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Ethnobotanical investigation of nutraceuticals used in the Nyong and Kelle Division, Centre Region, Cameroon

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Abstract

This study presents an ethnobotanical investigation of nutraceuticals plants used by the people of the Nyong and Kelle Division, in the Centre Region of Cameroon, to address various ailments. A systematic survey was conducted in ten markets and ten villages, where food traders were interviewed using a semi-structured questionnaire to gather information on the medicinal uses of plants. Traditional healers, elders, and community members validated the collected information. A total of 56 plants with medicinal properties were identified, categorized as 30 fruit trees, 19 vegetables, and 7 spices, belonging to 32 botanical families. The Anacardiaceae and Solanaceae families were the most represented. These nutraceuticals were found to treat 28 different illnesses, with the leaves being the most commonly used plant organ. Decoctions were the primary therapeutic indication, and digestive system-related ailments were prevalent. This research contributes to the preservation and dissemination of ethnobotanical knowledge inherited from previous generations.

Keywords: Ethnobotany; Nutraceuticals; Traditional Healing; Nyong and Kelle Division; Cameroon.

1. Introduction

The sustainable management of forest resources and the preservation of the environment are crucial to meet the social, economic, ecological, and cultural needs of present and future generations. Traditional medicine, which extensively utilizes plants, has gained increasing interest worldwide. According to the World Health Organization (WHO), approximately 70% of the population in many countries rely on traditional or folk medicine for treating various ailments. However, in Cameroon, traditional medicine remains largely unregulated, hindering its effective integration into the healthcare system [1]

In rural areas of Cameroon, people have long utilized certain edible plants, which serve as food, to address their health problems. Various plant parts such as bark, roots, leaves, shoots, flowers and fruits, as well as their extracts in the form of macerates, decoctions, juices, and topical applications, are used to treat ailments. Previous studies in Cameroon have focused on the therapeutic properties of common plants with medicinal indications [1,2,3,4,5,6]. In contrast, the present study investigates the ethnobotanical knowledge of edible plants that primarily serve as food. These plants can be considered nutraceuticals as they possess nutritional and medicinal properties, and can address specific health issues.

The aim of this research is to explore the ethnobotanical knowledge associated with these nutraceuticals, identify their therapeutic indications, and understand how they have been utilized by the people of the Nyong and Kelle Division,

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Centre Region, Cameroon, to treat ailments. It is essential to preserve this traditional knowledge and pass it on to future generations, as it represents a valuable heritage inherited from their ancestors.

2. Materials and Methods

2.1. Study Area

The study was conducted in the Nyong and Kelle Division, located in the Centre region of Cameroon (Figure 1). The Centre region, situated on the southern plateau, is the second-largest region in Cameroon, covering an area of 68,953 km². It is divided into ten administrative divisions and 71 subdivisions. The region's original vegetation comprised primarily forests in the southern part and savannah in the northern part. However, due to human activities such as logging, extensive agriculture, and urbanization, the amount of primary forests has significantly diminished [7,8]. The Centre region is characterized by a diverse range of plant species, including *Musaga cecropoides*, *Albizia zygia*, *Garcinia polyantha*, *Syzygium staudtii*, as well as fauna such as the Gambian rat (*Cricetomys gambianus*), the pangolin (*Manis tricuspis*), and the Gaboon viper (*Bitis gabonensis*).

The region exhibits progressive variations in rainfall, temperature, and vegetation characteristics. It has a subequatorial climate with a bimodal rainfall pattern, and the mean annual temperature averages around 25 °C, with annual rainfall ranging between 1300 mm and 1800 mm. The Nyong and Kelle Division (3°54' - 3°58' N and 10°47' - 10°49' E) encompasses an area of 6,362 km² and is divided into ten subdivisions and numerous villages, with Eseka serving as the headquarters of the division and subdivision.



Figure 1 Study area

2.2. Sampling

The sampling process involved the identification and collection of different local vegetables and fruit trees. These specimens were obtained through purchases, gathering, or harvesting from crop farms, home gardens, and forested areas within the study area.

