

Ethnobotanical Inventory of Food Plants Utilization in Tadyawan Tribe in Victoria, Oriental Mindoro

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Abstract. The Tadyawan Tribe is one of the Mangyan ethnolinguistic groups residing in Oriental Mindoro. Despite existing ethnobotanical studies among other Mangyan groups, limited information has been documented regarding the food plants utilized by the Tadyawan Tribe. This study aimed to identify the food plants utilized by the Tadyawan Tribe in Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro, determine their geographical distribution and botanical characteristics, document their utilization practices, and assess their ethnobotanical importance. A descriptive mixed-methods research design was employed using qualitative and quantitative approaches. Data were gathered from 32 purposively selected Tadyawan informants through semi-structured interviews, focus group discussions, and guided field activities. Plant identification and documentation were supported by botanical databases and verification from a botanist. Ethnobotanical importance was evaluated using Relative Frequency Citation (RFC), Data Matrix Ranking (DMR), and Use Value (UV). The study identified 30 food plant species belonging to 19 families and 22 genera. Fruits were the most frequently utilized plant parts, while drying was the most common preservation technique. Seeds were the most common method of propagation, and 20 species could be gathered throughout the year while 10 were gathered seasonally. Three species required particular conservation attention: *Caryota mitis* Lour., reported as threatened; *Medinilla magnifica* Lindl., categorized as endangered; and *Alpinia elegans* (C. Presl.) K. Schum., categorized as vulnerable. *Calamus microcarpus* Becc. obtained the highest RFC (0.97), DMR (169), and UV (0.80). The findings provide an ethnobotanical basis for the conservation of food plant resources, traditional knowledge, cultural heritage, and biological diversity of the Tadyawan Tribe.

Keywords: Ethnobotanical Indices; Ethnobotany; Food Plants; Indigenous Knowledge; Tadyawan Tribe

Introduction

Indigenous peoples represent a significant part of the world's cultural and social diversity, with approximately 370–500 million Indigenous peoples residing in 90 countries and representing about 5% of the global population. They comprise approximately 5,000 distinct cultures, many of which continue to experience poverty, marginalization, and limited access to social and economic resources (Cordero et al., 2022). In the Philippines, there are 110 ethnolinguistic groups comprising more than 14 million people, with the largest proportion residing in Mindanao, followed by Luzon and the Visayas (National Commission of Indigenous Peoples [NCIP], 2021). Among these Indigenous communities are the Mangyan groups of Mindoro, an island consisting of Oriental and Occidental Mindoro. The Mangyan are composed of eight ethnolinguistic groups—Iraya, Alangan, Tadyawan, Tau-Buid, Bangon, Buhid, Hanunoo, and Ratagnon—who primarily inhabit the highland areas of Mindoro.

The Tadyawan are one of the eight Mangyan ethnolinguistic groups and are primarily located in the municipalities of Naujan, Victoria, Socorro, Pola, Gloria, Pinamalayan, and Bansud in Oriental Mindoro. The term *Tadwayan* means “taong nasa tabing ilog,” referring to people living along riverbanks. Their communities are generally surrounded by forests, and many Tadyawan people have traditionally depended on plants and other natural resources for food and medicine (Rubite et al., 2012). Similarly, rural communities in the Philippines, particularly Indigenous peoples, rely on food plants available within their surrounding environment. However, food plants are increasingly threatened by excessive harvesting and the destruction of their natural habitats, creating concerns regarding food security among communities that depend on these

resources for sustenance (Food and Agriculture Organization [FAO], 2014). Thus, documenting the traditional use of food plants is important in understanding Indigenous food systems and the sustainable use of biological resources.

Several ethnobotanical studies have been conducted among the Mangyan communities of Mindoro (Rubite et al., 2012; Sebastian et al., 2013; Nazareno, 2019; Villanueva & Bout, 2020). However, these studies did not specifically and comprehensively focus on the food plants utilized by the Tadyawan Tribe. As long-term users of the natural forest resources, the Tadyawan possess valuable traditional knowledge regarding the identification, utilization, preparation, and preservation of locally available food plants. Therefore, documenting the food plant resources utilized by the Tadyawan Tribe is necessary to contribute to the preservation of their traditional knowledge, appreciation of their conventional food systems, and protection of the biological resources on which their community depends.

Research Questions

Generally, this study aims to identify the food plants utilized by the Tadyawan tribe in Victoria, Oriental Mindoro. Specifically, it aimed to answer the following:

1. What food plants are utilized in Sitio Lagpan Barangay Villa Cerveza, Victoria, Oriental Mindoro?
2. What is the geographical distribution of these food plants in Sitio Lagpan Barangay Villa Cerveza, Victoria, Oriental Mindoro?
3. What are the botanical characteristics and utilization in these food plants based on their preservation techniques, propagation, and conservation status?; and
4. What are the uses of food plants in terms of ethnobotanical quantitative indices such as Relative Frequency Citation (RFC), Data Matrix Ranking (DMR), and Use Value?

Scope and Limitation of the Study

This study focused on the food plant resources utilized by 70 Tadyawan families residing in Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro. Data were gathered through field surveys and the documentation of ethnobotanical information using oral interviews. The investigation covered the food plants' utilization practices, propagation methods, conservation status, and uses. The study was limited to the documentation and assessment of food plant resources and did not include germplasm conservation because of the insufficient resources available to the researcher. The study also relied on information obtained through field observations and oral interviews; therefore, the scope of the investigation was limited to the ethnobotanical knowledge and practices shared by the participating Tadyawan community. Due to the beliefs and traditions of the Tadyawan Tribe, recorded interviews and photographs of community members were prohibited. The collection or removal of actual plant specimens was likewise not permitted to prevent the possible misuse of native plant resources. Photographs were allowed only for the purpose of documenting and verifying the collected sample specimens.

Literature Review

Ethnobotanical Inventory of Food Plants

Ethnobotany is the study of the relationships between people and plants, particularly how specific cultures identify, name, organize, perceive, and utilize plant resources. The field has a long history, although the term *ethnobotany* was coined in 1896 by American botanist John Hershberger (Muhammad et al., 2015; Mahmood et al., 2011; Campbell et al., 2002). Ethnobotanical knowledge has contributed to the development of traditional medicine and continues to provide information about the cultural and practical importance of plants (Arquion et al., 2015).

Plants have been important sources of food and medicine since the beginning of human civilization (Shaheen et al., 2012). They have also served as sources of medicinal and nutraceutical compounds, with approximately 25% of modern drugs reported to have been isolated from plant sources (Xu et al., 2015; Anwar et al., 2016). The World Health Organization (2013) recognized the significant role of plants in medical applications. Traditional plant-based medicine remains particularly important in rural communities, where traditional preparations have been used for generations. Approximately 85% of traditional medicines used for primary health care globally are derived from plants, while a large proportion of people in developing countries continue to use traditional medicine for treating common ailments (Yadav & Siwach, 2005; Buwa et al., 2019).

Despite their potential nutritional and medicinal value, indigenous and traditional food plants are often overlooked because of limited information regarding their nutritional properties (Food and Agriculture Organization [FAO], 2014). Some underutilized plant species may provide valuable nutrients and may be well adapted to local environmental conditions. Therefore, documenting ethnobotanical knowledge and native food plants can contribute to greater awareness of their nutritional, medicinal, cultural, and potential nutraceutical

value. Such documentation is particularly important for preserving traditional knowledge and promoting the responsible utilization of indigenous plant resources.

Foreign Studies on Food Plants

International ethnobotanical studies have demonstrated the important role of wild and traditional food plants in human nutrition, health, and cultural practices. According to the World Health Organization (WHO), more than 80% of the world's population, or approximately 4.3 billion people, rely on traditional plant-based systems of medicine and food resources. Functional foods provide physiological or medicinal benefits beyond their nutritional value, while nutraceuticals may provide health advantages when consumed as part of the diet. These findings highlight the continuing importance of documenting traditional food plants and their uses among Indigenous and rural communities.

Several studies have documented the diversity and utilization of wild food plants in different countries. In southern Herzegovina, Bosnia, Luczaj and Dolina (2015) recorded 82 species of wild food and herbal tea plants, including species used as salads, cooked vegetables, edible fruits, and herbal teas. In southern Italy, Sansanelli et al. (2017) documented 52 wild food plant species belonging to 23 families, with Asteraceae and Rosaceae being the most represented families. *Cichorium intybus* L. had the highest Relative Frequency Citation (RFC) at 0.95, followed by *Sonchus* spp. at 0.76, while leaves were the most commonly used plant part. In Mozambique, Aparicio et al. (2021) recorded 106 species from 52 families, with 55.2% used as food and 43.1% used as traditional medicine. Similarly, a review of native Chilean wild edible plants identified 330 species from 196 genera and 84 families, although traditional knowledge and utilization have declined because of globalization, industrialization, and market integration (Heinrich et al., 2016; Shikov et al., 2017; Benitez et al., 2017; Leon-Lobos et al., 2022).

