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Utilization of plant resources among the *Kankanaeys* in Kibungan, Benguet Province, Philippines

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Abstract. *Bersamin AT, Tayaben JL, Balangcod KD, Balangcod AKD, Cendana AC, Dom-Ogen ET, Licnachan LOC, Siadto B, Wong FM, Balangcod TD. 2021. Utilization of plant resources among the Kankanaeys in Kibungan, Benguet Province, Philippines. Biodiversitas 4: 362-372.* The use of plant resources for human basic need dates back to ancient times. Plants have been man's recourse for natural healing, food, and for cultural practices. This study aimed to document the rich flora of Kibungan, Benguet, Philippines that the *Kankanaey* tribe utilizes. Interviews and focused group discussions were used to gather data and it was supplemented with ocular inspection of the locality. Results revealed that there were various uses of plants that could be categorized into medicinal, food, house construction, and others. The leaves of medicinal plants are more frequently used to treat wounds, diarrhea, cough, and skin inflammation. Decoctions for natural remedies include *gipas (Sarcandra glabra), gawed (Piper betle),* and *kutsay (Allium odorum).* Plant foods such as fruits, root crops, and vegetables are either cultivated or gathered from the forest. Specifically, plants collected from the wild included *pinit (Rubus fraxinifolius), amti (Solanum nigrum), bayabas (Psidium guajava), gatgattang (Sonchus arvensis), galyang (Alocasia macrorrhizos),* and *pako (Diplazium esculentum),* while *kamote (Ipomea batatas)* and corn (*Zea mays*) are cultivated. The pine tree *(Pinus kesiya)* is the main raw material for house construction. Interestingly, *dengaw (Acorus calamus*) is regarded as an amulet, which is believed to ward off evil spirits.

Keywords: *Kankanaey*, Kibungan, medicinal plants, plant resources, utilization, wild plants

INTRODUCTION

The use of plant resources for human basic can be traced back to ancient times. Plants have been a man's recourse for natural healing, food, construction, and cultural practices. Notably, wild sources of medicinal plants were used by man for centuries in traditional healing systems (Ullah et al. 2013) Through the years, this indigenous system of folk medicine is passed down from the older to the younger generations (Ugulu et al. 2009; Ahmad et al. 2014). Additionally, in local societies, traditional healers are recognized and are often part of the cultural and traditional practices. They also have significant influence on local health practices (WHO 1978; Cheikhyoussef et al. 2011). To date, the use of traditional medicine led to the increase of ethnobotanical and ethnopharmacological studies (Verpoorte 2005; Heinrich 2008). Presently, ethnomedicinal studies are essential for the discovery of new herbal remedies from indigenous and endemic plant species (Mahmood et al. 2012, 2013; Tantengco 2018).

With the increasing emergence of diseases, the documentation of the traditional medicinal plants for treatment of various ailments is significant because it provides information that can lead to the discovery of potential and perhaps more efficient plant-based drugs (Rahmatullah et al. 2011). Other than plants being used as medicine, plant resources have provided the basic needs of local communities. Additionally, plants are tapped as raw materials for construction, food, clothing, kitchen paraphernalia, and other uses. The accessibility of the natural resources by local communities has allowed them to develop innovative uses. However, it has been observed that the traditional knowledge is rapidly eroding due to a number of factors such as migration of indigenous people from rural to urban areas, industrialization, rapid loss of natural habitats, and changes in lifestyle. To prevent the loss of ethnobotanical knowledge, it is important to document this before it is irretrievably gone (Teklehaymanot and Giday 2007). Moreover, ethnobotanical studies play an important role to humanity as it can be a source of information for the development of drugs that provide treatment to emerging diseases (Abdallah 2016; Millat 2017; Salvaña and Arnibal 2019; Syahdar et al. 2019). Ethnobotanical studies can also preserve the indigenous plant-based knowledge of the local communities, and ultimately conserve global heritage (Pei 2001; Teklehaymanot and Giday 2007; Fongod et al. 2014;

Yaseen 2015).

The Cordillera region is located in Northern Luzon, Philippines, and is the largest of three mountain ranges. It is endowed with a diversity of flora and fauna with a semi-temperate climate, matched with a rich mix of cultures. The different cultural groups in the Cordillera are knotted with the surrounding environment henceforth have developed indigenous knowledge on plant use. They have used plants for the treatment of various ailments, yet most of these have not yet been scientifically or clinically proven for their efficacy. Drug discovery is currently a top priority in the region due to emerging diseases and the development of resistance of microorganisms to antibiotics (Tacconelli et al., 2017).