2.3. Survey

Field surveys were conducted in ten markets and ten villages, with one village representing each subdivision. When encountering a local vegetable or fruit, it was acquired, and the product owner was interviewed regarding the local name of the plant and its medicinal uses. This initial information was obtained through verbal interviews. To validate the medicinal uses of the plants obtained from the markets, consultations were conducted with herbalists, traditional healers, village elders, and patriarchs familiar with the "Bassa" tradition, focusing on the medicinal properties of the

local vegetables and fruits documented in the markets. The second source of information involved a review of relevant literature on these local vegetables, fruit trees, and spices.

For plant specimens where botanical names were not initially available, fresh and dried samples were collected and used to create herbariums. Identification of these specimens was performed at the National Herbarium of the Institute of Agronomic Research and Development in Yaoundé. Medicinal vegetables, fruit trees, and spices used for treating various ailments are denoted by an asterisk: low (*), moderate (**), and high (***) [9]. All the plants inventoried are listed in (table1), (table2) and (table3) by their local and scientific names, family, ailment for which it is used, parts used, mode of preparation and the therapeutic indications.

2.4. Statistical data analysis

The software Sphinx Plus Edition Lexica V5 was used for the development of the questionnaire, collection and processing data.

3. Results and Discussion

3.1. Nutraceuticals used in Nyong and Kelle Division

A total of 56 plants with medicinal properties were identified in the Nyong and Kelle Division, including 30 fruit trees, 19 vegetables, and 7 spices. These plants belonged to 32 different botanical families. The most represented family was Anacardiaceae, followed by Solanaceae and Fabaceae. A number of similar studies have been carried out in other African cities [9,10,11,12,13,14,15,16]. The most represented families in the present study were the families of Anacardiaceae and Solanaceae (Table 1, Table and Table3) while some authors revealed the predominance of the families of Asteraceae and Fabaceae [17]. In other countries the family of Asteraceae was more representative, particularly in Uganda [21,22], in South Africa [23] and in Brazil [24]. These differences on families with the present study might be due to, ours laid emphasis on nutraceuticals while the other studied any common plant was surveyed.

3.2. Diseases targeted by nutraceuticals

The present study inventoried plants which could be used for the curing of 28 ailments in the study area (Figure 2). Other authors have shown that medicinal plants, including nutraceuticals can treat 139 [10], 37 [11] and 32 [12] illnesses respectively. The difference can be due to the fact that these studies were carried out in large cities, whereas ours took place in the rural area. Concerning the prevalence of digestive diseases followed by gynecological problems, our results corroborate those previous studies [11,14]. In the other hand, some authors highlighted infectious illnesses [12].

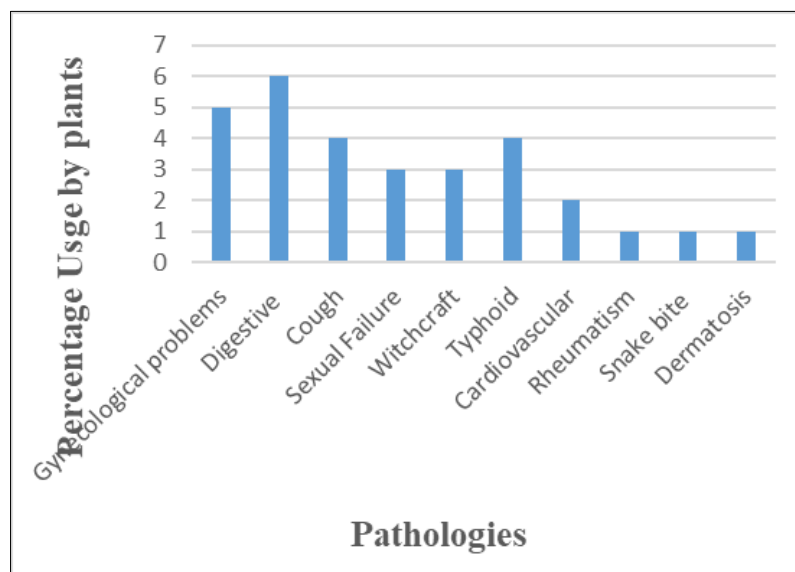


Figure 2 Distribution pattern of plants number and diseases.