More recent studies further demonstrate the diversity and conservation concerns associated with traditional food plants. Has et al. (2023) documented 88 food plant species from 35 families in Melintang and Meribung Villages, Nepal, using in-depth interviews and exploration methods. Fruit plants were widely used, and the community continued to depend heavily on food plants obtained from cultivated and forest environments. In Bhutan, Yangchen (2023) identified 16 wild edible plant species from 16 genera and 16 families in Merak Gewog. Herbs were the dominant growth form, while leaves were the most frequently consumed plant part. However, seasonal availability, overgrazing, habitat degradation, unsustainable harvesting, and forest fires threatened both wild edible plants and the Indigenous knowledge associated with them. These international studies demonstrate that food plants serve not only as sources of nutrition but also as important components of traditional knowledge and cultural heritage. They further emphasize the need for systematic documentation and conservation of food plant resources, providing a relevant basis for investigating and documenting the food plants utilized by the Tadyawan Tribe.

Local Studies of Food Plants

Local studies in the Philippines have documented the considerable diversity and importance of indigenous and wild food plants as sources of nutrition, medicine, and other useful products. The Philippines has approximately 13,500 species of higher vascular plants, many of which have potential nutraceutical, pharmaceutical, and cosmeceutical applications. In support of promoting underutilized indigenous plant resources, the Bureau of Agricultural Research implemented the Indigenous Plants for Health and Wellness Program (IPHWP) to increase awareness of their potential and contribution to addressing malnutrition (Dela Cruz, 2010). Similarly, Guiam (2010) documented more than 49 wild plant species harvested in 11 municipalities in the Cordilleras for their young shoots, tops, stalks, flowers, leaves, bulbs, and fruits as vegetables. Chua-Barcelo (2014) also recorded 36 wild fruit species belonging to 27 genera and 20 families in different municipalities of Benguet, with the plants being used as food, forage, offerings, processed products, cooking ingredients, dyes, decorations, and medicine.

Several studies further demonstrated the diversity of edible plants and their utilization practices among Philippine communities. Arquion et al. (2015) identified 53 wild edible plant species utilized by the inhabitants of Agusan del Sur. Fruits were the most commonly consumed plant parts (53%), followed by stems (24%), leaves (19%), blooms (2%), and roots (2%). The plants were consumed fresh or incorporated into different foods, including banana blossom used to prepare a meatless burger, pandan used as a flavoring for rice, and cassava prepared as an alternative or emergency food. Similarly, Rosales et al. (2018) documented 168 edible plant species belonging to 111 genera and 67 families on Cebu Island. Fruits were the most frequently cited edible plant parts, followed by leaves, stems, and trunks. The plants were commonly eaten raw or cooked, while other preparation methods included frying and powdering. These findings demonstrate the extensive knowledge of local communities regarding the identification, preparation, and utilization of diverse food plant resources.

Studies among Indigenous communities in Mindoro also provide evidence of the importance of wild food plants. Nazareno (2018) documented 14 edible wild plant species consumed by the Hanunuo and Buhid Mangyan communities of Bongabong, Oriental Mindoro. These species belonged to 11 plant families, including Araceae, Burseraceae, Combretaceae, Cucurbitaceae, Dioscoreaceae, Gnetaceae, Meliaceae, Moraceae, Rosaceae, Solanaceae, and Urticaceae. The study identified *Schismatoglottis* sp. 2 (ling-o) and *Schismatoglottis* sp. 1 (salidang) under Araceae, while *Rubus rosifolius* (balinana) and *Rubus fraxinifolius* (balinana) belonged to Rosaceae. These local studies establish that Philippine Indigenous communities possess substantial traditional knowledge concerning food plants. However, the documentation of food plant resources among the Tadyawan Tribe remains limited, providing a basis for conducting a focused ethnobotanical inventory of the species they utilize, their plant parts, preparation practices, and other forms of utilization.

The reviewed literature establishes that ethnobotanical knowledge is important in understanding how communities identify, utilize, and preserve plant resources for food, medicine, and other cultural purposes. Studies have shown that wild and traditional food plants contribute to nutrition and health while also supporting Indigenous knowledge and cultural practices. Foreign studies documented diverse food plant species in Bosnia, Italy, Mozambique, Chile, Nepal, and Bhutan, but also reported the decline of traditional knowledge due to globalization, habitat degradation, unsustainable harvesting, and other socioeconomic pressures. Local studies likewise revealed extensive food plant diversity in Benguet, the Cordilleras, Agusan del Sur, Cebu, and among the Hanunuo and Buhid Mangyans of Oriental Mindoro. However, while previous studies have documented the food plant resources of various Philippine Indigenous groups, limited information is available specifically on the food plants utilized by the Tadyawan Tribe. This gap supports the need for the present ethnobotanical inventory to document the food plant species, their utilization, and related traditional knowledge among the Tadyawan community.

Methodology

Research Design

The study employed a descriptive research design using a mixed-methods approach, integrating both quantitative and qualitative methodologies to investigate the utilization of native nutraceutical plants by the Tadyawan Tribe in Victoria, Oriental Mindoro. The quantitative component focused on the analysis of ethnobotanical indices, specifically Relative Frequency Citation (RFC), Data Matrix Ranking (DMR), and Use Value (UV). The results were presented using percentages, figures, and means. Meanwhile, the qualitative component was used to document information regarding the identification and geographical distribution of the food plants.

Research Locale

The study was conducted in Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro. The municipality of Victoria has a land area of 146.23 square kilometers, representing approximately 3.45% of the total land area of Oriental Mindoro. It has two climatic types, Type I and Type III, characterized by variations in dry and wet seasons. The municipality consists of 32 barangays and has a population of 52,175. The study site is a small settlement inhabited by itinerant, landless Tadyawan families in the vicinity of Victoria. Approximately 70 Tadyawan families were residing in the community at the time of the study.

Research Participants

A semi-structured questionnaire was used to collect data through interviews with the selected informants. Purposive sampling was employed, and the informants were identified with the assistance of tribal leaders. The participants consisted of residents aged 40 years and above who had extensive knowledge of the native nutraceutical plants utilized by their community. A total of 32 informants were interviewed at their convenience.

The informants were asked about their personal information, botanical characteristics of the plants, indigenous knowledge, utilization practices, preparation and conservation methods, and uses of native nutraceutical plants. Focus group discussions (FGDs) were also conducted with selected members of the Tadyawan Tribe to verify and validate the information obtained from the informants. The study also documented the identified food plants, their geographical distribution, and photographic samples. GPS and the Geocam application were used to record the geographical locations of the plants, while Google Earth Pro and the TCX Converter were utilized to determine the altitude of each identified plant species.

Data Gathering Procedure

The collection of food plant samples was conducted with the assistance of the informants and tribal leaders who had extensive knowledge of the identification and collection of food plants. Plant specimens were

collected immediately after the interviews. Photographs of the identified food plants were also taken for documentation purposes.

The collected food plants were identified using online botanical databases, including Co's Digital Flora of the Philippines (Pelser et al., 2011 onwards) and Plants of the World Online (POWO) (2022). Plant species that could not be confirmed through the online databases were further verified remotely by a botanist from the Bureau of Plant Industry in Manila.

Results and Discussion

Research Question 1: What food plants are utilized in Sitio Lagpan Barangay Villa Cerveza, Victoria, Oriental Mindoro?

Table 1. Demographic profile of the participants

Demographic Profile	Frequency (n=32)	Percentage
Age (in years)		
40 – 51	23	72
52 – 63	8	25
64 – 75	1	3
Mean: 49		
Range: 40 - 75		
Sex		
Male	16	50
Female	16	50
Civil Status		
Married	29	91
Widowed	3	9
Sources of information on food plants		
Ancestors and neighbors	27	84
Ancestors	5	16
Occupation		
Farming	32	100

Table 1 presents the demographic profile of the 32 participants. The participants were purposively selected from the older members of the Tadyawan Tribe, with ages ranging from 40 to 75 years and a mean age of 49 years. Most participants (72%) were 40–51 years old, followed by those aged 52–63 years (25%), while only 3% were aged 64–75 years. The participants were equally distributed by sex, with 50% males and 50% females. In terms of civil status, the majority were married (91%), while 9% were widowed. Regarding sources of information about food plants, most participants (84%) obtained information from both their ancestors and neighbors, while 16% reported their ancestors as their source of information. All participants (100%) were engaged in farming as their occupation.

