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An Ethnobotanical Study of Plants with Curative and Wound-Healing Properties in the Northern Zone of Cameroon

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Abstract

Wounds are skin lesions that manifest as an opening in the skin, and constitute a medical, social and economic problem for African populations. In particular, the relatively high cost of wound care makes the use of this treatment even more inaccessible to most, if not all, of the African population. The overall objective of the research is to determine the therapeutic effects that medicinal plants from the Northern zone of Cameroon may have on wound healing. The prospective study consisted of a survey of nine sites in three northern regions, namely Adamawa, North and Far North. Semi-structured interviews were conducted with traditional healers, hunters and eco-guards. These departments were chosen because of the lack of health infrastructure adapted to this type of pathology and their rich biodiversity of medicinal plants. 41 species of medicinal plants were identified as being involved in the process of healing and wound repair. These plants are divided into 20 families, of which the most represented are the Fabaceae with 9 species. This survey presented the medicinal plants of the northern part of Cameroon, as well as the different treatment and diagnostic methods that contribute to wound healing.

Subject Areas

Pharmacology

Keywords

Medicinal Plants, Wounds, Treatment, Cameroon

1. Introduction

The effectiveness of herbal medicine has proven its undeniable health benefits and has allowed natural medicine to enter our daily routines Today, the use of herbal medicine is experiencing a resurgence of interest in Western countries, particularly to treat imbalances brought on by modern life, whether it be stress or weight problems [1]. In Africa, traditional healers with only natural resources as their only therapeutic arsenal, treat in some cases more than 90% of the population. In Africa, medicinal plants are valuable resources for the majority of rural populations, where more than half of the population uses them for their health care [2]. In fact, out of the 300,000 plant species identified on the planet, more than 200,000 species live in tropical African countries and have medicinal virtues [3]. Cameroon is an important global biodiversity reserve and is home to hundreds of endemic species. Cameroon has some of the highest biological diversity in Africa in terms of variety, quantity, ecosystem and genetic resources. With a high rate of endemism, Cameroon ranks 4th in the world in terms of richness of flora. The country is home to 92% of Africa's ecosystems and the rich biodiversity contains 8300 identified plant species, of which only about 40 species are exploited. Plants play an essential role in the lives of Cameroonian populations. Consumed or sold, they represent an important part of their income [4]. Indeed, Cameroon is ranked among the world's top five log exporters [5]. In addition, its economy is divided into two major economic sectors: agriculture and logging, which represented (42%) of GDP in 1950 or (60%) of the active population [6]. Similarly, popular knowledge is currently held by very few people, especially the aging population, among whom there is a high rate of illiteracy [7]. It is in this perspective that an ethnobotanical study was undertaken in the northern part of Cameroon, more precisely in some departments of the country, in order to identify the plants used in traditional pharmacopoeia for wound healing.

The objective of the study is to identify the main medicinal plants used by traditional practitioners, healers and herbalists in the treatment of wounds in the northern part of Cameroon. (**Figure 1**)

2. Methodology

This study was conducted between June 2021 and February 2022 and consisted of a survey in the northern parts of Cameroon, including the regions of Adamawa,

(a) (b)

Figure 1. (a) Wound of a patient without any treatment; (b) Wound of a patient under traditional treatment.

the north and the extreme north, where we had to target three departments in each of the three regions. The choice of these departments was due to the lack of health infrastructures adapted to this type of pathology and also due to the rich biodiversity according to the information obtained beforehand, as well as to the difficult access to health centers in some of these areas, thus presenting a significant rate of frequentation by these wound patients. These surveys took place in the Adamawa region in the departments of Vina, Faro and Deo and Mbere, in the northern region we had to work in the departments of Benue, Faro and Mayo-Rey, and finally in the far north region, more precisely in the departments of Mayo-Kani, Diamare and Mayo-Danay.

