), industrial	Endemic	Least Concern
Rhododendron quadrasianum var. rosmarinifolium (S. Vidal) H.F. Copel.	*Konna/ kon-na*	No common name	Ericaceae	Leaves	Decoction	Food (tea)	Endemic	Not Assessed
Sarcandra glabra (Thunb.) Nakai	*Kasengseng*	Vidal's Rhododendron	Chloranthaceae	Leaves	Decoction	Food (tea)	Indigenous	Least Concern
Symplocos whitfordii Brand	*Gipas/ mountain tea*	Glabrous Sarcandra Herb	Symplocaceae	leaves	Decoction	Food (tea), medicine	Endemic	Vulnerable
Vaccinium cumingianum S.Vidal	*Sagingsing*	Whitfordii Snowberry	Ericaceae	Leaves	Decoction	Food (tea)	Endemic	Not Assessed
Zanthoxylum asiaticum (L.) Appelhans	*Itsa*	orange climber	Rutaceae	Leaves	Decoction	Food (tea)	Endemic	Not Assessed

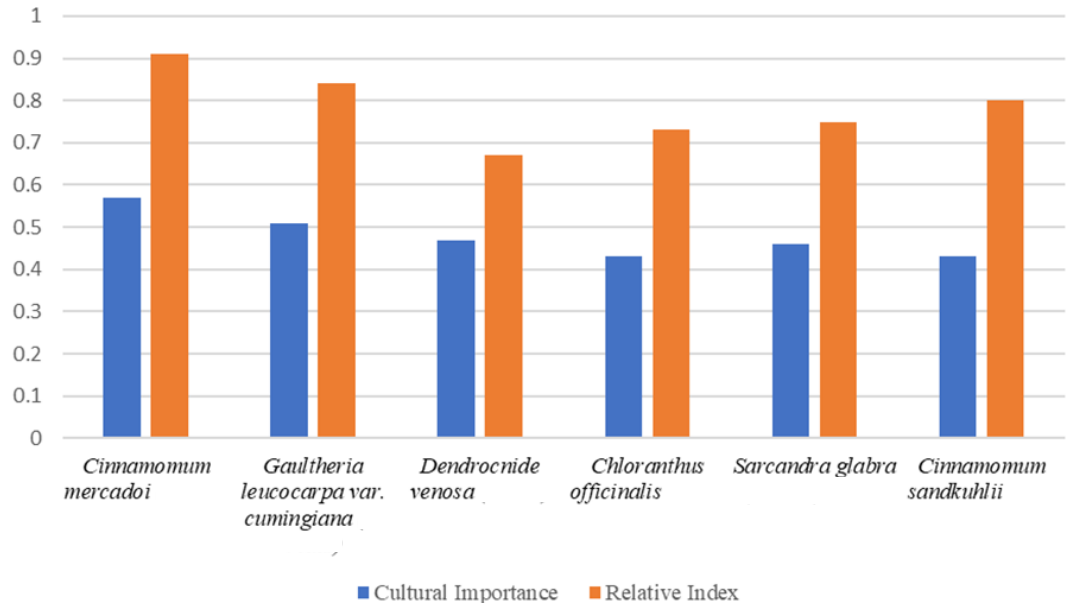

Figure 4. The wild tea plants with their Cultural Importance Index (CI) and the Relative Importance Index (RI) in Barlig and Bontoc, Mountain Province, Philippines

Key usage patterns

In terms of the method of preparation of the wild tea plants, local people apply only two (2) methods, which are decoction and steeping. Decoction (95%) is widely regarded as the most commonly used method in the preparation of beverages and medicines in Barlig and Bontoc, particularly when intended for therapeutic use (Figure 5.A). This process involves simmering medicinal plant materials such as leaves, roots, or bark in boiling water for a period of three to five minutes, after which the decoction is administered orally. In the case of *C. mercadoi* and *C. sandkuhlii*, confident respondents from Barlig noted a specialized preparation technique. This method involves a standard decoction followed by cooling, after which wine is added before consumption.