3.3. Plant Parts and Preparation Methods

Among the identified plants, leaves were the most commonly utilized plant part for medicinal purposes, followed by fruits, roots, and bark. The traditional healers and local communities primarily used decoctions (boiling plant materials in water) as the preferred method of preparation for medicinal remedies. Other methods included macerations, infusions, and topical applications.

The leaves are the organs mostly used for curing ailments (Figure3) followed by the bark. The dominance of the leaves was previously observed [10,16]. The frequent usage of leaves is justified by the abundant presence of the group of secondary metabolites where their synthesis centre is the leaves [18,19,20].

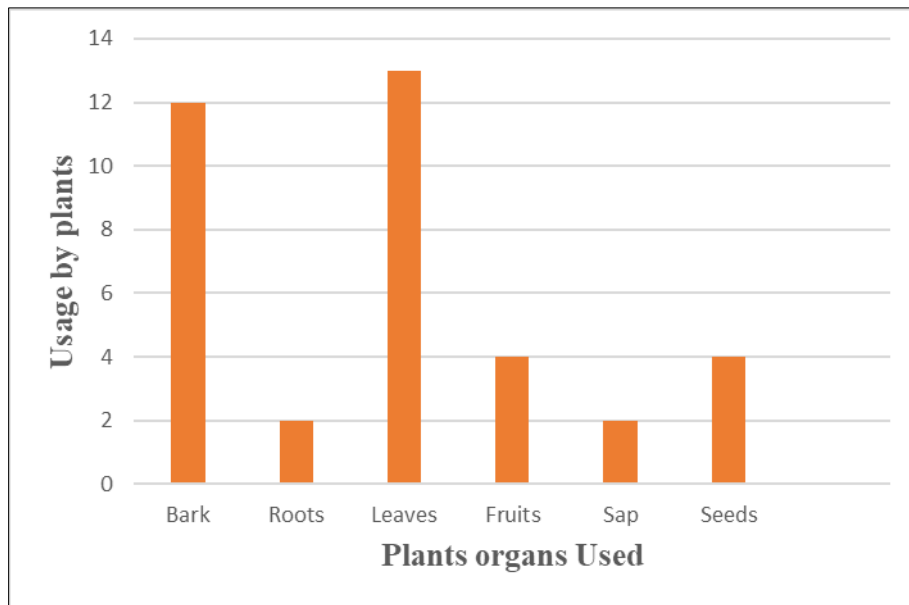


Figure 3 Plants Organs used in the study

3.4. Therapeutic Indications

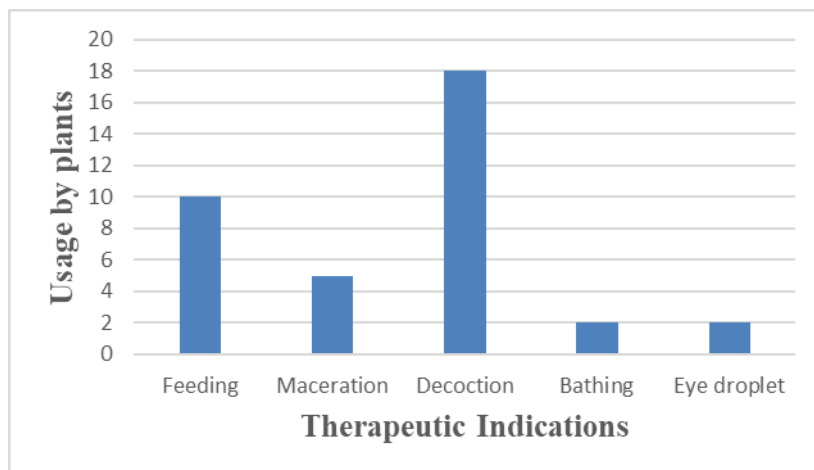


Figure 4 Therapeutic indications used

The identified plants were found to have diverse therapeutic indications, ranging from digestive disorders to respiratory ailments, skin conditions, and reproductive health issues. The most common therapeutic indications were related to the digestive system, including stomach aches, diarrhoea, and constipation. In the present study decoction (Figure 4) was the most used therapeutic indication prescribed. Other studies have shown similar results [13,25].