Emerging diseases continue to increase, while commercial drugs are becoming expensive which is no longer within the affordability of marginal communities. Additionally, the decline of food sources is an increasing problem as an effect of population growth and climate change. These problems can contribute to poverty. In the past decades, published research on the medicinal properties and nutritional value of indigenous wild plants in the region is limited (Balangcod and Balangcod 2011; Barcelo-Chua 2014). Thus, the discovery of new drugs and promotion of the use of neglected and underutilized indigenous plants are being encouraged.

In recent years, the Philippine government has recognized the importance of ethnobotanical knowledge and drug discovery such that government agencies are now supportive in funding interested groups, mostly researchers from the academe. Therefore, this study aims to document the various useful plants and the accompanying indigenous knowledge of the *Kankanaey* in Kibungan, Benguet Province, and Northern Philippines before this knowledge is lost. This study employed ethnobotanical surveys and focused group discussions specifically among the *Kankanaeys* in Kibungan, Benguet in gathering the important data. Conversely, even with a diversity of cultures with a rich diversity of traditional knowledge on plant uses in the Cordillera, only a few studies on this indigenous knowledge have been published. Thus, this research's result is an important contribution to the growing knowledge or information about plant utilization in the Cordillera and in the country.

MATERIALS AND METHODS

The study area

Benguet is one of the six provinces in the Cordillera Administrative Region, Northern Luzon, Philippines (Figure 1). It is nestled within towering mountain ranges with a semi-temperate climate. It is the home of the centuries-old mummies, a place of steep and high mountains and different kinds of forests. The natural resources, including flora and fauna, are diverse in the region. Additionally, there is also the presence of cultural diversity of several tribes, most have spent their entire life in the forests. Thus, these people have developed their ingenuities in harnessing the plant resources around them. Therefore, indigenous knowledge on plant utilization in the region is inherent in the local communities (Balangcod and Balangcod 2011).

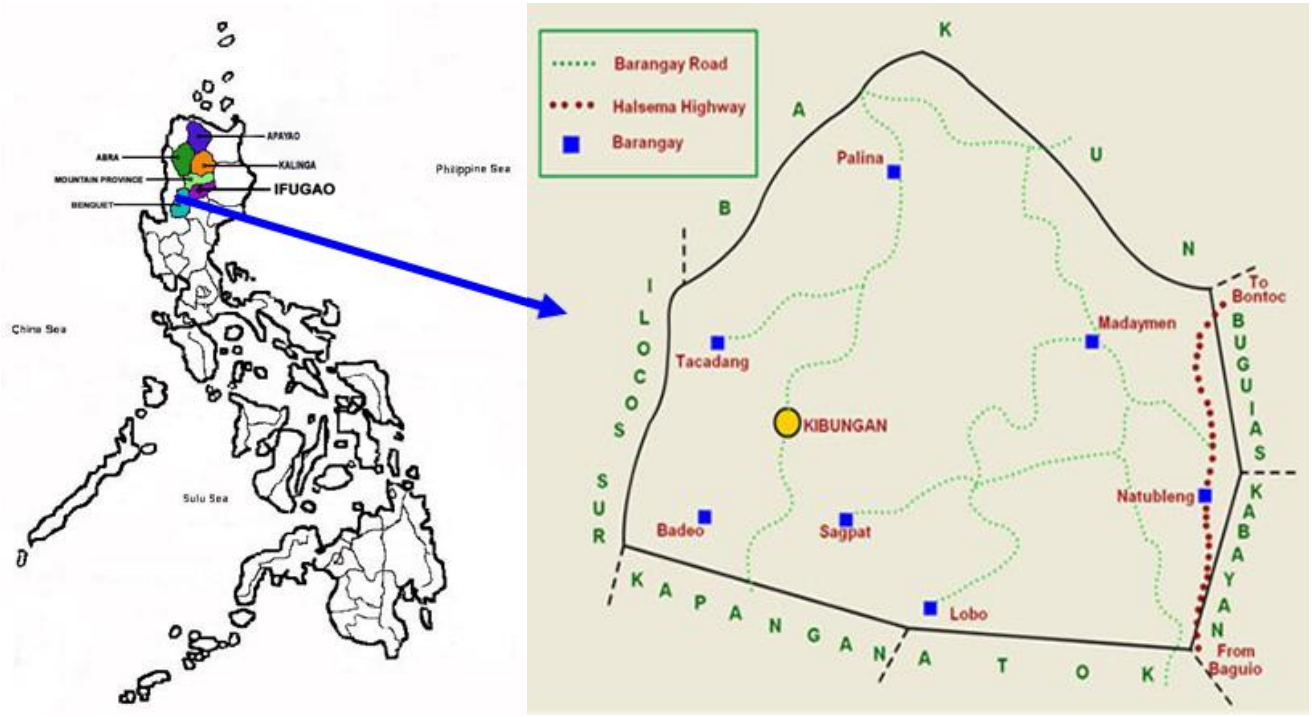

Figure 1. The location of the study area in Kibungan, Benguet Province, Philippines. Map of the Municipality of Kibungan, Benguet, Philippines was retrieved from https://benguet.gov.ph/v3/