Table 2. List of food plants from the Tadyawan tribe at Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro

Family	Scientific Name	Vernacular Name	English Name	References
Amaranthaceae	<i>Amaranthus spinosus</i> L.	Uray	Spiny amaranth	BPI, Manila
Anacardiaceae	<i>Spondias pinnata</i> (L.f.) Kurz.	Libas	Common hog plum	BPI, Manila
	<i>Amorphophallus paeoniifolius</i> (Dennst)	Ambiran	Elephant Yam	BPI, Manila
Araceae	<i>Schismatoglottis bogneri</i>	Ling-o	Schismatoglottis	Co's Digital Flora of the Philippines
Arecaceae	<i>Calamus microcarpus</i> Becc.	Tibanga	Common rattan	Co's Digital Flora of the Philippines
	<i>Caryota mitis</i> Lour	Pugaan	Fishtail palm	Co's Digital Flora of the Philippines
Athyriaceae	<i>Hemionitis esculenta</i> Retz.	Pako	Vegetable fern	Co's Digital Flora of the Philippines
	<i>Momordica charantia</i> L.	Ampalaya ligaw	Wild bitter melon	Co's Digital Flora of the Philippines
Cucurbitaceae	<i>Momordica cochinchinensis</i> (Lour)	Tabyayong	Spiny bitter cucumber	Co's Digital Flora of the Philippines

Dilleniaceae	<i>Dillenia philippinensis</i> Rolfe	Dingin	Elephant apple	BPI, Manila
Dioscoreaceae	<i>Dioscorea esculenta</i> Lour	Puloy	Lesser yam	Co's Digital Flora of the Philippines
	<i>Dioscorea hispida</i> Dennst.	Nami	Intoxicating yam	BPI, Manila
	<i>Dioscorea villosa</i> L.	Banilad	Wild yam	Co's Digital Flora of the Philippines
Gnetaceae	<i>Gnetum gnemon</i> L.	Bulaksong/ Bago	Joint fir	BPI, Manila
Lauraceae	<i>Litsea garciae</i>	Bangulo	Borneo avocado	Co's Digital Flora of the Philippines
Lamiaceae	<i>Premna odorata</i> Blanco	Purong	Fragrant premna	Co's Digital Flora of the Philippines
Marantaceae	<i>Donax canniformis</i> (G. Frost.) K. Schum)	Banban	Common donax	Co's Digital Flora of the Philippines
Melastomataceae	<i>Medinilla magnifica</i> Lindl.	Dalunganan	Showy Medinilla	Co's Digital Flora of the Philippines
Moraceae	<i>Ficus pseudopalma</i> Blanco	Kisbong	Palm-like fig	Co's Digital Flora of the Philippines
Moraceae	<i>Artocarpus sericarpus</i> F. M. Jarrett	Tigip	Pedalai	BPI, Manila
	<i>Artocarpus odoratissimus</i> Blanco	Uloy	Johey oak	Co's Digital Flora of the Philippines
Musaceae	<i>Musa acuminata</i> Colla.	Botulin	Dessert banana	Co's Digital Flora of the Philippines
	<i>Musa balbisiana</i> Colla.	Pakil	Botoan banana	Co's Digital Flora of the Philippines
Poaceae	<i>Setaria palmifolia</i>	Kikit	Palm grass	Co's Digital Flora of the Philippines
Rosaceae	<i>Rubus fraxinifolius</i> Sm.	Bulnana	Roseleaf raspberry	BPI, Manila
Solanaceae	<i>Capsicum annuum</i> L.	Siling labuyo	Capsicum	BPI, Manila
	<i>Solanum nigrum</i>	Tagutong	Poison berry	Co's Digital Flora of the Philippines
Zingiberaceae	<i>Alpinia elegans</i> (C. Presl) K. Schum	Bagonggon	Alpinia	Co's Digital Flora of the Philippines
	<i>Alpinia galanga</i> L. (Willd)	Lankauas	Spice ginger	Co's Digital Flora of the Philippines
	<i>Alpinia haenkei</i> C. Presl.	Kutang	Ring mallaca	Co's Digital Flora of the Philippines

Table 2 presents the food plants identified from the Tadyawan Tribe at Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro. A total of 30 food plant species were identified, representing 19 families and 22 genera. The identified species included plants traditionally recognized and utilized as food by the Tadyawan community.

The Dioscoreaceae, Moraceae, and Zingiberaceae were the most represented families, with three species each. The Araceae, Arecaceae, Cucurbitaceae, Musaceae, and Solanaceae were represented by two species each. The remaining families—Amaranthaceae, Anacardiaceae, Athyriaceae, Dilleniaceae, Gnetaceae, Lauraceae, Lamiaceae, Marantaceae, Melastomataceae, Poaceae, and Rosaceae—were represented by one species each. The family, scientific name, vernacular name, English name, and source of identification of each food plant are presented in Table 2.

Based on the focus group discussion (FGD), six food plants were identified as the most commonly used by the Tadyawan participants: *Capsicum annuum* L. (siling labuyo), *Calamus microcarpus* Becc. (tibanga), *Caryota mitis* Lour. (pugahan), *Hemionitis esculenta* Retz. (pako), *Musa balbisiana* Colla. (pakil), and *Momordica charantia* L. (ampalayang ligaw). According to the participants, these plants were commonly used because they were readily available when needed, particularly in meal preparation.

Research Question 2: What is the geographical distribution of these food plants in Sitio Lagpan Barangay Villa Cerveza, Victoria, Oriental Mindoro?

Table 3. Zone geographical distribution of food plants in Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro

Scientific Name	Vernacular Name	Altitude (Ft.)		
		ZONE 1 (115-131)	ZONE 2 (132-148)	ZONE 3 (149-165)
1. <i>Alpinia elegans</i> (C. Presl) K.	Bagonggon	✓	✓	
2. <i>Alpinia galanga</i> L.	Lankauas	✓		
3. <i>Alpinia haenkei</i> C. Presl	Kutang		✓	✓
4. <i>Amaranthus spinosus</i> L.	Uray			
5. <i>Amorphophallus paeoniifolius</i> (Dennst)	Ambiran		✓	✓
6. <i>Artocarpus odoratissimus</i> Blanco	Uloy	✓	✓	
7. <i>Artocarpus sericarpus</i> F.M. Jarrett	Tigip	✓	✓	✓
8. <i>Calamus microcarpus</i> Becc.	Tibanga		✓	✓
9. <i>Capsicum annuum</i> L.	Siling labuyo	✓	✓	
10. <i>Caryota mitis</i> Lour	Pugaan			✓
11. <i>Dillenia philippinensis</i> Rolfe	Dingin		✓	
12. <i>Dioscorea esculenta</i> Lour.	Puloy	✓	✓	✓
13. <i>Dioscorea hispida</i> Dennst.	Nami	✓	✓	
14. <i>Dioscorea villosa</i> L.	Banilad	✓	✓	✓
15. <i>Donax canniformis</i> (G. Frost) K.	Banban		✓	✓
16. <i>Ficus pseudopalma</i> Blanco	Kisbong	✓	✓	✓
17. <i>Gnetum gnemon</i> L.	Bulaksong/Bago			✓
18. <i>Hemionitis esculenta</i> Retz.	Pako	✓		
19. <i>Litsea garciae</i>	Bangulo	✓	✓	✓
20. <i>Medinilla magnifica</i>	Dalunganan		✓	✓
21. <i>Momordica charantia</i> L.	Ampalayang ligaw	✓		
22. <i>Momordica cochinchinesis</i> Lour	Tabyayog	✓	✓	
23. <i>Musa acuminata</i> Colla.	Betulin		✓	✓
24. <i>Musa balbisiana</i> Colla.	Pakil	✓	✓	✓
25. <i>Premna odorata</i> Blanco	Purong			✓
26. <i>Rubus fraxinifolius</i> Sm.	Bulnana	✓	✓	
27. <i>Schismatoglottis bogneri</i>	Ling-o	✓	✓	✓
28. <i>Setaria palmifolia</i>	Kikit	✓	✓	✓
29. <i>Solanum nigrum</i>	Tagutong	✓	✓	✓
30. <i>Spondias pinnata</i> (L.f.) Kurz.	Libas			✓

Table 3 shows the geographical distribution of 30 food plant species used as food and medicine by the Tadyawan Tribe in Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro. The plants showed varying distribution patterns, with most species randomly distributed and a few exhibiting clumped distribution, including *H. esculenta* (pako), *M. charantia* (ampalayang ligaw), *M. balbisiana* (pakil), *R. fraxinifolius* (bulnana), and *S. palmifolia* (kikit).

