

## DOCUMENTATION OF ETHNOMEDICINAL PLANTS USED BY THE SUBTRIBES OF LOWER KALINGA PROVINCE.

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### Abstract

Kalinga is a landlocked province situated in the Northern Luzon of the Philippines where the absence of data-build up about the identity of ethnomedicinal plants used by the subtribes of lower Kalinga was crucial. Methods were anchored in the Exploratory Sequential Design where ethnobotanical data were obtained by conducting many field trips, questionnaires, open-end and semi-structured interviews, inquiries, and group gathering from 2019-2021. The study looked into the names, parts used, diseases used, mode of preparations, and route of administration and classification of the documented ethnomedicinal plants. The ethnobotanical data were quantitatively studied using the informant consensus factor (ICF), fidelity level (F.L.), and medicinal use values (MUV) of plants. Results show 80 medicinal plants in the study areas, belonging to 80 species, 73 genera, and 42 families, leaves have the highest utilization of 63%, decoction with the highest 52%, and oral with the highest 53%. Four diseases have the highest ICF of 100, ten plant species have the highest fidelity level of 100%, and five notable medicinal plants have high MUV; *Cinnamomum* species with 3.95, *Eleusine indica* with 2.40, *Vitex negundo* with 1.96, *Lagerstroemia speciosa* with 1.33, *Cymbopogon citratus* with 1.26, and “omos” 1.25. Result of the study revealed that subtribes have maintained the use of medicinal plants for common, infectious, and even emerging diseases such as CoViD-19, leaves are the most utilized parts, decoction and oral are the commonly used preparation and administration respectively, there are diverse medicinal plants in the area, and some unusual plants are becoming rare and extinct. The researchers recommend conducting a follow-up study on the effectiveness of medicinal plants against CoViD-19, conducting training on the proper preparations of various medicinal plants, and conserving and propagating rare medicinal plants.

**Keywords:** Ethnomedicinal plants, subtribes, Lower Kalinga Province, Fidelity Level, Informant consensus Factor, Medicinal Use Value

## INTRODUCTION

### Background

The World Health Organization (WHO) has reported that 88% of its member states have acknowledged traditional and complementary medicine use. These countries have developed policies, laws, regulations, programs, and offices for such purposes (WHO, 2019).

As one of the member states of WHO, the Philippines is one of the 12 countries with the richest biodiversity in various ecological niches – one of them is the forest areas settled by indigenous groups who claim these territories as their ancestral domains. As occupants of these territories, they have direct control over the flora and fauna that abound in their environs. This situation allowed them to use living things to their advantage – for food, shelter, and health. Given their relationship with Mother Nature since time immemorial, these ethnic communities hold a vast body of knowledge on the beneficial use of botanical species growing in their villages. It is this

knowledge that this proposal would like to tap.

The significance of this project lies in the build-up of data about the identity of ethnomedicinal plants used by the subtribes of lower Kalinga. Such baseline information may find usage in classifying and categorizing medicinal properties of ethnobotanical species that can treat various diseases. This documentation would result in the definitive Identification of ethnobotanical plants with medicinal attributes found in Kalinga province. Further, this can lead to comparative endeavor with existing documentations done in other parts of the Cordillera Region – thus establishing the rarity and endemism of each particular plant. This project ultimately found a commonality among documentation outputs in the region, therefore preventing duplicity and biopiracy.

In addition, this study significantly benefits the yet-to-be-established Herbal Processing Center of the Kalinga State University as the resulting output served as an authoritative material in the growing of herbs deemed worthy of inclusion in the Processing Center's collections.

### Conceptual framework

The researchers adopted the concept of developing a traditional knowledge digital library (TDKL) developed by Dr. Sia et al. The idea starts with the indigenous knowledge on the use of medicinal plants of given tribal communities to be documented. The indigenous knowledge demonstrated was the plant parts used, diseases cured or beneficial services, mode of preparation, and route of administration.

Since IPRA Law covers the target communities, the study has undergone the required processes as stipulated in the guidelines. The traditional knowledge derived in this study will be included in the existing digital library for broader dissemination and protection.

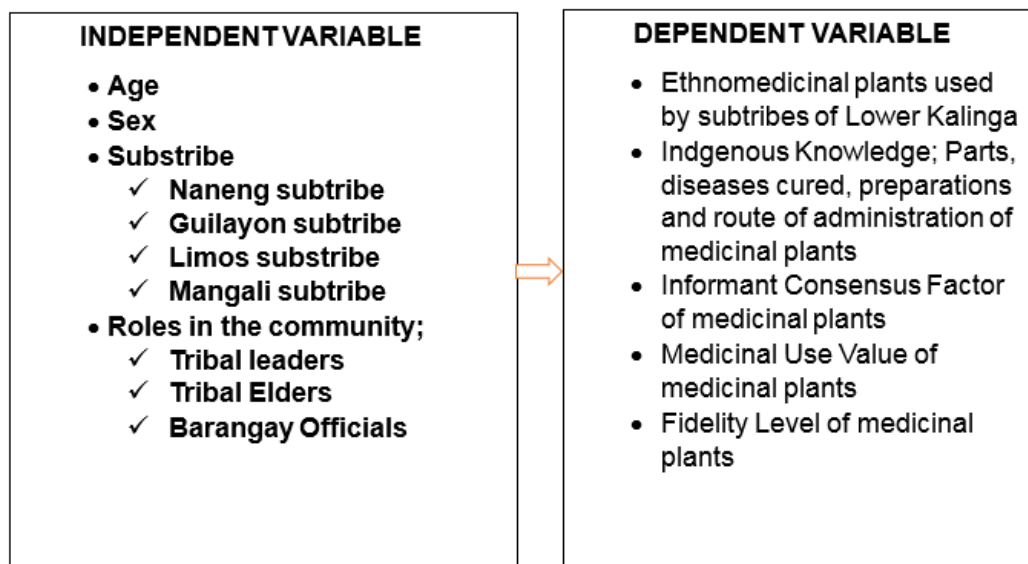


Figure 1: Conceptual framework of the study

### **Objectives of the study**

The study documented the ethnomedicinal plants used by the subtribes of Lower Kalinga Province. Specifically it;

1. Documented the ethnomedicinal knowledge of the subtribes of Lower Kalinga, particularly the Nanong, Guilayon in Tabuk City, and Limos of Pinukupuk and Mangali and Taloctoc of Tanudan in terms of;
  - a) Name of the ethnomedicinal plants
  - b) parts used for medicinal purposes
  - c) preparation of documented ethnomedicinal plants
  - d) how the medicines were administered
2. Identified and classified the ethnomedicinal plants of the Lower Kalinga
3. Determined and ascertained the following;
  - a) the Informant Consensus Factor (ICF)
  - b) The fidelity level (F.L.) of plants
  - c) The medicinal use-value (MUV) of plants
4. Store the findings into a database containing traditional knowledge and health and healing practices of the subtribes of Lower Kalinga

### **Significance of the study**

The end-users and target beneficiaries of this project are the Ykalingas. The end-user would have baseline information for drug development. Specifically, outputs of this study would empower the following entities;

Department of Health - That they may be given baseline data on the presence of ethnomedicinal plants used by the subtribes of Lower Kalinga

The subtribes of Lower and Upper Kalinga - They may be encouraged to sustain the cultivation of these plants for their source of cheaper and lesser invasive treatment and management of various diseases.

Benefits to biomedicine- The data about the plants may serve as a potential source of raw materials that can be used in the future development of drugs.

Health workers in indigenous communities may use the information to enhance their health service delivery, e.g., making their services culture-sensitive.

Environment advocates – They can use the information to emphasize the rich biodiversity of these communities in their campaign to conserve the forests or rationally manage the forest resources.

Cultural workers can use the information in their advocacy, promotion, and protection of our

cultural heritage.

Filipino researchers may wish to pursue scientific studies to determine the efficacy and safety of medicinal plants or other healing modalities.

Policymakers can use the information to establish a sui generis system protecting indigenous and local communities' traditional knowledge and practices.

Other researchers -This study may create awareness of the potentials of common yet unnoticed backyard plants and may be inspired to explore the different medicinal uses of the documented plants.

### **Scope and delimitation**

This study focused on the documentation of ethnomedicinal plants used by the subtribes of Naneng, Guilayon, Limos, Taloctoc, and Mangali of Lower Kalinga Province. The documentation was limited to the name of the plant used, plant parts, use or diseases cured, preparation, and route of administration.

## **METHODOLOGY**

Methods were anchored in the Exploratory Sequential Design where ethnobotanical data were obtained by conducting many field trips, questionnaires, open-end and semi-structured interviews, inquiries, and group gathering from 2019-2021. The study looked into the names, parts used, diseases used, mode of preparations, and route of administration and classification of the documented ethnomedicinal plants. The ethnobotanical data were quantitatively studied using the informant consensus factor (ICF), fidelity level (F.L.), and medicinal use values (MUV) of plants.

### **Locale of the study**

The study was conducted in the barangays of Naneng, Guilayon of Tabuk City, Limos of Pinukpuk, Taloctoc and Mangali of Tanudan in the Lower Kalinga Province.

The selection of these study communities was based on the following criteria; the reputed richness of indigenous healing traditions (presence of traditional healers), the richness of the biodiversity of the natural domain of the people, expressed willingness and capacity of the community to participate, and peace and order situation in the community.

