Ethnobotanical Survey of Medicinal Plants Used Against Fungal Infections in Prefecture of Sotouboua Central Region, Togo

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Abstract

Plants are a major source of active ingredients and are for that fact used to treat many diseases such as fungal infections. The objective of this study was to identify the plants used in traditional medicine to treat fungal diseases in the prefecture of Sotouboua. An ethnobotanical survey was conducted among healers, elderly and knowledgeable villagers. A semi structured questionnaire and pictures showing common and easily recognizable fungal infection symptoms were used to support a live interview. During this study, 37 plant species belonging to 20 families have been identified. Fabaceae were the most represented family (7 species). The most used parts were leaves (43, 24%) followed by the roots (18, 91%). The decoction is the preferred method of preparation while the oral route is the main route of administration.

Sotouboua prefecture in Togo has significant plant biodiversity that is used by dwellers in the management of fungal diseases.

Keywords: Ethnobotanical survey, medicinal plants, fungal infections, Prefecture of Sotouboua, Togo

Introduction

Traditional medicine has been used for centuries by herbalists, healers, spiritualists, hunters and farmers to treat various categories of human diseases (Alqasim, 2013).This traditional knowledge, transmitted from generation to generation is a result of thousands of experiences made by people while being in connection with their nature. In the rural areas in Africa, about 80% of the population depends on traditional medicine for their health needs (Ngono, 2011). This intensive use of traditional medicine is due to its affordability, availability, accessibility and acceptability **(**WHO, 2000; Gbadamosi, 2014**)**. However, scientific proof from trials done to assess the preventive and efficacy of traditional medicine products and practices is limited. For that reason, ethnobotanists, medicinal chemists, pharmacologists, economic botanists and ethnobiologists all over the globe have been actively working to gather records to preserve indigenous therapeutic plants and to hunt novel bioactive compounds (leads), which could be developed as an effective drugs **(**Cowan**,** 1999; Pushpangadan, 1984**)**. New molecules are needed in the management of various infectious diseases. Fungal infections are various, they range from superficial infections (ringworm) a major source of morbidity affecting hair (tinea), nail (onychomycoses), skin (herpes vine) and mucosa (aphthae) to systemic fungal infections (meningitis; pneumonia and bronchopneumonia) that are life-threatening (vicente,2003). These diseases affecting immunocompromised patients (HIV), premature infants, cancer patients receiving chemotherapy, transplant and burn patients (Garraffo, 2003) and healthy individuals, especially third world children suffering from poor sanitation conditions are steadily increasing (Borman et al.,2007). Although seemingly a large amount of drugs for the treatment of fungal infections are commercially available, only few of them are really effective antifungals. Many treatments have side effects or are actually toxic (Amphotericin B); are fungistatic and not fungicidal (azoles), or are responsible for inducing the development of resistance (Pfaller et al., 2011). Fungal diseases are then appearing to be one of the most challenging domain where new molecules are urgently needed and plants are most expected to be the source of these new molecules (Ahmed, 2008; Simbo, 2010; Gruca, 2015). Ethnobotanical investigations of plants used against fungal infections have been reported for parts of Togo (Batawila, 2002) and parts of the adjacent prefectures Sokodé and Tchamba (Tittikpina, 2013) but no