The study area was divided into three elevation zones: Zone 1 (115–131 ft), Zone 2 (132–148 ft), and Zone 3 (149–165 ft). Table 3 shows that 19 species were recorded in Zone 1, 23 species in Zone 2, and 19 species in Zone 3. Six species—*A. sericarpus* (tigip), *D. esculenta* (puloy), *D. villosa* (banilad), *L. garciae* (bangulo), *M. balbisiana* (pakil), and *Schismatoglottis bogneri* (ling-o)—were found in all three zones. *S. bogneri* (ling-o) and *S. palmifolia* (kikit) were also collected in river areas across the zones.

The distribution of the food plants indicates that altitude and temperature may influence their occurrence. This finding agrees with Villanueva (2018), who reported that plant distribution is primarily determined by elevation and environmental gradients such as temperature. Similarly, Sarmiento (1986) reported a decreasing temperature trend with increasing elevation. Therefore, differences in elevation and temperature across the three zones may have contributed to the observed distribution patterns of food plants in the study area.

Research Question 3: What are the botanical characteristics and utilization in these food plants based on their preservation techniques, propagation, and conservation status?; and

Table 4. Botanical Characteristics of food plants in Sitio Lagpan, Barangay Villa Cerveza, Victoria Oriental Mindoro

	Scientific Name	Venacular Name	Part/S Utilized For Food	Growth Habit	Availability/ Abundance	Origin And Distribution	Appendix Figure
1.	Alpinia elegans (C. Presl) K.	Bagonggon	fruit, rhizome	Herb	low abundant	Native	Appendix figure 52
2.	Alpinia galanga L.	Lankauas	rhizome	Herb	low abundant	Native	Appendix figure 53
3.	Alpinia haenkei C. Presl.	Kutang	fruit, rhizome	Herb	moderately abundant	Native	Appendix figure 54
4.	Amaranthus spinosus L.	Uray	leaves	Herb	low abundant	Naturalized	Appendix figure 55
5.	Amorphophallus paeoniifolius (Dennst)	Ambiran	stalk/stem	Herb	low abundant	Native	Appendix figure 56
6.	Artocarpus odoratissimus Blanco	Uloy	fruit, seed	Tree	moderately abundant	Native	Appendix figure 57
7.	Artocarpus sericarpus F.M. Jarrett	Tigip	fruit, seed	tree	moderately abundant	Native	Appendix figure 58
8.	Calamus microcarpus Becc.	Tibanga	shoot/soft trunk, fruit, leaves, seeds, roots	tree	low abundant	Native	Appendix figure 59
9.	Capsicum annum L.	Siling labuyo	leaves, fruit	shrub	moderately abundant	Naturalized	Appendix figure 60
10.	Caryota mitis Lour	Pugaan	shoot/soft trunk, stem, leaves,	tree	moderately abundant	Native	Appendix figure 61
11.	Dillenia philippinensis Rolfe	Dingin	fruit	tree	low abundant	Native	Appendix figure 62
12.	Dioscorea esculenta Lour.	Puloy	root/tuber	vine	moderately abundant	Naturalized	Appendix figure 63
13.	Dioscorea hispida Dennst.	Nami	root/tuber	vine	low abundant	Native	Appendix figure 64
14.	Dioscorea villosa L.	Banilad	root/tuber	vine	moderately abundant	Native	Appendix figure 65
15.	Ficus pseudopalma Blanco	Kisbong	leaves	tree	moderately abundant	Native	Appendix figure 67
16.	Gnetum gnemon L.	Bulaksong/Bago	leaves, fruit	tree	moderately abundant	Native	Appendix figure 68
17.	Hemionitis esculenta Retz.	Pako	leaves, stalk	herb	highly abundant	Native	Appendix figure 69
18.	Litsea garciae	Bangulo	fruit	tree	moderately abundant	Native	Appendix figure 70
19.	Medinilla magnifica Lindl.	Dalunganan	leaves, fruit	shrub	low abundant	Native	Appendix figure 71
20.	Momordica charantia L.	Ampalayang ligaw	leaves, fruit	vine	highly abundant	Naturalized	Appendix figure 72
21.	Momordica cochinchinesis Lour.	Tabyayog	fruit	vine	low abundant	Native	Appendix figure 73
22.	Musa acuminate Colla.	Botulin	fruit, blossom	herb	moderately abundant	Native	Appendix figure 74
23.	Musa balbisiana Colla.	Pakil	fruit, blossom	herb	moderately abundant	Native	Appendix figure 75
24.	Premna odorata Blanco	Purong	leaves, fruit	tree	low abundant	Native	Appendix figure 76
25.	Rubus fraxinifolius Sm.	Bulnana	fruit	shrub	moderately abundant	Native	Appendix figure 77
26.	Schismatoglottis bogneri	Ling-o	root/tuber	herb	high abundant	Native	Appendix figure 78
27.	Setaria palmifolia	Kikit	fruit, leaves, root/tuber	herb	high abundant	Native	Appendix figure 79
28.	Solanum nigrum	Tagutong	fruit	shrub	high abundant	Naturalized	Appendix figure 80
29.	Spondias pinnata (L.f.) Kurz.	Libas	leaves	tree	Low abundant	Native	Appendix figure 81

Table 5. Preservation techniques, propagation, and conservation status of food plants in Sition Lagpan, Barangay Villa Cerveza, Victoria Oriental Mindoro.

Scientific Name	Venacular Name	Preservation Technique	Mode/S Of Propagation	Harvesting Period	IUCN Status
1. <i>Alpinia elegans</i> (C. Presl) K.	Bagonggon	no preservation	seed/rhizome	anytime	Vulnerable
2. <i>Alpinia galanga</i> L.	Lankauas	no preservation	rhizome	anytime	Least concern
3. <i>Alpinia haenkei</i> L. (Willd)	Kutang	no preservation	rhizome	anytime	Least concern
4. <i>Amaranthus spinosus</i> L.	Uray	no preservation	seed	anytime	Least concern
5. <i>Amorphophallus paeoniifolius</i> (Dennst)	Ambiran	no preservation	tuber	anytime	Least concern
6. <i>Artocarpus odoratissimus</i> Blanco	Uloy	drying	seed	seasonal	Least concern
7. <i>Artocarpus sericarpus</i> F.M. Jarrett	Tigip	drying	seed	seasonal	Least concern
8. <i>Calamus microcarpus</i> Becc.	Tibanga	no preservation	seed	anytime	Least concern
9. <i>Capsicum annuum</i> L.	Siling labuyo	drying	seed	anytime	Least concern
10. <i>Caryota mitis</i> Lour	Pugaan	no preservation	seed/sucker	anytime	Threatened
11. <i>Dillenia philippinensis</i> Rolfe	Dingin	no preservation	seed	seasonal	Vulnerable
12. <i>Dioscorea esculenta</i> Lour.	Puloy	drying	tuber	seasonal	Least concern
13. <i>Dioscorea hispida</i> Dennst.	Nami	drying	tuber	seasonal	Least concern
14. <i>Dioscorea villosa</i> L.	Banilad	drying	tuber	seasonal	Least concern
15. <i>Donax canniformis</i> (G. Frost) K.	Banban	no preservation	seed	anytime	Least concern
16. <i>Ficus pseudopalma</i> Blanco	Kisbong	no preservation	seed/stem cutting	anytime	Least concern
17. <i>Gnetum gnemon</i> L.	Bulaksong/Bag o	no preservation	seed/stem cutting	anytime	Least concern
18. <i>Hemionitis esculenta</i> Retz.	Pako	no preservation	stolon	anytime	Least concern
19. <i>Litsea garciae</i>	Bangulo	no preservation	seed	seasonal	Least concern
20. <i>Medinilla magnifica</i> Lindl.	Dalunganan	no preservation	seed	seasonal	Endangered
21. <i>Momordica charantia</i> L.	Ampalayang ligaw	no preservation	seed	anytime	Least concern
22. <i>Momordica cochinchinesis</i> Lour.	Tabayayog	no preservation	seed	anytime	Least concern
23. <i>Musa acuminata</i> Colla.	Botulin	no preservation	sucker	anytime	Least concern
24. <i>Musa balbisiana</i> Colla.	Pakil	no preservation	sucker/seed	anytime	Least concern
25. <i>Premna odorata</i> Blanco	Purong	no preservation	seed	seasonal	Least concern
26. <i>Rubus fraxinifolius</i> Sm.	Bulnana	no preservation	seed	seasonal	Least concern
27. <i>Schismatoglottis bogneri</i>	Ling-o	no preservation	seed	anytime	Least concern
28. <i>Setaria palmifolia</i>	Kikit	no preservation	seed/sucker	anytime	Least concern
29. <i>Solanum nigrum</i>	Tagutong	no preservation	seed	anytime	Least concern
30. <i>Spondias pinnata</i> (L.f.) Kurz	Libas	no preservation	seed/stem cutting	anytime	Least concern

Table 5 presents the preservation techniques, modes of propagation, harvesting periods, and conservation status of the 30 food plant species identified among the Tadyawan Tribe. The findings showed that only six species—*Artocarpus odoratissimus* Blanco (uloy), *Artocarpus sericarpus* F.M. Jarrett (tigip), *Capsicum annuum* L. (siling labuyo), *Dioscorea esculenta* Lour. (puloy), *Dioscorea hispida* Dennst. (nami),

and *Dioscorea villosa* L. (banilad)—were preserved through drying, while the remaining species had no reported preservation practices. Seed propagation was the most common method (14 species), followed by tuber (4), sucker (3), seed/stem cutting (3), stolon (2), rhizome (2), seed/sucker (1), and seed/rhizome (1). These practices demonstrate the community's knowledge of both sexual and vegetative propagation for maintaining food plant resources.