The selection was based on consultation with researchers and leaders from the academe, government sector (National Commission on Indigenous Peoples, Department of Environment and Natural Resources, local government units), civil society organizations, and the community.

### **Research design**

This study adopted the traditional knowledge digital library (TDKL) template developed by Dr. Sia (Appendix A). This template utilized the Exploratory Sequential Design that operates on collecting qualitative data through an Interview Guide. This written questionnaire was

personally administered during a respondent-to-respondent visit. This approach ensured the proper recording of responses from the respondents. Furthermore, this method aided in the Identification of discrepancies of information from the respondents.

### **Respondents**

Eighty informants participated in this study. These respondents were composed of tribal leaders, elders of the tribe, barangay officials, known “herbolarios” or healers, and adults with knowledge in traditional medicine.

Pre-identification of individuals for the Key Informants Interview was carefully done, with the selection scheme based on their long-held reputation as actual practitioners of ethnomedicine in the village.

### **Instrumentation**

A non-standardized interview guide was prepared to facilitate the in-depth interviews of healer informants and family health caregivers. The interview gathered information on various aspects of ethnobotany, including the respondent's demographic information, the knowledge on the use of the ethnomedicinal plants, parts used for medicinal purposes, preparation of documented ethnomedicinal plants, and how the medicines are administered. Based on the local names, the Identification of plants was confirmed by showing the respondents the sketches of the actual plants published in the book *Common Medicinal Plants of the Cordillera Region* (Co, 1989). Other important questions were also be posed aside from those prepared. Interviews would naturally flow like informal conversations to let them speak spontaneously and not feel pressured. The researchers also noted remarks and opinions that may be uttered.

As part of the FPIC, informants were asked if they consent to the recording and videography of the whole proceedings, explaining that such a record greatly helped collect and interpret data.

Photo documentation of the ethnomedicinal plants, the location, and the preparation process.

Plans for data processing and analysis

### **Documentation of traditional knowledge and practices on health, disease, and healing**

Through the community participatory research approach and the methodologies described below, the following was documented: the physical attributes of the study community (access, topography, climate, and the like), the demography, and the ethnography. Likewise, the beliefs, knowledge, and practices on health, disease, and healing were documented. The project espouses the definition of traditional medicine as "the Total of knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures. These are used in the maintenance of health and the prevention, diagnosis, improvement of treatment of physical and mental illness," as defined by the World Health Organization.

The research team documented the community's concepts of health and wellbeing, illness, and healing. We wanted to learn about the illnesses which the community experience and how they respond to each one. We are interested in their stated etiology of illnesses. We would like to

learn how they define a healer and the different types of healers and healing methods. We want to know what they think of western/biomedical healing practices and why they utilize them. The researchers listened to the stories/experiences of healers and caregivers (mothers, fathers, grandparents) in providing health care.

### **Data gathering**

Before conducting all activities, the researchers obtained the Free Prior and Informed Consent (FPIC). The Provincial Office of the National Commission on Indigenous Peoples (NCIP) conducted and facilitated this process.

The following methods for gathering data were used after due consultation with the community and may be adjusted to become more culturally appropriate:

- a. Review of records
- b. Interviews
- c. Focus group discussion (FGD)
- d. Participant observation/ community immersion
- e. Survey

Data for the quantitative analysis were derived from the actual number of plants documented based on the interview vis-à-vis the frequency of their usage in treating various health problems in the community. Likewise, the ethnomedical practitioners were consulted to substantiate the number of ailments treated by these plants.

Qualitative data were the effectiveness of the plants as perceived by the identified respondents/local experts who are initially and correctly assumed to have working knowledge on; the use of these ethnomedicinal plants, the naming of parts used for medicinal purposes, difficulty or ease in the preparation of these ethnomedicinal plants, with documented demonstration, and how the medicines are administered.

To validate the information, the researchers adopted the focus group discussions (FGD) approach. The researchers used the average and percentage for data analyses.

The Informant Consensus Factor (ICF), fidelity level (F.L.), and medicinal use-value (MUV) of plants were computed based on the information gathered after the interview with the respondents. ICF was taken into account the degree of ethnobotanical knowledge of each informant. Knowledgeable informants were selected with the help of someone with administrative authority as well as the village elders.

A survey was conducted to determine the most common medicinal plants used by the community and for which indications. Likewise, the health-seeking behavior of the community was determined.

## **Collection and Identification of plants**

With the community's consent, plant materials of selected plants may be collected for the gene bank collection of the local academic institution. Plants that may be collected including those with particular educational interests. Some community members were trained in collecting a herbarium. Herbarium specimens are essential for identifying the plants by the taxonomist. Plants valuable for healing practices were collected and preserved with the consent of the community. The herbarium may help the younger generation become familiar with the medicinal plants utilized by their community, especially specimen challenging to obtain. The herbarium collection was taken part of the community's medicinal plant inventory.

As provided in the MOA and prior informed consent, community members accompanied the researchers in gathering medicinal plants available in their environment. Plants were photographed in their natural habitat, then collected and preserved with the community's permission. Healers/elders may show the plants to the youth and explain their value to the community.

With their consent, voucher plant specimens were collected for further Identification and verifications—the researchers sent through the CRHDC unidentified medicinal plants to UP Baguio for Identification and verification.

Any audio/video recording and photo documentation of the herbarium specimen were done with the community's consent. The documented medicinal plants were identified until the family level. Local Transport Permit was secured from the concerned regional DENR office for the community-approved local transport of specimen for herbarium and gene bank in the research institutions. Through the help of DENR, the research team ensured that the wildlife/biological resources to be transported are free from or are not carriers of any disease that can pose a danger to the health and safety of humans and other living organisms. The research team secured all conditions and permits required by the indigenous community, NCIP, and DENR to collect the community's medicinal plants and other materials.

## **Assessment and validation of gathered data**

Community members assessed the correctness of the data gathered to avoid misrepresentation and ensured an accurate account of the community's traditions and practices. We described the most commonly cited indications. Likewise, we mentioned the most frequently used plants. The plants were classified according to their family. After being transcribed and synthesized, data obtained from the interview, focus group discussion, and participant's observation was presented to the community for validation.

## **Data Validation**

For validation, focus group discussions were held among the healers, informants, and community members. During these discussions, the researchers would reiterate the information they gathered and verified each with the help of those who were present. When two or more informants confirmed the given data, the researcher assumed that the information was valid (Paluga, Millondaga, Galang, & Sia, 2013).

## Data analysis (Tools for Data Analysis)

Descriptive statistics such as averages and percentages were used to analyze the data.

### Quantitative data analysis

Quantitative indices are helpful in the selection of medicinal plants for further pharmacological studies. Ethnobotanical data were analyzed using the following three quantitative indices used in ethnobotanical studies (Ahmed & Akhtar, 2016, Andrade-Cetto, 2009, Höft, Barik, & Lykke, 1999, Phillips & Gentry, 2009)

### Informant Consensus Factor (ICF)

The informant consensus factor (ICF) was calculated for each category to identify the agreement of the informants on the reported cure. ICF value (range 0–1) was computed adopting the following equation;

$$ICF = \frac{Nur - nut}{Nur - 1}$$

Where:

Nur is the number of use reports in a particular disease category, and Nut is the number of taxa or species used to treat that disease category by informants.

The high ICF value indicates the homogeneity of information between the informants to treat specific disease categories by plants.

### Fidelity Level (F.L.)

The fidelity level (F.L.) is the percentage of informants claiming the use of a specific plant for the same purpose. It was calculated by following the formula;

$$FL = (IU \div IP) \times 100$$

Where:

I.U. = the number of informants claiming to use a plant species to cure a particular disease and I.P. = the number of informants who used the plant for any condition.

A high F.L. value validates potential traditional uses of a plant for a specific ailment. In contrast, a low F.L. value indicates a wide range of medicinal uses with fewer efficacies for each disease.

### The medicinal use-value (MUV)

The medicinal use-value (MUV) was calculated to demonstrate the relative importance of a single species used by ethnic people described as follows

$$MUV = NUR \div N$$

Where

NUR = is the total number of use reports, and N is the total number of informants.



## RESULTS AND DISCUSSION

Eighty informants participated in this study after pre-identification of individuals for the Key Informants Interview. The respondents composed primarily of female and majority are Barangay Healthcare Workers followed by tribal leaders/elders of the tribe, and known “herbolarios”. The transcribed data was validated after presenting it to the community for validation after two or more informants confirmed the given data (Paluga, Millondaga, Galang, & Sia, 2013).