2.1. Ethnobotanical Surveys

The semi-structured open-ended interview technique was used in all areas. Casual conversations and observations were included. These participatory tools allow knowledge to be estimated and responses to be solicited [8]. The purpose of this technique is to have as complete a floristic inventory as possible and to conduct ethnobotanical surveys that vary from one area to another in the study region [9]. In order to have a certain amount of information and to obtain flexibility on their part, we had to bring some of the people present, which allowed us to have much more relaxed and twice as fruitful exchanges. The topics discussed were essentially related to the socio-demographic status, the acquisition of knowledge and the established diagnoses, generalities on the plants used, generalities on the effective plants to the treatment and ethnopharmacological (mode of preparation, mode of administration, felt effect, prescriptions…). During our investigations, we always asked for the help of a guide-interpreter who understands the local language and of the phytotherapists themselves who knew the species well, during the field trips in order to identify the species mentioned and to collect some plant samples in order to build up herbariums. The field trips were most often carried out in the company of the informant (tra-

dithérapeute) who directly identified the species indicated for the wounds. In the case where the informant is too old or busy after the interview, the guide is the one who helps to collect specimens, then a second passage is carried out at the informant's place for verification of the collections. Botanical identifications made in the field were validated at the University of Maroua, the University of Ngaoundéré, as well as at the national herbarium in comparison with herbarium samples [10]. Unknown plants are deposited in samples for further study. The information given by the persons concerned taken were duly filled in on our forms. The plant samples were collected during our different field trips. The data collection consisted of the identification and collection in the forest of the plants given by the respondents and sometimes the purchase of certain plants for those who were not available. The species cited were identified and named for the most part. Information on difficulties encountered in the field was also noted. The field data were recorded on a spreadsheet and then analyzed.

2.2. Data Analysis

The results were processed using two software programs: Sphinx plus "2" to create the survey forms and Excel version 2013 process the data.

The Citation Frequency is given by the formula

$$FC = \frac{NC}{NH}$$

where: *FC*: Citation Frequency of each plant cited by herbalists; *NC*: Number of citations of each plant cited by herbalist and *NH*: Frequency of citation

3. Results

3.1. Socio-Demographic Status of the People Surveyed

In the field, information was collected during the various surveys. The respondents revealed a predominance of males over females in the different regions surveyed: more precisely, the Adamawa region with 88% of men against 12% of women, in the northern region the frequency is 80% of men against 20% of women and finally in the Far North region where we have 89% of men against 11% of women (1). It is also important to note that the people most involved in this activity are mature people whose age varies from (]40; 60]) years (2), during these different approaches we also note that a good number of those who master the medicinal plants are of Muslim religion (3). We also note that many of these therapists are not educated, especially in the northern region (4). In order to ensure the continuity of traditions, as well as the conservation of knowledge, the means of learning to ensure this is the fact that some parents already initiated their offspring to these different forms of traditional treatments that they then kept in the form of inheritance in order to ensure a better conservation of ancestral knowledge in terms of plants beneficial to man (5). It should be noted that as methods of diagnosis to know what are the distant or close causes of the wounds encountered in different patients, many of them still use archaic methods. From

these different interviews, it appears that the vision mode is the cowrie shell the most used method by the doctors, followed by the requested examinations, which is a diagnostic method requested by those who sometimes work with scientists (Table 1).

3.2. Typologies of Plants Identified in the Regions

From the various surveys conducted in the field, it appears that the most effective plants are mostly shrubs, which are the type of plants with a greater variety of healing plants. This is the case in the three northern regions surveyed with the following statistics: Adamawa (39), North (44), Far North (47) compared to the other types of plants. As represented in Figure 2.