Figure 2. The villages in Kibungan, Philippines are situated within the forests hence the forest is the major source of their basic needs

Figure 3. The forests in Kibungan, Philippines display a diverse vegetation

Figure 4. Some parts of the forest are used as foraging area for the cattle of the local communities in Kibungan, Philippines

Kibungan, where this study was specifically conducted, is one of the 13 municipalities of Benguet Province, Philippines. Kibungan (original name is Kibuñgan) is a fourth-class municipality, with geographical coordinates of 16° 41' 49" North and 120° 39' 34" East. The area is mountainous but rich in forest resources (Figures 2 to 4). It has eight barangays (Figure 1) and a population of approximately 17,292 (Philippine Statistics Agency, Population of Benguet 2015). Ninety percent of the population are *Kankanaeys*, the remaining 10% are a mix of other tribes and have stayed in the area as a result of intermarriage. The *Kankanaeys* of Kibungan are hardworking people, with agriculture as their major source of livelihood. They belong to a bigger tribe called the *Igorots* which means mountain people. The term *Igorot* generally refers to all the local communities living in the Cordillera region.

Description of the participants

The 47 participants in this study are mostly *Kankanaeys*, age range is from 20 to 70, with an equal ratio of male and female. Most have stayed in the area for a minimum of 20 years. The predominant occupation is farming. The participants can be described as hardworking people, who almost spend their day time working in the rice fields and *uma* or swidden gardens. They dedicatedly tend their crops, from planting to harvest time, so that they can sell their harvests in order to buy the basic necessities like salt, sugar, and others. The people are humble and most of all, accommodating.

Ethical considerations

Permission from the mayor and prior informed consent from the community were sought before the conduct of the study. The local officials and elders were also present during the consultation. Information regarding ethnobotanical knowledge among the *Kankanaeys* was gathered through focused group discussions and interviews using a semi-structured questionnaire. Field observations confirmed the information gathered through interviews.

Collection of data and plant samples

Field visits involved direct contact with the community. An interview of 47 participants and two focused group discussions were conducted and supplemented with ocular inspection of the locality. Ethnobotanical surveys of the forest were accomplished with the help of some of the informants. A local resident who volunteered as a guide and knowledgeable about the uses of the plants and their distribution, was very helpful in data gathering. She accompanied us to the areas where we can collect some plant samples. Variables used to characterize and summarize the data were: local or common name, scientific name, family, parts of the plant used, ailments cured, how the plants were used, and citation frequency. The Use Value (UV) is an index that indicates relative importance of a species. This was computed for the medicinal plants following the formula, $UV = \Sigma Ui / n$ where: Ui = the number of uses mentioned by each informant for a given species, n = the total number of informants (Zenderland et al. 2019). The Use Value is an index developed, that is applied in ethnobotany to calculate a value per folk or biological plant taxon.

RESULTS AND DISCUSSION

Plant usage is an important part of human existence. The uses of plants can range from the most basic such as food, medicine, and clothing as well as other uses like construction of dwellings, animal houses, fences, ornaments, rituals, and others. The local communities in the Philippines, often times referred to as cultural minorities, have common and unique ways of plant utilization. This can be attributed to the type of vegetation that is present in their surroundings. It was observed that plants common in different places had common uses among the local groups. The plants that are unique in distribution has also unique uses for each group.

To the *Kankanaey* in Kibungan, there are various uses of plants that have been documented based on the interviews and focused group discussions. These are summarized separately according to their uses in Tables 1 to 4.

Medicinal plants used by *Kankanaey*s in Kibungan, Benguet, Luzon, Philippines

Twenty-eight plants were identified that has medicinal values and are being used by the informants. The leaves of medicinal plants are frequently used as decoction and poultice to treat wounds, diarrhea, cough, and skin inflammation. Among these natural remedies, *gipas (Sarcandra glabra), gawed (Piper betle),* and *kutsay (Allium odorum)* were noted as the common medicinal plants.

Of the 28 plants, four plants namely, *bayabas* (*Psidium guajava*), *bawang* (*Allium sativum*), *laya* (*Zingiber officinale*), and *subusob* (*Blumea balsamifera*) is included in the ten herbal plants identified by the Department of Health. It is interesting to note that twenty-eight plants are being used as herb or alternative medicine by the community for the treatment of ailments. The same plants were also reported by authors who made a study on the *Kalanguya* in Tinoc, Ifugao, Philippines and in Punjab Province, Pakistan (Balangcod and Balangcod 2011; Rehman 2017). The Department of Health had endorsed 10 herbal plants used by indigenous communities as cure for various ailments (Philippine Department of Health 2004).