### Knowledge on the use of the ethnomedicinal plants of subtribes of Lower Kalinga

**Table 1: Knowledge on the use of the ethnomedicinal plants of subtribes of Lower Kalinga**

Local Names	Scientific Name	No. of Use Reports	Diseases/ Uses	Part/s Used	Preparation	Route of Administration
1. Padol	<i>Cinnamomum sp.</i>	316	Cough	bark	decoction or infusion	Oral
			Tuberculosis	bark	decoction or infusion	Oral
			Asthma	bark	decoction or infusion	Oral
			UTI	bark	decoction or infusion	Oral
			Fever	bark	decoction or infusion	Oral
			LBM	bark	decoction or infusion	Oral
2. Dulpiyang	<i>Eleusine indica</i>	192	UTI	leaves or roots	decoction	Oral
			Goiter	leaves	decoction	Oral
			Bignat	Whole plant	Boiled for Herbal bath	Herbal bath
			Cancer	whole plant	decoction	Oral
			Kidney problems	whole plant	decoction	Oral
3. Dangla / Lagundi	<i>Vitex negundo</i>	157	Cough	leaves	Decoction	Oral
			“Bignat”	leaves		Oral
			Flu	leaves		Oral
			Malaise	Leaves	Boiled for herbal bath	Herbal Bath
			Herbal/steam bath/ steam for inhalation	leaves and stem	Boiled for Steam Bath	Steam bath
			COVID-19	leaves	decoction	Oral
			Cleansing	leaves	decoction	Oral
			Diarrhea	leaves	decoction	Oral
4. Banaba	<i>Lagerstroemia speciosa</i>	106	Joint Pain	Leaves	decoction	Oral
			Body Pain	Leaves	decoction	Oral
			UTI	bark and	decoction	Oral

				stem		
5. Lemongrass	<i>Cymbopogon citratus</i>	101	UTI	Leaves	Decoction	Oral
			cough	Leaves	Decoction	Oral
			“Bignat”	Leaves	Decoction	Oral
			colds	Leaves	Decoction	Oral
			Kidney Problems			Oral
			Herbal bath	leaves	boiled for herbal bath	Oral
6.Omos		100	Dysentery	leaves	decoction	Oral
			Diarrhea	leaves	decoction	Oral
7. Dalayap leaves	<i>Citrus × aurantiifolia</i>	71	Cough	leaves	decoction, steam bath, herbal bath	Stem bath
			High Fever	leaves	decoction, steam bath, herbal bath	Stem bath
8.Sitsit	<i>Drymaria cordata</i>	70	Wounds	roots	crushed and applied to affected areas	Topical
			cuts	roots	crushed and applied to affected areas	Topical
9. Laya	<i>Zingiber officinale</i>	68	Sore throat	rhizome	decoction	Oral
			Cough	rhizome	decoction	Oral
			wounds	rhizome	Crushed and applied to affected areas	Oral
			Arthritis	rhizome	Charred, Juice is extracted, decoction	Oral
			Uric acid/Arthritis	rhizome		Oral
			Stomach ache	rhizome	decoction	Oral
			Cleansing	rhizome	decoction	Oral
10. Guyabano	<i>Annona muricata</i>	60	Mumps	leaves	decoction	Oral
			Herbal Bath	leaves	Boiled for herbal bath	Herbal Bath, Aromatic
			UTI	leaves	decoction	Oral
			Cleansing	leaves	decoction	Oral
			Cancer	Leaves and fruits	decoction	Oral
			Cough and Colds	leaves and fruit	decoction	Oral
			Breast lumps	Leaves and fruits	decoction	Oral
11.Kunig	<i>Curcuma zedoaria</i>	56	Cleansing	rhizome	decoction	Oral

	(Berg.) Rosc.					
			Uric acid/Arthritis	rhizome	decoction	Oral
			Stomach ache	rhizome	decoction	Oral
			Cancer	Rhizome	decoction	Oral
			UTI	Rhizome	Decoction	Oral
			Hypertension	Rhizome	Decoction	Oral
			Cough	Rhizome	decoction	Oral
			Fever	Rhizome	decoction	Oral
			Dengue	Rhizome	decoction	Oral
			Joint Pain	Rhizome	decoction	Oral
			Body Pain	Rhizome	decoction	Oral
12. Cocunut	<i>Cocus nucifera</i>	53	Skin Lesion	Oil	Cooked	Oral
			Asthma	Oil	Cooked	Oral
			Cough	Oil	Cooked	Oral
			Colds	Oil	Cooked	Oral
			Covid-19	oil	Cooked	Oral
			Circumcision wound	Coconut husk powder	directly applied	Topical
13. Igad-igad	<i>Kalanchoe sp.</i>	50	Skin Lesion	whole plant	Applied as a poultice in affected areas	topical
14. Tawa-tawa	<i>Euphorbia hirta</i>	46	Boils	whole plant	crushed and applied in affected areas	topical
			Dengue	whole plant	Decoction	Oral
			Cough	whole plant	decoction	Oral
			Cleansing	whole plant	Decoction	Oral
			UTI	whole plant	Decoction	Oral
			High Fever	whole plant	Decoction	Oral
			Sore eyes	plant Latex/sap	extraction	Topical
15. Gumaca	<i>Amaranthus sp.</i>	44	Jaundice	whole plant	Boiled for Herbal bath	Herbal Bath

16. Subusob	<i>Blumea balsamifera</i>	42	Kidney stones	leaves and roots	decoction	Oral
			Gas pain	leaves and roots	decoction	Oral
			Fever	whole plant	Boiled for herbal bath	Herbal bath
			Cough,	whole plant	Boiled for herbal bath	Herbal bath
			Colds	whole plant	Boiled for herbal bath	Herbal bath
17. Oregano	<i>Origanum vulgare</i>	41	Cough	leaves	decoction	Oral
			Asthma	Leaves	Decoction/Extract the Juice	Oral
			Cough	Leaves	Decoction/Extract the Juice	Oral
			Herbal Bath	Leaves	Decoction/Extract the Juice	Oral
			Fever	Leaves	Decoction/Extract the Juice	Oral
18. Bayabas	<i>Psidium guajava</i>	40	Wound	leaves	Boiled for washing	topical
			Stops bleeding	Leaves	Extracted directly and applied to the affected area	
			Colic	Leaves	Heated and applied to the affected area	Topical
			LBM	Leaves	Juice is extracted to swallow/decoction	Oral
			scabies	leaves	Boiled for washing	Washing
			Herbal Bath	leaves	Boiled for steam bath	steam bath
			Stomach ache	leaves	decoction	Oral
			Diarrhea	leaves	decoction	Oral
			Cough	leaves	decoction	Oral
			Circumcision Wounds	Leaves	Extract directly applied in the affected area	Topical
			Lesions	leaves	Extract directly applied in the affected area	Topical
19. Bangtitan	<i>Ageratum conyzoides</i>	39	Cuts	whole plant	Crushed and applied in affected areas	Topical
			Scabies	whole plant	Extract directly applied in the affected area	Topical

			Wound	Leaves	Extract directly applied in the affected area	Topical
			diarrhea	leaves	Extract enough Juice	Oral
20. Papaya-native	<i>Carica papaya</i>	39	Convulsion	Stalk	Crushed and Extract Juice	Oral
			Fever	Stalk	Crushed and Extract Juice	Oral
			Stimulates Breast milk	Fruit	cooked as food	Oral
			Dog bite	Latex	applied directly to the affected area	Topical
21. Skylove	<i>Mikania cordata</i>	35	Cuts	Leaves	Crushed and applied in affected areas	topical
			Wounds	Leaves	Crushed and applied in affected areas	topical
			Scabies	Leaves	Crushed and applied in affected areas	topical
			Wounds	Leaves	Extract directly applied in the affected area	Topical
22. Sidil	<i>Jatropha curca</i>	34	Headache	Leaves	Crushed and applied to affected areas	Topical
			Fever	Leaves	Crushed and applied to affected areas	Topical
23. Palangipang	<i>Kalanchoe sp.</i>	31	Headache	Leaves	Crushed and applied to affected areas	Topical
			Fever	Leaves	Crushed and applied to affected areas	Topical
24. Kawenta	<i>Canna indica</i>	30	Scabies	Bark, leaves	Boiled for herbal bath	Herbal Bath
25. Mani-mani	<i>Arachis pintoii Krapov.</i>	29	Varicose veins	Whole plant	Crushed and applied in affected areas	Topical
26. Dalandan	<i>Hyptis capitata</i>	28	Headache	Leaves	Extracted directly and applied to the affected area	Topical
			LBM	Leaves	Decoction	Oral
			Stomach pain	Leaves	decoction	Oral
27. Agibangon	<i>Eupatorium adenophorum</i>	26	Herbal Bath	Leaves	boiled for herbal bath	Topical
			Jaundice	Leaves	boiled for herbal bath	topical
			Cough	Leaves	Used as Chest and Back patches	Topical
			Bronchitis	Leaves	Used as Chest and Back patches	Topical
			Insect Bite	Leaves	Extract directly applied in the	Topical

					affected area	
			Colds	Leaves	Used as Chest and Back patches	Topical
			Diarrhea	leaves	Extract enough Juice	Oral
			Ulcer	leaves	Extract enough Juice	Oral
28. Linggo	<i>Sesamum indicum</i>	25	Ringworm	Leaves	Extract directly applied in the affected area	Topical
29. Suha	<i>Citrus maxima</i>	24	Herbal Bath	Leaves	Boiled for herbal bath	Herbal Bath, Aromatic
			Cough	Leaves	decoction	Oral
			Colds	Leaves	decoction	Oral
			Convulsion			Oral
30. Lantana	<i>Lantana camara</i>	24	cough	leaves	Decoction	Oral
			asthma	leaves		
31. Bannata	<i>Piper sp.</i>	19	Asthma	Leaves	Heated with coconut oil and plastered at the back and chest	topical
32. Taltalikod	<i>Phyllanthus niruri Linn.</i>	18	Colic	leaves	Heated then applied in affected areas, decoction for fever	topical/oral
33. Allaguia pechay	<i>Plantago major</i>	18	Kidney stone	whole plant	Decoction	Oral
			UTI	whole plant	Decoction	Oral
			Cleansing	whole plant	Decoction	Oral
			Arthritis	whole plant	Decoction	Oral
			Round Medicine	whole plant	Decoction	Oral
			Kidney failure	whole plant	Decoction	Oral
34. Ar-aritus	<i>Heliotropium Indicum L.</i>	17	UTI	whole plant	Decoction	Oral
			Kidney problems	whole plant	Decoction	Oral
35. Dalaw	<i>Acorus calamus L.</i>	16	Jaundice	whole plant	Boiled for Herbal bath	Herbal Bath
			Malnourished	whole plant	decoction	Oral
36. Kalidong	<i>Oxalis corniculata</i>	16	Burns	whole plant	crushed and applied in affected areas	Topical
			Scabies	whole plant		