With regards to the steeping method of the wild tea plant, specifically, the *Decaspermum fruticosum* is often boiled in hot water for a minimal amount of time, and some wild tea plant species like *Zanthoxylum asiaticum* and *Murraya* sp. are prepared by putting the leaves directly in hot water without boiling. This method preserves the aromatic compounds and essential oils, which can degrade under prolonged exposure to heat, often resulting in an undesirable bitter aftertaste. Additionally, locals add some sweeteners like sugar and honey to the plant extracts to improve the flavor.

In this study, six (6) different parts of the wild tea plants were used (Figure 5.B) by the locals in Mountain Province. The most frequently used plant part was the leaf (65%), followed by bark (15%). The stems, roots, seeds, and fruits are not used frequently. The locals claim that leaves are commonly harvested for consumption because it is a tradition passed down through generations that the leaves were consumed and tested by previous generations, and that signifies safety; they dare not test other parts. The leaves were only collected to allow the plant to thrive, according to locals, which serves to preserve the species for future generations.

Cultural importance

Cultural importance denotes how important a species is in the daily life of local communities. The cultural importance of the wild tea plants in the province has not been explored. This study shows that the wild tea plants are not only used as a tea beverage but are also used for other purposes by several of the local people. The wild tea plants differ in their uses, such as food, medicine, condiments, processing, industrial/domestic purposes, and forage uses (Table 2).

Among the five use categories, food (tea beverage) has the highest percentage (75%), followed by medicine (17%), industrial (4%), ornament (1%) and condiment (1%). Only one species is used as a spice or condiment (1%), specifically *G. l. var. cumingiana*, locally called sapal/shopor. In terms of aesthetic value, *Ardisia polysticta* is the only species mentioned, while three species are used for industrial/household purposes. Furthermore, eleven species that were documented are being utilized as medicine. The result indicates that the locals mostly utilize the various wild tea plants to make tea beverages. Table 3 presents that *C. mercadoi* was noted to be of high cultural importance and was followed by *G. leucocarpa* var. *cumingiana*, *D. venosa, S. glabra*, *C. officinalis* and *C. sandkuhlii.* These species have a CI Index of above 0.40, which may indicate that these are mostly preferred tea beverages as compared to the other species. These species may have long been known for their uses, where this traditional knowledge was passed through generations. Preferences of the local folks on these species for a tea beverage may have been affected by compounds present in teas and in their organoleptic properties.

Cinnamomum mercadoi has a higher CI Index value compared to the other species used for medical purposes. It can be noted from the above table that species have low CI Index values; however, this does not mean that their significance is negligible. Few species were noted to be used for purposes other than tea beverage and medicinal home remedy, and were of very low cultural importance. Only *G. l. var. cumingiana* was used as a condiment, *A. polystica* may have been used for esthetic purposes, and *C. mercadoi* for industrial or domestic uses. However, it could be assumed based on the above data that the identified species were mainly used for tea beverage; thus, these may only be used as an alternative for other purposes.

Conservation practices

Conservation activities are being done, specifically for wild tea plants. However, during barangay general assemblies, barangay officials conduct awareness programs on forest fire prevention and protection. In collaboration with the local Bureau of Fire Protection, these activities were carried out. In an effort to stop forest fires, the locals also cleaned the dried leaves and twigs along the fire lines. In addition, the locals also prevent the tourists from getting any plant species.

