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Research Article

Ethnopharmacological Survey on Medicinal Plants Used by Traditional Healers in Central and Kara Regions of Togo for Antitumor and Chronic Wound Healing Effects

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Cancer is an emerging public health problem in sub-Saharan Africa. Several medicinal plants are used by traditional healers to treat tumors. In Togo, there are no recorded data for these plants but traditional healers claim to cure tumors with some success. So, information on medicinal plants used to cure human tumors and cancer could be of great importance for their widespread use and scientific validation. The present ethnopharmacological survey aims to record information on antitumor plants in central and Kara regions of Togo. Semistructured validated questionnaires were administered to fifty-seven traditional healers specialized in tumor management in 7 prefectures of Togo. Good practices and know-how were recorded. Quantitative ethnobotanical tools were used to analyze and summarize the data collected. 85 recipes of medicinal plants for tumors management are provided. In the local dialect, 78.95% of traditional healers do not have a clear tumor designation and 29.90% find that the causes of tumors remain unknown. According to 48.78% of traditional healers, the diagnosis of tumors in patients is made in the hospital. The types of tumors frequently treated are those of the breast (43.75%) and the lung (16.67%). The seventy listed medicinal plants belong to thirty-nine families, the most represented being Rubiaceae (17.95%), Caesalpiniaceae (12.82%), Fabaceae (10.26%), and Annonaceae (7.69%). The ten most cited species were *Xylopia aethiopica, Aframomum melegueta, Khaya senegalensis, Parkia biglobosa, Piliostigma thonningii, Blighia sapida, Vitellaria paradoxa, Adansonia digitata, Annona muricata*, and *Parinari curatellifolia*. Most of the recipes are prepared as decoction (40%) and administered orally (54.12%). Both regions of our study have a wealth of medicinal plants, and traditional healers would use their local knowledge in the management of various tumors and chronic wounds.

1. Introduction

Noncommunicable diseases are now responsible for the majority of global deaths [1]. Cancer, one of them, is increasingly recognized as a critical public health problem. The International Agency for Research on Cancer estimated 18.1 million new cancer cases for 185 countries of the world and 9.6 million cancer deaths in 2018. In Africa, there were 1.1 million new cancer cases and 0.69 million cancer deaths in 2018 [1]. Estimations suggest that Asia and Africa have the highest proportion of cancer deaths compared with their incidence [1]. It is now well known that apart from the accumulation of mutations, chronic inflammation and chronic wounds lead to cancer in the affected organs [2]. Indeed, chronic wounds due to tissue damage and/or infections could induce chronic oxidative stress and inflammation [3–5]. By these pathways, the generation of free radical, chronic inflammation, and chronic wounds can lead

to cancer. Then, anticancer products that are able to heal chronic wounds and chronic inflammation and have also radical scavenging are the best for stopping tumor progression [6]. Another approach is to find drugs that possess not only a cytotoxic activity but also an anti-inflammatory and antioxidant activity to fight cancer.

According to the World Health Organization (WHO), about 65–80% of the world's population in developing countries depends essentially on traditional medicine for their primary health care [7, 8]. The effectiveness, availability, cost, and minimization of side effects would contribute to this situation [9]. Medicinal plants can play an important role in cancer drug discovery [10]. The main strategies used for the selection of plant species for cancer/tumor drugs' discovery include random screening, chemotaxonomic information, and ethnomedical knowledge [11, 12].

Ethnopharmacological surveys are needed in Africa to identify medicinal plants used by healers to treat several human ailments such as tumors and cancer. These surveys helped record local knowledge of healers and provided a database of plants used traditionally as anticancer plants for further preclinical and clinical studies. In Africa, most published data and ethnopharmacological surveys related to the anticancer potential of plants were from Cameroon, Ghana, Nigeria, Egypt, Madagascar, Morocco, Algeria, and Ethiopia [13–16]. In Togo, some ethnopharmacological surveys have been conducted but they have not focused on cancer [17–21]. The ecological and floristic diversity and the presence of an association of traditional healers practicing in the field support the hypothesis of the availability of potential anticancer plants in Togo. So, the aim of this study was to fulfill the lack of data on plant species used in traditional medicine for cancer management in Togo by interviewing traditional healers. The database of this survey will be used for preclinical studies in order to develop bioactive anticancer drugs.

2. Methods

2.1. Study Area. Togo is a Western African country. It is surrounded in the North by the Republic of Burkina Faso, in the East by the Republic of Benin, in the West by the Republic of Ghana, and in the South by the Atlantic Ocean. Togo has been divided into five economic regions from North to South: Savannah region, Kara region, Central region, Plateaux region, and Maritime region. The present ethnopharmacological survey was carried out in two regions (Figure 1): Central and Kara accounting for 7 communities. The area of study is located between 0.61°–1.33°East and 7.89°–10.01°North. With a humid tropical and middle tropical climate, it mainly consists of dry and wooded savannahs, dense dry, and clear forests.

This survey was carried out in close cooperation with the Center for Studies and Research in Applied Traditional Medicine (CERMETRA). This center gathers traditional healers and researchers and is well organized and active in the two regions. The aim of this center is to organize traditional healers in Togo in order to share their knowledge and promote traditional medicine in each region.

2.2. Data Collection. This ethnopharmacological survey was carried out according to the methods of Segun et al. [13], Agyare et al. [16], and Kantati et al. [18]. The survey and data compilation took place from August 2018 to April 2019 in close cooperation with the national staff of CERMETRA based in the Central region. The primary goal of this survey was to collect ethnopharmacological information about medicinal plants for cancer treatment. The participants were selected among traditional healers who are members of CERMETRA and specialized in cancer treatment using medicinal plants. All participants were informed about the survey, and personal visits were made to their usual meeting centers. As Segun et al. [13] and Agyare et al. [16], before the interview, they were informed that some gifts in cash were provided to compensate their time and cost of travelling. The study protocol was approved by the ethics committee, and the informed consent was sought at the beginning of the interview. Fifty-seven traditional healers were interviewed with a semistructured questionnaire. The survey was carried out in two steps: the first step was to meet these traditional healers identified in their usual meeting centers. Information on their identity, the practice of the profession of traditional healers, knowledge of cancer/tumors, and the recipes used, local names, composition, preparation, and collection was requested. The questionnaire is written in French and explained in the local language to traditional healers either by a field assistant of the community or by ourselves depending on the localities.