37. Pinit	<i>Rubus sp.</i>	16	Chicken pox	leaves	Boiled for Herbal Bath	Herbal Bath
38. Ampalaya	<i>Charantia momordica</i>	15	Hypertension	Leaves	Cooked as food Extracted as Juice	Oral
			Anemia	whole plant	Cooked as food	Oral
			High blood	whole plant	Cooked as food	Oral
39. Suksuktop	<i>Equisetum ramosissimum</i>	14	Urinary Tract Infection	whole plant	Decoction	Oral
			Cleansing	whole plant	Decoction	Oral
			Diarrhea	whole plant	decoction	Oral
			Kidney Problems	whole plant	decoction	Oral
40. Atta-atta	<i>Oldenlandia sp.</i>	14	Diphtheria	Leaves	Crushed and applied in affected areas	Topical
41. Pansit-pansitan	<i>Peperomia pellucida</i>	14	Arthritis	whole plant	cooked and eaten	Oral
			UTI	whole plant	Freshly Eaten/Chewed	Oral
42. Mimosa	<i>Mimosa pudica</i>	13	UTI	roots	Decoction	Oral
			For menstruation	whole plant	decoction	Oral
43. Linglingay	<i>Artemisia vulgaris</i>	12	Wound- stops bleeding	whole plant	Extract directly applied in the affected area	Topical
			Blood clotting (expels blood after giving birth)	whole plant	Decoction	Oral
44. Cogon	<i>Imperata cylindrical</i>	12	difficulty in urinating	roots	Decoction	Oral
			UTI	leaves	decoction	Oral
45. Pollay	<i>Cinchona species</i>	11	Malaria	Leaves/ Bark	Decoction	Oral
46. Notanot	<i>Desmodium sp.</i>	10	Stomach ache	leaves	Decoction	Oral
			Difficulty defecating	Leaves	Decoction	Oral
			Blood on stool	leaves	Decoction	Oral
47. Tabtabako, pook	<i>Elaphantopus sp.</i>	10	Dysentery, body odor	Whole plant	decoction, Extract directly applied in the affected area	Oral
			Ulcer	leaves	decoction	Oral

			UTI	Roots	Decoction	Oral
			Vitamin Deficiency	Roots	decoction	Oral
48. Alanting	<i>Homalomena sp.</i>	10	Boils	Leaves	Applied to affected areas after heating (with coconut oil)	Topical
			Wound	leaves	Extract directly applied in the affected area	Topical
			Stops bleeding	leaves	Extract directly applied in the affected area	Topical
49. Lupa	<i>Laportea meyeniana Warb.</i>	10	UTI	Leaves	Decoction	Oral
			Kidney Stones	leaves	decoction	Oral
			Cleansing	leaves	decoction	Oral
			Round medicine	leaves	decoction	Oral
50. Damortis	<i>Pithecellobium dulce</i>	10	LBM	stem.bark	decoction	Oral
51. Gumamela	<i>Hibiscus species</i>	9	Boils	flower	Extract directly applied in the affected area	Topical
52. Sili	<i>Capsicum frutescens</i>	7	Wound	Fruit	Crushed and applied in affected areas	Topical
			Ringworm	fruit	Extract directly applied in the affected area	Topical
53. Akapulco	<i>Senna alata</i>	7	Scabies	Leaves	Extract directly applied in the affected area	Topical
			Skin diseases	leaves	Extract directly applied in the affected area	Topical
			Steam bath/herbal bath	leaves	Boiled for Herbal bath	Herbal bath
54. Pinusgan	<i>Centella asiatica (L.) Urb.</i>	5	Colic	leaves	Heated then applied in affected areas	Topical
55. Miracle Fruit	<i>Crescentia cujete</i>	5	Cleansing	Fruit (flesh)	Cooked/ decoction	Oral
			hypertension	Fruit (flesh)	Cooked/ decoction	Oral
			cough	Fruit (flesh)	Cooked/ decoction	Oral
56. Christmas Tree	<i>Euphorbia tirucalli</i>	5	Dysentery	Stalk	Decoction	Oral



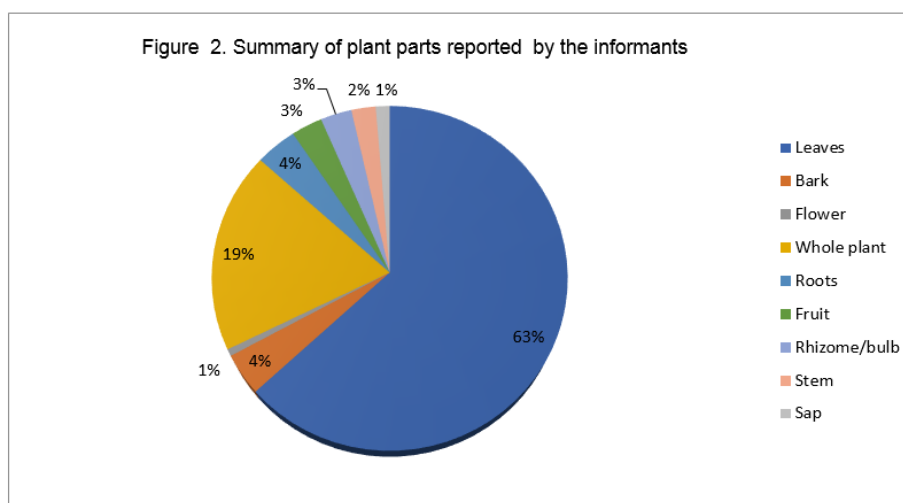
57. Pullot	<i>Calopogonium mucunoides</i>	4	Dysentery	Leaves	Decoction	Oral
58. Martial Law	<i>Chromolaena odorata</i>	4	Wounds	leaves	Extract directly applied in the affected area	Topical
			Stop bleeding	leaves	Extract directly applied in the affected area	Topical
59. Aga-agat	<i>Curcuma domestica Valet.</i>	3	Cancer	Leaves	Decoction	Oral
			Cleansing	leaves	decoction	Oral
			Anti-oxidant	leaves	decoction	Oral
60. Attubing	<i>Coix lacryma jobi</i>	3	kidney	leaves	decoction	Oral
61. Piyas (kamias)	<i>Averrhoa bilimbi</i>	2	Herbal Bath	leaves	Boiled for herbal bath	Herbal Bath
62. Anubrang	<i>Callicarpa sp.</i>	2	Palpitation	leaves	Decoction	Oral
63. Pawes	<i>Rhynchosyris obliquum</i>	2	Antifungal	leaves	Extract directly applied in the affected area	Topical
64. Bawang	<i>Allium sativum L.</i>	1	Wound		Extract directly applied in the affected area	Topical
65. Alenak, ollay	<i>Amaranthus viridis L.</i>	1	Cough	leaves	decoction	Oral
66. Bugnay (lalaki)	<i>Antidesma bunius</i>	1	UTI	leaves	decoction	Oral
67. Buwa	<i>Areca catechu</i>	1	Antihelminthic	Nut	Freshly Eaten/Chewed	Oral
68. Paad	<i>Asplenium sp.</i>	1	Chest pain	whole plant	decoction	Oral
69. Kardis	<i>Cajanus cajan</i>	1	Diarrhea	leaves	decoction	Oral
70. Coffee powder	<i>Coffea species</i>	1	Diarrhea	coffee powder	Freshly Eaten/Chewed	Oral
71. Squash leaves	<i>Cucurbita sp</i>	1	Arthritis	leaves	Knee patch	Topical
72. Tabbog	<i>Ficus sp.</i>	1	UTI	leaves	decoction	Oral
			insect bite	leaves	Extract directly applied in the affected area	Topical
73. Morning glory	<i>Ipomea purpura</i>	1	Wound	leaves	Extract directly applied in the affected area	Topical
74. Kataka-taka	<i>Kalanchoe pinnata</i>	1	mumps	leaves	heated and applied to affected areas	Topical

75. Peppermint	<i>Mentha sp.</i>	1	Cough	leaves	decoction	Oral
76. Banana - sap	<i>Musa species</i>	1	Diarrhea	Banana water	none	Oral
77. Avocado	<i>Persea americana</i>	1	Ulcer	leaves	decoction	Oral
			Diarrhea	Seed	decoction	Oral
78. Serpentina	<i>Rauvolfia serpentina</i>	1	Hypertension	leaves	Eaten raw/ decoction	Topical
79. Strawberry	<i>Rubus sp.</i>	1	Diabetes	fruit	eaten as raw	Oral
80. But	<i>Sida sp.</i>	1	Wounds	leaves	Extract directly applied in the affected area	Topical

There are 80 documented medicinal plants with their respective number of use reports, diseases cured or uses, parts used, mode of preparation, and route of administration (Table 1).