From Table 1, it can be discerned that plants have various uses in the treatment of ailments. Wounds are the commonly treated conditions and the common diseases treated are cough and diarrhea. The plant part that is commonly used is the leaves. Interestingly, the Philippines' different local communities demonstrate similarities in the utilization of the plant resources around them. This finding is supported by a study that reported plant utilization among the *Negritoes*, *Ibaloi*, and *Kalanguya* (Fox 1952; Balangcod 2001; Balangcod and Balangcod 2011). This is perhaps because these societies have similar concepts of diseases.

Plant parts used

For the medicinal plants, it was observed that most preparations involved infusion or decoction of leaves. The stem and roots were used sparingly. For the food plants, the identified plants are mostly cropped hence are cultivated. Almost all plant parts are edible. Specifically, leaves are mostly gathered, cooked, and consumed. Fruits of cultivated plants like guava, beans (*Phaseolus vulgaris)*, *kape (Coffea arabica)*, papaya (*Carica papaya*), *saba* (*Musa paradisiaca)*, *sili* (*Capsicum frutescens*), *zucchini* (*Cucurbita pepo*), *sayote* (*Sechium edule)* and others are eaten raw. Common wild fruits like *pinit* (*Rubus fraxinifolius*) and *ul-ek* (*Saurauia elegans)* are gathered from the forests. Seeds of corn are also cooked and eaten. Other plant parts such as rhizomes of *gabi* (*Colocasia esculenta*) and stem and shoots of *camote* (*Ipomoea batatas*) are also eaten after cooking. Construction materials for dwellings are sourced from the stem of woody plants and leaves of *cogon* (*Imperata cylindrica*). Brooms are made by bundling the stem and leaves of *buybuy* or tiger grass *(Thysanolaena latifolia*). The following tables demonstrate the different plants and the plant parts that are used.

Mode of preparation

For the mode of preparations for the medicinal plants in Table 1, it can be observed that this depends on the type of disease or ailment being treated. Usually for skin-related diseases, the common preparation is crushing the leaves and applying on the affected area as a poultice. For washing or use as an aseptic, this is done by decoction or boiling the leaves or other plant parts. Likewise, decoction is also used to treat cough and colds. For stomach related as well as kidney ailments, the common preparation is decoction of the leaves, stems, or barks and then drunk; some consume the plant part raw.

Frequency and use value

In table 1, most of the participants (frequency) revealed that *gawed* (*Pierp betle*) was the most known cure for fever (11), nine participants claimed that *kutsay* (*Allium odorum*) is used for the treatment of wounds and cough. *Gipas* (*Sarcandra glabra*), locally called mountain tea, is claimed by seven participants as cure for urinary tract infection (UTI), wounds, colds and as a source of antioxidants.

In recent years, the use of another indicator to denote the importance of a plant species for medicinal purposes is the use-value. Use value indicates the importance value of the plant, thus high scores indicate that the plant has higher importance value to the community. In Table 1, four plants namely; *bayabas* (*Psidium guajava*), *dengaw* (*Acorus calamus*), *gipas* (*Sarcandra glabra*) and *laya* (*Zingiber officinale*) have equal importance value of 0.085, two plants namely; *guyabano* (*Annona muricata*) and *sepal* (*Drimys piperata*) have importance values of 0.064. An importance value of 0.43 was reflected by five plants such as *dengaw* (*Acorus calamus*), *paragis* (*Eleusine indica*), *pinit* (*Rubus fraxinifolius), putputod* (*Equisetum ramosissimum*) and *subusob* (*Blumea balsamifera*). These plants with the top three high scores of use value demonstrate their importance to the local community in Kibungan.

Table 1. Medicinal plants used by the *Kankanaeys* in Kibungan, Benguet, Luzon, Philippines

