

Plants and Medicinal Practices in Burkina Faso: The Case of Breast Cancer

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Abstract: Plants possess therapeutic properties thanks to the different secondary metabolites that are stored in them and constitute a large reservoir. In front of the recurring problems of breast cancer, an investigation on these medicinal plants could allow the development of new biomolecules which would be an alternative against breast cancer. It is within this framework that this study consists in identifying the recipes of medicinal plants used in the treatment of this pathology by traditional health practitioners in the cities of Fada N'Gourma, Bobo-Dioulasso, Boromo and Dédougou. A survey form was used to collect sociodemographic and ethnobotanical data. The approach used to conduct the survey was a semi-structured individual interview in the local language and snowballing. As results of the ethnobotanical study, we identified 52 species divided into 29 families used in 70 recipes by traditional healers. Barks are the most used organs (41.42%), the most used method of preparation is powder (47.14%). Male tradipraticians largely dominate women. Of these respondents, 114 traditional healers agreed to contribute to the study. The majority of respondents were between 40 and 70 years old. The study made it possible to select a recipe consisting of two medicinal plants that will be subjected to phytochemical and pharmacological investigations.

Keywords: Breast Cancer, Recipes, Traditional Healers, Burkina Faso

1. Introduction

Plants are of great importance in all civilizations. They have a fascination for man and animals. For a very long time, plants have always had a place in the life of Man. Thus, known civilizations have all used plants either wild or cultivated for food, defense, clothing or health care [1, 2]. The therapeutic use of plant extracts for the treatment of human diseases is therefore very old and has also progressed over time [3, 2]. The empirical knowledge acquired has

allowed different civilizations to consider plants as a main source of medicines. Moreover, according to the WHO: "Traditional medicines include practices, approaches to knowledge and beliefs related to health that use therapies based on plant, animal or mineral substances, spiritual therapies, techniques and manual exercises used in isolation or in combination to treat, diagnose and prevent disease or maintain health. The WHO also specifies that in developed countries, traditional medicine is referred to as "complementary" or "alternative" because it is not part of

their predominant health care system [4]. The practice of complementary medicine is based on tradition, sometimes supported by pharmacological studies, rarely on clinical studies. Nowadays, medicinal plants are still the primary source of new drugs. They are considered as an essential source of raw material for the research of new molecules essential for the development of future drugs [5]. In the world, nearly 80% of the population uses medicinal plants because of the lack of access to prescribed medicines and also because plants have proven to be effective. A large part of the world's population, more precisely in developing countries, is treated with traditional herbal remedies [6]. Furthermore there is no scientific evidence, as to the use of all medicinal plants that may prove toxic or interact with drugs. Scientists need to assess the benefit-risk ratio in order to improve the quality of care [7]. In Burkina Faso, traditional medicine has long been used Zerbo *et al.* thanks to the richness and diversity of its flora [8, 9]. For this, the pharmaceutical industry, physicians, biologists and chemists are seeking to better understand the heritage of spontaneous species used in traditional medicine. It is within the framework of the valorization of the natural substances of the plants of the flora of Burkina Faso that we carried out an ethnobotanical study with the traditional practitioners and herbalists in order to inventory the species of medicinal plants enjoying biological activities, in particular the anticancer activities.