To ease dialogue with traditional healers and increase the chances of getting useful information, ethnopharmacological usage such as skin disorders, chronic inflammation, tumors, chronic wounds, and malfunctions affecting internal organs can be used as a keyword to reach cancer when selecting plants used to treat cancer [4, 5]. It is well known that anticancer products that are able to heal chronic wounds and chronic inflammation and have also radical scavenging are the best for stopping tumor progression [22].

The second step of the survey was to go into the bush with a specialist from each community who recognizes the plants. Samples were collected for further systematic identification. Identities of plants' samples collected were confirmed in the herbarium by botanists of the Botany Department, Faculty of Sciences, University of Lomé. Voucher numbers were obtained for all species except four samples (Figure 1) which were deposited also in the herbarium. This is because of the width of the leaves and the difficulty of keeping the bulbs in the form of a herbarium. The taxonomic keys of online databases of PROTA (PROTA4U, Plant Resources of Tropical Africa) and African Plant Database (http://www.theplantlist.org) were used in this process, and the nomenclature of species was done using the online database.

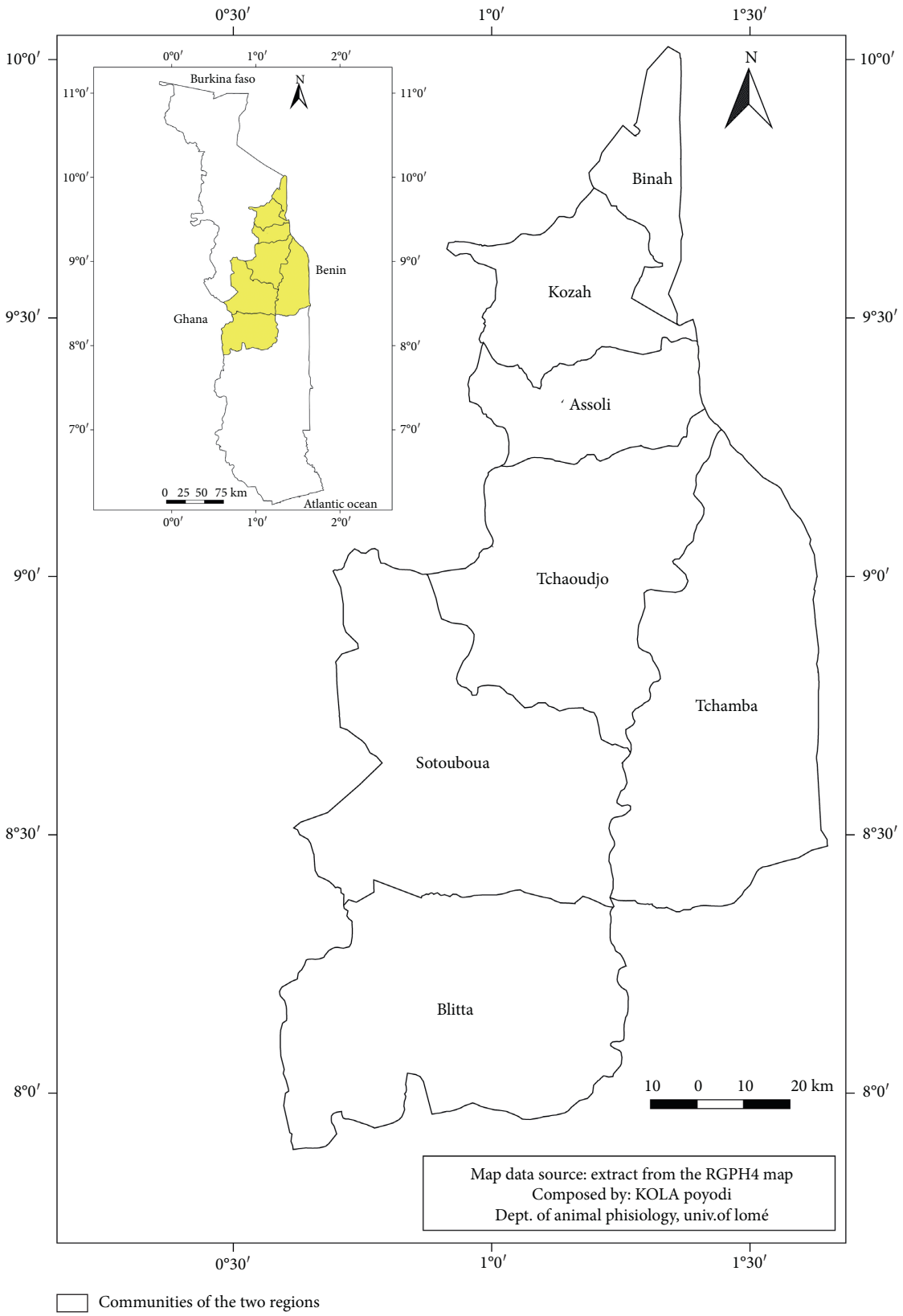


Figure 1: Map of Togo showing the study areas.

2.3. Data Analysis. MS Excel 2013 spreadsheets were used to make simple calculations. The collected data from the survey questionnaire were analyzed using a quantitative method including Fidelity Level (FL), Use Value (UV), and

Frequency of Citation. This method enables us to make a consensus of the plant species which is frequently used to treat cancer. FL indicates the percentage of informants who claimed to use plant species for the same purpose regarding diseases' treatment. FL (%) = $(N_p/N) \times 100$, where N_p indicates the number of the interviewed healers who claimed to use a plant species to treat a particular disease and N indicates the interviewed healers who used herbs as a medicine to cure any disease [23]. FC (%) = (number of remedies containing the plant/total of remedies collected) × 100. The use value, a quantitative method that demonstrates the relative importance of species known locally, was also calculated as follows: UV = $\Sigma U/n$, where UV is the use value of a species, U is the number of citations per species, and n is the number of informants [24].