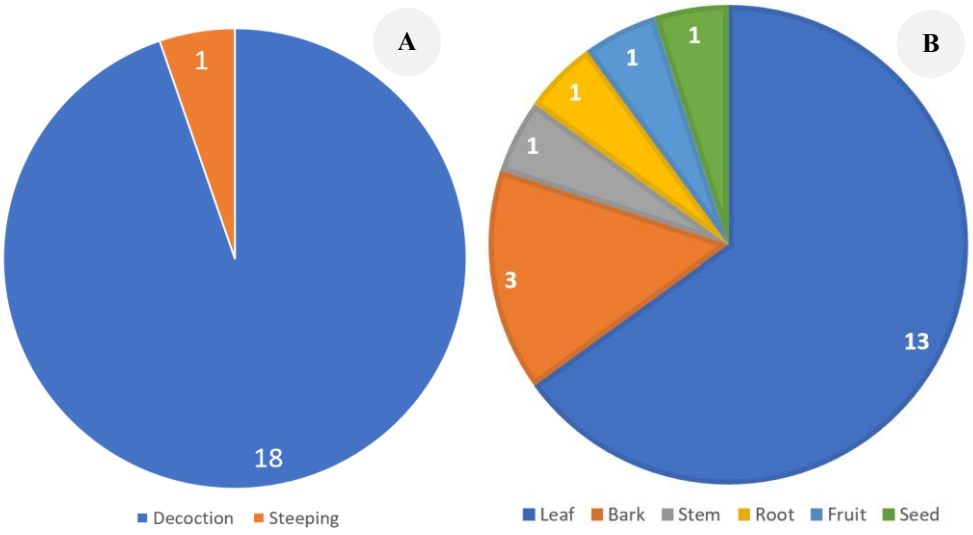

Figure 5. Wild tea plant part used and method of preparation in Barlig and Bontoc, Mountain Province, Philippines. A: Methods preparation, B. Plant part used

Table 3. Cultural importance of wild tea plants in Mountain Province, Philippines, with the Cultural Importance Index (CI) component of each use category

Species	HF	ME	CO	EU	IN	Total CI
Ardisia polysticta Miq.	0.08			0.04		0.12
Aster philippinensis S. Moore	0.01					0.01
Chloranthus officinalis Blume	0.35	0.08				0.43
Cinnamomum mercadoi S. Vidal	0.35	0.14			0.08	0.57
Cinnamomum sandkuhlii Merr	0.26	0.09			0.08	0.43
Cyrtandra parviflora C.B. Clarke	0.05	0.04				0.09
Decaspermum blancoi S.Vidal	0.18	0.04				0.22
Decaspermum fruticosum (Lam.) A.J.Scott	0.18	0.07				0.25
Dendrocnide venosa (Elmer) Chew	0.29	0.18				0.47
Drimys piperita Hook.f. (Winteracea)	0.13	0.04	0.15			0.32
Gaultheria leucocarpa var. *cumingiana* (S.Vidal) T.Z.Hsu	0.44	0.08				0.52
Murraya sp.	0.18				0.05	0.23
Mussaenda benguetensis Elmer	0.11	0.05				0.16
Rhododendron quadrasianum var. *rosmarinifolium* (S. Vidal) H.F. Copel.	0.11					0.11
Sarcandra glabra (Thunb.) Nakai	0.36	0.1				0.46
Symplocos whitfordii Brand	0.10					0.10
Vaccinium cumingianum S. Vidal	0.09					0.09
Zanthoxylum asiaticum (L.) Appelhans	0.07					0.07
Total	3.34	0.87	0.15	0.04	0.21	

Note: HF: Human Food, ME: Medicinal, CO: Condiment, AU: Aesthetic Uses, IN: Industrial and/or Domestic Use

Discussion

Plant taxonomic diversity

Eighteen wild tea plants were identified up to the species level, in terms of their endemicity or distribution status; 16 species were endemic, and 2 species are indigenous. In terms of the conservation status, most of the wild tea plants were of least concern, but some are vulnerable and not assessed based on the IUCN Red List. The findings of the study are similar to those of other ethnobotanical studies in the country, such as those of Cordero et al. (2022) and Andalan et al. (2024). Ericaceae is the most represented as it is distributed globally with 4,426 species estimated in 129 genera, which are presently classified into eight subfamilies (Stevens et al. 2004; Schwery et al. 2015). The family Ericaceae has been recorded to possess medicinal properties (Bouyahya et al. 2021). According to Garcia et al. (2018), the Philippines is known to be a biodiversity hotspot, so it is anticipated to have a multitude of plants with rich ethnobotanical knowledge.

The findings of the study can directly influence local and national policy initiatives to protect these wild tea resources. The species that have been recognized as "Vulnerable" need to be given priority attention for conservation initiatives. The IUCN Red List can be updated using the data on the "Not Assessed" species, giving a more accurate picture of their conservation status globally. A sustainable conservation strategy must empower and include local communities to safeguard their natural heritage since these plants are essential to indigenous culture. Local governments may use the results to create ordinances controlling the gathering of at-risk species and promoting sustainable actions.