2. Materials and Methods

2.1. Framework of the Study

The ethnobotanical survey was conducted in four (04) cities

of Burkina Faso from May to October 2021. This survey concerned in particular the associations of traditional practitioners and herbalists practicing in the different cities. Bobo-Dioulasso is the economic capital of the country, located in the Hauts-Bassins region in the west of Burkina Faso, with geographical coordinates of 11°10'59.999" North, 4°16'59.999" West. In terms of population, it is the second largest city after Ouagadougou (the country's capital) covering an area of 136.78 km² with 903,887 inhabitants (RGPH, 2020). The climate is South Sudanese with an average rainfall of 900.8 mm and an average temperature of 27.7°C (Köppen-Geiger). It has a vegetation dominated by wooded savannahs and open forests with all subtypes, from wooded savannah to grassy savannah [10]. Fada N'Gourma is located in the eastern region of Burkina Faso with coordinates of 12°03'00" North and 0°22'01" East. This city is populated with 180356 inhabitants (RGPH 2020) covering an area of 36 Km². The climate is of the South Sudanese type with an average temperature of 28.3°C and an average rainfall of 565 mm (Köppen-Geiger). Fada N'Gourma has a vegetation characterized by a shrubby savanna [11]. The Boucle du Mouhoun includes the cities of Boromo and Dédougou. The city of Boromo has 13,157 inhabitants with coordinates of 11°44'44" North and 2°55'48" West. As for Dédougou, it is the largest city in terms of population in this region with 38,862 inhabitants and its geographical position is 12°27'48" North and 3°27'39" West. According to Köppen-Geiger, the Boucle of Mouhoun has a desert climate (Sudano-Sahelian zone) with an average temperature of 29°C and average rainfall of 830.9 mm. The population is homogeneous in these study areas (Figure 1) and the local languages commonly spoken are Dioula, Dafing, Gourmanchtéma, and Mooré.

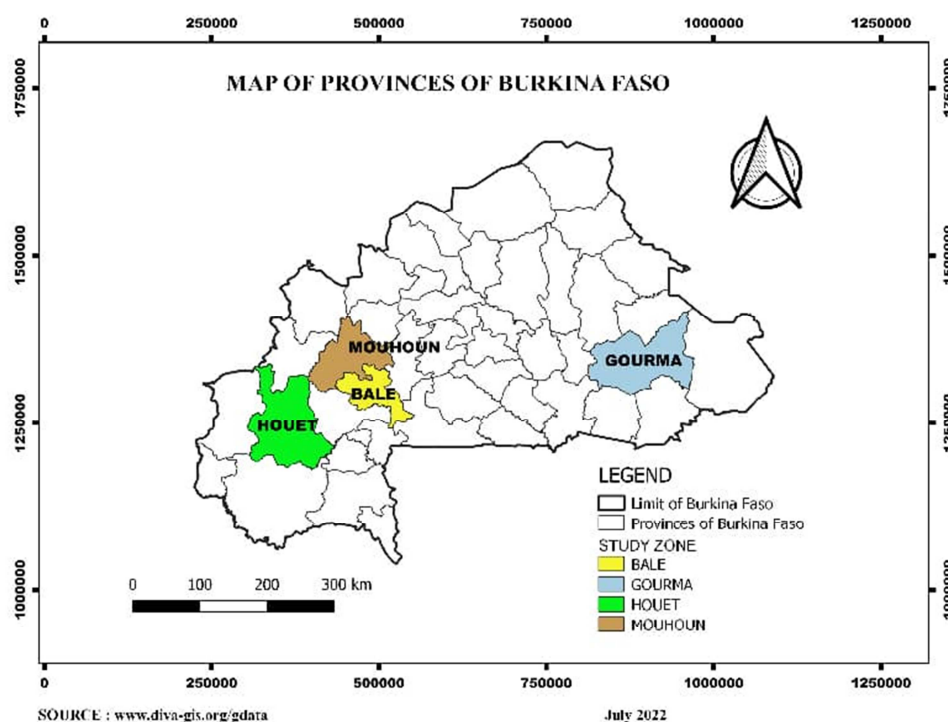


Figure 1. Map of Burkina Faso showing surveyed areas.