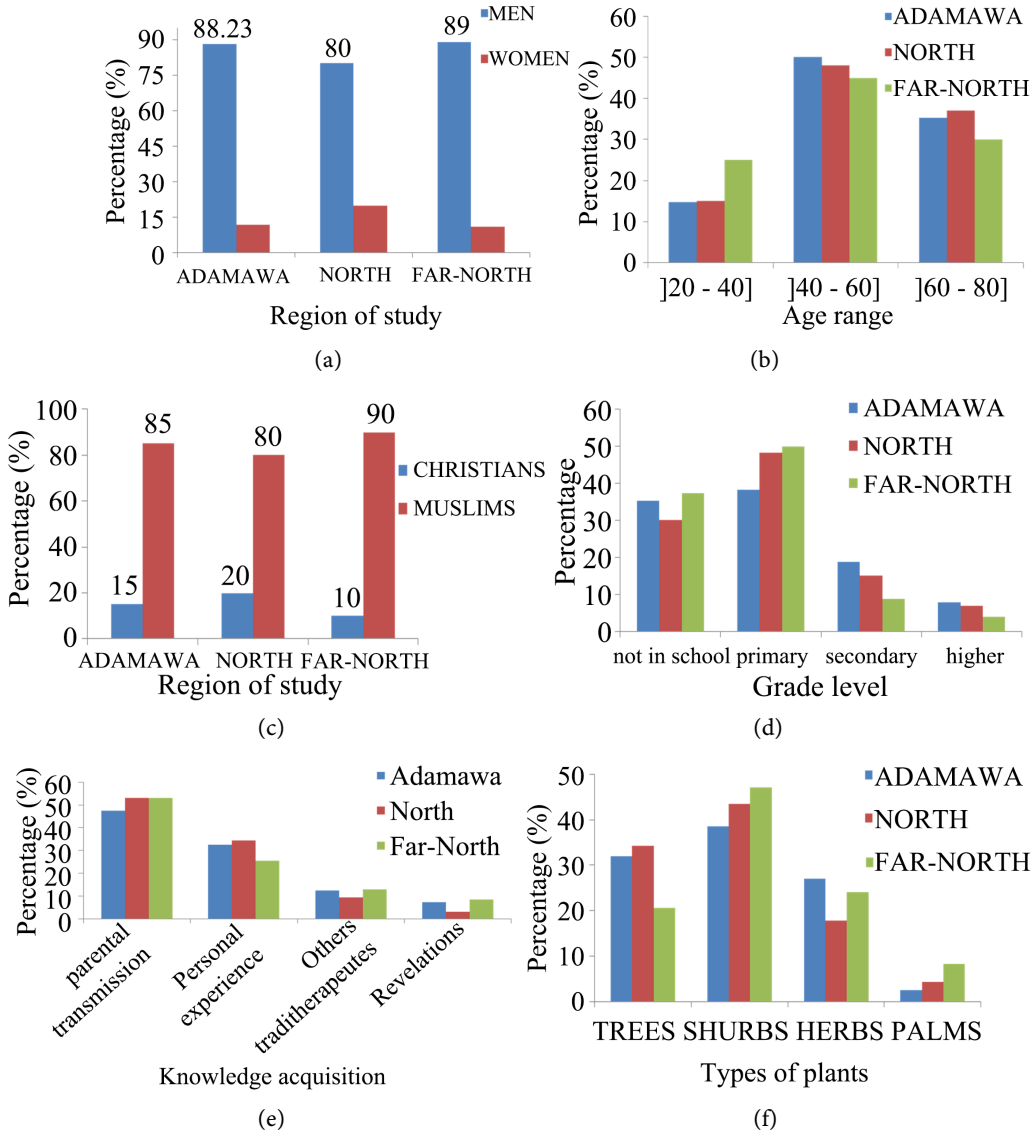

Figure 2. Top: (a) Percentage of men and women surveyed; (b) Different age groups of the people surveyed; (c) Religions of the people surveyed; (d) Educational level of the people surveyed; (e) Ways of transmitting knowledge; (f) Different types of plants identified.

Table 1. Different kind of methods.

Types of diagnosis	Percentage (%)
No tests requested	23%
examinations requested	32%
personal examination	5%
Asking questions	8%
Visions	34%

3.3. Different Kinds of Methods

In order to know what are the distant or close causes of the different patients of the wounds that come to them, the traditional therapists use different methods of diagnosis, in order to adapt the adequate treatment. And to do this, many of them are still using ancestral methods, while others use medical analysis to better diagnose.

3.4. Different Parts of Plants Used in the Treatment

The parts of plants used in treatments for different diseases in the different regions surveyed are the most used and in 9 departments surveyed are, in order of importance, the bark of the trunk with (47%) in the Adamawa region,(47%) in the Northern region and (43%) in the Far-North region. (Figure 3) Followed by the leaves which are (20%) in the Adamawa region, (18%) in the Northern region and (24%) in the Far-North region to name a few. The analysis of variance shows a highly significant difference ($0.000 < 0.001$) between the plant parts used. The great solicitation of barks and leaves in traditional medicine would find its reason in their richness in active substances. The parts used also vary according to the species and the wounds to be treated.