3. Results and Discussion

3.1. Characteristics of Traditional Healers. Of the 57 traditional healers surveyed, 50 were men (87.72%) and 7 were women (12.28%). Most of them (85.96%) inherited the profession of "traditional healer" from their parents. This finding is in agreement with that of Avana-Tientcheu et al. [25] in the Boyo Division in Cameroon. Sixty-eight percent (68%) of the respondents claimed to have been practicing for 11–50 years (Figure 2(a)) with the majority (85.96%) having acquired the knowledge through ancestral inheritance. These findings are similar to those of Agyare et al. [16] and Agyare et al. [26] in Ghana and Segun et al. [13] in Nigeria. This profession requires a long experience for the practitioner to be able to identify plants for effective management of diseases.

Islam (59.65%) and the traditional religion (28.07%) were the predominant religions of the respondents. About 21.05% of the healers were in the age between 20 and 40 years, 66.67% between 41 and 70 years, and 12.28% between 70 and 120 years (Figure 2(b)). This age distribution confirms the findings in Togo [17] and is similar to the findings in Ghana and Cameroon [25, 26] where a significant dominance of elder or very aged healers was documented. It suggests that the profession of traditional healers was mainly done by elders. In contrast, a trend for youngers in this profession has been reported in a study in Ghana [27].

About healers' education level, 3.51% held a university degree, 28.07% attended high and middle school, 24.56% attended primary school, and 43.86% were illiterate (Figure 2(c)). In contrast, only 5% were illiterate or without any formal education in other surveys in Ghana [16].

3.2. Treatment Practices. Cancer designation leads to ambiguous interpretations among traditional healers. In the local language, 78.95% of traditional healers do not have a common clear local name of tumors and cancer. According to them, it is an emerging disease that did not exist before. Similar observations were made by Segun et al. [13] in Nigeria where interviewers faced the problem of the recognition of the disease by healers. In our study, cancer is perceived as a disease that can attack any part of the body. The most common cancers they know and treat are breast cancer (43.75%) and lung cancer (16.67%). Segun et al. [13] in Nigeria found that breast, stomach, and skin cancer are the specific types mentioned. This shows that breast cancer is well known by healers as one of the most prevailing cancers in women. The healers of our study area interpret cancer as an incurable wound, wounds that rot, chronic inflammation, swelling, and solid tumors. Segun et al. [13] found similar results. These interpretations are in line with the statement of Ohshima et al. [5] and Aggarwal et al. [3] who underline the link between chronic inflammation, old wounds, and cancer.

In Kabyè dialect, cancer is designated by "Lémiré, Gangang, koudonkissalou, and heimatenmaten"; in kotocoli/Tem by "Abiliou, Feyo, canasseré, and Fézikinlondina"; and in Ewé by "Abidjomakou, Abimakoumakou, and Canssa."

Another important aspect of our findings is that 48.78% of the traditional healers surveyed stated that their patients were diagnosed in modern hospitals. Due to financial constraints and the lack of appropriate health centers in their area, they choose to be treated by traditional healers. Some traditional healers are able to diagnose certain tumors themselves based on their experience in the field but others send their patients to the hospital for confirmation of the diagnosis. They used certain signs that are frequently encountered in patients such as a lump in the breast and a swelling mainly. They do not fail to make a medical follow-up by analyses during the treatment. These facts show that these healers are able to manage tumors. For 70.30% of traditional healers, their patients do not receive conventional treatment especially anticancer drugs. Similar cases had been reported by Segun et al. [13] in Nigeria. But in contrast to these findings on cancer diagnosis, Agyare et al. [16] in Ghana found that most of the cancer diagnoses are done by the traditional healers based on their long years of experience and apprenticeship. Few cases are diagnosed at a hospital but prefer to use herbal preparations for the treatment. This depicts a good collaboration between the healer community in the Ashanti region in Ghana and the immense activity of the Ghana Federal Government to increase healers' education level.

During our survey, the healers were asked about the main causes of cancers and tumors in humans in their areas, based on their experience. About 29.9% of traditional healers stated that the causes of cancers and tumors remain unknown. However, for 22.69% of the healers, cancer is caused by tobacco smoking and air pollution and food and hygiene for 31.95% while 6.18% stated that cancer is caused by a spiritual attack. Only 9.28% cited that hereditary factors are responsible for cancer. Similar findings were obtained by Agyare et al. [16], and this reflects a quite good understanding of risk factors for oncogenesis. In other studies in Nigeria, beyond half of the healers claimed that cancer is caused by spiritual attack and offence to the gods and abominable things in the family [13]. This suggests that the causes of cancer remain a contradictory debate in the field of traditional medicine because some trust in spiritual attacks