2.2. Ethnobotanical Survey

It took place during the month of May to September 2021 in the cities of Bobo-Dioulasso, Boromo, Dédougou and Fada N'Gourma and involved two hundred and thirty-seven (237) traditional practitioners and herbalists. The methodology used was a semi-structured interview using a survey form with each therapist. The survey on the traditional use of plants was conducted with two associations: "the Relwendé association and the Wisdom of Houet Health Practitioners" in Bobo-Dioulasso. In Boromo, it focused on traditional practitioners belonging to the association of practitioners of the Balearic Pharmacopoeia. In Dédougou, the survey was conducted among the Regional Union of Associations of Traditional Practitioners of the Boucle of Mouhoun. Finally, in the city of Fada N'Gourma, our study was conducted with

traditional practitioners belonging to the Lafia Maani of Gulmu association and herbalists. The data collected concerned their knowledge of breast cancer, the names of the plants they use for the treatment of breast cancer and the parts of the plant used.

2.3. Statistical Analysis

Statistical data were analyzed using Microsoft Excel 2013 software. The data collected on the survey forms were of two kinds, sociodemographic and ethnobotanical. They allowed us to study the following parameters: age, gender, number of years of experience, level of study, botanical family, part of the plant used, and mode of administration. The parameters such as: the frequency of quotation of the mode of preparation, the frequency of quotation of the parts used, were calculated according to the following formula:

$$F = (\text{Number of citations for the considered plant}) / (\text{Total number of citations for all plants}) * 100$$

3. Results and Discussion

3.1. Socio-demographic Data

3.1.1. Description of the Traditional Practitioner Population

A total of 237 traditional practitioners were surveyed, including 65 in Fada N'Gourma, 41 in Boromo, 47 in Dédougou and 84 in Bobo-Dioulasso. Among these respondents, 114 traditional practitioners agreed to contribute to the study, while 69 refused to share their knowledge of breast cancer treatment. Of these, 64 traditional healers were found to have no knowledge of breast cancer treatment (Figure 2). Some traditional healers found that because of the high toxicity of certain plants, they could not give recipes that included these plants. Others, because of a lack of recognition of traditional practitioners by researchers, refuse to collaborate. This could certainly justify their refusal to collaborate.

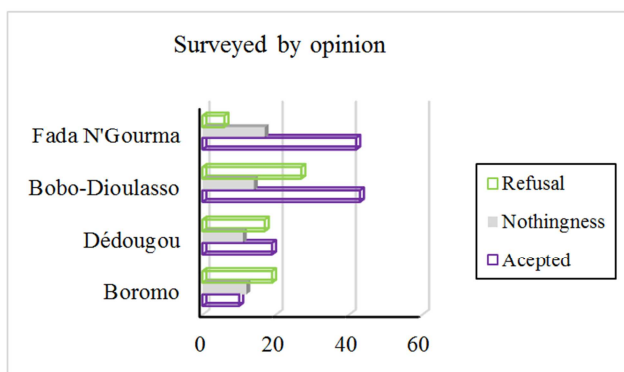


Figure 2. Surveyed by opinion.

3.1.2. Distribution of Interviewees by Age Group

The ages of the traditional practitioners interviewed ranged from 20 to over 70 years. The majority of respondents were between 40 and 70 years of age (Figure 3). The ancestral character of the knowledge about plants makes that it is the

elderly people who take care of them, which could justify this age range. Other authors have come to this conclusion as well [12, 13]. In addition, this knowledge most often requires incantations when preparing medicines and complicated mysteries to perform [14]. Nevertheless, we record a significant number of young traditional practitioners. This reflects the effort made by these young people in the field of traditional medicine.

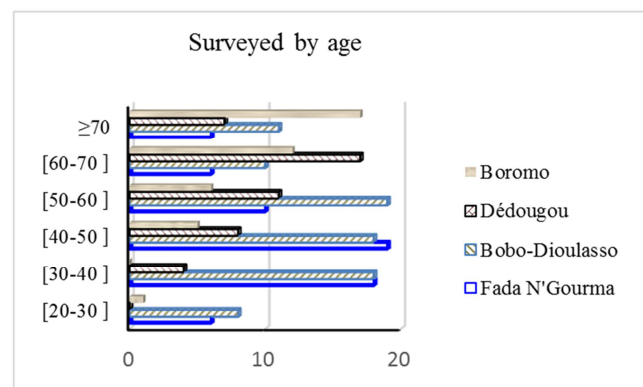


Figure 3. Surveyed by Age.