3.5. Drugs Preparation

Overall, the information provided shows that there are three modes of preparation: maceration, decoction and infusion. The analysis of variance shows a very significant difference between the three methods of preparation of medicines. The analysis of variance shows a very significant difference between the three methods of preparation of medicines, which are: maceration, decoction and infusion. At the level of ethnic groups, this difference is not noticeable, because cultural exchanges between the different ethnic groups may be one of the factors that have favored the popularization of different methods of preparing treatments. (Table 2)

The ethnobotanical surveys undertaken in the northern zone have been of great importance to us and also to the populations, because this work has made it possible on the one hand to know which plants are effective in the treatment and healing of wounds, but also to know which parts of these plants are needed, how they are prepared and administered, and above all to know which types of wounds they treat. (Table 3)

Table 2. Method of preparation of drugs.

Mode of preparation	Adamawa	North	Far-north
Decoction of Root Bark Every Morning and Evening	5.29	4.38	7.51
Maceration of Leaves	25.3	20.87	20.97
Infusion of the Powder of the Heart of the Trunk in Hot Water	5.29	7.68	4.84
Decoction of Plant Roots Every Other Day	18.82	18.13	19.89
Alcohol Maceration of the Seed Powder	3.53	2.19	4.84
Decoction of the Whole Plant 1 Glass and in the Evening 1 Glass	9.41	11.53	9.68
Maceration of the Powder of Stems of the Plant	2.93	4.94	5.9
Maceration of the Powder of the Bark of the Plant	25.88	26.92	19.89
Maceration of the Whole Plant	3.53	3.33	6.45

Table 3. Inventory and use of some medicinal plants used in Northern Cameroon.

Vernacular names	Scientific name	Family	Types of plants	Parts used	Types of wounds treated	FC	Mode of preparations
Moura Touta	*Strychnos innocua*	Loganiaceae	Trees	Young Fruits	Dog Bite	1.58	Crush into a leg
Dalehi	*Striga senegalensis*	Orobanchaceae	Herbs	Leaves	Snake Bite, Burns	1.58	Dry the leaves then crush it into powder
Duli	*Grewia villosa*	Tiliaceae	Shrubs	Leaves	Internal and External Wounds	1.58	Dry the leaves then crush it into powder
Saboullé	*Lagenaria vulgaris*	Cucurbitaceae	Herbaceous	Leaves	Burns	3.17	Dry the leaves then crush it into powder
Hodi	*Afrormosia laxiflora*	Fabaceae	Shrubs	Trunk Bark	Snake Bite, and Skin Diseases	3.17	Dry the bark then crush it into powder
Bourboumdje	*Echinochloa stagnina*	Poaceae	Herbaceous	Trunk Bark	Chronic Wounds	3.17	Dry the bark then crush it into powder
Bourbou	Citrullus sp	Cucurbitaceae	Herbaceous	Seeds	Scabies, Itching Skin	3.17	Decoction of the roots
Golombie	*Grewia villosa*	Tiliaceae	Shrubs	Root	Stomach Wounds	1.58	Decoction of the roots with rock salt
Saboullé	*Cassia occidentalis*	Fabaceae	Shrubs	The Whole Plant	Genital Infections and External Wounds	1.58	Heat the leaves use the juice
Sembal	*Cassia obovata*	Senna	Shrubs	The Whole Plant	All Types of Wounds	1.58	Decoction of all parts of the plant
Gapdé	*Hexalobus glabrescens*	Annonaceae	Trees	The Whole Plant	All Types of Wounds	3.17	Decoction of all parts of the plant
Bodihi	*Musa paradisiaca*	Musaceae	Herbaceous	Sap	All Types of Wounds	1.58	Collect the sap