Local or common name	Scientific name	Family	Plant part used	How the plant is used	Ailments/ diseases cured	Citation Freq.	Use value
Atelba	*Viburnum luzonicum* Rolfe	Caprifoliaceae	Fruit	Decoction of fruit is given during loose bowel movement (LBM)	Loose Bowel Movement	1	0.021
Avocado	*Persea americana* Mill.	Lauraceae	Leaves	Decoction of leaves is given during diarrhea and to relieve stomach pain	Diarrhea, stomach pain	1	0.043
Bawang	*Allium sativum* L.	Alliaceae	Bulb	Pounded and applied as poultice during toothache	Toothache	1	0.021
Bayabas	*Psidium guajava* L.	Myrtaceae	Shoots, fruit	Crushed shoots are applied as poultice on wounds; Decoction of shoots is used for allergies and rashes; Fruit and shoot is eaten during diarrhea;	Wounds, diarrhea, Allergies, Rashes	6	0.085
Biday	*Ocimum tenuiflorum* L.	Lamiaceae	Root	Crushed roots are applied as poultice on wounds	Wounds	1	0.021
Dungaw/dengaw	*Acorus calamus* L.	Acoraceae	Roots, stem	Crushed roots are applied as poultice on affected area to relieve muscle pain, skin allergy and reduce inflammation; Decoction of stem is given for dysentery	Muscle pain, skin inflammation or allergy, dysentery	3	0.085
Eng-eng nga (mushroom)	*Auricularia polytricha* (Mont.) Sacc.	Auriculariaceae	All parts	Eaten raw to expel worms (both humans and animals)	Expel worms	1	0.021
Gawed	*Piper betle* L.	Piperaceae	Leaves	Leaves are applied directly on the forehead to abate fever	Fever	11	0.021
Gipas	*Sarcandra glabra* (Thunb.) Nakai	Chloranthaceae	Leaves, roots	Decoction of leaves and roots is given during colds and urinary tract infection (UTI); It is also used to wash wounds; Leaves are also used as tea for cleansing	UTI, wounds, colds; anti-oxidant	7	0.085
Guyabano	*Annona muricata* L.	Annonaceae	Fruits, leaves	Decoction of leaves is drunk as tea to treat cancer and for cleansing	Cancer, cleansing (anti-oxidant)	2	0.064
Kutsay	*Allium ramosum* L. (Syn: *Allium odorum* L.)	Alliaceae	Leaves	Crushed leaves are applied as poultice on wounds, Decoction of leaves is given during cough	Wounds, cough	9	0.043
Lagundi	*Vitex negundo* L.	Lamiaceae	leaves	Decoction of leaves is used during cough	Cough	1	0.021
Lantana	*Lantana camara* L.	Verbenaceae	Leaves	Decoction of leaves is given during cough	Cough	1	0.021
Laya	*Zingiber officinale* Roscoe	Zingiberaceae	Rhizome	Decoction from the pounded rhizome is given during cough; can also be used as wash for wounds and after giving birth, and poultice to relieve joint pain; Taken to induce lactation	Cough, wound, Joint Pain, induce lactation	6	0.085
Lemon grass	*Cymbopogon citratus* (DC.) Stapf	Poaceae	Leaves, roots	Boiled and taken as tea for cleansing	As anti-oxidant	1	0.021
Madre de Cacao	*Gliricidia sepium* (Jacq.) Kunth ex Walp.	Fabaceae	Leaves	Leaves are applied directly on the forehead to abate fever	Fever	1	0.021

Mahogany	*Swietenia mahagoni* (L.) Jacq.	Meliaceae	Seed	Eaten directly during diarrhea	Diarrhea	1	0.021
Papait/bibiday	*Ageratina adenophora* (Spreng.) R.M.King & H.Rob.	Asteraceae	Leaves	Crushed leaves are applied as poultice on wounds	Wounds	4	0.021
Paragis	*Eleusine indica* (L.) Gaertn.	Poaceae	Leaves and roots	Decoction of leaves is given for cleansing/ detoxification and treating dysmenorrhea	Cleansing, hypertension, dysmenorrhea	3	0.043
Pineapple	*Ananas comosus* (L.) Merr.	Bromeliaceae	Fruit peel	Boiled as tea for cleansing	As antioxidant	1	0.021
Pinit	*Rubus fraxinifolius* Poir.	Rosaceae	Leaves, trunk	Decoction of leaves and trunk is given during urinary tract infection	Urinary Tract Infection	1	0.043
Putputod (horsetail)	*Equisetum ramosissimum* Desf.	Equisetaceae	All parts	Decoction of all parts is given during urinary tract infection and kidney ailments	Urinary Tract Infection, kidney ailments	2	0.043
Sili	*Capsicum frutescens* L.	Solanaceae	Seed	Gently rubbed on wounds	Wounds	2	0.021
Sipal/sepal	*Drimys piperita* Hook.f.	Winteraceae	Fruit	Dried and given during stomach ache; Eaten raw; decoction of fruit is given during loose bowel movement (LBM)	Stomach ache, LBM	2	0.064
Subusob	*Blumea balsamifera* (L.) DC.	Asteraceae	Leaves, roots	Decoction of leaves is given during cough. Roots are boiled and the vapor is inhaled to treat colds.	Cough, Colds	2	0.043
Tabako	*Nicotiana tabacum* L.	Solanaceae	Leaves	Crushed leaves are applied as poultice on lump	Lump	1	0.021
Tagumbaw	*Jatropha curcas* L.	Euphorbiaceae	Bark, leaves	Crushed leaves and bark are applied as poultice on fractures	Fracture	3	0.021
Tinapong	*Coffea arabica* L.	Rubiaceae	Fruit	Toasted and directly eaten during diarrhea	Diarrhea	1	0.021