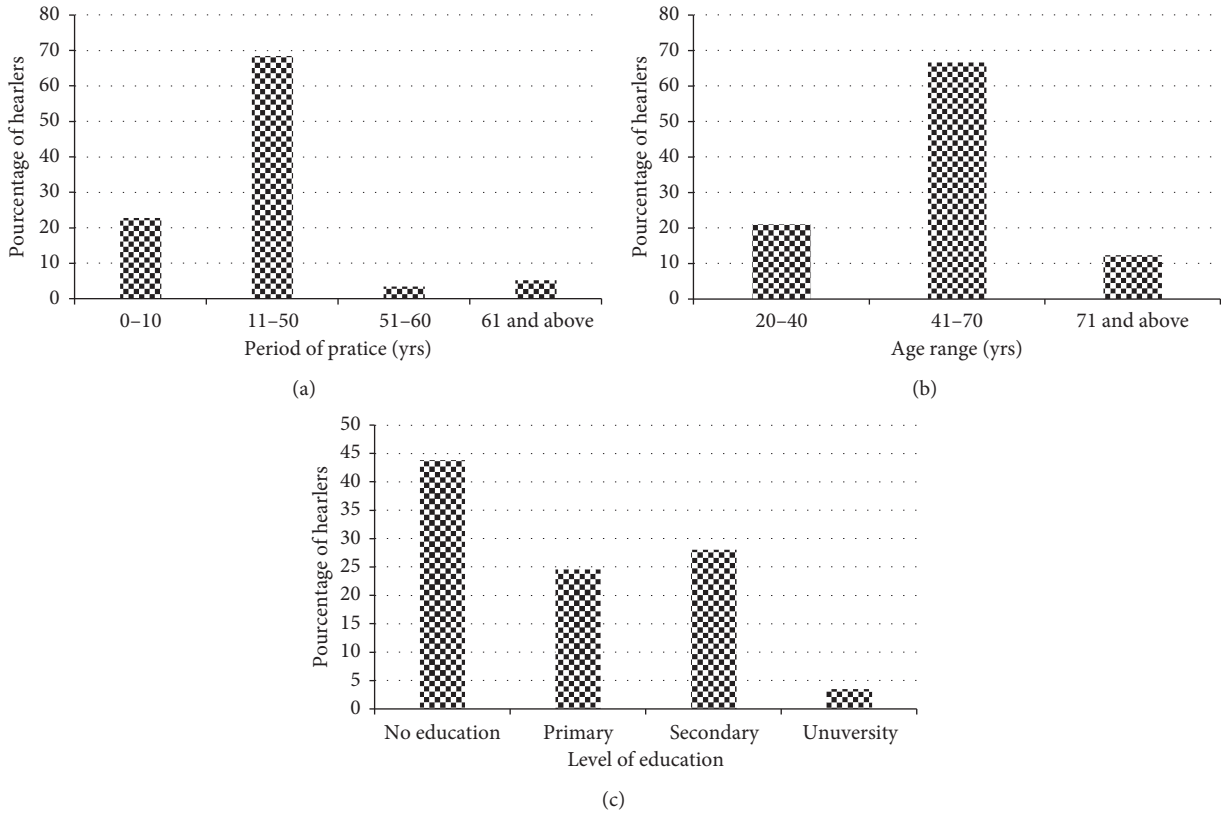


Figure 2: Biodata analysis of healers. (a) Period of practice. (b) Age range. (c) Distribution of the level of education.

and others rely on genetic and environmental factors similar to the scientists' concepts.

3.3. Plants Reported as Antitumor and Relative Frequency Citation. A total of 85 recipes of medicinal plants for tumor management are provided by the 57 traditional healers. These 85 recipes are prepared with 70 different species of plants. These 70 species of medicinal plants distributed among 39 families were identified with their scientific and local names for tumor and related diseases' management in Kara and Central regions of Togo (Table 1). The most represented families are Rubiaceae (17.95%), Caesalpiniaceae (12.82%), Fabaceae (10.26%), and Annonaceae (7.69%). The ten most cited species are *Xylopia aethiopica, Aframomum melegueta, Khaya senegalensis, Parkia biglobosa, Piliostigma thonningii, Blighia sapida, Vitellaria paradoxa, Adansonia digitata, Annona muricata*, and *Parinari curatellifolia.* Most plant species reported in this study were also reported in other similar studies in Africa [13, 16, 25, 28].

Three groups of medicinal plants recorded in our survey were made (Table 2): group I (very frequently used), group II (frequently used), and group III (less frequently used). The top 10 plants most cited represent 14.28% of all plants recorded (10/70 plants). A similar observation was made by Agyare et al. [16] in Ghana, where *Khaya senegalensis* and *Blighia sapida*, with use values 0.12 and 0.10, respectively, in our study, are common species most cited in the top 10 species to treat cancer. In a study in Cameroon, Kuete et al. [29] have demonstrated that *Xylopia aethiopica*, the most used species for cancer in our study, possesses the lowest IC50 on *in vitro* cytotoxicity on human cancer cells. *Aframomum melegueta*, a frequent use species in our study for tumors and chronic wounds, is also a frequent use species for wounds in Ghana [26]. Compared to several ethnopharmacological surveys in Nigeria, Ethiopia, Morocco, and Algeria, our top 10 plants most cited are different from their results [15, 28, 30]. This may be due to the difference between flora and geographical characteristics and also knowledge of medicinal plants by healers. In North Africa, among the plethora of plants used, *Nigella sativa* and *Trigonella foenum-graecum* are the most preferred ones by herbalists for the treatment of cancer. These wide differences of Africa flora justify the wealth of Africa in plant species that may have anticancer properties.

Chronic inflammation and chronic wounds can lead to cancer in the affected organs. Table 3 shows the list of species cited for the two types of tumors most treated and chronic wound healing in our regions of study. Among our top 10 species, three of them, *Piliostigma thonningii*, *Blighia sapida*, and *Parinari curatellifolia*, are recommended for both types of the most treated tumors (breast and lung) and for old wounds. This suggests an interest for these plants which may possess antitumor and anti-inflammatory effects.

For the formulation of their recipes, 90.77% of traditional healers find their plant species in the forest only and 7.70%

Table 1: Medicinal plants used for the management of tumors and chronic wounds in Central and Kara regions of Togo.