Table 1 Ethnobotanical data and phytomedicine fruits trees consumed in the Nyong and Kelle Division

No	Scientific names	Families	Local names	Diseases	Parts of plant used	Preparation mode	Usage frequency
1	<i>Aframomum limatum</i>	Zingiberaceae	-Bogui	Snake bite	-fruit	eating	***
2	<i>Aframomum melegueta</i>	Zingiberaceae	Ndon	-Cough, -panacea for witchcraft,	-Fruit, -leafy shoot	-eating - Decoction	****
3	<i>Ananas comosus</i>	Bromeliaceae	Nton lilan	Typhoid,	Fruit skin	decoction	**
4	<i>Ancistrocarpus densispinosus</i>	Malvaceae	Ndjago nko	-Eye hematoma ,wounds	-Leaves , -sap, bark	-Cornet -plaster	****
5	<i>Annona muricata</i>	Annonaceae	Saba saba	-Typhoid, - Heart Diseases -high blood pressure, cancer	-Leaves -Leaves -Leaves -Fruit	-Decoction -Decoction -Drinking fruit juice	***
6	<i>Antrocaryon klaineanum</i>	Anacardiaceae	Ngonga	Related to gynecological problems	Bark	Decoction by lavage	****
7	<i>Baillonella toxisperma</i>	Sapotaceae	Ndjap	Gynecological problems -Wounds	-Bark -Sap	-Decoction by lavage -Plaster	***
8	<i>Canarium schweinfurthii</i>	Burseraceae	Hehe	-Gastritis rheumatism	-Bark, leaves Sap	Decoction -Burning frankincense to send away evil spirits	***
9	<i>Carica papaya</i>	Caricaceae	Pohpoh	-Malaria -Anthelminthic	-Leaves, roots, bark -Seeds	Decoction Eating seeds or Grinding them as macerate and drink	****
10	<i>Carpolobia alba</i>	Polygaceae	Hipagui	-Male sexual impotence Mystical problems	-Fruits - leaves	-Eating -By bathing with the leaves	**

11	<i>Citrus limon</i>	Rutaceae	Hipouma Belais	-Cough, -Typhoid -obesity	-Fruits -Fruits Fruits	-Decoction Decoction -Eating	**
12	<i>Coula edulis</i>	Olacaceae	Komol	-Rheumatism, dermatitis	-Seeds	eating	**
13	<i>Cocos nucifera</i>	Arecaceae	Mbondo	-After delivery	Bark	-Decoction by lavage	**
14	<i>Cola acuminata</i>	Sterculiaceae	Libel	Cough	-Bark -leaves	Decoction	**
15	<i>Cola pachycarpa</i>	Sterculiaceae	Nkom moye	-Stammering -Teeth whitening	- fruits -Almond	-Drinking -Eating	**
16	<i>Cucumis Sp</i>	Cucurbitaceae	Libock	-Male sexual impotence, -sexual stimulant	-Leaves -Roots	Decoction Decoction	**
17	<i>Dacryodes edulis</i>	Burseraceae	S'aaa	-Snake bite	l-eaves	-Leaves plaster	**
18	<i>Elaeis guineensis</i>	Arecaceae	Lihen	-Gonorrhoea -Syphilis -Hepatitis	-Young leaves Nuts soup	Decoction Eating	***
19	<i>Garcinia kola</i>	Clusiaceae	Nyei	-Cough, -Gastritis -speed lactation	-Bark -Seeds -Roots	-Decoction Eating	***
20	<i>Irvingia gabonensis</i>	Irvingiaceae	Ndoga	-Diabetes	-Almond	Eating	***
21	<i>Mangifera indica</i>	Anacardiaceae	Ndjangolo	-Cough -Amoebic dysentery	-Bark	Decoction -Decoction by lavage	***
22	<i>Myrianthus arboreus</i>	Urticaceae	Likokom	Anemia	Dry leaves	Decoction	***
23	<i>Penta lethra macropylla</i>	Mimosaceae	Bambar	-Snakes expellant -Cardiovascular diseases rheumatism, malaria, headache	-Seeds -Bark -Bark	-Seeds worn on neck -Maceration -Maceration	***
24	<i>Persea americana</i>	Lauraceae	Pia	Anthelmintic	Bark leaves	Maceration	**