Key usage patterns

The leaf is a standard plant part used as a beverage because it is easy to collect and prepare (Mesfin et al. 2014; Lemma 2017; Tefera and Yihune 2019). In tropical nations like the Philippines, leaves are an easily accessible plant part that are always available in an emergency, such as the leaves are used for medicinal purposes (Tindowen et al. 2017). Since leaves can grow and regenerate more readily than other plant parts, harvesting them is a more sustainable practice. In addition, leaves store numerous bioactive compounds (Andalan et al. 2024) and are used for the synthesis of several secondary metabolites (Hamel et al. 2018) that can be a source of biological activities (Nasungan 2022). Moreover, other plant parts were used frequently, but they also contain essential phytochemicals. Some species of wild tea have more flavor in the bark than in their leaves, like *C. mercadoi*; thus, the bark is more likely to be consumed. Pásztory et al. (2016) reported that the bark has active ingredients and is utilized by folk medicine. Other species are also consumed by their roots, one of them is the *D. venosa*. The root is not commonly harvested because the physiological activity stops when the root is harvested; thus, the entire plant is lost (Mekonnen et al. 2022).

Two methods, particularly decoction and steeping, were identified by the locals. The finding of the study corroborates the study of Daswani et al. (2011), which found that the primary method of using native plants is decoction. Typically, decoctions are consumed orally. Of all the conventional forms of preparation, they have the strongest activity and are the most rapidly absorbed by the body (Yang et al. 2009).

The consumption of tea depends on the consumer. As to claims within the locality of both Barlig and Bontoc, some prefer to consume tea without any additives, and others enjoy it with honey, sugar, or muscovado. Older folks consume it as it is, together with sweet potato, which acts as the sweetener. Milani et al. (2018) demonstrate the addition of additives such as sweeteners and flavorings to black tea, which is consumed in considerable amounts. Previous studies by Sharma et al. (2008) and Korir et al. (2014) stated that with the addition of sugar to the tea, the antioxidant content and potency are decreased.

The nature of traditional knowledge and how it is transmitted presents one important set of constraints. Knowledge is frequently specialized, despite efforts to include a variety of informants across age, gender, and roles, like the barangay officials, hunters, farmers, homemakers, and village elders. Only a very small number of people, such as certain healers or ritual practitioners, may be aware of certain plant applications or identification techniques, and their perspectives may not have been completely recorded (Berlin 1992). Additionally, as was mentioned, industrial development, shifting livelihoods, and a decrease in generations passing on information make traditional knowledge dynamic and more vulnerable to deterioration (Huntington 2000; Pieroni et al. 2011). Before the study could record it, some important knowledge on uncommon plants or their historical use may have already been lost. Despite their willingness, informants may also suffer from recall bias, unintentionally leaving out information or forgetting particular preparations or usage frequencies, especially for procedures that are not routinely carried out (Quinlan 2005).

Cultural importance of wild tea plants

Humans are inherently dependent on plants for a myriad of ecological benefits, sustenance, and medicinal purposes. Our study on wild tea plants in the Cordillera Administrative Region reveals a rich tapestry of traditional knowledge, though some species exhibit a low Cultural Importance (CI) Index. This finding, where species with restricted local distribution and single traditional uses show lower CI Index, aligns with previous observations by Chua-Barcelo (2014) concerning underutilized fruit species. This potentially highlights localized knowledge or the vulnerability of certain traditional practices to broader influences.

The result shows that among the five use categories, food (tea beverage) has the highest percentage (75%) (Table 2), followed by medicine (17%), industrial (4%), condiment (1%), and ornament (1%). According to Liu et al. (2022), with the growing demand for health and nutrition foods in recent years, plant-based beverages have become known to the community, thus wild tea plants are mainly used as a functional beverage. Plants have also

generated attention due to their pharmacological effects and phytochemical makeup (Boudou et al. 2022). Previous studies also mentioned that teas have long been utilized because they are abundant in potent bioactive compounds that could benefit human health (Nasungan 2022). Apart from being used as a tea beverage and medicine, wild plants are used as spices and food additives because of their flavoring, aroma, and preservation qualities and utilized as raw supplies for traditional domestic crafts (Al-Fatimi 2024).