Plant species	Families	Local name	Voucher number	Parts used	Mode of preparation/ administration	Type of tumors and chronic wounds	FL	FC (%)	UV
Abrus precatorius L.	Fabaceae	Adodobia fadi/ T	Togo15540	Le	Pow/Orl	Lung	1.75	1.18	0.02
Acanthospermum hispidum DC.	Asteraceae	Lan gbanisoè/K	Togo15528	Le	Dec/Orl	Bone, skin	5.26	3.53	0.05
Adansonia digitata L.	Bombacaceae	Télou/K	Togo15526	Stb, Fr	Dec, Pow/Top, Sau/Orl	Chronic wound, breast	7.02	4.71	0.07
Afraegle paniculata (Schum.) Engl.	Rutaceae	Ngoné/K	Togo15541	Sed	Pow/Orl	Breast	1.75	1.18	0.02
Aframomum melegueta K. Schum.	Zingiberaceae	Colombo/K	Togo15492	Fr	Pow, Dec/Orl/ Bba/Top	Throat, bone, breast, skin, chronic wound	14.03	9.41	0.14
Afzelia africana Sm. ex Pers.	Caesalpiniaceae	Wéré/K	Togo15520	Stb, Rt	Pow/Top	Chronic wound, skin, bone	5.26	3.53	0.05
Allium sativum L.	Alliaceae	Aiyo/E	Togo15542	Fr	Dec/Orl	Lung	1.75	1.18	0.02
Amaranthus hybridus L.	Amaranthaceae	Karatoutou	Togo15532	Rt, Le	Pow, Top/Orl	Breast, cervix	3.51	2.35	0.03
Annona muricata L.	Annonaceae	Agnigli/E	Togo15173	Le	Dec/Orl	Breast, bone, lung	7.01	4.71	0.07
Annona senegalensis Pers.	Annonaceae	Tchoutchourè	Togo15533	Rt, Le	Pow/Top	Bone, chronic wound	3.51	2.35	0.03
Azadirachta indica A. Juss.	Meliaceae	Kini/K	Togo15543	Stb	Dec/Orl	Chronic wound	1.75	1.18	0.02
Blighia sapida K. D. Koenig	Sapindaceae	Kpizou	Togo15525	Le, Fr	Dec/Top; Sau, Pow/Orl	Chronic wound, lung, skin, breast, brain	10.53	7.06	0.10
Bridelia ferruginea Benth.	Euphorbiaceae	Kolou/T	Togo15504	Rt	Pow/Top	Chronic wound	1.75	1.18	0.02
Butia capitata (Mart.) Becc.	Arecaceae	Foda kokolo/K		Rt/Fr	Dec/Orl	Breast	1.75	1.18	0.02
Caesalpinia pulcherrima (L.) Sw.	Caesalpiniaceae	Wayi/K	Togo15506	Le	Dec/Orl	Prostate	1.75	1.18	0.02
Calotropis procera (Aiton) R. Br.	Asclepiadaceae	Kpakpadjoé/K	Togo15534	Rt, Le	Dec/Orl, top	Breast, chronic wound	3.51	2.35	0.03
Carica papaya L.	Caricaceae	Somboré/K	Togo15544	Rt	Pow/Orl	Lung	1.75	1.18	0.02
Citrus limon (L.) Burm. *f.*	Rutaceae	Gnami/K	Togo15497	Fr	Mac/Orl	Lung, breast	5.26	3.53	0.05
Cochlospermum planchonii Hook. F.	Cochlospermaceae	Tèkalichoua/K	Togo15501	Rt	Pow/Orl	Breast	1.75	1.18	0.02
Cola nitida (Vent.) Schott & Endl.	Sterculiaceae	Coroo/T	Togo15551	Hul	Pow/Top	Breast	1.75	1.18	0.02
Colocasia esculenta (L.) Schott	Araceae	Pankani/K	Togo15546	Le	Pow/Orl	Breast	1.75	1.18	0.02
Combretum collinum Fresen.	Combretaceae	Fokizao/T	Togo15507	Rt	Sau/Orl	Lung	1.75	1.18	0.02
Curcuma longa L.	Zingiberaceae	Wissikoyè	Togo15496	Rt	Pow/Orl	Breast	1.75	1.18	0.02
Daniellia oliveri (Rolfe) Hutch. & Dalziel	Caesalpiniaceae	Tchèlè/T	Togo15547	Le	Sau/Orl	Lung	1.75	1.18	0.02
Dichrostachys cinerea (L.) Wight and Arn.	Mimosaceae	Sozossi/T	Togo15548	Rt	Sau/Orl	Breast	1.75	1.18	0.02
Elaeis guineensis f. androgyna A. Chev.	Arecaceae	Pawou/K		Rt	Dec/Orl/Bba	Chronic wound	1.75	1.18	0.02

Table 1: Continued.