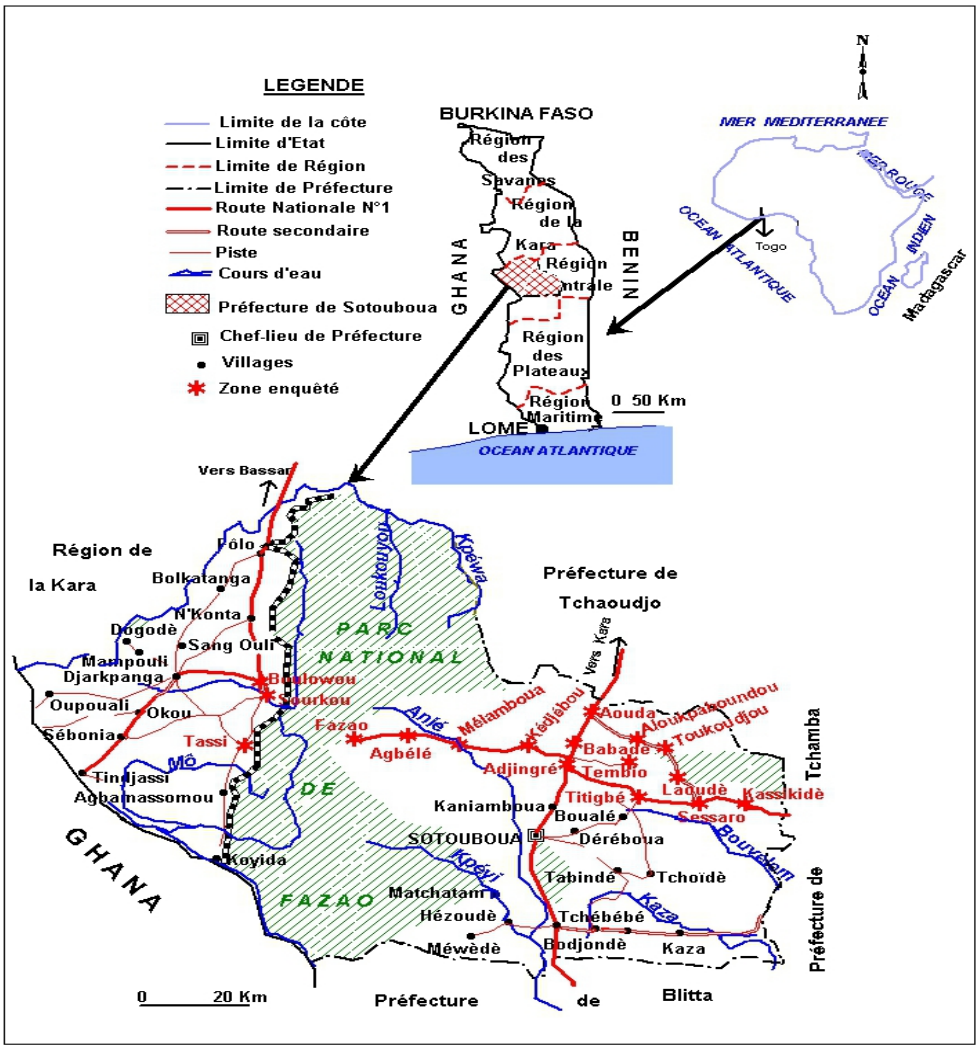
investigation has ever been carried out in Sotouboua. It is therefore necessary to carry out a survey to document the plants used against fungal infections in Sotouboua.

Method

Study area

Togo is a country of 56 600 km^2 situated on the West-African coast. He is limited by Benin in the East, Ghana in the West, Burkina Faso to the North and Atlantic Ocean in the South. Togo is divided in five administrative and economic areas which are from south to north: region Maritime; region des Plateaux; region central, region de la Kara and region des Savanes. The central region is covering 13.470 km^2 with a population of 494 000hts. Situated between the parallel 8 ° and 9°15 of the north latitude and the meridians 0°15 and 1°35 of the longitude east, the region is divided in 5 prefectures: Prefecture de Sokodé; Prefecture de Tchamba; Prefecture de Blitta and Prefecture de Sotouboua which is our study area. On the climatic plan the region enjoys with a hot and wet tropical climate. Rains extend over six months (from May till October). The August and September are the rainiest. The pluviometric totals are situated between 1200 and 1500 mm a year. The temperatures vary generally between 20 and 30°C with minima between November- January and maxima in February-March. Sotouboua is divided in to two plains by the national park Fazao. The park witch is a reserve of fauna is also a reserved zone of flora as bush fires and trees cutting are strictly controlled. The mountainous zones are covered by forests while plains are dominated by savannas with denser and more linear ligneous populating along rivers.

Almost all the ethnic groups of the country (about forty) are represented in Sotouboua but the major ethnic groups are: Kabyè; Kotokoli and Losso. The economy is essentially based on the agriculture. The trade and fishing are less represented whereas the branch of industry is almost non-existent.



Source : Direction de la Statistique de l'Information et de la Documentation, (D S I D).

Sample collection

An ethnobotanical survey was carried out in Prefecture de Sotouboua to identify plants used to treat fungal diseases in that area. During this survey direct interviews have been conducted among traditional healers, community elders and people having knowledge of traditional medicine. As Raveesha and co- workers in 2015, pictures showing common and easily recognizable fungal diseases (tinea, herpes vine and aphthae) has been used to make interviewers aware of the symptoms with regard to the medicinal plants used to treat such symptoms.