Continued

Bananier	*Lantana camara*	Verbenaceae	Shrubs	Leaves	Burns	3.17	Decoction of the leaves
Camara A Feuilles De Mellisse	*Lantana camara*	Verbenaceae	Shrubs	Trunk Bark	Childbirth Wounds	1.58	Dry the bark and crush it into powder
Camara A Feuilles De Mellisse	*Butyrospermum parkii*	Sapotaceae	Trees	Trunk Bark	Wounds of the Lower Abdomen	3.17	Dry the bark and crush it into powder
Karlawal	*Indigofera tinctoria*	Fabaceae	Shrubs	Trunk Bark	Mystic Wounds	1.58	Decoction of the bark
Mbaléri Gniemgniem	Citrullus sp	Cucurbitaceae	Herbaceous	Seeds	Wounds From Accidents	3.17	Decoction of the roots
Golombie	*Grewia villosa*	Tiliaceae	Shrubs	Root	Wounds of Diabetics	3.17	Decoction of the roots with rock salt
Saboullé	*Grewia villosa*	Tiliaceae	Shrubs	Root	All Types of Wounds	3.17	Decoction of the roots with rock salt
Saboullé	*Burkea africana*	Fabaceae	Trees	Trunk Bark	All Types of Wounds, Even Mystical Ones	6.34	Decoction of bark
Kohi	*Khaya senegalensis*	Meliaceae	Trees	Trunk Bark	Wounds From Accidents	4.76	Decoction of barks
Dahéhi	*Crataeva adansonii*	Capparaceae	Trees	Root	Cuts, Burns, Cancer Wounds	1.58	Decoction of roots
Taina	*Crataeva adansonii*	Capparaceae	Trees	Leaves	Snakebite, Burns, Abrasions	4.76	Decoction of roots
Taina	*Indigofera tinctoria*	Fabaceae	Shrubs	Trunk Bark	Wounds From Operations, Internal Wounds	1.58	Decoction of bark
Mbaléri Gniemgniem	*Pupalia lappacea*	Amaranthaceae	Herbaceous	Leaves	Burns, Cuts	1.58	Dry the leaves and crush them into powder
Ngniackamré	*Solanum aethiopicum*	Solanaceae	Herbaceous	Trunk Bark	Traffic Accidents, Cuts	3.17	Decoction of bark
Kouladjé	*Butyrospermum parkii*	Sapotaceae	Trees	Trunk Bark	Wounds of Cancerous Type	1.58	Decoction of bark
Karlawal	*Ficus iteophylla*	Moraceae	Shrubs	Trunk Bark	All Types of Wounds	3.17	Decoction of bark
Koulkouladjé	Grewia sp	Malvaceae	Shrubs	Trunk Bark	All Types of Wounds	4.76	Decoction of bark
Broumbroum	*Prosopis africana*	Fabaceae	Trees	Trunk Bark	Burns	1.58	Decoction of bark

Continued

Boudoudji	*Indigofera tinctoria*	Fabaceae	Shrubs	Trunk Bark	Deep Wounds	3.17	Decoction of bark
Mbaléri Gniemgniem	*Pupalia lappacea*	Amaranthaceae	Herbs	Leaves	Snake Bite	1.58	Dry the leaves and crush them into powder
Ngniackamré	*Ficus iteophylla*	Moraceae	Trees	Sap	Burns And Ulcers	1.58	Collect the sap
Koulkouladjé	*Couleus dysentericus*	Lamiaceae	Herbaceous	Trunk Bark	All Types of Wounds	4.76	Decoction of bark
Falawadou	*Fluggea virosa*	Phyllanthaceae	Shrubs	Trunk Bark	Mystic Wounds	1.58	Dry the bark then crush it into powder
Andakei	*Strychnos innocua*	Loganiaceae	Trees	Young Fruits	Cancerous Wounds	1.58	Crush in leg
Moura Touta	*Hexalobus glabrescens*	Annonaceae	Shrubs	Trunk Bark	Wounds From Accidents	1.58	Dry the bark then crush it into powder
Bodei	Grewia sp	Malvaceae	Shrubs	Trunk Bark	Burns, Cuts	1.58	Decoction of bark
Broumbroum	*Prosopis africana*	Fabaceae	Trees	Bark of the Trunk	Scabies Wounds	1.58	Decoction of the bark
Boudoudji	*Vernonia amygdalina*	Asteraceae	Shrubs	Leaves	Internal Wounds	1.58	Decoction of leaves
Ndolè	*Musa paradisiaca*	Musaceae	Herbs	Heart of the Trunk	Abrasions	1.58	Crush in leg
Tronc Plantain	*Theobroma cacao*	Sterculiaceae	Shrubs	Young Fruits	Dog Bites	1.58	Crush in leg
Cacao	*Carissa edulis*	Apocynaceae	Shrubs	Bark of the Trunk	All Types of Wounds	1.58	Dry the bark and crush it into powder
Tchaboulei	Gladiolus sp	Iridaceae	Herbaceous	Leaves	All Types of Wounds	3.17	Crush in leg
Djembale	*Hexalobus glabrescens*	Annonaceae	Trees	Bark of the Trunk	Stomach Wounds	3.17	Dry the bark then crush it into powder
Bodei	*Arachis hypogea*	Fabaceae	Herbaceous	Leaves	Head Wounds	3.17	Decoction of the leaves
Kayerlahi	*Fluggea virosa*	Phyllanthaceae	Shrubs	Bark of the Trunk	Childbirth Wounds	3.17	Dry the bark then crush it into powder
Andakei	*Carissa edulis*	Apocynaceae	Shrubs	Trunk Bark	Mystical Wounds, Snake Bites	1.58	Dry the bark then crush it into powder
Tchaboulei	Gladiolus sp	Iridaceae	Herbaceous	Leaves	Wounds of the Stomach	1.58	Crush it into a leg
Djembale	*Borassus aethiopum*	Arecaceae	Palm tree	Root Bark	Cuts, Burns, Cancer Wounds	1.58	Decoction of the root bark