### Plant parts used

A whole plant and the different plant parts are used for medicinal purposes. These parts are the roots, stem, bark, leaves, flowers, fruits, saps, and specialized structures such as rhizomes and bulbs (Figure 2).



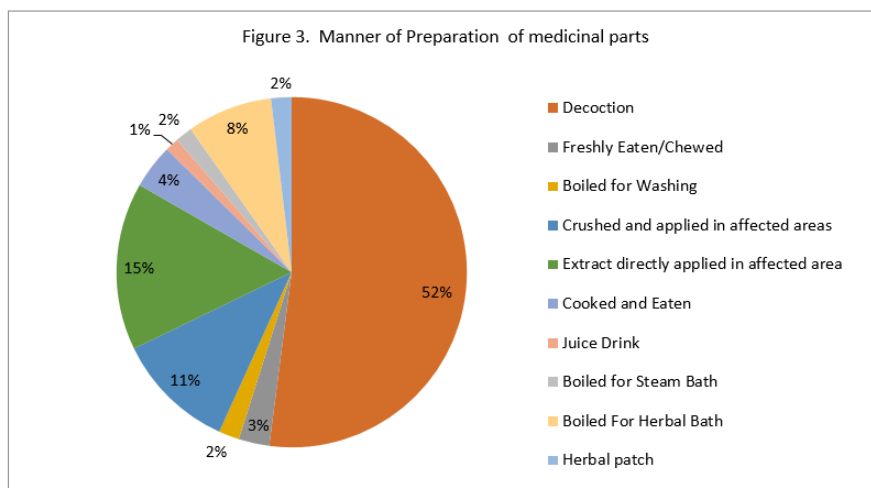
**Figure 2: Summary of plant parts reported by the informants**

The utilization of these parts is ranked as follows; the leaves comprise 63 percent, followed by the whole plant with 19 percent, barks, and roots 4% each, fruit and rhizome/bulb 3% each, sap and flower parts only 1% each. This result is similar to the study in Thailand, where the leaf and the stem parts were used as medicine (Phumthum et al., 2018). Besides, the most used plant parts in Zimbabwe include the leaves and barks, with 72.2 percent each

### Preparation of medicinal plants

Decoction shows the 52 % highest mode of preparing medicinal plants. A previous study found out that the respondents were very knowledgeable of decoction to prepare herbal medicine in

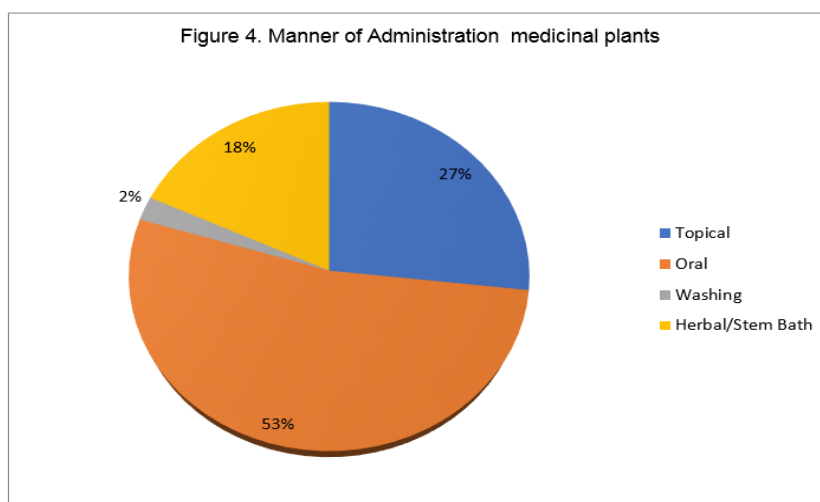
Kalinga (Ammakiw & Odiem, 2014). This result shows that the informants could prepare a decoction conveniently. The direct extraction and application to affected area follows with 15%, crushed and applied in affected area 11%, boiled for herbal bath 8%, cooked and eaten 8%, freshly eaten/chewed 3%, boiled for stem bath, herbal patch, and boiled for washing 2% each. The juice drink preparation has the lowest 1% (Figure 3).



**Figure 3: Manner of Preparation of medicinal parts**

#### Manner of administration

Figure 4 shows that medicinal plants are administered orally (53 percent). The herbal and stem bath administration follows with 27 percent, topical application 18 percent, while washing has the lowest percentage of 2 percent.



**Figure 4: Manner of Administration medicinal plants**

The oral route of administrations seems to go along with the preparation of decoction with 52

percent. One of the common plant preparations in Zimbabwe is decoction that is taken orally (Matowa et al., 2020)

### Classification of ethnomedicinal plants in Lower Kalinga Province

**Table 2: Classification of ethnomedicinal plants in Lower Kalinga Province**

Local Names	Scientific Name	Family
1. Aga-at	<i>Curcuma domestica Valet.</i>	Zingiberaceae
2. Agibangon	<i>Eupatorium adenophorum</i>	Asteraceae
3. Akapulco (Ul-ullig)	<i>Senna alata</i>	Fabaceae
4. Alanting	<i>Homalomena sp.</i>	Araceae
5. Alenak, ollay	<i>Amaranthus viridis L.</i>	Amaranthaceae
6. Allagua pechaaya	<i>Plantago major</i>	Plantaginaceae
7. Ampalaya	<i>Charantia momordica</i>	Cucurbitaceae
8. Anubrang (4 sides)	<i>Callicarpa sp.</i>	Verbenaceae
9. Ar-aritus	<i>Heliotropium indicum L.</i>	Boraganicea
10. Atta-atta	<i>Oldenlandia sp.</i>	Rubiaceae
11. Attubing	<i>Coix lacryma jobi</i>	Poaceae
12. Avocado	<i>Persea americana</i>	Lauraceae
13. Banaba	<i>Lagerstroemia speciosa</i>	Lythraceae
14. Banana - sap	<i>Musa species</i>	Musaceae
15. Bangtitan	<i>Ageratum conyzoides</i>	Asteraceae
16. Bannata	<i>Piper sp.</i>	Piperaceae
17. Basut	<i>Sida sp.</i>	Malvacea
18. Bawang	<i>Allium sativum L.</i>	Amaryllidaceae
19. Bayabas	<i>Psidium guajava</i>	Myrtaceae
20. Bugnay (lalaki)	<i>Antidesma bunius</i>	Phyllanthaceae
21. Buwa	<i>Areca cathecu</i>	Arecaceae
22. Christmas Tree	<i>Euphorbia tirucalli</i>	Euphorbiaceae
23. Cocunut	<i>Cocos nucifera</i>	Arecaceae
24. Coffee powder	<i>Coffea species</i>	Rubiaceae
25. Cogon	<i>Imperata cylindrica</i>	Poaceae
26. Dalandan	<i>Hyptis capitata</i>	Lamiaceae
27. Dalaw	<i>Acorus calamus L.</i>	Acoraceae
28. Dalayap leaves	<i>Citrus × aurantiifolia</i>	Rutaceae
29. Damortis	<i>Pithecellobium dulce</i>	Fabaceae
30. Dangla / Lagundi	<i>Vitex negundo</i>	Lamiaceae
31. Dulpiyang / paragis	<i>Eleusine indica</i>	Poaceae
32. Gawed	<i>Piper betle</i>	Piperaceae
33. Gumaca	<i>Amaranthus sp.</i>	Amaranthaceae
34. Gumamela	<i>Hibiscus species</i>	Malvacea
35. Guyabano	<i>Annona muricata</i>	Annonaceae
36. Igad-igad	<i>Kalanchoe sp.</i>	Crassulaceae
37. Kalidong and Pokol	<i>Oxalis corniculata</i>	Oxalidaceae
38. Kardis	<i>Cajanus cajan</i>	Fabaceae
39. Kataka-taka	<i>Kalanchoe pinnata</i>	Crassulaceae
40. Kawenta	<i>Canna indica</i>	Cannaceae
41. Kung	<i>Curcuma zedoaria (Berg.) Rosc.</i>	Zingiberaceae