The person interviewed is included if only he can fill these 3 criteria: 1- he has recognized at least one infection symptom. 2- He knows at least one

plant that can be used to treat the recognized infection. 3- He can identify and collect a specimen of the cited plant.

The data was collected in local language (Kabyè and Kotokoli) through a semi-structured questionnaire and open-ended conversations. At each interview, the following data were gathered and set on an identity card: Date and place of gathering information; age and sex; profession; education; vernacular name of the plant; disease healed; Part of the plant being used; mode of preparation and administration. Then the plant specimen collected is pressed, labelled with its local name and send to the vegetal physiology laboratory of Université de Lomé for identification.

Data analysis

All data collected has been analyzed using Excel software. The plant species were listed in alphabetical order by scientific name, family name, local name, used value (UV), plants parts used, mode of preparation and administration. The UV of the species of plants being utilized was evaluated using the formula: UV = Number of times a particular species was mentioned/Number of persons interviewed.

Results

Informants

A total of 226 informants aged from 30 to 70 years have participated in this study. Major informants are female. Majority of the interviewers were aged around 50-60 years. Most of the interviewers have attempted 6 or 10 years education level. Significant portion of informants were local old people (Table 1).

Table 1: Socio demographic data of informants

Variable	Categories	Number of person	percentage
Gender	Male	95	42,03
	female	131	57,96
Age	30 -39	39	17,25
	40 -49	113	50
	50 - 59	50	22,12
	60 ≤	24	10,61
Educational background	Illiterate	109	48,23
	6 years education school	84	37,16
	10 years education school	28	12,38
	13 years education school	05	2,21

Medicinal plants diversity

In this study, 37 plant species distributed in 20 families were identified as being used to treat fungal infections. The most representative family was the Fabaceae with 7 species, followed by Rubiaceae with 4 species and Caesalpiniacea; Combretaceae with 3 species each. Other families have one or two species.

Table 2: Medicinal plants used in the treatment of fungal infections.

Scientific name	Family	Local name	U V	Disease	part used	Preparation	Administration
Acanthospermum hispidum DC	Asteraceae	Kpangsoyè	0,02	Aphtae	Whole plant	Decoction	Oral
Agave sisalana Perrine	Agavaceae	Kolgragou felgou	0,005	Aphtae	Root	Decoction	Oral
Anogeissus leiocarpus (DC.) Guill. & Perr.	Combretaceae	Kolou	0,01	Aphtae	Leaves	Decoction	Oral
Annona senegalensis Pers	Annonaceae	Tchoutchourè	0,01	Aphtae	Leaves and Fruit	Decoction	Oral
Blighia sapida K.D. Koenig	Sapindaceae	Kpiziyè	0,075	Aphtae haerpes vine	Fruit or Bark	Calcinat	Applied Locally
Burkea africana Hook	Fabaceae	Tchangbali	0,01	Aphtae	Leaves	Decoction	Oral
Cajanus cajan (L.) Huth	Fabaceae	Assongoyè	0,02	aphtae	Whole plant	Decoction	Oral
Chassalia kolly (Schumach.) Hepper	Rubiaceae	Tiyah	0.06	Tinea	Roots	Paste	Applied locally
Cochlospermum planchonii Hook	Cochlospermaceae	Kalantcheyah	0,001	aphtae	Leaves	Decoction	Oral
Daniellia oliveri (Rolfe) Hutch. & Dalziel	Caesalpiniaceae	Hemou	0,055	aphtae	Leaves and bark	Maceration	Oral
Detarium microcarpum Guill. & Perr.	Caesalpiniaceae	Kpayè	0,01	aphtae	Bark	Maceration	Oral
Ficus sur Forssk	Moraceae	Kaliay	0,05	Tinea ;	Leaves		Applied Locally