Table 2. Plants used for food by the *Kankanaeys* in Kibungan, Benguet, Luzon, Philippines

Local or common name	Scientific name	Family	Plant part used	How the plant is used	Cultivated or taken from the wild	Citation freq.
Amti (weeds)	*Solanum nigrum* L.	Solanaceae	Leaves	Cooked, mixed with other foods	Forest	2
Ayusep	*Vaccinium myrtoides* Miq.	Ericaceae	Fruit	Eaten raw	Wild	2
Bayabas	*Psidium guajava* L.	Myrtaceae	Shoots, Fruit	Cooked or eaten raw	Cultivated or wild	9
Bilis	*Garcinia vidalii* Merr.	Clusiaceae	-	Eaten raw	Wild	1
Binnok	*Medinilla* sp.	Melastomataceae	Leaves, fruit	Eaten raw	Wild	2
Camote	*Ipomoea batatas* (L.) Lam.	Convolvulaceae	Root	Cooked and mixed with other food	Cultivated or wild	6
Cassava	*Manihot esculenta* Crantz.	Euphorbiaceae	Tuber	Cooked	Wild	2
Climbing Beans	*Phaseolus vulgaris* L.	Fabaceae	Fruit	Cooked	Wild	1
Corn	*Zea mays* L.	Poaceae	Kernel,	Cooked	Cultivated or wild	11
Gabi	*Colocasia esculenta* (L.) Schott	Araceae	Leaves, root	Cooked	Cultivated or wild	9
Gaddang	*Languas haenkei* (C.Presl) Merr.	Zingiberaceae	Fruit	Eaten raw	Cultivated or wild	1
Gagattang (Weeds)	*Taraxacum officinale* F.H.Wigg.	Asteraceae	Leaves	Cooked, mixed with other foods	Wild	7
Galyang	*Alocasia macrorrhizos* (L.) G.Don.	Araceae	Corm, leaves	Cooked	Cultivated	8
Kape	*Coffea arabica* L.	Rubiaceae	Bean	Brewed and drank	Cultivated or wild	8
Kendoy/Kendey	*Rorippa indica* (L.) Hiern.	Brassicaceae	Leaves	Cooked	Taken from the wild	3
Laya	*Zingiber officinale* Roscoe	Zingiberaceae	Rhizome	Cooked, mixed with other foods	Wild, cultivated	9
Pako	*Diplazium esculentum* (Retz.) Sw.	Athyrioideae	Leaves, Stem	Cooked	Cultivated or wild	9
Papaya	*Carica papaya* L.	Caricaceae	Fruit	Eaten raw	Cultivated or wild	1
Pinet, Pinit	*Rubus* sp.	Rosaceae	Berries, fruit	Eaten raw	Wild	3
Pomelo	*Citrus maxima* (Burm.) Merr.	Rutaceae	Fruit	Eaten raw	Cultivated or wild	1
Pising	*Colocasia esculenta* (L.) Schott	Araceae	Corm, leaves	Cooked	Cultivated	1
Saba	*Musa* × *paradisiaca* L.	Musaceae	Fruit	Eaten raw or cooked	Cultivated	2
Sayote	*Sechium edule* Sw.	Cucurbitaceae	Fruit	Cooked and mixed with other food	Taken from the wild	2
Sili (Labuyo)	*Capsicum frutescens* L.	Solanaceae	Fruit	Condiment	Cultivated	1
Suyok(Rono), bellang	*Miscanthus sinensis* Anders.	Poaceae	Shoots	Eaten raw	Wild	1
Ul-ek. Utok	*Saurauia elegans* Fern.-Vill.	Saururaceae	Fruit	Eaten raw	Wild	1
Zucchini	*Cucurbita pepo* L.	Cucurbitaceae	Flower	Cooked and mixed with other food	Cultivated	1

Table 3. Plants used for construction, carving, broom making and firewood by *Kankanaeys* in Kibungan, Benguet, Luzon, Philippines