The significant role of wild Cordillera plants in home medication, particularly in rural areas, has been consistently reported by various studies (Chua-Barcelo 2014; Balangcod and Balangcod 2015; Garsi 2019). Specific examples from this region underscore their therapeutic value: the roots of *D. venosa* are traditionally used by the Manobo Tribe to ease childbirth pain (Ilagan et al. 2022), reflecting a broader healing capacity for conditions like ulcers, diabetes, and inflammation (Van Valkenburg 2002; Gunardi et al. 2023). The genus *Cinnamomum*, represented by species like *C. mercadoi* and *C. sandkuhlii*, is highly valued for its anti-inflammatory, antioxidant, antimicrobial, and antidiabetic properties (Kumar et al. 2019; Wang et al. 2020; Sharifi-Rad et al. 2021). *Cinnamomum mercadoi*, specifically, serves as a remedy for digestive disorders, flatulence, headache, and rheumatism (Langenberger et al. 2009; Fuentes et al. 2010). Similarly, *S. glabra* is a natural remedy for wounds, diarrhea, cough, and skin inflammation (Bersamin et al. 2021). *Drimys piperita* Hook.f. is traditionally used for malaria and to enhance vitality (Cepeda et al. 2019), with isolated compounds exhibiting anti-diarrheal and anti-spasmodic effects (Pladio and Villaseñor 2004). The *Chloranthus* genus has a long history as a folk remedy for various ailments, including swollen boils and snake bites, possessing anticancer, anti-inflammatory, antibacterial, antiviral, and antimalarial activities (Liu et al. 2022).

The ethnobotanical importance of wild tea plants in the Philippines resonates with a broader regional trend across Southeast and East Asia, where various genera are valued for their cultural and medicinal properties. The extensive utilization of *Cinnamomum* species in traditional medicine in nations like China, Indonesia, and Vietnam is proof of this shared admiration. It is further highlighted by the intentional cultivation of a stimulating beverage tea from *Chloranthus erectus* in Indonesia and the extensive incorporation of *S. glabra* (Caoshanhu) into therapeutic teas, supplements, and household products in China (Liu et al. 2016; Hai et al. 2018; Arseniuk 2020; Zeng et al. 2021; Tang et al. 2024). This regional shared appreciation for wild tea plants as both therapeutics and culturally significant beverages—sometimes even incorporated into rituals or as a symbol of community well-being—is further highlighted by the intentional cultivation of teas in the Philippines (Taguiling and Villena 2017).

Despite their profound significance, traditional knowledge systems surrounding these wild tea plants face increasing threats. Modernization, urbanization, and a decline in intergenerational knowledge transfer pose significant risks to the continuity of these invaluable practices (Aziz et al. 2018). The loss of sophisticated knowledge on plant identification, preparation, and particular applications is a result of both a gradual decline of traditional languages and the declining participation of newer generations in traditional practice (Maffi 2005). Furthermore, environmental degradation, habitat loss, and climate change directly threaten the biodiversity of these wild plants, making their collection and sustainable use more challenging (Pimm et al. 2014). The low Cultural Importance (CI) Index observed for some species may indeed be an early indicator of this erosion, suggesting that knowledge about certain plants is becoming increasingly localized or endangered.

Therefore, exploring the diverse applications and advantages of wild edible and medicinal plants is crucial for raising awareness and developing effective conservation strategies. This aligns with the understanding in communities like Mayaoyao, Ifugao, where biodiversity is equally valued for food and medicinal purposes (Enkiwe-Abayao 2002). Documenting these traditional practices is not only vital for preserving cultural heritage but also for identifying potential bioresources for future health and economic benefits, while ensuring that the rights and intellectual property of local knowledge holders are respected and protected.

