

Ethnobotany of aromatic plants used by phytotherapists in the district of Glazoue, Ouesse and Save in Benin

Abstract

Aromatic and medicinal plants (AMP) are flora with a fragrant essence. The aim of this study is to identify the aromatic plants used by herbalists in three districts of the Departement des Collines. The method of data collection is based on ethnobotanical surveys of herbalists using the Dagnelli formula and pre-established survey questionnaires. The results of the survey of 300 herbalists identified 22 most commonly used aromatic plants, divided into 17 families and 21 genera. The most represented families are Lamiaceae (15%); Annonaceae (15%). Among the MAPs inventoried, the most cited and used are: *Ocimum canum* L. *Ocimum gratissimum* L.; *Chenopodium ambrosioides* L.; *Hyptis suaveolens* L.; *Xylopia aethiopica* (Dunal) A. Rich; *Securidaca longepedunculata* Fresen. MAPs treat 163 conditions identified in this study. Some of the AMP are used alone or in combination with other plants. AMP drugs are: leaves (64%), roots (23%). The ailments treated by the majority of AMP are: fever; tooth decay; conjunctivitis; constipation; haemorrhoids; hernia; inflammation; skin lesion; stomach ache; snakebite; causes of malaria; sores and painful periods. In view of the proven importance and different uses of AMP, it is necessary to study them further (ecology, distribution, and conservation status) in order to better prevent or cure human health.

Keywords: Aromatic plants, Useful plants, Diseases, Healing and Benin

Introduction

The floristic resource constitutes a huge reservoir that is very important for health needs (Akognongbe *et al.*, 2014; Akodéwou *et al.*, 2014). The vast majority of the Beninese population remains dependent on the plant for the satisfaction of daily needs (Wedjangnon *et al.*, 2016). Plants, since then, have been used as medicines and even under certain conditions as food (Din *et al.*, 2011). According to the World Health Organization (WHO), about 65-80% of the world's population, use medicinal plants in primary health. According to Agbangnan *et al.*, (2013), 25-50% of conventional medicines nowadays have the bioactive molecules of medicinal plants as active ingredients. The high cost of modern medicine drugs makes people resort to traditional medicine (medicinal plants) for treatment. Medicinal plants are an inevitable source of medicine (Dougnon *et al.*, 2016). Modern medicine has turned to ethnobotanical studies to have a wide range of varieties of molecules from medicinal plants to prevent and fight against diseases (Jiofack *et al.*, 2010). In Benin, traditional medicine (medicinal plants) has become increasingly important in the treatment of diseases. The

promotion of aromatic and medicinal plants is a major concern of many researchers and institutional leaders (Adomou *et al.*, 2012; Ouinsavi *et al.*, 2016). Aromatic and medicinal plants (AMPs) useful to humans can be categorized according to uses: herbal tea plant; hygienic and amenity drink; plant for cosmetic use; plant for aromatic and condiment use; plant for food use; plant for industrial use; medicinal plant. Indeed, aromatic and medicinal plants are used in phytomedicines to bring healing and even preventive (INRA, 2013). Enough authors have demonstrated the therapeutic aspect of aromatic plants (Adomou *et al.*, 2012 and Mangambu *et al.*, 2014). Some of the MAPs are used in the agricultural field to control crop pests to promote good agricultural yield (Kpatinvoh *et al.*, 2017). MAPs are generally used in food for the purpose of flavoring sauce and drink. The recognition of the clinical, pharmaceutical, and economic value of MAP-based medicines continues to grow. MAPs are considered a commodity chain in their own right (INRA, 2013). MAPs were at the origin of the first botanical gardens (Tardivon *et al.*, 2012; Alfaiz *et al.*, 2013; Neffati and Sghaier, 2014). Different ethnobotanical works have been carried out in Benin to document and perpetuate the traditional knowledge of MAPs. These are: Adjanohoun (1999), Houessou (2010), Adomou *et al.* (2012) and Assongba (2014). Beninese plant formations are dwarfed in quality by aromatic and medicinal plants (Neuenschwander *et al.*, 2011). A single plant species is used in different ways and in different areas, in different localities where it exists according to the needs and knowledge knew about this plant (Ouinsavi *et al.*, 2016). Despite the numerous studies on medicinal plants in Africa (Etuk *et al.*, 2010) and elsewhere in the world (Pavani *et al.*, 2012; Thirumalai *et al.*, 2012), it should be noted that enough studies carried out on aromatic plants are not yet done in Benin. As for the one in the hills department, it is the first study of its kind. This is one of the reasons why this study on aromatic and medicinal plants used by phytotherapists in three districts of the department of the hills was chosen in order to list these aromatic and medicinal plants with a view to their perpetuation.