Local or common name	Scientific name	Family	Plant part used	How the plant is/ are used	Where gathered	Citation freq.
Alnus	*Alnus japonica* (Thunb.) Steud.	Betulaceae	Trunk	Posts, walls, firewood	Forest	6
Apiit/Apiitan	*Clethra canescens var. luzonica* (Merr.) Sleumer	Clethraceae	Trunk, stem	Animal house, hedges/fence	Forest	1
Atelba	*Viburnum luzonicum* Rolfe	Caprifoliaceae	Stem	Hedges	Forest	1
Bayabas	*Psidium guajava* L.	Myrtaceae	Stem	Fences, stakes	Forest	1
Buybuy	*Thysanolaena latifolia* (Roxb. ex Hornem.) Honda	Poaceae	Leaves, stem	Bundled to make brooms	Forest and cultivated	7
Cogon	*Imperata cylindrica* (L.) P.Beauv.	Poaceae	Leaves	Used as roofing material	Forest	8
Eucalyptus	*Eucalyptus globulus* Labill.	Myrtaceae	Trunk, stem	Posts, flooring, walls	Forest and cultivated	1
Kawayan/Bamboo	*Bambusa vulgaris* Schrad. ex J.C.Wendl.	Poaceae	Stem	Hedges	Forest	1
Manga	*Mangifera indica* L.	Anacardiaceae	Trunk	Furniture, posts	Cultivated	7
Narra	*Pterocarpus indicus* Willd.	Fabaceae	Stem, trunk	Furniture	Forest, cultivated	9
Palayon/Palleyen	*Lithocarpus jordanae* (Laguna) Rehder	Fagaceae	Trunk	Posts, flooring, walls, poles	Forest	1
Pa-o (Rono)	*Miscanthus sinensis* Andersson	Poaceae	Stem	Hedges	Forest	1
Sabbang	*Ficus* sp.	Moraceae	Stem, trunk	Flooring	Cultivated	1
Saleng/Pine tree	*Pinus kesiya* Royle ex Gordon	Pinaceae	Stem, trunk	Posts, flooring, walls, firewood	Forest, cultivated	10
Tuel	*Bischofia javanica* Blume	Euphorbiaceae	Trunk	Pof flooring, walls	Forest	1

Plants used for food by the *Kankanaey*s in Kibungan, Benguet, Luzon, Philippines

The forest of Kibungan is abundant with edible plants, which the community enjoys like fruits, root crops, and vegetables. The *pinit* (*Rubus fraxinifolius*), *amti* (*Solanum nigrum*), bayabas (*Psidium guajava*), *gatgattang* (*Sonchus arvensis*), *galyang* (*Alocasia macrorrhizos*), *kamote* (*Ipomea batatas*) and *pako* (*Diplazium esculentum*) are among the wildly growing food resources. Table 2 presents the plants used for food by the *Kankanaey*s in Kibungan, Benguet. Most of the cultivated edible plants are common in other parts of the country also. It is because these are considered cash crops.

The vegetables are usually gathered, cooked, and consumed. Some are stored for other days like rice, corn, *gabi*, and *camote*. The latter two crops are sometimes reserved and served during festivities called *cañaos*, for the entire community to enjoy. *Cañao* refers to social gatherings among local communities in the Cordillera and is usually characterized by butchering of animals, local dances with gongs' accompaniment, striking of metals and amusements. Meat and vegetables are served to the attending participants and guests, invited or not invited, during a *cañao*. Usually, the merriment is spiced by serving rice wine called *tapuy* that is made from special variety of rice. This wine can raise the spirits and energy of the attendees. The local residents in Kibungan usually share their agricultural produce with their neighbors; some are sold to their marketplace from which the money is used to buy other kitchen needs like salt, sugar, bread and others.

Plants used for construction, carving, broom making, firewood and other uses by the *Kankanaey*s in Kibungan, Benguet, Luzon, Philippines

From the adjoining forests in Kibungan, trees are also gathered for their woody trunks to be used in making houses. The wood is used to build posts, walls, floors, and ceiling joists. The *cogon, Imperata cylindrica*, is utilized as roofing materials. For some plants, the stems and branches are used to build fences around the dwellings to keep stray animals from the immediate vicinity of the household. The *buybuy* (tiger grass*), Thysanolaena latifolia* is bundled to make brooms. The trunks of *manga (Mangifera indica)*, and narra *(Pterocarpus indicus*), are utilized for furniture. Table 3 presents the plants used for these purposes.