				Herpes vine			
Fucus exasperata Vahl	Moraceae	Laalayou	0,005	aphtea	Leaves	Decoction	Oral
Gardenia ternifolia J.Ellis	Rubiaceae	Kaou	0,005	tinea	Root	Calcinat	Applied Locally
Heliotropium indicum L.	Boraginaceae	Soucondiè	0,02	aphtea	Whole plant	Decoction	Oral
Holarrhena floribunda (G.Don) T.Durand & Schinz	Apocynaceae	Kororo	0,005	aphtea	Leaves	Decoction	Oral
Hymenocardia acida	Euphorbiaceae	KpaiKpai	0,15	aphtea	Leavess	Decoction	Oral
Hyptis suaveolens (L.) Poit.	Lamiaceae	Pinbinè	0,005	aphtea	Root	Maceration	Oral
Jatropha curcas L.	Euphorbiaceae	Essogbalou	0,005	aphtea	Leaves	decoction	Oral
Lophira lanceolata Van Tiegh. ex Keay	Ochnaceae	Tabsomang	0,025	Herpes vine	Stem	rubbing	Applied Locally
Maranthes kerstingii (Engl.) Prance	Chrisobalanaceae	Poundoulayzay	0,02	aphtea	Leaves	Decoction	Oral
Maytenus senegalensis (Lam.) Exell	celastraceae	Liakpangsoyè	0,01	aphtea	Leaves	decoction	Oral
Sarcocephalus latifolius (Sm.) E.A.Bruce.	Rubiaceae	Kayou	0,055	aphtea	Root	Decoction	Oral
Parinari curatellifolia Planch. ex Benth.	Chrysobalanaceae	Malay	0,03	aphtea	Leaves	decoction	Oral
Parkia biglobosa (Jacq.) R.Br. ex G.Don	Fabaceae	Soulou	0,015	aphtea	Bark	decoction	Oral
Paullinia pinnata L.	Sapindaceae	Adjandj kpouzou	0,025	aphtea	aerial part	decoction	Oral
Piliostigma thonningii (Schum.) Milne-Redh.	Caesalpiniaceae	Pambakou	0,025	Aphtea Herpes vine	Root	decoction	Oral

Pseudocedrela kotschyii (Schweinf.) Harms	Meliaceae	Helitétéwiyé	0,045	aphtea	Root	Maceration	Oral
Pteleopsis suberosa Engl. et Diels	Combretaceae	Kézinzinang	0,187	aphtea	Leaves and bark	decoction	Oral
Pterocarpus erinaceus Poir.	Fabaceae	Tém	0,095	Tinea Herpes vine	latex		Applied Locally
Securinega virosa (Roxb. ex Willd.) Baill.	Phyllanthaceae	Tchaakatchaka	0,06	aphtea	aerial part	decoction	Oral
Stereospermum kunthianum Cham.	Bignoniaceae	Essogbalou	0,005	Herpes vine	leaves	decoction	Oral
Tamarindus indica L.	Fabaceae	Nidié	0,025	aphtea	leaves	decoction	Oral
Terminalia avicennioides Guill. & Perr. Fl. Seneg. Tent.	Combretaceae	Koyèkouloumryè	0,025	aphtea	Aerial part	Decoction	Oral
Vernonia cinerea (L.) Less.	Asteraceae	Kogbèdiyè	0,04	aphtea	Aerial part	decoction	Oral
Xeroderris stuhlmannii (Taub.) Mendonça&E.C.Sousa	Fabaceae	Kpodougboou	0,005	aphtea	aerial part	decoction	Oral
Zanthoxylum zanthoxyloides (Lam.) Zepern. & Timler,	Rutaceae	Kolgragu felgou	0,01	aphtea	aerial part	Maceration	Oral

These plants listed belongs to divers botanical families as presented by (Figure 1)

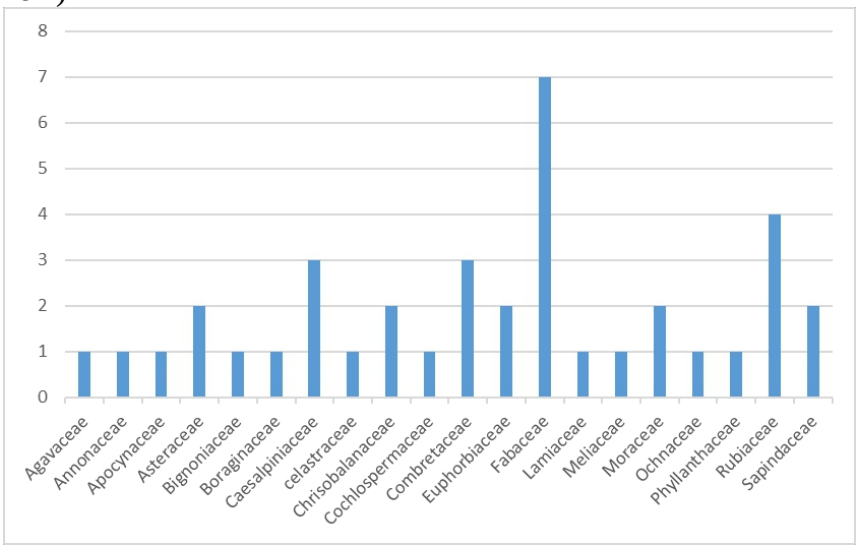


Figure1: Families of plants used in the treatment of fungal infections.