Plant species	Families	Local name	Voucher number	Parts used	Mode of preparation/ administration	Type of tumors and chronic wounds	FL	FC (%)	UV
Eleusine indica (L.) Gaertn.	Poaceae	Adandala/T	Togo15502	Rt	Pow/Top	Breast	1.75	1.18	0.02
Erythrina senegalensis A. DC.	Fabaceae	Gbengben tchikoloka/T	Togo15549	Rt	Pow/Top	Throat wound	1.75	1.18	0.02
Fadogia agrestis Schweinf. ex Hiern	Rubiaceae	Djangadjanga/ T	Togo15550	Rt	Dec/Orl	Liver	1.75	1.18	0.02
Gardenia ternifolia Schumach. & Thonn.	Rubiaceae	Kao/K	Togo15505	Rt	Dec/Orl	Breast	1.75	1.18	0.02
Gymnosporia senegalensis (Lam.) Loes.	Celastraceae	Tchakatchaka/ K	Togo15535	Le	Dec, Orl/Top	Chronic wound	1.75	2.35	0.03
Khaya senegalensis (Desr.) A. Juss.	Meliaceae	Hemou/K, Frimou/T	Togo15523	Stb, Le	Dec, Pow, Mac, Orl/Bba/Nas	Chronic wound, skin, brain, bone	1.75	8.24	0.12
Kigelia africana (Lam.) Benth.	Bignoniaceae	Abiliou/T; Lémiré/K	Togo15529	Le/Stb	Mac/Bba	Breast	5.26	3.53	0.05
Lannea acida A. Rich.	Anacardiaceae	Kèlo/T	Togo15552	Rt	Pow/Top	Chronic wound	1.75	1.18	0.02
Mangifera indica L.	Anacardiaceae	Mango/K	Togo15493	Le, stb	Dec/Orl	Chronic wound, breast	5.26	3.53	0.05
Momordica charantia L.	Cucurbitaceae	Katchala	Togo15503	Le	Pow/Orl	Brain	1.75	1.18	0.02
Morinda citrifolia L.	Rubiaceae	Noni	Togo15500	Fe	Pow/Orl	Breast	1.75	1.18	0.02
Moringa oleifera Lam.	Moringaceae	Kpadadrè/K	Togo15536	Le/Se	Pow/Orl	Breast	3.51	2.35	0.03
Musa acuminata Colla	Musaceae	Akori/K		Pul	Pow/Top	Skin, chronic wound	3.51	2.35	0.03
Nicotiana tabacum L.	Solanaceae	Taba/K	Togo15554	Le	Dec/Orl	Chronic wound	1.75	1.18	0.02
Ocimum basilicum L.	Lamiaceae	Konzonzonga/ K	Togo15555	Le	Pow/Top	Skin	1.75	1.18	0.02
Ocimum gratissimum L.	Lamiaceae	Azèou/K; Estro/E	Togo15530	Le	Dec, Mac/Orl; Pow/Nas	Lung, brain, breast	5.26	3.53	0.05
Opilia amentacea Roxb.	Opiliaceae	Kalibinou/K	Togo15517	Rt	Dec/Orl	Lung	1.75	1.18	0.02
Ornithogalum caudatum Aiton	Hyacinthaceae	Aléwa gabou/K		Bu	Dec/Bba	Breast	1.75	1.18	0.02
Panax gingeng	Araliaceae	Ginseng	Togo15521	Rt	Dec/Orl	Lung	1.75	1.18	0.02
Parinari curatellifolia Planch. ex Benth.	Chrysobalanaceae	Milioumiliou/T	Togo15527	Le, Rt, Rtb	Sau, Dec, Pow/ Orl	Lung, chronic wound, breast	7.02	4.71	0.07
Parkia biglobosa (Jacq.) R. Br. ex G. Don	Mimosaceae	Soulou/K	Togo15524	Rt, stb	Dec/Orl/Bba	Chronic wound, breast	12.28	8.24	0.12
Paullinia pinnata L.	Sapindaceae	Adji kpizou/K	Togo15498	Le, rt	Dec, Pow, Orl/ Top	Chronic wound	3.51	2.35	0.03
Pericopsis laxiflora (Benth.) Meeuwen	Fabaceae	Kodolia/T	Togo15519	Le, Rt	Dec/Orl/Bba	Bone, chronic wound	3.51	2.35	0.03
Phyllanthus muellerianus (Kuntze) Exell.	Euphorbiaceae	Nbiré Nbiré/T	Togo15556	Rt	Dec/Orl	Bone	1.75	1.18	0.02
Physalis angulata L.	Solanaceae	Ribomboni/T	Togo15557	Stb	Pow/Orl	Chronic wound	1.75	1.18	0.02

Table 1: Continued.

Plant species	Families	Local name	Voucher number	Parts used	Mode of preparation/ administration	Type of tumors and chronic wounds	FL	FC (%)	UV
Piliostigma thonningii (Schumach.) Milne-Redh	Caesalpiniaceae	Eclo/E, Babakou/K	Togo15494	Le, rt	Pow/Top, Sau/ Orl	Skin, lung, chronic wound, prostate, breast	12.28	8.24	0.12
Piper guineense Schumach. & Thonn.	Piperaceae	Atigali/K	Togo15558	Fr	Dec/Orl	Chronic wound	1.75	1.18	0.02
Plumeria alba L.	Apocynaceae	Ventupanier	Togo15560	Le, Stb	Dec/Top	Chronic wound	1.75	1.18	0.02
Pseudocedrela kotschyi (Schweinf.) Harms	Meliaceae	Doutotoré/T	Togo15518	Rt, Le	Mac, Dec/Orl, Bba	Breast, bone	3.51	2.35	0.03
Pteleopsis suberosa Engl. & Diels	Combretaceae	Sisinon/T	Togo15559	Le	Pow/Orl	Chronic wound	1.75	1.18	0.02
Sarcocephalus latifolius (Sm.) E. A. Bruce	Rubiaceae	Kitchatchalou/ T	Togo15553	Rt, Stb	Pow, Orl/Top	Lung, chronic wound	1.75	1.18	0.02
Securidaca longipedonculata Fres.	Polygalaceae	Fozi/T	Togo15531	Rt	Mac, pow, Bba/ Top/Nas	Breast, bone, brain	1.75	3.53	0.05
Senna siamea (Lam.) H. S. Irwin & Barneby	Fabaceae	Zanguerati/E	Togo15545	Le	Dec, Orl	Lung	1.75	1.18	0.02
Sesamum indicum L.	Pedaliaceae	Goussi/E	Togo15495	Fr	Sau/Orl	Breast	1.75	1.18	0.02
Sporobolus pyramidalis P. Beauv.	Poaceae	Faux gazon	Togo15537	Rt, Fe	Pow/Top	Breast, chronic wound	3.51	2.35	0.03
Tamarindus indica L.	Caesalpiniaceae	Nidié/K	Togo15562	Fr	Pow/Top	Breast	1.75	1.18	0.02
Tapinanthus oleifolius (J. C. Wendl.) Danser	Loranthaceae	Gui rouge	Togo15563	St	Pow/Top	Breast	1.75	1.18	0.02
Theobroma cacao L.	Sterculiaceae	Cocoo/K	Togo15564	Le	Dec/Top	Chronic wound	1.75	1.18	0.02
Vitellaria paradoxa C. F. Gaertn.	Sapotaceae	Woussa/T	Togo15522	Stb, Rt	Dec, Sauc/Orl	Breast, chronic wound, brain	10.53	7.06	0.10
Waltheria indica L.	Sterculiaceae	Fafouloumou/ T	Togo15499	Rt	Dec/Orl	Lung	1.75	1.18	0.02
Xylopia aethiopica (Dunal) A. Rich.	Annonaceae	Soussi/K	Togo15492	Fr	Dec, Sauc/Orl; Bba	Bone, chronic wound, liver, breast	21.05	15.29	0.19
Zanthoxylum zanthoxyloides L.	Rubiaceae	Kalao/K	Togo15561	Rtb	Pow, sau, orl/ Top	Breast	1.75	1.18	0.02
Zea mays L.	Poaceae	Samiriè/K	Togo15538	St	Pow/Orl	Lung, chronic wound	3.51	2.35	0.03
Zingiber officinale Roscoe	Zingiberaceae	Wissikoè/K	Togo15539	Rz	Pow/Orl	Breast	3.51	2.35	0.03