25	<i>Psidium guajava</i>	Myrtaceae	Ngouaban	-Diarrhea -Amoebic dysentery	-Leaves, ruits -Leaves	-Eating Eating	***
26	<i>Spongias Cytherea</i>	Anacardiaceae	Kassi manga	-Diarrhea -Eye infections	-Bark , leaves -Fruits juice	Decoction Eye drops	*
27	<i>Trchoscypha abut</i>	Anacardiaceae	Ndoi bako	Gynecological problems -Back pains	-Bark -Bark	-Decoction by lavage -Decoction by lavage	***
28	<i>Trichoscypha acuminata</i>	Anacardiaceae	Ndoi	Gynecological problems -Back pains	Bark -Bark	-Decoction by lavage -Decoction by lavage	***
29	<i>Uapaca guineensis</i>	Phyllanthaceae	Sem	-Mystical problems, -ill luck	-Bark, leaves	Bathing	***
30	<i>Vitex doniana</i>	Verbenaceae	Evouvoulan	Hepatitis -Syphilis	-Bark, Roots - Leaves	-Maceration -Decoction	*

Table 2 Ethnobotanical data and phytomedicine of vegetables consumed in the Nyong and Kelle Division

Nº	Scientific names	Families	Local ames	Diseases	Parts of plant used	Preparation mode	Usage frequency
1	<i>Albelmoschus esculentus</i>	Malvaceae	Bikoye	-Diabetes, -Improve and increase sperm count -Goiter	-Fruit -Fruit	Maceration -Maceration -Eating	***
2	<i>Allium cepa</i>	Liliaceae	Lilan linkong	Eye worm	-Cut part of onion bulb	-Bringing it closer to the eye	***
3	<i>Amranthus hybrids</i>	Amaranthaceae	Pooga	-Tape worm expellant -Relief from pulmonary problems	-Leaves, Roots Leaves, Roots	-Maceration Maceration	*
4	<i>Celosia argentea</i>	Amaranthaceae	Nsangan libiih	-Diuretic -Cough	Leaves	Decoction	*
5	<i>Colocasia esculentum</i>	Araceae	Libanga	Whitlow	tubers	On the finger as a ring	****

6	<i>Corchorus olitorius</i>	Malvaceae	Njango	-Laxative, -Blood purifier -Tooth pains	-Leaves Leaves Roots	Maceration Decoction	**
7	<i>Crassocephalum rubens</i>	Asteraceae	Bikounjan	Laxative stomach ache Liver problems	leaves	Maceration	**
8	<i>Cucurbita moschata</i>	Cucurbitaceae	Micha	Sexual stimulant	Leaves	Maceration	*
9	<i>Gnetum africaum</i>	Gnetaceae	Hikok	Laxative High blood pressure	Leaves	Maceration	**
10	<i>Ipomoea batatas</i>	Convolvulaceae	Nwere	Abscess	Leaves	Grounded leaves as plaster on abscess	***
11	<i>Lycopersicon esculentum</i>	Solanaceae	Tomato nkong	Gonorrhoea	leaves	Maceration	**
12	<i>Manihot esculenta</i>	Euphorbiaceae	Nkwem	Anemia	Leaves	Grounded macerated	***
13	<i>Pennisetum urpueum</i>	Poaceae	Misongo	Epilepsy	Leaves shoots	Maceration	*
14	<i>Solanum aethiopicum</i>	Solanaceae	Msiangar	Diabetes	fruits	Decoction	**
15	<i>Solanum acrocarpon</i>	Solanaceae	Bitotoro	Diarrhea	Leaves	Decoction	**
16	<i>Solanum melongena</i>	Solanaceae	Hisingui	Waist pains	Fruits	Decoction	**
17	<i>Talinum triangulare</i>	Portulacaceae	Saba saba	Facilitates delivery	leaves	Maceration	*
18	<i>Vernonia amygdalina</i>	Asteraceae	Madowa	Poisoning , diabetes, poor digestion	Leaves	decoction	*
19	<i>Xanthosoma sagittifolia</i>	Araceae	Likabo	Amoebic , dysentery	Stem, twig	Maceration by lavage	**