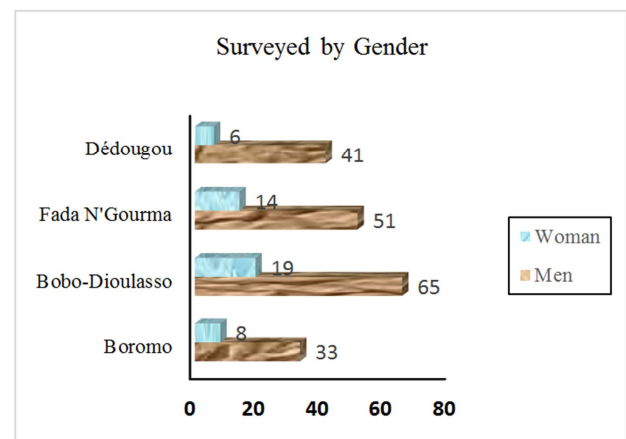


Figure 4. Surveyed by Gender.

3.1.3. Distribution of Traditional Healers by Gender

Of the 237 people surveyed, 47 were women, including 14 in Fada N'Gourma, 8 in Boromo, 6 in Dédougou, and 19 in Bobo-Dioulasso, and 190 were men, distributed as follows: 51 in Fada N'Gourma, 33 in Boromo, 41 in Dédougou, and 65 in Bobo-Dioulasso (Figure 4). This inequality in gender distribution could be explained by the fact that men are more interested in ancestral knowledge and women are occupied with housework. This predominance of men was also observed by Ouattara *et al.* [14].

3.1.4. Distribution of Surveyed by Level of Education

In terms of level of education, 193 traditional healers were non-literate compared to 44 literate traditional healers (Figure 5). The high level of non-literacy in this study reveals that the use of medicinal plants is mainly reserved for people of modest means. In addition, some traditional healers use geomancy, an ancestral science that does not require literacy. Other authors have come to the same conclusion [12, 13].

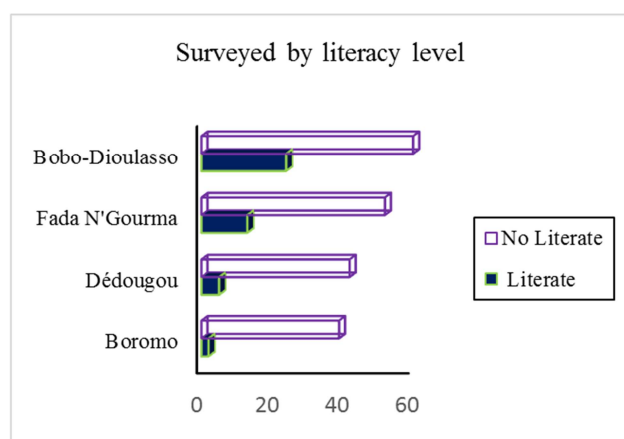


Figure 5. Surveyed by Literacy Level.

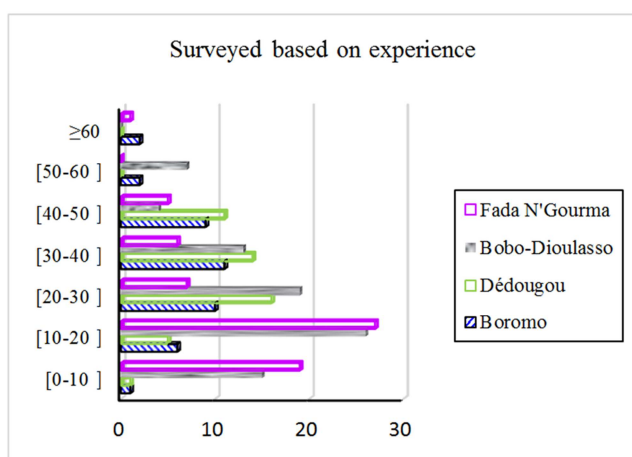


Figure 6. Surveyed based on experience.