Regarding harvesting periods, 20 species could be collected throughout the year, while 10 species were harvested seasonally. The availability of many species throughout the year provides a continuous source of food for the community, whereas seasonal plants may be more dependent on environmental conditions. The use of drying for selected species may help extend their availability beyond their harvesting period. These traditional practices demonstrate the Tadyawan Tribe's adaptation to the seasonal availability and natural distribution of food plants and contribute to the continued transmission of indigenous knowledge concerning plant utilization and management.

Based on the Department of Environment and Natural Resources (DENR) Administrative Order No. 2007-01 and Co's Digital Flora of the Philippines, two species, *Dillenia philippinensis* Rolfe (dingin) and *Alpinia elegans* (C. Presl) K. (bagonggon), were classified as Vulnerable; *Caryota mitis* Lour (pugaan) was classified as Threatened; and *Medinilla magnifica* Lindl. (dalunganan) was classified as Endangered. The presence of these species emphasizes the need for sustainable harvesting, propagation, and habitat conservation. Protecting these plants is particularly important because their continued use by the Tadyawan community depends on maintaining their populations and the indigenous knowledge associated with their sustainable utilization.

Research Question 4: What are the uses of food plants in terms of ethnobotanical quantitative indices such as Relative Frequency Citation (RFC), Data Matrix Ranking (DMR), and Use Value?

Table 6. Food Plants with higher relative frequency citation (RFC)

RANK	FOOD PLANT	RFC
1	<i>Calamus microcarpus</i> Becc.	0.97
2	<i>Musa balbisiana</i> Colla.	0.94
3	<i>Caryota mitis</i> Lour	0.92
4	<i>Capsicum annuum</i> L.	0.88
5	<i>Momordica charantia</i> L.	0.88
6	<i>Hemionitis esculenta</i> Retz.	0.84
7	<i>Ficus Psuedoplama</i> Blanco	0.75
8	<i>Alpinia elegans</i> (C. Presl.) K.	0.72
9	<i>Artocarpus odoratissimus</i> Blanco	0.63
10	<i>Artocarpus sericarpus</i> F.M. Jarrett	0.63
11	<i>Spondias pinnata</i> (L.f.) Kurz.	0.63
12	<i>Litsea garciae</i>	0.50

Table 6 presents the Relative Frequency of Citation (RFC) of the food plant species utilized as food and medicine by the Tadyawan Tribe in Sitio Lagpan. The RFC values ranged from 0 to 0.97, indicating differences in the local importance and frequency of citation of the identified food plants. *Calamus microcarpus* Becc. (tibanga) obtained the highest RFC value (0.97), followed by *Musa balbisiana* Colla. (pakil) (0.94) and *Caryota mitis* Lour (pugaan) (0.91). The shoot or soft trunk of *C. microcarpus* and *C. mitis* was commonly utilized as food, while the fruits and blossoms of *M. balbisiana* were also frequently used.

The high RFC values of *C. microcarpus*, *M. balbisiana*, and *C. mitis* indicate that these species were widely known and frequently cited by the informants. Their high citation rates may be associated with their accessibility and importance as sources of food and traditional medicine for the Tadyawan community. The RFC therefore provides an indication of the local importance of each plant species based on the proportion of informants who recognized or utilized it.

The highly cited food plants may also serve as potential candidates for further phytochemical, pharmacological, and biological investigations to determine their nutritional and medicinal properties. However, such investigations should also consider their safety and possible toxicity. The high RFC values further emphasize the importance of documenting and conserving the indigenous knowledge associated with these plants before such knowledge and resources become less accessible to future generations.

Table 7. Food Plants with higher data matrix ranking (DMR)

	Food Plant	Total	Rank
1.	<i>Calamus microcarpus</i> Becc.	169	1
2.	<i>Caryota mitis</i> Lour	145	2
3.	<i>Momordica charantia</i> L.	84	3
4.	<i>Musa balbisiana</i> Colla.	76	4
5.	<i>Spondias pinnata</i> (L.f.) Kurz.	76	5
6.	<i>Ficus pseudopalma</i>	64	6
7.	<i>Capsicum annuum</i> L.	50	7
8.	<i>Litsea garciae</i>	42	8
9.	<i>Dillenia philippinensis</i> Rolfe	42	9
10.	<i>Hemionitis esculenta</i> Retz.	41	10

Table 7 shows the Data Matrix Ranking (DMR) of the 30 food plant species based on their perceived usefulness as sources of food and medicine. A total of 32 knowledgeable informants participated in the DMR assessment and assigned scores from 0 to 5, where 0 = not used, 1 = least used, 2 = less used, 3 = good, 4 = very good, and 5 = best. The scores for each species were summed and ranked following the method described by Hassan et al. (2017, 2019). Among the identified species, *Calamus microcarpus* Becc. (tibanga) obtained the highest DMR score (169), followed by *Caryota mitis* Lour. (pugaan) with 145 and *Momordica charantia* L. (ampalayang ligaw) with 84. These results indicate that the three species were perceived by the informants as the most useful food plants for both food and medicinal purposes.

In contrast, 12 of the 30 food plant species received a DMR score of zero, indicating that they were not utilized by the Tadyawan participants. These included *Alpinia haenkei* C. Presl., *Amaranthus spinosus* L., *Amorphophallus paeoniifolius* (Dennst.), *Artocarpus odoratissimus* Blanco, *Dioscorea hispida* (Dennst.), *Donax canniformis* (G. Forst.) K., *Gnetum gnemon* L., *Momordica cochinchinensis* Lour., *Premna odorata* Blanco, *Schismatoglottis bogneri*, *Setaria palmifolia*, and *Solanum nigrum*. According to the informants, the limited knowledge regarding the nutritional and medicinal properties of these plants contributed to their non-utilization and low preference within the community. This finding demonstrates that the presence of a plant in the community does not necessarily indicate that it is traditionally utilized.

The top-ranked species also demonstrated economic potential in addition to their food and medicinal uses. The young shoots and trunks of *C. microcarpus* and *C. mitis*, as well as the blossoms of *Musa balbisiana* Colla. (pakil), were reportedly sold in local markets. This finding is consistent with the study of Arquion et al. (2015), which documented *Caryota mitis* Lour. (puguan) and other indigenous plants being sold in markets in Agusan del Sur. Thus, the DMR results highlight not only the cultural and nutritional importance of highly utilized food plants but also their potential contribution to the livelihood of the Tadyawan community.

Table 8. Food plants with the highest Use Value (UV)

Rank	Food Plant	Use Value
1	<i>Calamus microcarpus</i> Becc.	0.70
2	<i>Momordica charantia</i> L.	0.48
3	<i>Caryota mitis</i> Lour.	0.45
4	<i>Musa balbisiana</i> Colla.	0.39
5	<i>Dioscorea villosa</i> L.	0.39
6	<i>Spondias pinnata</i> (L.f.) Kurz.	0.38
7	<i>Alpinia elegans</i> (C. Presl.) K.	0.36
8	<i>Ficus pseudopalma</i> Blanco	0.31
9	<i>Capsicum annuum</i> L.	0.27
10	<i>Hemionitis esculenta</i> Retz.	0.25
11	<i>Litsea garciae</i>	0.25

Table 8 presents the food plants with the highest Use Value (UV), which indicates the relative importance of each species based on the number of uses reported by the informants. *Calamus microcarpus* Becc. obtained the highest UV (0.70), followed by *Momordica charantia* L. (0.48) and *Caryota mitis* Lour. (0.45). Other highly valued species included *Musa balbisiana* Colla. and *Dioscorea villosa* L. (both 0.39), *Spondias pinnata* (L.f.) Kurz. (0.38), and *Alpinia elegans* (C. Presl.) K. (0.36). The high UV of *C. microcarpus*, *M. charantia*, and *C. mitis* indicates their importance as multipurpose resources for the Tadyawan Tribe, particularly as sources of food and traditional medicine.