Table 3 Ethnobotanical data and phytomedicine of plants used as spices in the Nyong and Kelle Division

Nº	Scientific names	Families	Local names	Diseases	Parts used	Mode of preparation	Usage frequency
1	<i>Capsicum frutescens</i>	Solanaceae	Hiloba nkong	-Purgative Hemorrhoids	fruits	eating	***
2	<i>Irvingia gabonensis</i>	Irvingiaceae	Wiba	Diabetes	Almond	eating	**
3	<i>Monodora myristica</i>	Annonceae	Hikoma	Witchcraft	-Stem, -Bark	Maceration	**
4	<i>Panda oleosa</i>	Pandanaceae	Handa	Hepatitis	Almond	Eating	**
5	<i>Ricinodendron heudelotii</i>	Euphorbiaceae	Ndjansang	wounds	Sap	plaster	**
6	<i>Scorodophloeus zenkeri</i>	Fabaceae	Hiomi	-Babies navel pains -Abdominal pains	-Bark Stem, seeds	Decoction by lavage	***
7	<i>Tetrapleura tetraptera</i>	Fabaceae	Sasas	Hemorrhoids -Vomiting, poisoning	-Fruit roots, bark	- Decoction -Maceration	**

3.5. Validation of Traditional Knowledge

To validate the traditional knowledge associated with the medicinal plants, consultations were conducted with traditional healers, village elders, and patriarchs who were knowledgeable about the local traditions and the medicinal uses of plants. Their expertise and confirmation provided credibility to the information gathered during the surveys.

3.6. Conservation and Preservation

The ethnobotanical knowledge of medicinal edible plants in the Nyong and Kelle Division represents a valuable cultural heritage passed down through generations. However, the increasing modernization and changing lifestyles pose a threat to the preservation of this traditional knowledge. Efforts should be made to document and preserve this knowledge, as it offers potential opportunities for sustainable healthcare practices and the development of new therapeutic agents.

3.7. Integration into Healthcare Systems

The integration of traditional medicine, particularly the use of medicinal edible plants, into the formal healthcare system could enhance healthcare accessibility and affordability in the region. Collaboration between traditional healers and modern healthcare practitioners can lead to the development of evidence-based herbal remedies and the promotion of safe practices.

3.8. Limitations

This study has certain limitations. The scope of the research was restricted to the Nyong and Kelle Division, and therefore, the findings may not be representative of the entire country. Additionally, while efforts were made to validate the traditional knowledge, there may still be variations in the perceived medicinal properties and uses of the identified plants.

4. Conclusion

The present study revealed a rich ethnobotanical knowledge of medicinal edible plants in the Nyong and Kelle Division of Cameroon. The diverse range of plants and their therapeutic indications highlight the importance of traditional medicine in the region. It is crucial to document, preserve, and integrate this valuable knowledge into healthcare systems to promote sustainable healthcare practices and conserve the cultural heritage associated with these plants.

Compliance with ethical standards

Acknowledgments

The authors wish to pay a heartfelt tribute to Mr Joseph Bayi, a member of the research team who was tragically taken away from us while he was completing his PhD.

Disclosure of conflict of interest

No potential conflicts of interest relevant to this work were reported.

Statement of informed consent

All the people interviewed agreed to take part in the study, after being briefed on its objectives.

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