Continued

Dukouli	*Pseudocedrela kotschyi*	Meliaceae	Trees	Trunk Bark	Wounds of Cancers	3.17	Dry the bark then crush it into powder
Mbodi	*Arachis hypogea*	Fabaceae	Herbaceous	Leaves	All Types of Wounds	1.58	Decoction of the leaves
Kayerlahi	*Albizia coriaria*	Fabaceae	Trees	Leaves	All Types of Wounds	3.17	Decoction of the leaves
Sanda	*Acacia campylacantha*	Fabaceae	Shrubs	Trunk Bark	All Types of Wounds	1.58	Decoction of bark
Patuki	*Hymenocardia acida*	Phyllanthaceae	Trees	Trunk Bark	Internal Wounds, Snake Bites	3.17	Decoction of bark
Samatahi	*Lycospersicum esculentum*	Solanaceae	Grasses	Trunk Bark	Abrasions	1.58	Decoction of bark
Koulahi	*Cassia goratensis*	Caesalpiniaceae	Shrubs	Trunk Bark	Burns	3.17	Decoction of barks
Guelehouki	*Borassus aethiopum*	Arecaceae	Palm tree	Root Bark	Wounds Resulting From Childbirth	3.17	Root bark decoction
Dukouli	*Abrus precatorius*	Fabaceae	Shrubs	Root Bark	Stings of Aragnes, and Scorpions	3.17	Decoction of bark roots
Barbambi	Ficus sp	Moraceae	Shrubs	Root	Burns, Snake Bites	1.58	Decoction of roots
Barkehi	*Tamarindus indica*	Fabaceae	Trees	Root	Abrasions	1.58	Decoction of roots
Djabbi	*Ziziphus spina-christi*	Rhamnaceae	Trees	Trunk Bark	Scabies Wounds	1.58	Decoction of barks