3.1.5. Distribution of Respondents by Experience

The experience of the traditional healers interviewed ranged from 3 years to 70 years. The study found that the majority of

respondents had between 10 and 40 years of experience (Figure 6). The high number of years of experience may reflect the reliability of the information received. Indeed, for other researchers, knowledge of the uses of medicinal plants is acquired over time following an accumulation of experience and transmitted from one generation to another [15]. In Burkina Faso, knowledge of medicinal plants is passed down from generation to generation and can sometimes be lost when a person dies.

3.2. Ethnobotanical Data

3.2.1. Listed Plants

The ethnobotanical study, which was carried out in four (04) zones, enabled us to collect as much information as possible on the species involved in breast cancer treatment from traditional health practitioners, using ethnobotanical survey forms. The ethnobotanical survey revealed that 52 species (Table 1) belonging to 29 botanical families distributed in 70 recipes are used in the treatment of breast cancer, including 27 species in Fada N'Gourma, 22 species in Bobo-Dioulasso, 6 species in Dédougou and 9 species in Boromo (Figures 9 & 10). These results confirm the richness of medicinal biodiversity in Burkina Faso. Previous work by Thiombiano *et al.*; Ouoba *et al.*; Zerbo *et al.*; Thiombiano *et al.* confirmed this forest richness distributed throughout Burkina Faso [9, 16-18]. Moreover, the high number of medicinal plant recipes for this disease is proof that traditional practitioners possess endogenous knowledge that can contribute to the prevention and management of breast cancer. The most represented botanical families are Apocynaceae, Caesalpiniaceae, Euphorbiaceae, Fabaceae, and Meliaceae. These families are found almost in all four study areas irrefutable proof of the biodiversity of the country's flora [9]. It is undoubtedly this distribution that allowed us to have a family found in all study areas at once (Figure 7).

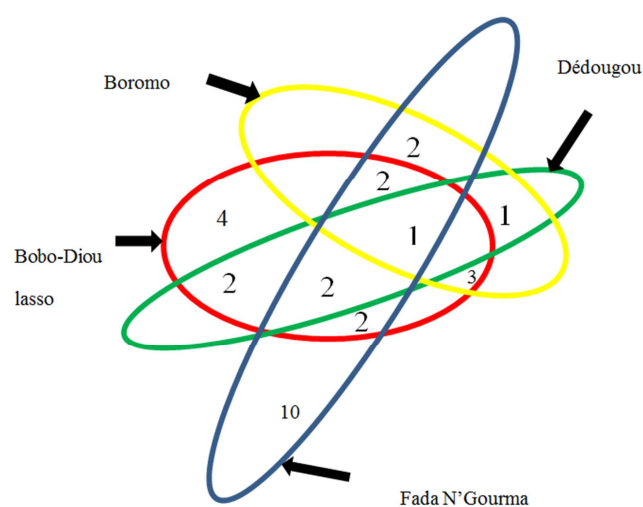
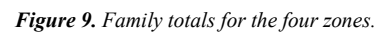
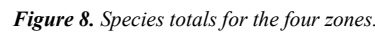


Figure 7. Diagram of the distribution of families according to the cities surveyed.



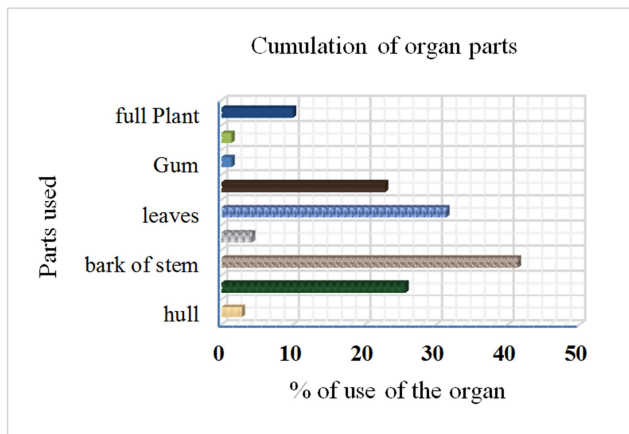


Figure 10. Cumulative organ parts used.