Calamus microcarpus and *Caryota mitis* were commonly consumed as vegetables, particularly their young shoots or soft trunks. The Tadyawan participants also reported using different plant parts medicinally, including the roots and leaves for treating wounds and the young shoots for stomach-related ailments. *C. microcarpus* was additionally used for handicraft production, demonstrating its multiple functions within the community. These findings are supported by Guzman (2015), who reported the use of rattan shoots as vegetables and documented medicinal properties in its stalks, roots, and leaves. However, the importance of

C. microcarpus varies among communities, as Buenavista et al. (2022) reported a lower UV of 0.30 among local residents of Camiguin Island, Cagayan, Philippines. Similarly, Paraguison et al. (2020) reported considerably lower RFC (0.049) and UV (0.042) values for *C. mitis* as a medicinal plant among the Manobo Tribe of Agusan del Sur, demonstrating that plant utilization may differ according to local knowledge and cultural practices.

The high UV of *M. balbisiana* (0.39) also reflects its nutritional and medicinal importance. Its fruits, flowers, inner trunk, and other parts have been traditionally utilized for food and medicinal purposes. Previous studies have reported antioxidant, antidiabetic, immunomodulatory, hypolipidemic, anticancer, and antimicrobial properties of *M. balbisiana* (Yadav, 2021; Kumar et al., 2021). Likewise, *C. mitis* has been reported to contain phytochemicals such as flavonoids and glycosides associated with antioxidant, anti-inflammatory, antimicrobial, and antidiabetic activities (Perumpuli et al., 2022). El-Akad et al. (2021) further reported the potential of compounds associated with *C. mitis* as sources of chemopreventive agents. Overall, the high UV values demonstrate the cultural, nutritional, medicinal, and economic importance of selected food plants and highlight the value of documenting and conserving the indigenous knowledge of the Tadyawan Tribe.

Ethical Considerations

Before conducting the study, the researcher obtained a work permit from the National Commission on Indigenous Peoples (NCIP) Regional Center to conduct interviews and document plant species. The researcher complied with the requirements for securing Indigenous Knowledge and Practices (IKSPs), Customary Laws (CLs), and the Research and Documentation Guidelines of 2012, particularly Sections 12, 13, and 14. An Affidavit of Undertaking confirming compliance with the prescribed guidelines and procedures was notarized and submitted to the NCIP main office in Quezon City, Metro Manila. Permission to access the study sites was also obtained from the local authorities, including the Barangay Chairman of Barangay Villa Cerveza and the leader of the Tadyawan Tribe. The participants were verbally informed about the study, and the research focused on knowledge holders aged 40 years and above. The study respected the rights, beliefs, traditions, and cultural practices of the Tadyawan community. No activities were conducted that could intentionally violate their rights, exploit their community, or damage their environment and places of cultural significance. To protect indigenous knowledge and cultural sensitivity, photographs and recorded interviews were not permitted. In addition, actual plant specimens were not removed from the province.

Conclusion

This study evaluated the food plant diversity, utilization patterns, geographical distribution, and indigenous knowledge of the Tadyawan Tribe in Sitio Lagpan, Barangay Villa Cerveza, Victoria, Oriental Mindoro. By addressing the lack of documentation on ethnobotanical resources in this region, the research identified 30 food plant species spanning 19 families and 22 genera, revealing that trees and herbs—particularly through their fruits serve as crucial pillars for the community's dietary and medicinal needs. Ethnobotanical indices including Relative Frequency of Citation (RFC), Data Matrix Ranking (DMR), and Use Value (UV) revealed that species such as *Calamus microcarpus* Becc., *Momordica charantia* L., and *Caryota mitis* Lour. hold high cultural and economic significance. Spatial analysis demonstrated predominantly random and clumped distribution patterns across elevation zones, with most species accessible year-round through seed propagation. However, the presence of 12 unutilized species underscores that local plant availability does not automatically translate to traditional use. Furthermore, the identification of threatened species—notably *Caryota mitis* Lour. (Threatened), *Medinilla magnifica* Lindl. (Endangered), and *Alpinia elegans* (C. Presl.) K. (Vulnerable), exposes significant conservation risks under current harvesting practices. These findings emphasize an urgent need to establish sustainable harvesting protocols, localized conservation initiatives, and policy measures that preserve both the threatened flora and the indigenous knowledge of the Tadyawan Tribe for future generations.

Recommendations

Based on the findings of the study, the cultivation and propagation of highly valued food plants should be encouraged, particularly those with high use values. Training on proper cultivation, collection, processing, and post-harvest handling may also be provided to the community. Further field surveys should be conducted to determine the specific locations, abundance, and distribution of each food plant species in the study area. The active participation of the Tadyawan Tribe should be encouraged in the conservation and sustainable management of threatened, endangered, and vulnerable food plants. Further nutritional, phytochemical, and medicinal studies are also recommended to determine the potential benefits and uses of the identified species. Finally, the indigenous knowledge of the Tadyawan Tribe should be properly documented and shared with

younger generations, with the consent and participation of community knowledge holders, to help preserve this knowledge for future generations.

References

- Al Lily, A. E., Abunasser, F. M., Alhajhoj, A., Almaghaslah, D., & Alrabiah, S. (2017). The crucial roles of communication, presentation, and information literacy in education. *Education and Information Technologies*, 22(2), 469–485. <https://doi.org/10.1007/s10639-015-9429-6>
- Ahn, H.-J., & Sitzmann, T. (2011). Using technology to support student self-regulation in problem-based learning environments. *Educational Technology Research and Development*, 59(1), 77–92. <https://doi.org/10.1007/s11423-010-9162-4>
- Ben Youssef, A., Dahmani, M., & Ragni, L. (2022). ICT use, digital skills and students' academic performance: Exploring the digital divide. *Information*, 13(3), Article 129. <https://doi.org/10.3390/info13030129>
- Blau, I., & Shamir-Inbal, T. (2017). Digital literacy: A prerequisite for effective learning in a blended learning environment? *Journal of Educational Technology & Society*, 20(1), 191–202. <https://www.jstor.org/stable/jeductechsoci.20.1.191>
- Chi, M. T. H., & VanLehn, K. (2006). Seeing is believing: Constructing knowledge with dynamic visual literacies. *Journal of the Learning Sciences*, 15(2), 121–147. https://doi.org/10.1207/s15327809jls1502_1
- Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.
- Dwyer, D. C. (2012). The effect of multimedia instruction on student learning. *Review of Educational Research*, 82(1), 55–85. <https://doi.org/10.3102/0034654312437288>
- Kareem, M. A., & Hussein, I. J. (2019). The impact of human resource development on employee performance and organizational effectiveness. *Management Dynamics in the Knowledge Economy*, 7(3), 307–322. <https://doi.org/10.25019/mdke/7.3.02>
- Leithwood, K., Harris, A., & Hopkins, D. (2019). Seven strong claims about successful school leadership revisited. *School Leadership & Management*, 40(1), 5–22. <https://doi.org/10.1080/13632434.2019.1596077>
- Lent, R. W., Brown, S. D., & Hackett, G. (1994). Toward a unifying social cognitive theory of career and academic interest. *Journal of Vocational Behavior*, 45(1), 79–122. <https://doi.org/10.1006/jvbe.1994.1027>
- Mishra, S. (2020). Social networks, social capital, social support and academic success in higher education: A systematic review. *Educational Research Review*. <https://doi.org/10.1016/j.edurev.2019.100307>
- Reardon, S. F., & Portilla, X. A. (2020). Socioeconomic status and educational inequality. *Educational Researcher*, 49(2), 97–110. <https://doi.org/10.3102/0013189X20927533>
- Ribble, M. (2015). *Digital citizenship in schools*. International Society for Technology in Education.
- Tondeur, J., et al. (2017). Preparing pre-service teachers to integrate technology in education. *Computers & Education*, 112, 218–235. <https://doi.org/10.1016/j.compedu.2017.05.001>
- Wang, C. H., Hsu, H. C., & Campbell, R. H. (2019). Technological competency and academic performance among university students. *Computers & Education*, 128, 13–23. <https://doi.org/10.1016/j.compedu.2018.09.004>
- Warschauer, M., & Matuchniak, C. (2010). New times, new literacies: Multilingual learners in a digital world. *Teachers College Record*, 112(1), 214–247. <https://doi.org/10.1177/016146811011200103>
- Zhao, Y., & Frank, K. A. (2018). Factors affecting technology use in schools: An ecological perspective. *American Educational Research Journal*, 55(2), 298–337. <https://doi.org/10.3102/0002831217743225>
- Aati, H., El-Gamal, S. A., & Kayser, O. (2019). Traditional use of ethnomedicinal native plants in the Kingdom of Saudi Arabia. *Journal of Ethnobiology and Ethnomedicine*, 15, Article 2. <https://doi.org/10.1186/s13002-018-0263-2>
- Ahmad, M., Sultana, S., Fazl-i-Hadi, S., Hadda, T. B., Rashid, S., Zafar, M., Khan, M., Khan, P., & Yaseen, G. (2014). An ethnobotanical study of medicinal plants in the high mountainous region of Chail Valley (District Swat-Pakistan). *Journal of Ethnobiology and Ethnomedicine*, 10, Article 36. <https://doi.org/10.1186/1746-4269-10-36>
- Ajit, S. (2012). *Nutraceuticals: Critical supplement for building a healthy India*. Ernst & Young; FICCI Task Force on Nutraceuticals.