Local names: E = Ewé; K = Kabyè; T = Tem. Used parts: Stb = stem barks, Le = leaves, Rtb = root barks, Fr = fruit, Rt = roots, Rz = rhizomes, Bu = bulbs, and Se = seeds. Mode of preparation and administration routes: Dec/Orl = decoction and oral route, Mac/Orl = maceration and oral route, Dec, Mac/Orl = decoction or maceration and oral route, Mac/Bba = maceration and body bath, Sau/Orl = sauce and oral route, Pow/Orl = Powder and oral route, Dec, Sauc/Orl = Decoction or sauce and oral route, Pow/Top = Powder and Topical route, and Pow/Nas = Powder and nasal route.

said to be obliged to manage a garden for some plant species. Similar observations have been reported in the study by Agyare et al. [16] in Ghana. In our study, about 88.71% said that the plants are available in forests while 11.29% reported that they sometimes have problems with the collection due to seasonal unavailability. For 96.92%, identification of the herbal material is made by themselves in most cases as they state that they have long experience in their field.

3.4. Plant Parts Used and Recipes' Preparation. The traditional healers of our study area use different parts of the plants for their concoctions. Leaves and roots are the most

Table 2: Plants used for the treatment of tumors and chronic wounds from groups I, II, and III.

Group I: more than 10 citations	Frequency	Group II: from 10 to 7 citations	Frequency	Group III: from 6 to 4 citations	Frequency
		Aframomum melegueta	8	*Blighia sapida*	6
		Khaya senegalensis	7	*Vitellaria paradoxa*	6
Xylopia aethiopica	13	*Parkia biglobosa*	7	*Adansonia digitata*	4
		Piliostigma thonningii	7	*Annona muricata*	4
				Parinari curatellifolia	4

Table 3: Species cited for the two most tumors and chronic wound healing.

Type of disease	Plant (botanical name)	Local name	Part used
Breast tumor	*Adansonia digitata* L.	Télou/K	Stb, Fr
	Afraegle paniculata (Schum.) Engl.	Ngoné/K	Sed
	Aframomum melegueta K. Schum.	Colombo/K	Fr
	Amaranthus hybridus L.	Karatoutou	Rt, Le
	Annona muricata L.	Agnigli/E	Le
	Blighia sapida K. D. Koenig	Kpizou	Le, Fr
	Butia capitata (Mart.) Becc.	Foda kokolo/K	Rt/Fr
	Calotropis procera (Aiton) R. Br.	Kpakpadjoé/K	Rt, le
	Citrus limon (L.) Burm. f.	Gnami/K	Fr
	Cochlospermum planchonii Hook. f.	Tèkalichoua/K	Rt
	Cola nitida (Vent.) Schott & Endl.	Coroo/T	Hul
	Colocasia esculenta (L.) Schott.	Pankani/K	Le
	Curcuma longa L.	Curcuma	Rt
	Dichrostachys cinerea (L.) Wight & Arn.	Sozossi/T	Rt
	Eleusine indica (L.) Gaertn.	Adandala/T	Rt
	Gardenia ternifolia Schumach. & Thonn.	Kao/K	Rt
	Kigelia africana (Lam.) Benth.	Abiliou/T; Lémiré/K	Le/Stb
	Mangifera indica L.	Mango/K	Le, Stb
	Morinda citrifolia L.	Noni	Fe
	Moringa oleifera Lam.	Kpadadrè/K	Le/Se
	Ocimum gratissimum L.	Azèou/K; Estro/E	Le
	Ornithogalum caudatum Aiton	Aléwa gabou/K	Bu
	Parinari curatellifolia Planch. ex Benth.	Milioumiliou/T	Le, Rt, Rtb
	Parkia biglobosa (Jacq.) R. Br. ex G. Don	Soulou/K	Rt, Stb
	Piliostigma thonningii (Schumach.) Milne-Redh	Eclo/E, Babakou/K	Le, Rt
	Pseudocedrela kotschyi (Schweinf.) Harms	Doutotoré/T	Rt, Le
	Securidaca longipedonculata Fres.	Fozi/T	Rt
	Sesamum indicum L.	Goussi/E	Fr
	Sporobolus pyramidalis P. Beauv.	Faux gazon	Rt, Fe
	Tamarindus indica L.	Nidié/K	Fr
	Tapinanthus oleifolius (J. C. Wendl.) Danser	Gui rouge	St
	Vitellaria paradoxa C. F. Gaertn.	Woussa/T	Stb, Rt
	Xylopia aethiopica (Dunal) A. Rich.	Soussi/K	Fr
	Zanthoxylum zanthoxyloides L.	Kalao/K	Rtb
	Zingiber officinale Roscoe	Wissikoè/K	Rz
Lung tumor	*Abrus precatorius* L.	Adodobia fadi/T	Le
	Allium sativum L.	Aiyo/E	Fr
	Annona muricata L.	Agnigli/E	Le
	Blighia sapida K. D. Koenig	Kpizou	Le, Fr
	Carica papaya L.	Somboré/K	Rt
	Combretum collinum Fresen.	Fokizao/T	Rt
	Daniellia oliveri (Rolfe) Hutch. & Dalziel	Tchèlè/T	Le
	Ocimum gratissimum L.	Azèou/K; Estro/E	Le
	Opilia amentacea Roxb.	Kalibinou/K	Rt
	Panax gingeng	Ginseng	Rt
	Parinari curatellifolia Planch. ex Benth.	Milioumiliou/T	Le, Rt, Rtb
	Piliostigma thonningii (Schumach.) Milne-Redh	Eclo/E, Babakou/K	Le, Rt
	Sarcocephalus latifolius (Sm.) E. A. Bruce	Kitchatchalou	Rt, Stb
	Senna siamea (Lam.) H. S. Irwin & Barneby	Zanguerati/E	Le
	Waltheria indica L.	Fafouloumou/T	Rt
	Zea mays L.	Samiriè/K	St

Table 3: Continued.