3.2.2. Parts of Organs Used

For most traditional healers, plants are full of medicinal virtues, only it is the human being who may not know them. Thus, the parts of the plants are used in different ways in the different recipes used by traditional healers for the care of people with breast cancer. Indeed, traditional practitioners use more stem bark (41.42%), followed by leaves (31.2%), root bark (25.71%) and fruit (22.85%). The least used parts of the plant are, among others, the pod (1.42%), the gum (1.42%),

the latex (4.28%), the shell (2.85%) and the whole plant (10%) (Figure 10). All parts of the plant are used in the preparation of medicines by traditional health practitioners only that the organs differ from one caregiver to another. Our results are similar to those of Zerbo *et al.* and other non-Burkinabè authors who have shown that the leaves are the most used in traditional medicine treatments [8, 19-22]. Therefore, we should draw attention to their removal as a source of biodiversity threat. These parts are much solicited because of their easy accessibility, moreover it is these organs that store the most secondary metabolite [23, 24].

3.2.3. Method of Preparation

Thanks to various methods, plants are transformed into medicine. Thus, four modes of preparation have been identified among traditional practitioners. Moreover, traditional practitioners use the means and solvents available to them. This justifies the preparation of the drug in powder and decoction (mainly with water as a solvent), which were respectively 47.14% and 45.71% of the percentage of use (Figure 11). In a recent study, Thiombiano *et al.* showed that 90% of traditional practitioners used the decoction preparation in the different treatments [18]. Also, other authors have reached this conclusion [8, 25-27].

Table 1. Global list of the constituent species of the said recipes.

Families	Species	Common name (Gourmanchtèma)	Parts used	Other medicinal uses
Aloeaceae	<i>Aloe vera</i> (L.) Burm. F.	-	Leaves	Dental pain
Anacardiaceae	<i>Sclerocarya birrea</i> (A. Rich.) Hochst.	o namagibu	Gum, bark of stem, bark of root, Leaves	Inflammation, heartache
Annonaceae	<i>Annona muricata</i> L.	o bonpientuobu	bark of stem	Cough, fever
	<i>Annona senegalensis</i> Pers.	o bualasanbu	bark of root	Dysentery
Apocynaceae	<i>Saba senegalensis</i> (A. DC.) Pichon	-	Fruits, Leaves, bark of stem	Cough, tuberculosis
Asclepiadaceae	<i>Calotropis procera</i> (Ait.) Ait. f.	o pulinpuugu	Leaves, latex, bark of root	Pain, swelling, inflammation
	<i>Leptadenia hastata</i> (Pers.) Decne	gu naliangu	Full plant	Pain, bleeding
Asteraceae	<i>Chrysanthellum americanum</i> L. Vatke.	i kpanpadi	Full plant	Hepatitis, diabetes
Bombacaceae	<i>Bombax costatum</i> Pellegr. & Vuillet	Bu fùòbu	bark of root	Dysentery
	<i>Ceiba pentandra</i> (L.) Gaertn.	Bu gbénbu	bark of root	Diarrhea, fever
Burseraceae	<i>Boswellia sacra</i> Flueck.	Li sesegili	bark of stem	Rheumatism
Caesalpiniaceae	<i>Detarium microcarpum</i> Guill. & Perr	o nakpagibu	Fruits, bark of root, bark of stem	Inflammation
	<i>Senna alata</i> (L.) Roxb.	-	Leaves	Wound
	<i>Tamarindus indica</i> L.	bu pugibu	fruit	Inflammation, heartache
Capparaceae	<i>Crateva adansonii</i> DC.	-	bark of stem	Tumor
Caricaceae	<i>Carica papaya</i> L.	o papaytibu	Leaves	Jaundice
Celastraceae	<i>Maytenus senegalensis</i> (Lam.) Exell	Li ja4oali	bark of stem, Leaves	Tumor
Cochlospermaceae	<i>Cochlospermum planchonii</i> Hook. f. ex Planch.	a féyéna	bark of root	Hepatitis, jaundice
Combretaceae	<i>Guiera senegalensis</i> J. F. Gmel.	u pulima	bark of stem, Leaves	Malaria, Cough, Hepatitis
Ebenaceae	<i>Diospyros mespiliformis</i> Hochst. ex A. Rich	o gâàbu	bark of root	Dysentery, inflammation
Euphorbiaceae	<i>Euphorbia hirta</i> L.	i kpajebiima	Full plant	Dysentery, diarrhea, asthma
	<i>Euphorbia poissonii</i> Pax.	li penli	Leaves, bark of stem, Latex	Inflammation, tremor, kidney pain
	<i>Flueggea virosa</i> (Roxb. ex Willd.) Voigt.	i cilimi	Leaves, bark of root	Stomach ache, hepatitis, fibroma
Fabaceae	<i>Arachis hypogaea</i> L.	A tiina	Fruit	-
	<i>Chamaecrista nigricans</i> (Vahl) Greene	-	Leaves	Malaria, stomach ache
	<i>Daniellia oliveri</i> (Rolfé)	o gnuabu	bark of stem, Leaves	Pain
	<i>Dialium guineense</i> Willd.	-	Leaves, bark of root	Tumor