42. Lantana	<i>Lantana camara</i>	Verbenaceae
43. Laya	<i>Zingiber officinale</i>	Zingiberaceae
44. Lemongrass	<i>Cymbopogon citratus</i>	Poaceae
45. Linggo, Lennga	<i>Sesamum indicum</i>	Pedaliaceae
46. Linglingay	<i>Artemisia vulgaris</i>	Asteraceae
47. Lupa	<i>Laportea meyeniana Warb.</i>	Urticaceae
48. Mani-mani	<i>Arachis pintoi Krapov.</i>	Fabaceae
49. Martial Law	<i>Chromolaena odorata</i>	Asteraceae
50. Mimosa	<i>Mimosa pudica</i>	Fabaceae
51. Miracle Fruit	<i>Crescentia cujete</i>	Bignoniaceae
52. Morning glory	<i>Ipomea purpurea</i>	Convolvulaceae
53. Notanot	<i>Desmodium sp.</i>	Leguminosae
54. Omos	Under verification	
55. Oregano	<i>Origanum vulgare</i>	Lamiaceae
56. Paad-Bird's nest fern	<i>Asplenium sp.</i>	Asplenaceae
57. Padol	<i>Cinnamomum species</i>	Lauraceae
58. Palangipang	<i>Kalanchoe sp.</i>	Crassulaceae
59. Pansit-pansitan	<i>Peperomia pellucida</i>	Piperaceae
60. Papaya	<i>Carica papaya</i>	Caricaceae
61. Pawes	<i>Rhynchosyris obliquum</i>	Gesneriaceae
62. Peppermint	<i>Mentha sp.</i>	Lamiaceae
63. Pinit	<i>Rubus sp.</i>	Rosaceae
64. Pinusgan,takip-kohol	<i>Centella asiatica (L.) Urb.</i>	Apiaceae
65. Piyas (kamias)	<i>Averrhoa bilimbi</i>	Oxalidaceae
66. Pollay (quinine plant)	<i>Cinchona species</i>	Rubiaceae
67. Pulot	<i>Calopogonium mucunoides</i>	Fabaceae
68. Serpentina	<i>Rauvolfia serpentina</i>	Apocynaceae
69. Sidil	<i>Jatropha curca</i>	Euphorbiaceae
70. Sili	<i>Capsicum frutescens</i>	Solanaceae
71. Sitsit	<i>Drymaria cordata</i>	Caryophyllaceae
72. Skylove	<i>Mikania cordata</i>	Asteraceae
73. Squash leaves	<i>Cucurbita sp</i>	Cucurbitaceae
74. Subusob/Sambong	<i>Blumea balsamifera</i>	Asteraceae
75. Suha	<i>Citrus maxima</i>	Rutaceae
76. Suksukto	<i>Equisetum ramosissimum</i>	Equisetaceae
77. Tabbog	<i>Ficus sp.</i>	Moraceae
78. Tabtabako, pook	<i>Elaphantopus sp.</i>	Asteraceae
79. Taltalikod, samsampalukan	<i>Phyllanthus niruri Linn.</i>	Euphorbiaceae
80. Tawa-tawa	<i>Euphorbia hirta</i>	Euphorbiaceae

There are 79 known species and one unknown species belonging to 73 genera and 42 families of ethnomedicinal plants reported and identified in Lower Kalinga Province (Table 2). Of the 42 families, Asteraceae has the highest number of 7 species, followed by Fabaceae with six species, Euphorbiaceae, Lamiaceae, and Poaceae with four species each, while Rubiaceae and Zingiberaceae with three species each, Amaranthaceae, Araceae, Malvaceae, Oxalidaceae, and Verbenaceae with two species each. Meanwhile, Acoraceae, Amaryllidaceae, Annonaceae, Apiaceae, Araceae, Asplenaceae, Bignoniaceae, Boraginaceae, Cannaceae, Caricaceae, Convolvulaceae, Cucurbitaceae, Euphorbiaceae, Gesneriaceae, Leguminosae, Lythraceae,

Musaceae, Myrtaceae, Pedaliaceae, Phyllanthaceae, Plantaginaceae, Rosaceae, Rutaceae, and Urticaceae has one species each.

The above finding is similar to common families of medicinal plants used in Adana, Turkey that include Lamiaceae, Asteraceae, Rosaceae, and Euphorbiaceae (Güneş, Savran, Paksoy, Koşar, & Çakılcıoğlu, 2017)

### **Informant consensus factor for reported uses/diseases among the subtribe of Lower Kalinga Province**

The informant consensus factor indicates the homogeneity of the information about the use of a particular plants species that range from 0 to 1. Values equal or closer to 1 indicates a relatively high usage(Sánchez, González-Burgos, Iglesias, Lozano, & Gómez-Serranillos, 2020).

**Table 3: Informant consensus factor for reported uses/diseases among the subtribe of Lower Kalinga Province**

<b>Reported Uses / Diseases</b>	<b>Number of Use Reports (NUR)</b>	<b>Number of taxa or species (NUT)</b>	<b>Informant Consensus Factor (ICF)</b>
Headache	81	1	1.00
Tuberculosis	11	1	1.00
Varicose veins	10	1	1.00
Diuretics	8	1	1.00
Scabies	54	2	0.98
Jaundice	53	2	0.98
Relapse	33	2	0.97
Burns	27	2	0.96
Herbal Bath	89	5	0.95
Boils	21	2	0.95
Skin Lesion	20	2	0.95
Mumps	26	3	0.92
Tooth ache	14	2	0.92
Cough, colds	385	34	0.91
Dengue	46	5	0.91
Nutritional supplement for malnourished	19	3	0.89
Urinary Tract Infection (UTI)	190	23	0.88
Asthma	58	8	0.88
Insect Bite	9	2	0.88
Stomach ache	47	7	0.87
Arthritis, Joint pain	43	7	0.86
Sore eyes	22	4	0.86
Alopecia	15	3	0.86
Malaise	15	3	0.86
Diabetes	8	2	0.86
Diarrhea, LBM, Dysentery	113	18	0.85
Fever, convulsion	119	20	0.84

Gingivitis	12	3	0.82
Malaria	12	3	0.82
Wounds, stop bleeding	141	28	0.81
CoViD-19	40	8	0.82
Goiter	5	2	0.75
Cleansing	26	8	0.72
Inflammation	11	4	0.70
Body and back pain	55	18	0.69
Gas pain	26	9	0.68
Cancer	7	3	0.67
Chicken pox	44	16	0.65
Kidney problems	31	12	0.63
Hypertension	41	18	0.58
Laxative	12	6	0.55
Ringworm	3	2	0.50
Snake bite	18	11	0.41
Colic	28	26	0.07
Diphtheria	15	14	0.07

Four reported diseases or uses have the highest informant consensus factor (ICF) of 1.00 among the informants in Lower Kalinga Province. Of these four reported diseases or benefits, headache has the highest reported use of 81 using one plant species, followed by tuberculosis with 11, varicose veins with 10, and diuretics with 8. Scabies and jaundice have the second higher ICF of 98. Meanwhile, colic and diphtheria show the lowest ICF of 0.07.

Interestingly, CoViD-19 has an ICF of 0.82. Besides, eight reported plant species are being used as a remedy against the current pandemic.

### Fidelity level of some notable plants against particular diseases

**Table 4: Fidelity level of some notable plants against particular diseases**

Frequently Used species		Particular Disease/ Use	IU	IP	FL (%)
Local name	Scientific Name				
Palangipang	<i>Kalanchoe sp.</i>	Headache	21	21	100%
Pinit	<i>Rubus sp.</i>	Chicken pox	16	16	100%
Pollay	<i>Cinchona sp.</i>	Malaria	11	11	100%
Damortis	<i>Pithecellobium dulce</i>	Loose Bowel Movement	10	10	100%
Gumamela	<i>Hibiscus species</i>	Boil	9	9	100%
Pinusgan	<i>Centella asiatica (L.) Urb.</i>	Colic	5	5	100%
Notanot	<i>Desmodium sp.</i>	Blood on stool	5	5	100%
Martial Law	<i>Chromolaena odorata</i>	Wounds	4	4	100%
Piyas	<i>Averrhoa bilimbi</i>	Herbal Bath	2	2	100%

Pawes	<i>Rhynchoglossum obliquum</i>	Anti-fungal	2	2	100%
Kawenta	<i>Canna indica</i>	Chicken pox	28	30	93%
Atta-atta	<i>Oldenlandia sp.</i>	Diphtheria	13	14	93%
Gumaka	<i>Amaranthus sp.</i>	Jaundice	27	30	90%
Bannata	<i>Piper sp.</i>	Asthma	17	19	89%
Liplipak	<i>Kalanchoe sp.</i>	Mumps (kabbi)	21	24	88%
Akapulco, Ull-ulig	<i>Senna alata</i>	Steam /herbal bath	6	7	86%
Mimosa and Pan-aw	Mimosa Pudica, Imperata cylindrica	Urinary tract infection (UTI)	11	13	85%
Tabtabako	<i>Elaphantopus sp.</i>	Vitamin supplement	5	6	83%
Christmas Tree (pencil plant)	<i>Euphorbia tirucalli</i>	Dysentery	4	5	80%
Lantana	<i>Lantana camara</i>	Cough	19	24	79%
Skylove	<i>Mikania cordata</i>	Wounds, cuts	27	35	77%
Dalaw	<i>Acorus calamus L.</i>	Malnutrition	12	16	75%
Allaguia pechay	<i>Plantago major</i>	Kidney problems, Cleansing	6	8	75%
Oregano	<i>Origanum vulgare</i>	Cough	30	41	73%
Igad-igad	<i>Kalanchoe sp.</i>	Wound	36	50	72%
Suksukto	<i>Equisetum ramosissimum</i>	Urinary tract infection	10	14	71%
Pansit-pansitan	<i>Peperomia pellucida</i>	Arthritis	10	14	71%
Suha	<i>Citrus maxima</i>	Headache	14	21	67%
Cogon	Imperata cylindrical	Diuretic	8	12	67%
Palangipang and sidil	<i>Kalanchoe sp.</i>	Fever	8	12	67%
Lupa	<i>Laportea meyeniana Warb.</i>	Kidney Stones, UTI	4	6	67%
Laya	<i>Zingiber officinale</i>	Cough, sore throat	44	68	65%
Ar-aritus	<i>Heliotropium indicum L.</i>	Urinary tract infection	11	17	65%
Omos		Diarrhea	30	48	63%
Guyabano	<i>Annona muricata</i>	Urinary tract infection	32	53	60%
Linglingay	<i>Artemisia vulgaris</i>	Cleansing	7	12	58%
Attubing	<i>Coix lacryma jobi</i>	Nutrition supplement	7	12	58%
Subusob	<i>Blumea balsamifera</i>	Gas pain	22	41	54%
Sidil	<i>Jatropha curca</i>	Snake bite	17	32	53%
Tawa-tawa	<i>Euphorbia hirta</i>	Dengue	24	46	52%
Mani-mani	<i>Arachis pintoii Krapov.</i>	Varicose veins	10	20	50%
Mani-mani	<i>Arachis pintoii Krapov.</i>	Convulsion	10	20	50%
Taltalikod	<i>Phyllanthus niruri Linn.</i>	Fever	9	18	50%