- Anwar, F., Gulzar, M., Hussain, M., & Zengin, G. (2016). *Capparis spinosa* L.: A plant with high potential for development of functional foods and nutraceuticals/pharmaceuticals. *International Journal of Pharmacology*, 12(3), 201–219. <https://doi.org/10.3923/ijp.2016.201.219>
- Arquion, R., Galanida, C., Villamor, B., & Aguilar, H. (2015). Ethnobotanical study of indigenous plants used by local people of Agusan del Sur, Philippines. *Asia Pacific Higher Education Research Journal*, 2(2), 46–58.
- Benítez, G., Molero-Mesa, J., & González-Tejero, M. R. (2017). Gathering an edible wild plant: Food or medicine? A case study on wild edibles and functional foods in Granada, Spain. *Acta Societatis Botanicorum Poloniae*, 86(3), Article 3550. <https://doi.org/10.5586/asbp.3550>
- Buenavista, D. P., Mollee, E., & McDonald, M. (2022). Any alternative to rice? Ethnobotanical insights into dietary use of edible plants by the Higaonon in Bukidnon Province, the Philippines. *Regional Sustainability*, 3(2), 95–109. <https://doi.org/10.1016/j.regsus.2022.04.002>
- Buwa, L., Mayekiso, B., Mhinana, Z., & Adeniran, A. (2019). An ethnobotanical and ethnomedicinal survey of traditionally used medicinal plants in Seymour, South Africa: An attempt toward digitization and preservation of ethnic knowledge. *Pharmacognosy Magazine*, 14(58), 624–630. https://doi.org/10.4103/pm.pm_259_18
- Campbell, M. J., Hamilton, B., Shoemaker, M., Tagliaferri, M., Cohen, I., & Tripathy, D. (2002). Antiproliferative activity of Chinese medicinal herbs on breast cancer cells in vitro. *Anticancer Research*, 22(6C), 3843–3852.
- Chanda, S., & Kaneria, M. (2011). Indian nutraceutical plant leaves as a potential source of natural antimicrobial agents. In A. Méndez-Vilas (Ed.), *Science against microbial pathogens: Communicating current research and technological advances* (pp. 1251–1259). Formatex Research Center.
- Chauhan, B., Kumar, G., Kalam, N., & Ansari, S. H. (2013). Current concepts and prospects of herbal nutraceutical: A review. *Journal of Advanced Pharmaceutical Technology & Research*, 4(1), 4–8. <https://doi.org/10.4103/2231-4040.107494>
- Cordero, C. P., Meve, U., & Alejandro, G. J. D. (2022). Quantitative ethnobotanical documentation of medicinal plants used by the indigenous Ati tribes in Panay Island, Philippines. *Malayan Journal of Sustainable Environment*, 9(2), 143–170. <https://doi.org/10.24191/myse.9.18832>
- Dela Cruz, R. (2010). Health-promoting approach to tap PHL indigenous plants. *Bureau of Agricultural Research and Development Digest*, 11(3–4), 7–10.
- El-Akad, R. M., Zeid, A. A., El-Rafie, H. M., Kandil, Z. A., & Farag, M. A. (2021). Comparative metabolites profiling of *Caryota mitis* and *urens* via UPLC/MS and isolation of two novel in silico chemopreventive flavonoids. *Journal of Food Biochemistry*, 45(4), Article e13648. <https://doi.org/10.1111/jfbc.13648>
- Ethnic Groups Philippines. (n.d.). *Tadyawan*. <http://www.ethnicgroupsphilippines.com/ethnic-groups-in-the-philippines/tadyawan/>
- Food and Agriculture Organization of the United Nations. (2014). *Promotion of underutilized indigenous food resources for food security and nutrition in Asia and the Pacific*. FAO Regional Office for Asia and the Pacific. <http://www.fao.org/3/a-i3685e.pdf>
- Guia, V. (2010). Saving the underutilized indigenous crops. *Bureau of Agricultural Research and Development Digest*, 11(3–4), 7–10.
- Guzman, M. (2015). Species diversity of rattan (uay) in selected municipalities in the province of Abra, Philippines. *JPAIR Multidisciplinary Research*, 20(1), 147–162. <https://doi.org/10.7719/jpair.v20i1.318>
- Halberstein, R. A. (2005). Medicinal plants: Historical and cross-cultural usage patterns. *Annals of Epidemiology*, 15(9), 686–699. <https://doi.org/10.1016/j.annepidem.2005.02.004>
- Hassan, N., Din, M., Shuaib, M., Ul-Hassan, F., Zhu, Y., Chen, Y., Nisar, M., Iqbal, I., Zada, P., & Iqbal, A. (2019). Quantitative analysis of medicinal plants' consumption in the highest mountainous region of Bahrain Valley, Northern Pakistan. *Journal of Biodiversity and Environmental Sciences*, 14(3), 35–49.
- Hassan, N., Nisar, M., Nawaz, F. A., & Yinong, L. (2017). Determination of informant consensus factor of medicinal plants used as therapy in District Dir Lower Pakistan. *Journal of Medicinal Plants Studies*, 5(4), 183–188.
- Heinrich, M., Kerrouche, S., & Bharij, K. S. (2016). Recent advances in research on wild food plants and their biological-pharmacological activity. In M. de Cortes Sánchez-Mata & J. Tardío (Eds.), *Mediterranean wild edible plants: Ethnobotany and food composition tables* (pp. 253–272). Springer. https://doi.org/10.1007/978-3-319-27543-7_11
- Hussain, M., Khalid, F., Noreen, U., Bano, A., Hussain, A., Alam, S., Shah, S., Sabir, M., & Habiba, U. (2022). An ethnobotanical study of indigenous medicinal plants and their usage in rural valleys of Swabi and