Families	Species	Common name (Gourmanchtèma)	Parts used	Other medicinal uses
Liliaceae	<i>Ptilostigma thonningii</i> (Schumach.) Milne-Redh	U nabaangu	bark of root	Wound, ulcer
	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	-	Leaves, bark of stem	Fibroma
	<i>Allium sativum</i> L.	sabisabijaga	Fruit	Hypotensive
Meliaceae	<i>Theobroma cacao</i> L.	Bu kakaotibu	bark of stem	Sedative
	<i>Azadirachta indica</i> A. Juss.	o danmadaci	bark of stem	Malaria, antiparasitic
	<i>Khaya senegalensis</i> (Desr.) A. Juss.	bu kògibu	bark of stem, bark of root	Stomach ache
Mimosaceae	<i>Trichilia emetica</i> Vahl	-	bark of root	Cold, hepatitis
	<i>Pseudocedrales kotschy</i> (Schweinf.) Harms	Li sesegili	Leaves	Stomach ache
	<i>Acacia nilotica</i> (L.) Willd. ex Del.	Bu kádátibu	bark of stem, fruits	Ulcer, stomach ache
	<i>Entada africana</i> Guill. & Perr.	u luokaagu	bark of stem	Stomach ache, inflammation
	<i>Parkia biglobosa</i> (Jacq.) R. Br. ex G. Don	bu dubu	bark of stem	Hepatitis, Jaundice
Olacaceae	<i>Ximenia americana</i> L.	o midibu	Leaves, bark of stem	Pain,
Phyllanthaceae	<i>Phyllanthus amarus</i> Schum. & Thonn.	i dagbentiga	Full plant	Dysentery, diarrhea
Poaceae	<i>Oxytenanthera abyssinica</i> (A. Rich.) Munro	U 4màlú	Leaves	Asthma
	<i>Pennisetum americanum</i> (L.) Leeke	Bu dipienbu	Fruit	Stomach ache, mystic
	<i>Pennisetum glaucum</i> (L.) R. Br.	N diyebu	Fruit	Stomach ache, mystical
	<i>Setaria italica</i> (L.) P. Beauv.	I diipieni	Fruit	Stomach ache, mystical
	<i>Sorghum bicolor</i> (L.) Moench.	I diimoani	Fruit	Stomach ache, mystical
Polygalaceae	<i>Securidaca longipedunculata</i> Fres.	N polú	bark of stem, bark of root	Inflammation
Rhamnaceae	<i>Ziziphus mauritiana</i> Lam.	o nakpanyuanbu	Leaves, bark of root, bark of stem	Stomach aches
Rubiaceae	<i>Mitragyna inermis</i> (Willd.) O. Ktze	o yelenbu	Leaves, bark of stem	Malaria, hepatitis
Solanaceae	<i>Capsicum annuum</i> L.	i cambi	Fruit	Pain, hernia, inflammation
	<i>Solanum africanum</i> Moulin.	-	Full plant	-
Sterculiaceae	<i>Cola acuminata</i> (P. Beauv.) Schott & Endl.	Li guoli	Hull	Asthma
Zygophyllaceae	<i>Balanites aegyptiaca</i> (L.) Del.	o pakpanpagabu	bark of stem	Pain, wound, inflammation