Notanot	<i>Desmodium sp.</i>	Constipation	5	10	50%
Alanting	<i>Homalomena sp.</i>	Boils	5	10	50%
Gawed	Piper betle	Colds	2	4	50%
Banaba	<i>Lagerstroemia speciosa</i>	Urinary tract infection	28	58	48%
Dalayap	<i>Citrus × aurantiifolia</i>	Cough	37	78	47%
Agibangon	<i>Eupatorium adenophorum</i>	Herbal Bath	12	26	46%
Coconut oil	<i>Cocus nucifera</i>	Cough	24	53	45%
Papaya	<i>Carica papaya</i>	Lactation	17	39	44%
Sili	<i>Capsicum frutescens</i>	Cough, clogged nose	3	7	43%
Agibangon	<i>Eupatorium adenophorum</i>	Jaundice	11	26	42%
Lemon grass	<i>Cymbopogon citratus</i>	Cough, colds	40	100	40%
Ampalaya	<i>Charantia momordica</i>	Diabetes	6	15	40%
Alanting	<i>Homalomena sp.</i>	Wounds, cuts	4	10	40%
Miracle Fruit	<i>Crescentia cujete</i>	Hypertension	2	5	40%
Sitsit	<i>Drymaria cordata</i>	Wounds, cuts	25	70	36%
Kunig	<i>Curcuma zedoaria (Berg.) Rosc.</i>	Joint Pain	20	56	36%
Ollay and dangla	<i>Amaranthus viridis L., Vitex negundo</i>	Urinary tract infection	18	50	36%
Padol and Omos	<i>Cinnamomum sp.</i>	Malaise	15	46	33%
Aga-at	<i>Curcuma domestica Valet.</i>	Cancer	1	3	33%
Dalandan	<i>Hyptis capitata</i>	Headache	9	28	32%
Bangtitan	<i>Ageratum conyzoides</i>	Scabies	10	32	31%
Dalpiyang	<i>Eleusine indica</i>	Round medicine	14	52	27%
Gebba	<i>Psidium guajava</i>	Scabies (gaddil)	15	60	25%
Padol	<i>Cinnamomum sp.</i>	Cough	35	158	22%
Lagundi, Dangla	<i>Vitex negundo</i>	CoViD-19	32	157	20%
Lemongrass	<i>Cymbopogon citratus</i>	CoViD-19	15	100	15%
Padol	<i>Cinnamomum sp.</i>	CoViD-19	10	158	6%
Coconut oil	<i>Cocus nucifera</i>	CoViD-19	2	53	4%
Guyabano	<i>Annona muricata</i>	CoViD-19	1	53	2%
IU=Number of informants who independently reported the use of the plant for a specific purpose					
I.P. = Total of informants who reported the use of the plant for any use or purpose					

**Table 5: Medicinal use value (MUV) of reported medicinal plants among the subtribes of Lower Kalinga Province**

Local Names	Scientific Name	Family	Number of Use Reports	Medicinal Use Value (MUV)
1. Padol	<i>Cinnamomum species</i>	Lauraceae	316	3.95
2. Dulpiyang	<i>Eleusine indica</i>	Poaceae	192	2.40
3. Dangla	<i>Vitex negundo</i>	Lamiaceae	157	1.96
4. Banaba	<i>Lagerstroemia speciosa</i>	Lythraceae	106	1.33
5. Lemongrass	<i>Cymbopogon citratus</i>	Poaceae	101	1.26
6. Omos			100	1.25

7. Dalayap leaves	<i>Citrus × aurantiifolia</i>	Rutaceae	71	0.89
8. Sitsit	<i>Drymaria cordata</i>	Caryophyllaceae	70	0.88
9. Laya	<i>Zingiber officinale</i>	Zingiberaceae	68	0.85
10. Guyabano	<i>Annona muricata</i>	Annonaceae	60	0.75
11. Kunig	<i>Curcuma zedoaria</i> (Berg.) Rosc.	Zingiberaceae	56	0.70
12. Lana(Cocunut oil)	<i>Cocos nucifera</i>	Arecaceae	56	0.70
13. Igad-igad	<i>Kalanchoe sp.</i>	Crassulaceae	50	0.63
14. Tawa-tawa	<i>Euphorbia hirta</i>	Euphorbiaceae	46	0.58
15. Gumaca	<i>Amaranthus sp.</i>	Amaranthaceae	44	0.55
16. Subusob	<i>Blumea balsamifera</i>	Asteraceae	42	0.53
17. Oregano	<i>Origanum vulgare</i>	Lamiaceae	41	0.51
18. Bayabas	<i>Psidium guajava</i>	Myrtaceae	40	0.50
19. Bangtitan	<i>Ageratum conyzoides</i>	Asteraceae	39	0.49
20. Papaya	<i>Carica papaya</i>	Caricaceae	39	0.49
21. Skylove	<i>Mikania cordata</i>	Asteraceae	35	0.44
22. Sidil	<i>Jatropha curca</i>	Euphorbiaceae	34	0.43
23. Palangipang	<i>Kalanchoe sp.</i>	Crassulaceae	31	0.39
24. Kawenta	<i>Canna indica</i>	Cannaceae	30	0.38
25. Mani-mani	<i>Arachis pintoi</i> Krapov.	Fabaceae	29	0.36
26. Dalandan	<i>Hyptis capitata</i>	Lamiaceae	28	0.35
27. Agibangon	<i>Eupatorium adenophorum</i>	Asteraceae	26	0.33
28. Gawed	<i>Piper betle</i>	Piperaceae	26	0.33
29. Linggo	<i>Sesamum indicum</i>	Pedaliaceae	25	0.31
30. Suha	<i>Citrus maxima</i>	Rutaceae	24	0.30
31. Lantana	<i>Lantana camara</i>	Verbenaceae	24	0.30
32. Bannata	<i>Piper sp.</i>	Piperaceae	19	0.24
33. Taltalikod	<i>Phyllanthus niruri</i> Linn.	Euphorbiaceae	18	0.23
34. Allaguia pechay	<i>Plantago major</i>	Plantaginaceae	18	0.23
35. Ar-aritus	<i>Heliotropium indicum</i> L.	Boraginaceae	17	0.21
36. Dalaw	<i>Acorus calamus</i> L.	Acoraceae	16	0.20
37. Kalidong and Pokol	<i>Oxalis corniculata</i>	Oxalidaceae	16	0.20
38. Pinit	<i>Rubus sp.</i>	Rosaceae	16	0.20
39. Ampalaya	<i>Charantia momordica</i>	Cucurbitaceae	15	0.19
40. Suksukto	<i>Equisetum ramosissimum</i>	Equisetaceae	14	0.18
41. Atta-atta	<i>Oldenlandia sp.</i>	Rubiaceae	14	0.18
42. Pansit-pansitan	<i>Peperomia pellucida</i>	Piperaceae	14	0.18
43. Mimosa	<i>Mimosa pudica</i>	Fabaceae	13	0.16
44. Linglingay	<i>Artemisia vulgaris</i>	Asteraceae	12	0.15
45. Cogon	<i>Imperata cylindrica</i>	Poaceae	12	0.15
46. Pollay	<i>Cinchona species</i>	Rubiaceae	11	0.14
47. Notanot	<i>Desmodium sp.</i>	Leguminosae	10	0.13
48. Tabtabako, pook	<i>Elaphantopus sp.</i>	Asteraceae	10	0.13

