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

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Manuscript received: 25 September 2020. Revision accepted: 26 December 2020.

Abstract. Bersamin AT, Tayaben JL, Balangcod KD, Balangcod AKD, Cendana AC, Dom-Ogen ET, Liencachan 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 gipa (Sarcandra glabra), gawed (Piper betle), and kutsay (Allium odoratum). 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 macrorrhiza), 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 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; Cheikhyoussif et al. 2011). To date, the use of traditional medicine led to the increase of ethnobotanical and ethnopharmacological studies (Verpoorte 2005; Heinrich 2008). Presently, ethnomedical 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 ingenuity 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, \[ UV = \frac{\sum U_i}{n} \] where: \( U_i = \) 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 Kankanaeys in Kibungan, Benguet, Luzon, Philippines

Twenty-eight plants were identified that have 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 Kalinga in Tinoc, Ifugao, Philippines and in Punjab Province, Pakistan (Balangcod and Balangcod 2011; Rehman 2017). The Department of Health had endorsed 10 medicinal plants used by indigenous communities as a 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 Negritos, Ibaloi, and Kalanguya (Fox 1952; Balangcod 2001; Balangcod and Balangcod 2011). This is perhaps because these societies have similar concepts of diseases.

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 (Piper 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 pipera) 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.

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

| Local or common name | Scientific name | Family | Plant part | 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     |
| Bidad                | 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.) Nakal | 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     |
| Katsay               | 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     |
| Plant Name          | Scientific Name                          | Family       | Part Used          | Uses                                                                 | Conditions    | BLM |
|---------------------|------------------------------------------|--------------|--------------------|----------------------------------------------------------------------|---------------|-----|
| Mahogany            | *Swietenia mahagoni* (L.) Jacq.          | Meliaceae    | Seed               | Eaten directly during diarrhea                                         | Diarrhea      | 1   |
| Papait/bibiday      | *Ageratina adenophora* (Spreng.) R.M.King & H.Rob. | Asteraceae   | Leaves             | Crushed leaves are applied as poultice on wounds                      | Wounds        | 4   |
| Paragis             | *Eleusine indica* (L.) Gaertn.           | Poaceae      | Leaves and roots   | Decoction of leaves is given for cleansing/detoxification and treating dysmenorrhea | Cleansing, hypertension, dysmenorrhea | 3   |
| Pineapple           | *Ananas comosus* (L.) Merr.              | Bromeliaceae | Fruit peel         | Boiled as tea for cleansing                                            | As antioxidant | 1   |
| Pinit               | *Rubus fraxinifolius* Poir.              | Rosaceae     | Leaves, trunk      | Decoction of leaves and trunk is given during urinary tract infection  | Urinary Tract Infection | 1   |
| 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   |
| Sili                | *Capsicum frutescens* L.                 | Solanaceae   | Seed               | Gently rubbed on wounds                                               | Stomach ache, LBM | 2   |
| 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) | Wounds        | 2   |
| 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   |
| Tabako              | *Nicotiana tabacum* L.                   | Solanaceae   | Leaves             | Crushed leaves are applied as poultice on lump                         | Lump          | 1   |
| Tagumbaw            | *Jatropha curcas* L.                     | Euphorbiaceae| Bark, leaves       | Crushed leaves and bark are applied as poultice on fractures           | Fracture      | 3   |
| Tinapong            | *Coffea arabica* L.                      | Rubiaceae    | Fruit              | Toasted and directly eaten during diarrhea                              | Diarrhea      | 1   |
| 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              |
| Binok                | Medinilla sp.            | Melastomataceae | Leaves, fruit | Eaten raw                                   | Wild                             | 2              |
| Canote               | Ipomoea batatas (L.) Lam.| Convolvulaceae | Root            | Cooked and mixed with other food            | Cultivated or wild                | 6              |
| Cassava              | Manihot esculenta Crantz.| Euphorbiaceae | Tubers          | 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              |
| Gagatang (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 Rosco | Zingiberaceae | Rhizome        | Cooked, mixed with other foods              | Wild, cultivated                 | 9              |
| Pako                 | Diplazium esculentum (Retz.) Sw. | Athyriaceae | Leaves, Stem   | Cooked                                      | Cultivated or wild                | 9              |
| Papaya               | Carica papaya L.         | Caricaceae  | Fruit           | Eaten raw                                   | Cultivated or wild                | 1              |
| Pinit, Pinit         | Rubus sp.                | Rosaceae    | Berries, fruit  | Eaten raw                                   | Wild                             | 3              |
| Pomelo               | Citrus maxima (Bur.) Merr. | Rutaceae    | Fruit           | Eaten raw                                   | Cultivated or wild                | 1              |
| Pising               | Colocasia esculenta (L.) Schott | Araceae | Corm, leaves | Cooked                                      | Cultivated                       | 1              |
| Saba                 | Musa x paradisica 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 (Labayo)        | 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/Apitian        | *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 | Stem, trunk     | 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 Kankanaeys 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), batanggat (Sonchus arvensis), galyang (Alocasia macrorrhiza), kamote (Ipomea batatas) and pakō (Diplazium esculentum) are among the wildly growing food resources. Table 2 presents the plants used for food by the Kankanaeys 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. Cañaos 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 cañaos. 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 Kankanaeys 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 Kankanaeys 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 nyog (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 Athyrioidae. The flora of Kibungan is of diverse plant families that are wild while others can be cultivated. The Kankanaeys 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), kamote (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.              | Arecaeae     | 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                    | Riverbanks, 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.

ACKNOWLEDGEMENTS

The authors are grateful to the Commission on Higher Education DARETO for financial assistance. We are equally thankful to the local communities and participants who unselfishly shared the information. The authors are also grateful to the local government officials for allowing us to conduct the study and to the University of the Philippines Baguio as the lead implementing institution for this project.

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