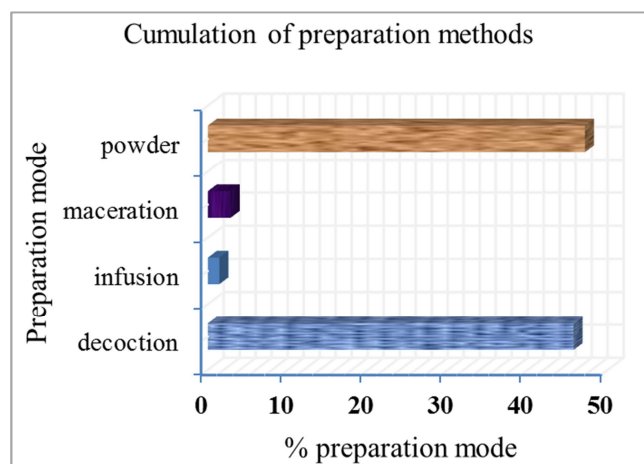


Figure 11. Preparation mode accumulation.

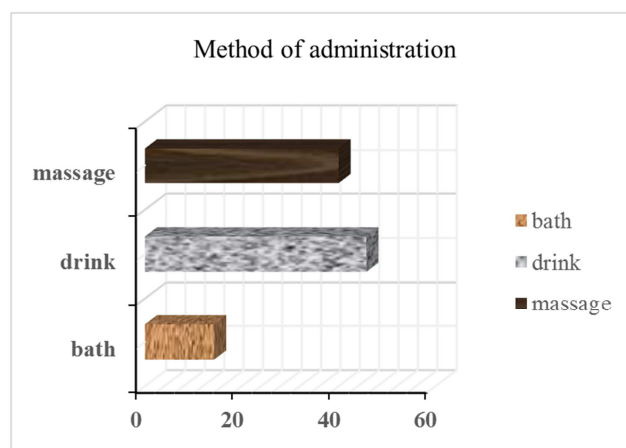


Figure 12. Cumulative mode of administration.

3.2.4. Method of Administration

Several methods of drug administration are used by traditional practitioners. Of these methods of administration, oral administration (decoction) dominated with 45.71% of use, followed by massage (40%) and bathing with 14.29% (Figure 12). These results are similar to those found by Ouattara et al.; Thiombiano et al. [14, 18]. Moreover, this particularity of oral administration was observed by Aboudou et al. during their research in Togo on the use of medicinal plants [28]. This route is the most dominant among many others because of its simplicity in application and especially its effectiveness in treatment.

4. Conclusion

This study has allowed us to highlight the biodiversity of anti-cancer medicinal plants in Burkina Faso as well as the wealth of endogenous knowledge in the study areas. In addition, it has also allowed us to build a database of medicinal plants used in the treatment of breast cancer. Further studies are therefore necessary for the continuation of the study to determine the pharmacological activities of these plants. At the end of the pharmacological studies, a research of biomolecules will be made for the development of phytomedicines in the prevention and the fight against the

breast cancer. For this purpose, one of the recipes of the ethnobotanical survey will be taken.

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