Conservation practices

The conservation status of the eighteen wild tea plant species identified in the study is largely encouraging, with most being classified as "Least Concern" on the IUCN Red List. This result is consistent with similar ethnobotanical assessments carried out throughout the Cordillera, which indicate that not all wild plant resources are heavily used for customary purposes (Magcale-Macandog et al. 2015). Instead, the utilization patterns appear to be significantly influenced by a plant's availability and accessibility, with communities primarily gathering species that are common and found in close proximity. This selective harvesting, driven by convenience, can inadvertently act as a natural conservation mechanism, reducing pressure on rarer or more geographically remote species.

However, despite the current "Least Concern" status for many species, ongoing conservation measures remain critical, particularly for frequently utilized wild plants, to ensure their long-term sustainability (Abdusalam et al. 2020). Across the Philippines and other Asian countries, a multifaceted approach to plant conservation is being adopted, integrating both modern scientific methods and traditional ecological knowledge. In-situ conservation efforts include the establishment and effective management of protected areas and community-managed forests, where local communities actively participate in safeguarding plant diversity through sustainable harvesting practices and resource management plans (Pulhin and Pulhin 2003; Tauli-Calugan 2025). This aligns with the understanding in communities across the Cordillera, such as in Mayaoyao, Ifugao, where biodiversity is valued equally for its food and medicinal purposes (Enkiwe-Abayao 2002). Ex-situ conservation complements these efforts through botanical gardens (Tobias et al. 2019). Therefore, documenting these

traditional practices is not merely about preserving cultural heritage; it is a vital step toward identifying potential bioresources for health and economic benefits, while simultaneously ensuring that the rights and intellectual property of local knowledge holders are respected and protected through a collaborative, community-based conservation model.

Furthermore, the revitalization and documentation of Traditional Ecological Knowledge (TEK) are paramount. Indigenous communities in the Philippines, for instance, often possess intricate knowledge of plant life cycles, optimal harvesting periods, and sustainable regeneration techniques, which are vital for the continued existence of wild tea plant populations (Afuang et al. 2021). Promoting intergenerational knowledge transfer and supporting community-based conservation initiatives are key strategies to empower local communities in safeguarding their botanical heritage. Policy frameworks and legal instruments also play a crucial role in regulating access to and use of wild plant resources, preventing over-exploitation and ensuring equitable benefit-sharing (ASEAN Centre for Biodiversity 2023). By integrating these diverse conservation practices, it is possible to balance the traditional utilization of wild tea plants with their ecological preservation, ensuring their availability for future generations and sustaining the cultural practices linked to them.

In conclusion, Barlig and Bontoc, Mountain Province, are naturally occurring locations with diverse highly beneficial wild tea plants. Thirteen families of eighteen (18) wild tea plants were identified in the Mountain Province's Barlig and Bontoc. The different wild tea plants were being utilized for various cultural importance, particularly as human food, medicine, aesthetics, condiments, and industrial material or decoration. Among the cultural importance mentioned, most of the wild tea plants were used as human food, specifically as a beverage, and most of these wild teas are shrubs. *Cinnamomum mercadoi* has the highest cultural importance index and relative importance index among the eighteen wild tea plants. In addition, leaves are the common plant part being used, and the methods of preparation are decoction and steeping. Locals have conservation practices being done to prevent the degradation of the wild tea plants, but few people are taking part in the conservation efforts being made.

Furthermore, plant resources can also be depleted if they are continuously harvested without effective conservation and management. Thus, it is possible to encourage and recommend biodiversity conservation policies to preserve the plants and their native habitats. Digital archives or field guides for the wild tea species should be created to systematically document and archive traditional ecological knowledge. Educational programs should be made that actively engage younger generations to teach them about the importance of wild tea plants and the traditional knowledge tied to them. These programs can cultivate a sense of pride and stewardship, ensuring the knowledge is passed on.

Building on the fundamental ethnobotanical knowledge acquired from the present study, a number of interesting research possibilities emerged. The results of the study may be a basis for conducting studies on the different wild tea plants in terms of their potential biological activities, such as antioxidant and antimicrobial properties, phytochemical screening, particularly species with high cultural importance index, and investigating these plants' deeper sociocultural importance in addition to their practical applications.

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