Plant parts used in the treatment of fungal infections

Percentages of plant part used were calculated as the ratio between the number of plants in which a certain part is used and the total number of plants. Leaves are the major plant parts used for the treatment of fungal infections (43, 24%) followed by root (18, 91 %) and aerial parts (16, 21%).

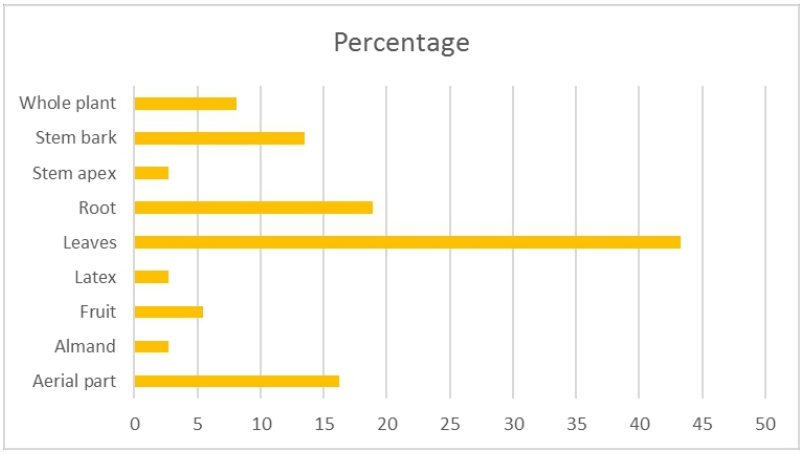


Figure 2. Plant parts used in the treatment of fungi infections.

Preparation and administration of plants used in the treatment of fungal infections.

Different mode of preparation were usually used but the most cited are decoction and maceration. The prepared remedies are administrated by oral route or topical application.

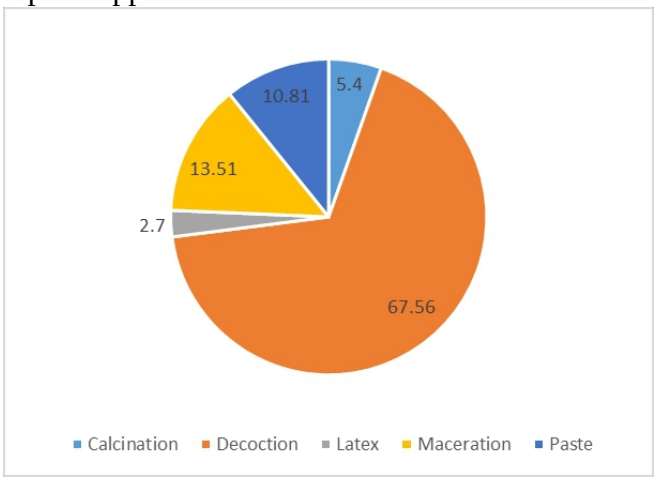


Figure 3: Percentage distribution of plants preparation used in the treatment of fungal infections.

The oral route is the most used in the treatment of fungal infections (78 %) while the external use represent (22%).

Discussion

This study was aiming to check off the medicinal plants used to cure fungal infections. An ethnobotanical survey has been carried out in many villages of Prefecture de Sotouboua in the central region of Togo. A total of 226 community elders, traditional healers and people having knowledge of medicinal plants participated in the study. There were131 (57, 97 %) females and only 95 (42, 03 %) males. This finding is contrary to the general tendency where males are in the majority (Simbo, 2010; Anup et al., 2014; Gbadamosi et al., 2014; Gbekle et al., 2015). The large majority of females in our study is due to the fact that most of the symptoms shown on the photographs used for the survey (Aphthae, herpes vine; Tinea) are related to infants. Women being in charge of children's care are more knowledgeable to plants used against children's diseases. Similar trend regarding the majority of females is also reported in Morocco (Mustapha et al., 2012); in Nigeria (Shosan et al., 2014); in South Africa (Otang et al. 2011). The majority of respondents are around 50 years old; this is because people of this age are so mature and responsible to enjoy elderly's confidence regarding the community secret holding. As such they are depository of the knowledge of plants used to cure diseases and ailments in the community.