- Hazara region of Pakistan. *Brazilian Journal of Biology*, 82, Article e243811. <https://doi.org/10.1590/1519-6984.243811>
- Ikinyom, N., Lamwaka, A. V., & Malagala, A. T. (2023). Ethnobotanical study of nutraceutical plants used to manage opportunistic infections associated with HIV/AIDS in Acholi sub-region, Northern Uganda. *Tropical Medicine and Health*, 51, Article 50. <https://doi.org/10.1186/s41182-023-00540-w>
- International Union for Conservation of Nature. (2021). *The IUCN Red List of Threatened Species* (Version 2021-3). <https://www.iucnredlist.org>
- Jafarirad, S., & Rasoulpour, I. (2019). Pharmaceutical ethnobotany in the Mahabad (West Azerbaijan) biosphere reserve: Ethno-pharmaceutical formulations, nutraceutical uses and quantitative aspects. *Brazilian Journal of Pharmaceutical Sciences*, 55, Article e18133. <https://doi.org/10.1590/S2175-97902019000118133>
- Kumar, N., Ved, A., Yadav, R., & Prakash, O. (2021). A comprehensive review on phytochemical, nutritional, and therapeutic importance of *Musa acuminata*. *International Journal of Current Research and Review*, 13(9), 114–124. <https://doi.org/10.31782/IJCRR.2021.13901>
- León-Lobos, P., Díaz-Forestier, J., Díaz, R., Celis-Diez, J. L., Diazgranados, M., & Ulian, T. (2022). Patterns of traditional and modern uses of wild edible native plants of Chile: Challenges and future perspectives. *Plants*, 11(6), Article 744. <https://doi.org/10.3390/plants11060744>
- Łuczaj, Ł., & Dolina, K. (2015). A hundred years of change in wild vegetable use in southern Herzegovina. *Journal of Ethnopharmacology*, 166, 297–304. <https://doi.org/10.1016/j.jep.2015.02.033>
- Mahmood, A., Qureshi, R. A., Mahmood, A., Sangi, Y., Shaheen, H., & Ahmad, I. (2011). Ethnobotanical survey of common medicinal plants used by people of District Mirpur, AJK, Pakistan. *Journal of Medicinal Plants Research*, 5(18), 4493–4498.
- Mekonnen, A. B., Mohammed, A. S., & Tefera, A. K. (2022). Ethnobotanical study of traditional medicinal plants used to treat human and animal diseases in Sedie Muja District, South Gondar, Ethiopia. *Evidence-Based Complementary and Alternative Medicine*, 2022, Article 7328613. <https://doi.org/10.1155/2022/7328613>
- Merrill, E. D. (1912). *A flora of Manila*. Bureau of Printing.
- Mindoro Biodiversity Conservation Foundation, Inc. (2010). *Mindoro biodiversity conservation program thrusts 2010–2020*. MBCFI.
- Montero, J. C., & Geducos, D. T. (2021). Ethnomedicinal plants used by the local folks in two selected villages of San Miguel, Surigao del Sur, Mindanao, Philippines. *International Journal of Agricultural Technology*, 17(1), 193–212.
- Nasri, H., Baradaran, A., Shirzad, H., & Rafieian-Kopaei, M. (2014). New concepts in nutraceuticals as an alternative for pharmaceuticals. *International Journal of Preventive Medicine*, 5(12), 1487–1499.
- National Commission on Indigenous Peoples. (2011). *Indigenous peoples master plan (2012–2016)*. United Nations Development Programme. <https://www.ombudsman.gov.ph/UNDP4/wp-content/uploads/2013/02/Indigenous-Peoples-Master-Plan-2012-2016.pdf>
- Nazareno, R. (2019). The utilization of edible wild food resources of the Hanunuo and Buhid tribes in Bongabong, Oriental Mindoro. *Ascendens Asia Journal of Multidisciplinary Research Abstracts*, 3(2A), 228.
- Nuñez, O. M., Rodriguez, B., & Nasiad, J. (2021). Ethnobotanical survey of medicinal plants used by the Mamanwa tribe of Surigao del Norte and Agusan del Norte, Mindanao, Philippines. *Biodiversitas*, 22(6), 3284–3296. <https://doi.org/10.13057/biodiv/d220634>
- Odebunmi, C. A., Adetunji, T. L., Adetunji, A. E., Olatunde, A., Oluwale, O. O., Adewale, I. O., Ejiwumi, A. O., Itheme, C. O., & Aremu, T. O. (2022). Ethnobotanical survey of medicinal plants used in the treatment of COVID-19 and related respiratory infections in Ogbomosho South and North Local Government Area, Oyo State, Nigeria. *Plants*, 11(19), Article 2667. <https://doi.org/10.3390/plants11192667>
- Pandey, N., Meena, R. P., Kumar, R., Rai, S. K., & Pandey, S. S. (2011). Medicinal plants derived nutraceuticals: A re-emerging health aid. *International Journal of Pharma and Bio Sciences*, 2(1), 420–441.
- Paraguison, L. N., Tandang, D. N., & Alejandro, G. J. D. (2020). Medicinal plants used by the Manobo Tribe of Prosperidad, Agusan Del Sur, Philippines: An ethnobotanical survey. *Asian Journal of Biological and Life Sciences*, 9(3), 392–400. <https://doi.org/10.5530/ajbls.2020.9.49>
- Payum, T., Das, A. K., & Shankar, R. (2014). Nutraceutical folk food plants used among indigenous people of East Siang District of Arunachal Pradesh, India. *American Journal of PharmTech Research*, 4(4), 387–399.
- Pelser, P. B., Barcelona, J. F., & Nickrent, D. L. (Eds.). (2011–present). *Co's digital flora of the Philippines*. <https://www.philippineplants.org>
- Perumpuli, P. A. B. P., Singharathne, S. M. D. S. P., & Wanninaika, I. P. (2022). *Caryota urens*: Value addition, nutritional and medicinal values. *Food Research*, 6(2), 1–10.

- Plants of the World Online. (2022). *Plants of the World Online*. Royal Botanic Gardens, Kew. <http://www.plantsoftheworldonline.org/>
- Priyashree, S., Jha, S., & Pattanayak, S. P. (2010). A review on *Cressa cretica* Linn.: A halophytic plant. *Pharmacognosy Reviews*, 4(8), 161–166. <https://doi.org/10.4103/0973-7847.70910>
- Rosales, R., Casio, C., & Amistad, V. (2018). Floristic inventory and ethnobotany of wild edible plants in Cebu Island, Philippines. *Asian Journal of Biodiversity*, 9(1), 1–18. <https://doi.org/10.7828/ajob.v9i1.1236>
- Rubite, R., Sia, I., Co, L., & Ylagan, L. (2012). *Ethnopharmacologic documentation of selected Philippine ethnolinguistic groups: The Mangyan (Tadyawan) people of Mindoro Island*. Health Research and Development Network (HERDIN). <https://www.herdin.ph/index.php?view=research&cid=76539>
- Sajjad, A., Adnan, S., Alam, H., & Mohamed, E. (2017). Ethnobotanical study of traditional native plants in Al Ain, UAE. *International Journal of Advanced Research in Biological Sciences*, 4(2), 165–174. <https://doi.org/10.22192/ijarbs.2017.04.02.020>
- Shaheen, H., Shinwari, Z. K., Qureshi, R. A., & Ullah, Z. (2012). Indigenous plant resources and their utilization practices in village populations of Kashmir Himalayas. *Pakistan Journal of Botany*, 44(2), 739–745.
- Shikov, A. N., Tsitsilin, A. N., Pozharitskaya, O. N., Makarov, V. G., & Heinrich, M. (2017). Traditional and current food use of wild plants listed in the Russian Pharmacopoeia. *Frontiers in Pharmacology*, 8, Article 84. <https://doi.org/10.3389/fphar.2017.00084>
- Shinde, N., Bangar, B., Deshmukh, S., & Kumbhar, P. (2014). Nutraceuticals: A review on current status. *Research Journal of Pharmacy and Technology*, 7(1), 110–113.
- Teklehaymanot, T., & Giday, M. (2010). Ethnobotanical study of wild edible plants of Kara and Kwego semi-pastoralist people in Lower Omo River Valley, Debub Omo Zone, SNNPR, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 6, Article 23. <https://doi.org/10.1186/1746-4269-6-23>
- Tounekti, T., Mosbah, M., & Khemira, H. (2019). Ethnobotanical study of indigenous medicinal plants of Jazan Region, Saudi Arabia. *Evidence-Based Complementary and Alternative Medicine*, 2019, Article 3190670. <https://doi.org/10.1155/2019/3190670>
- Tshabalala, T., Mutanga, O., & Abdel-Rahman, E. M. (2022). Predicting the geographical distribution shift of medicinal plants in South Africa due to climate change. *Conservation*, 2(4), 694–708. <https://doi.org/10.3390/conservation2040045>
- Ulian, T., Diazgranados, M., Pironon, S., Padulosi, S., Liu, U., Davies, L., Howes, M.-J. R., Borrell, J. S., Ondo, I., Pérez-Escobar, O. A., & Mattana, E. (2020). Unlocking plant resources to support food security and promote sustainable agriculture. *Plants, People, Planet*, 2(5), 421–445. <https://doi.org/10.1002/ppp3.10145>
- Villanueva, E. L., & Buot, I. E., Jr. (2018). Vegetation analysis along altitudinal gradient of Mt. Ilong, Halcon Range, Mindoro Island, Philippines. *Philippine Journal of Systematic Biology*, 12(1), 60–74.
- Yadav, A. (2021). Banana (*Musa acuminata*): Most popular and common Indian plant with multiple pharmacological potentials. *World Journal of Biology Pharmacy and Health Sciences*, 7(1), 36–44. <https://doi.org/10.30574/wjbphs.2021.7.1.0073>
- Yazdanshenas, H., Mousavi, S. A., Ali, T., & Shafeian, E. (2016). Identification of medicinal plants based on modern and indigenous knowledge (Case study: GhasemAbad rangeland, west of Isfahan province, Iran). *Report and Opinion*, 8(2), 16–21. <https://doi.org/10.7537/marsrojo8021601>
- Yassin, S., Abera, B., & Ensermu, K. (2015). Ethnobotanical study of indigenous knowledge of plant-material culture in Masha and Yeki Districts, Southwest Ethiopia. *Academic Journal of Plant Sciences*, 9(2), 25–49. <https://doi.org/10.5897/AJPS2014.1241>