Type of disease	Plant (botanical name)	Local name	Part used
	Adansonia digitata L.	Télou/K	Stb, Fr
	Aframomum melegueta K. Schum.	Colombo/K	Fr
	Afzelia africana Sm. ex Pers.	Wéré/K	Stb, Rt
	Annona senegalensis Pers.	Tchoutchourè	Rt, Le
	Azadirachta indica A. Juss.	Kini/K	Stb
	Blighia sapida K. D. Koenig	Kpizou	Le, Fr
	Bridelia ferruginea Benth.	Kolou/T	Rt
	Calotropis procera (Aiton) R. Br.	Kpakpadjoé/K	Rt, Le
	Elaeis guineensis f. androgyna A. Chev.	Pawou/K	Rt
	Gymnosporia senegalensis (Lam.) Loes.	Tchakatchaka/K	Le
	Khaya senegalensis (Desr.) A. Juss.	Hemou/K, Frimou/T	Stb, Le
	Lannea acida A. Rich.	Kèlo/T	Rt
	Mangifera indica L.	Mango/K	Le, Stb
	Musa acuminata Colla	Akori/K	Pul
Chronic wound	*Nicotiana tabacum* L.	Tabac/K	Le
	Parinari curatellifolia Planch. ex Benth.	Milioumiliou/T	Le, Rt, Rtb
	Parkia biglobosa (Jacq.) R. Br. ex G. Don	Soulou/K	Rt, Stb
	Paullinia pinata L.	Adji kpizou/K	Le, Rt
	Pericopsis laxiflora (Benth.) Meeuwen	Kodolia/T	Le, Rt
	Physalis angulata L.	Ribomboni/T	Stb
	Piliostigma thonningii (Schumach.) Milne-Redh	Eclo/*E*, Babakou/K	Le, Rt
	Piper guineense Schumach. & Thonn.	Atigali/K	Fr
	Plumeria alba L.	Ventupanier	Le, Stb
	Pteleopsis suberosa Engl. & Diels	Sisinon	Le
	Sporobolus pyramidalis P. Beauv.	Faux gazon	Rt, Fe
	Theobroma cacao L.	Cocoo/K	Le
	Vitellaria paradoxa C. F. Gaertn.	Woussa/T	Stb, Rt
	Xylopia aethiopica (Dunal) A. Rich.	Soussi/K	Fr
	Zea mays L.	Samiriè/K	St

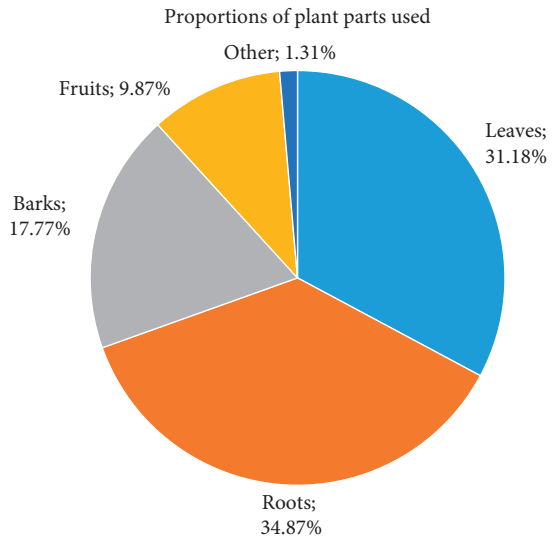


Figure 3: Plant parts used.

used parts (Figure 3). This finding is in line with the ethnopharmacological studies conducted by Koudouvo et al. [17] in the Maritime region of Togo on antimalarial plants and Kantati et al. [18] on central nervous system disorders in Togo. Frequent use of roots is a threat to plant biodiversity. Eighty-five herbal remedies which included decoctions (40%), powder (37.65%), sauce (15.29%), dough (4.71%), and maceration (2.35%) were listed by the traditional healers for treating cancer and tumors. About 87.30% of the recipes proposed are in association with two or more plants. It reflects the results of Segun et al. [13]. This association is a common practice in traditional medicine where practitioners find it beneficial because polyherbal therapy has the advantage of producing maximum therapeutic effects with minimum side effects [31].

Administration routes of recipes are mainly the oral route and the topic application. Most recipes are administered twice or once a day. According to 68% of traditional healers, the duration of tumor management with medicinal plants is very variable, ranging from one to three months, depending on the case. For the majority of traditional healers (71.64%), their preparations are kept in cans or bottles. The management of cancer in our study, mainly from one to three months and often unknown, reflects the complexity of the disease and its multifactorial aspects.

3.5. Traditional Healers' Needs. During our investigation, we wanted to know which needs traditional healers were expecting from university researchers and the Togolese government. Ninety percent of traditional healers request training sessions on the basics of cancer such as symptoms, good methods of plant transformation, and the processing of their medicines. They are also seeking support from the government for recognition of their activities and the

opening of pharmacies for traditional medicines. They said that they make a huge contribution to people's health. Many patients go to them for the lack of financial means and conventional health structures as well as for the effectiveness of their treatments.

4. Conclusion

This ethnopharmacological survey on tumors and cancers in two regions of Togo revealed that traditional healers had an endogenous understanding of tumors and cancers. The present study documented seventy anticancer medicinal plant species. As the emergence of resistance to cancer chemotherapy is a deep concern, Togolese flora must be explored for new bioactive anticancer drugs. The commonly recommended strategy in the discovery of drugs is to evaluate plant extracts *in vitro* and *in vivo* to confirm their therapeutic potential. Keeping this in mind, our ethnopharmacological survey is the first step before confirmation *in vitro* and *in vivo*. Work is in progress to validate the antioxidant, anti-inflammatory, and antitumor effects of some species in different models.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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