Plants used for ornaments/adornment, preservation of the dead, and rituals by *Kankanaey*s in Kibungan, Benguet, Luzon, Philippines

The everyday life and cultural aspect of the local community in Kibungan can be reflected by the way they use some plants (Table 4). The *dengaw (Acorus calamus*) is used as an amulet, which is believed to ward off evil spirits. A piece of the root can also be pinned on clothes especially when travelling far distances from the village as a protection from being harmed by bad spirits that may be encountered along the way. Interestingly, it can be noted that *bayabas (Psidium guajava)* and *niyog (Cocos nucifera)* are used to preserve the dead as substitutes to formalin as embalming agent. The women are also vain as demonstrated by the use of seeds of *takkayan (Coix lacryma-jobi)* for ornaments. Specifically, the women gather the seeds of the said plant and craft these into earrings, bracelets and necklaces. Curtains, bags and similar items can be seen from the beads of *takkayan*. In some places in the Philippines, the seeds can also be crafted into rosaries. In Kibungan, Benguet, the *takkayan* grows wild in rice paddies, riverbanks and marginal areas.

Notably, the different families of plants utilized as food in Kibungan are Solanaceae, Rubiaceae, Brassicaceae, Zingiberaceae, Rosaceae, Rutaceae, Poaceae, Cucurbitaceae, Saururaceae, Caricaceae and Athyrioideae. The flora of Kibungan is of diverse plant families that are wild while others can be cultivated. The *Kankanaey*s are known as vegetable growers or farmers and as such, they also cultivate some plants that grow well on the farm such as *bayabas* (*Psidium guajava*), corn (*Zea mays*), *gabi* (*Colocasia esculenta*), *galyang* (*Alocasia macrorrhiza*), *camote* (*Ipomea batatas*), *kape* (*Coffea arabica*), *laya* (*Zingiber officinale*) and others as shown in Table 2. The plant parts that are mostly utilized for food are the fruits and the leaves. The fruits and the leaves are either cooked or eaten raw.

In Kibungan, Benguet, the plants which are utilized in construction belong to different plant families such as Betulaceae, Pinaceae, Clethraceae, Caprifoliaceae, Myrtaceae, Poaceae, Anacardiaceae, Fabaceae, Fagaceae, Moraceae, and Euphorbiaceae. The trunks are utilized for posts, walls, flooring, and hedges. They are also used as firewood. Most of these are growing in the forest. It can be noted that these plants are highly beneficial as they are the source of materials for house construction.

Table 4. Plants used for ornaments/adornment, rituals/ mummification by *Kankanaeys* in Kibungan, Benguet, Luzon, Philippines

Local or common name	Scientific name	Family	Plant part used	How the plant is used	Where gathered	Citation freq.
Bayabas	*Psidium guajava* L.	Myrtaceae	Leaves, shoots	Mummification, Decoction is used to wash the corpse and as substitute for formalin	Wild or cultivated	9
Dungaw/dengaw	*Acorus calamus* L.	Acoraceae	Roots	Amulet, attached to clothing to drive away evil spirits	Cultivated	14
Niyog	*Cocos nucifera* L.	Arecaceae	Fruit	The extracted oil is rubbed on the body for the preservation of the dead	Forest, cultivated	12
Takkayan/tukkayan	*Coix lacryma-jobi* L.	Poaceae	Fruit	Necklace, bracelet, earring, curtains, bag, Christmas tree, basket	Riverbank, field	11
Rice	*Oryza sativa* L.	Poaceae	Grain	Prayer, drink (*tapuy*)	Cultivated	1

In almost all local communities in the Cordillera, including Kibungan, traditional knowledge on plant use and other natural resources is closely tied with the world of spirits. In each village, it is believed that certain diseases are caused by supernatural beings (Balangcod and Balangcod 2018; Balangcod 2018). Hence, illnesses that cannot be cured or treated by plants and modern medicine, can be treated through the meddling of a priest or *mambunong*, whose role is of prime importance in the village. The village priest usually performs rituals and offerings, in the forms of plants, clothing, and the like, to appease the spirits who are believed to have caused the illnesses.

In general, the close association of the *Kankanaey* with their environment, the development of traditional uses of plants and other resources around them, and their awareness of the importance of the useful plants are commendable. This is revealed in the informal interviews, focused group discussions, and site observations. Additionally, while there are some unique uses of plants among the *Kankanaey* in Kibungan, there also exists a pattern of utilization of plant-based medicines relative to other local communities in the Philippines.

In conclusion, several plants were reported to be used for various purposes such as medicinal, food, house construction and for other purposes. It has been noted that wild plants, which are highly beneficial, are naturally found in Kibungan, Benguet. The traditional uses of plants, not only as medicine but also for other purposes like food, construction and many others are still practiced in Kibungan, Benguet even at present. For future studies, the vast richness of plant indigenous knowledge can be augmented by determining the bioactive components of the medicinal plants and performing bioassays. Additionally, if not managed properly, the continuous gathering of plant resources can lead to their depletion. Therefore, the protection of the environment to conserve the natural habitats of the plants can be promoted. Initiatives for their cultivation can be advocated.

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