The study showed that the majority of interviewers (51, 77%) are literate. Interestingly, the frequency of use of medicinal plants was inversely related to the level of education of the interviewed population; illiterate: 48, 23%; 6 years education school: 37.16%; 10 years education school: 12.38 % and 13 years education school: 2.21%. The people who studied are more inclined towards the modern medicines resulting in loss of valuable herbal-based knowledge (Mustapha et al., 2012).

A total of 37 plant species belonging to 20 families were reported as remedies for the treatment of fungal infections (Table 1). This is indicative of a considerable diversity and abundance of plant species used in the treatment of fungal infections in the study area. Some authors has reported similar biodiversity findings: Otang et al. in 2012 has reported 33 plant species distributed in 26 families and 32 genera as being used to treat one or more of the opportunistic fungal infections in HIV/AIDS patients in the Amathole District of the Eastern Cape Province, South Africa. In Pakistan Sheher et al. in 2013 has reported 50 plants belonging to 33 families during a literature survey on plants used to treat skin infections.

The most representative plant family was: Fabaceae (7 species) followed by Rubiaceae with 4 species and Caesalpinaceae; Combretaceae with 3 species each and Asteraceae; Chrisobalanaceae; Moraceae and Sapindaceae with 2 species each. Other families are represented by one specie (fig 1). Although the active chemical compounds (and their modes of action) of the surveyed plants were largely unknown, it is plausible regarding the long period of usage that the plant families contain bioactive secondary metabolites that work against fungal infections. For example, previous studies reported that Fabaceae and Caesalpinaceae are containing alkaloids, anthocyanin, saponosides, tanins (Maloueki et al., 2015). The family Combretaceae is reach in Tannin; alkaloids; polyphenols (Gbogbo et al., 2013). .All these compounds are well known for their antimicrobial activities. In addition of these antimicrobial compounds most of the cited families have been reported to contain flavonoids, a class of chemical compounds known to possess anti-oxidant properties that prevent free radical generation and tissue damage associated with the onset of dermatosis. Also these plant families are endowed with terpenoids, a secondary metabolite that enhance and maintain the immunity of the patient.

The most cited plants are: *Pteleopsis suberosa; Hymenocardia acida; Blighia sapida; Pterocarpus erinaceus; Daniella oliveri; ; Ficus sur; Sarcocephalus latifolius ; Pseudocedrela kotschyi; Vernonia cinerea* . An ethnobotanical survey carried out by Tittikpina and co-workers in the same region at the prefecture of Tchamba has shown that the two leading plants used against Bacterial and fungal infections were *Pterocarpus erinaceus and Daniella oliveri.*

Different parts of medicinal plants were used to treat fungal infections. Among the different plant parts, leaves were most commonly used (43, 24%) for the treatment of diseases followed by roots (18, 91%); aerial parts (16, 21%); barks (13, 51%); whole plants (8, 10%); fruits (5, 40%). The stem apexes, latexes and almonds (2, 70) each one. Results with similar trend have been reported by other researchers (Telefo et al., 2011; Gbadamosi et al., 2014). The plant leaves are important ingredients in traditional treatment of various diseases as it features as a component in many herbal preparation. As the main photosynthetic organs, leaves might contain photosynthates which could be responsible for medicinal values (Ghorbani, 2005; Anup et al., 2014). Also, collection of leaves and then using them as medicine is very easy as compared to roots, flowers and fruits (Telefo et al., 2011; Giday et al., 2009). Another reason of using leaves could be concerning conservation of the plants as digging out roots might be the cause of death of the plant and putting the species in a vulnerable condition (Batawila, 2002; Rehecho et al., 2011)

Most preparations are made with water as a solvent and the decoction is generally the method of choice (67, 56 %). The preference of this mode of preparation is reported by many authors (Abouri et al., 2012: Gbekle et al., 2015). The great majority of the remedies were taken orally (78 %). External application were also employed, and may consist, generally, in a local application to the affected part.

Conclusion

The survey has added more to the existing discoveries of the relevance of plants and its usefulness in the treatment of fungal infections among the residents of Prefecture de Sotouboua in Central region of Togo. The different plants clamed in this study need to be evaluated through a phytochemical, pharmacological and toxicological investigation to discover their active compounds.

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