49. Alanting	<i>Homalomena sp.</i>	Araceae	10	0.13
50. Lupa	<i>Laportea meyeniana Warb.</i>	Urticaceae	10	0.13
51. Damortis	<i>Pithecellobium dulce</i>	Fabaceae	10	0.13
52. Gumamela	<i>Hibiscus species</i>	Malvacea	9	0.11
53. Sili	<i>Capsicum frutescens</i>	Solanaceae	7	0.09
54. Akapulco	<i>Senna alata</i>	Fabaceae	7	0.09
55. Pinusgan	<i>Centella asiatica (L.) Urb.</i>	Apiaceae	5	0.06
56. Miracle Fruit	<i>Crescentia cujete</i>	Bignoniaceae	5	0.06
57. Christmas Tree	<i>Euphorbia tirucalli</i>	Euphorbiaceae	5	0.06
58. Pulot	<i>Calopogonium mucunoides</i>	Fabaceae	4	0.05
59. Martial Law	<i>Chromolaena odorata</i>	Asteraceae	4	0.05
60. Aga-at	<i>Curcuma domestica Valet.</i>	Zingiberaceae	3	0.04
61. Attubing	<i>Coix lacryma jobi</i>	Poaceae	3	0.04
62. Piyas (kamias)	<i>Averrhoa bilimbi</i>	Oxalidaceae	2	0.03
63. Anubrang	<i>Callicarpa sp.</i>	Verbenaceae	2	0.03
64. Pawes	<i>Rhynchoglossum obliquum</i>	Gesneriaceae	2	0.03
65. Bawang	<i>Allium sativum L.</i>	Amaryllidaceae	1	0.01
66. Alenak, ollay	<i>Amaranthus viridis L.</i>	Amaranthaceae	1	0.01
67. Bugnay (lalaki)	<i>Antidesma bunius</i>	Phyllanthaceae	1	0.01
68. Buwa	<i>Areca cathecu</i>	Arecaceae	1	0.01
69. Paad	<i>Asplenium sp.</i>	Aspleneae	1	0.01
70. Kardis	<i>Cajanus cajan</i>	Fabaceae	1	0.01
71. Coffee powder	<i>Coffea species</i>	Rubiaceae	1	0.01
72. Squash leaves	<i>Cucurbita sp</i>	Cucurbitaceae	1	0.01
73. Tabbog	<i>Ficus sp.</i>	Moraceae	1	0.01
74. Morning glory	<i>Ipomea purpurea</i>	Convolvulaceae	1	0.01
75. Kataka-taka	<i>Kalanchoe pinnata</i>	Crassulaceae	1	0.01
76. Peppermint	<i>Mentha sp.</i>	Lamiaceae	1	0.01
77. Banana - sap	<i>Musa species</i>	Musaceae	1	0.01
78. Avocado	<i>Persea americana</i>	Lauracea	1	0.01
79. Serpentina	<i>Rauwolfia serpentina</i>	Apocynaceae	1	0.01
80. Wild Strawberry	<i>Rubus sp.</i>	Rosaceae	1	0.01
81. Basut	<i>Sida sp.</i>	Malvacea	1	0.01

Ten plant species show the highest fidelity level (F.L.) of 100% for different diseases (Table 4). Three species *Pithecellobium dulce*, *Centella asiatica (L.) Urb* and *Desmodium sp* have reported uses of treating gastro-intestinal conditions such as loose bowel movement (LBM), colic, and presence of blood on the stool, respectively. Meanwhile, three species have reported remedies for skin problems, *Hibiscus sp* for boils, *Chromolaena odorata* for cleaning wounds, and *Rhynchoglossum obliquum* against fungi (antifungal). Likewise, two species have reported use against infectious diseases, *Rubus species* for chickenpox and *Cinchona species* for

malaria. *Averrhoa bilimbi* has reported use as an herbal bath while *Kalanchoe* species for a headache remedy. Two plant species *Canna indica* and *Oldenlandia* species follow with a 93 % fidelity level (F.L.) with reported use against chickenpox and diphtheria, respectively. The highest fidelity level of the ten plant species means that these are preferred, as mentioned often by the informants (Tefera & Kim, 2019). Of the ten species, the *Kalanchoe* species has the highest 21 number of use reports for headache, followed by a *Rubus* species of 16 use reports for chickenpox.

Interestingly, the last five plant species with the lower fidelity levels are reported remedies for the existing CoViD-19 pandemic. These species include *Vitex negundo* with 20%, *Cymbopogon citratus* with 15%, *Cinnamomum* species with 6%, *Cocus nucifera* 4%, and *Annona muricata* has the lowest fidelity level of 2%. This finding indicates that subtribes of Lower Kalinga are innovative in using their indigenous knowledge in ethnomedicine to combat new diseases such as CoViD-19. Pharmacists and herbalists from Syria used 26 species belonging to 15 families (Khatib & Nattouf, 2021).

### **Medicinal use value (MUV) of reported medicinal plants among the subtribes of Lower Kalinga Province**

Six plant species show a high medicinal use value (MUV) of more than 1.00. *Cinnamomum* species has the highest reported medicinal use value (MUV) of 3.95, followed by 2.40 for *Eleusine indica*, 1.96 for *Vitex negundo*, 1.33 for *Lagerstroemia speciosa*, 1.26 for *Cymbopogon citratus*, and 1.25 for a plant species locally known as “omos” of the family Orchidaceae. Twenty-nine (29) species show medicinal use values of 0.09 and below. This finding indicates that there are some plants present in particular areas.

The *Cinnamomum* species is a rare plant and threatened extinction. The medicinal bark is frequently removed, which could result in the possible death of the tree. One tree was reported dead because of this practice. Few trees remain in the area.

The high medicinal values indicate that these plant species are frequently used as medicines in the area, while the low values imply that these are rarely for health remedies (Phumthum et al., 2018)

## **SUMMARY**

### **Documented ethnomedicinal plants**

The informants reported a total of 80 medicinal plants. These plants are used for at least 40 health remedies, including CoViD-19.

The plant parts used are as follows; leaves comprise 63 percent, whole plant with 19 percent, barks and roots 4% each, fruit and rhizome/bulb 3% each, sap and flower parts only 1% each.

As to preparation, decoction has the 52 % highest, followed by direct extraction and application to affected area follows with 15%, crushed and used in affected area 11%, boiled for herbal bath 8%, cooked and eaten 8%, freshly eaten/chewed 3%, boiled for steam bath, herbal patch and boiled for washing 2% each and juice drink 1%.

In terms of administration, oral 53 %, herbal and steam bath 27 %, topical application 18 %, and washing 2 %.

### **Classification of medicinal plants**

Regarding the classification of medicinal plants, there are 79 known species and one unknown species belonging to 73 genera and 42 families. Asteraceae has the highest number of 7 species, Fabaceae 6 species, Euphorbiaceae, Lamiaceae and Poaceae 4 species, Rubiaceae and Zingiberaceae 3 species, Amaranthaceae, Arecaceae, Malvaceae, Oxalidaceae, and Verbenaceae with two species each. Meanwhile, Acoraceae, Amaryllidaceae, Annonaceae, Apiaceae, Araceae, Asplenaceae, Bignoniaceae, Boraginaceae, Cannaceae, Caricaceae, Convolvulaceae, Cucurbitaceae, Euphorbiaceae, Gesneriaceae, Leguminosae, Lythraceae, Musaceae, Myrtaceae, Pedaliaceae, Phyllanthaceae, Plantaginaceae, Rosaceae, Rutaceae, and Urticaceae has one species each.

### **Informant Consensus Factor (ICF)**

There are four reported diseases or uses with the highest informant consensus factor (ICF) of 1.00. There are headaches with the highest reported use of 81 using one plant species, followed by tuberculosis with 11, varicose veins with ten, and diuretics with 8. Scabies and jaundice have .98 ICF, colic and diphtheria have the lowest ICF of 0.07. Interestingly, CoViD-19 has an ICF of 0.82, with eight reported plant species being used as a remedy against the current pandemic.

### **Fidelity Level (F.L.)**

Ten plant species show the highest fidelity level (F.L.) of 100%. These species are *Pithecellobium dulce*, *Centella asiatica* (L.) Urb and *Desmodium* species with reported uses of treating gastro-intestinal conditions such as loose bowel movement (LBM), colic, and presence of blood on the stool, respectively, *Hibiscus* species for boils, *Chromolaena odorata* for cleaning wounds, and *Rhynchoglossum obliquum* against fungi (antifungal), *Rubus* species for chickenpox and *Cinchona* species for malaria, *Averrhoa bilimbi* with reported use as an herbal bath and *Kalanchoe* species for a headache remedy. *Canna indica* and *Oldenlandia* species have a 93 % fidelity level (F.L.) with reported use against chickenpox and diphtheria. Interestingly, five medicinal plants with lower fidelity levels have reported remedies for the existing CoViD-19 pandemic; *Vitex negundo* with 20% F.L., *Cymbopogon citratus* 15% F.L., *Cinnamomum* species 6% F.L., *Cocus nucifera* 4% F.L. and *Annona muricata* 2% F.L.

### **Medicinal Use value (MUV)**

Five medicinal plants have MUV of more than 1.00. These are *Cinnamomum* species with medicinal use value (MUV) of 3.95, *Eleusine indica* with 2.40, *Vitex negundo* with 1.96, *Lagerstroemia speciosa* with 1.33, *Cymbopogon citratus* with 1.26, and “omos” 1.25. Moreover, 29 species have medicinal use values of 0.09 and below.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **Conclusions**

The research team concludes the following based on the results.

1. The subtribes of Lower Kalinga have maintained their indigenous knowledge system on the use of available medicinal plants as remedies for common, infectious, and emerging diseases such as CoViD-19.
2. The leaves are the most utilized plant parts through boiling and taken orally.
3. The subtribes of Lower Kalinga Province use diverse medicinal plants with 80 species belonging to 73 genera and 42 families.
4. Some medicinal plants with higher medicinal use values are becoming rare and threatened with extinction.

### **Recommendations**

The following recommendations are based on the findings.

1. Conduct follow up study on the effectiveness of medicinal plants against CoViD-19
2. Conduct training on the proper preparations of various medicinal plants.
3. Conserve medicinal plants by establishing gene banks
4. Conduct study on the propagation of rare medicinal plants

### **Acknowledgements**

The submitted manuscript is a Research Article and was conducted under the supervision of:

DR. EDUARDO T. BAGTANG, SUC President III of Kalinga State University and Consortium Director of the Cordillera Regional Health Research & Development Consortium, DR. MARIA ROWENA **MADARANG**.

This research project was conducted from October 2019 to July 2022. Moreover, the Research Project was sponsored by the Cordillera Regional Health Research & Development Consortium and Department of Health and the initiative of the administration of the Kalinga State University, Philippines.

### **Declaration of Interest Statement**

The authors have no relevant interest(s) to disclose.

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