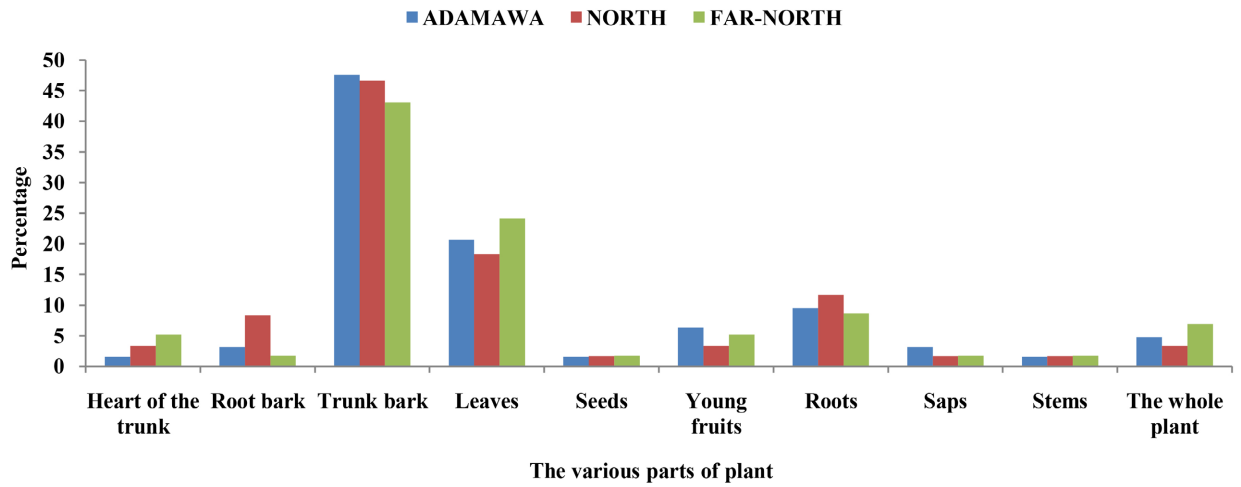

Figure 3. Different plant parts used in the treatments.

4. Discussion

Our work has allowed us to identify a number of medicinal plants with healing properties in the Northern zone of Cameroon. In order to arrive at these results,

ethnobotanical studies were conducted in the Northern zone, following the example of Gormo in 2013 [11] who worked on the use of plants among the peoples of Northern Cameroon. With regard to wound healing, this is the first study of its kind conducted in these regions. However, the healing properties of these plants are not very descriptive. In-depth studies would be necessary to provide elements of understanding of the mechanisms involved in the main effects observed. The results of the ethnobotanical survey showed that bark and roots (35%) are the parts of the plant most used by traditional practitioners, herbalists and others. Of the three modes of preparation, maceration is the most used. The major limitations of these methods of preparation are the failure to respect the rules of asepsis, the lack of dosage control and the lack of conservation. The effectiveness of the plants cited in this study requires the monitoring of the transformations in the body (absorption, metabolization and elimination). Their bioavailability may be decreased at absorption by enzymes, during their metabolization by hepatic passage effects. It would then be necessary to study their behavior in the body in order to consider adequate pharmaceutical forms. Concerning the survey was conducted among 183 people in the three regions of the septentrion, it was found that: Concerning the socio-demographic status of these people, men were the most represented in the majority compared to women, which could be explained by the fact that women are less involved in this type of activity, which is consequently more popular with men, However, ethnobotanical surveys conducted in the department of Lom and Djerem by [12] showed that it was women who were more involved in the use of medicinal plants since they use them in other areas than herbalism. It was also found that it is the more mature people who are interested in this activity; this profile of traditional practitioners in the Maritime region of Togo is the one observed in most gender studies, confirming that the practice of traditional medicine is the prerogative of middle-aged men [13]. It has been found that knowledge of a traditional medicine recipe is primarily a family secret that is passed on from generation to generation through customs and oral traditions. It is therefore necessary to be of mature age and have a certain degree of confidence to access the knowledge of this medicine. This is the main reason why this profession is practiced by older people. The present study showed a good diversity of plants used for wound healing in the northern zone of Cameroon, a total of 41 species of medicinal plants were recorded, divided into 20 families, of which the most represented families are Fabaceae with 9 species, followed by two dominant families which are equally Annonaceae (3) and Tiliaceae (3). Other ethnobotanical studies in Algeria revealed the same diversity of 21 plant species belonging to 16 botanical families and used in the local application according to 27 traditional recipes [14].

5. Conclusion

In order to contribute to the valorization of medicinal plants used in traditional

medicine in the northern part of Cameroon, an ethnobotanical survey was conducted among 184 respondents chosen because they had a better knowledge of wound treatment in the 9 departments visited. We listed 41 species of medicinal plants divided into 20 families. The quantitative analysis of the frequency indices was calculated, and the citation frequencies were also revealed for a good knowledge of alternative and curative medicinal plants. This study provides useful documentation for the preservation of traditional medicine knowledge, especially the most effective plants for healing in the Cameroon area. It provides a research base for further advanced studies and therapeutic perspectives for better wound management.

Conflicts of Interest

The authors declare no conflicts of interest.

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