Materials and methods

Study environment

The study took place in the Collines Department, which has an area of 13,931 km². This Department is composed of six (6) District (Dassa-Zounmè, Glazoué, Ouèssè, Savalou, Savè and Bantè). The district of this department is subjected to the influences of the humid tropical climate of the Sudano-Guinean type with two rainy seasons with hazards. They have vegetation of wooded forests and shrubby savannahs. The Ouémé River runs through the

study districts. This study took into account three (3) districts of the six (6) of the department, which are: the district of Glazoué, Savè, and Ouessé. The districts are selected because of their diversity of languages, plant formations, and high human population

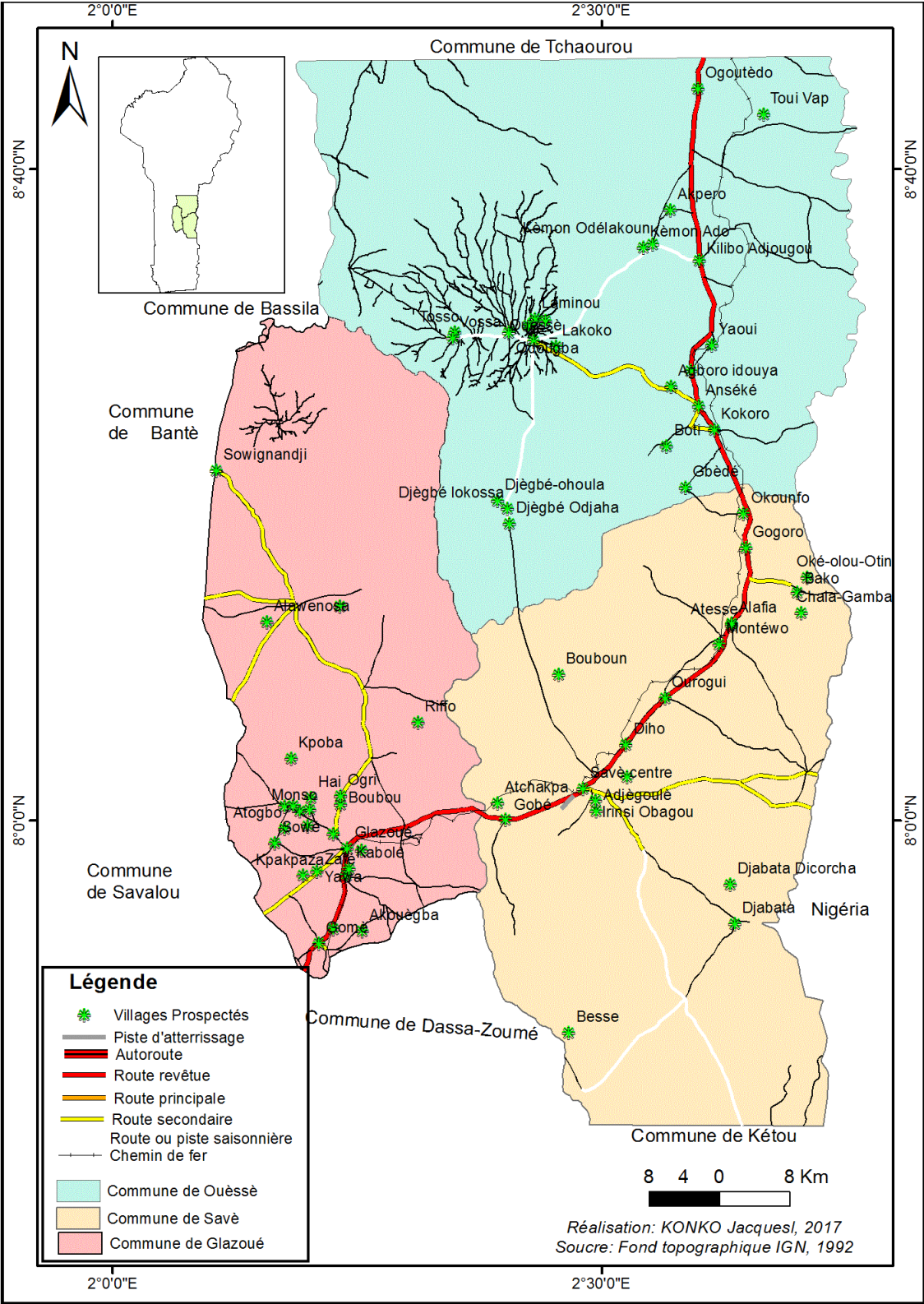


Figure 1: Location of the study area

Study materials

The biological material (plant and human) is made up of the phytotherapists of the three districts (Glazoué, Savè, and Ouèsse) in which the survey was carried out, as well as all the aromatic and medicinal plants that are listed.

Ethnobotanical survey

The choice of villages was made in the dynamics of having representativeness of the sociolinguistic groups of the study area. The choice of study villages was based on the existence of herbalists who use medicinal and aromatic plants (Assongba *et al.*, 2014; Dognon *et al.*, 2016). A total of 71 villages were visited and 300 herbalists were surveyed by using Dagnilli's (1998) formula at a rate of 100 per district. The herbalists questioned (men and women) were those who had knowledge of plant aromas. The information concerning the symptoms or causes of diseases was confirmed with local doctors, nurses (health agents) and completed by the bibliographical review (Adjanooun *et al.*, 1989). For practical exploitation of the data and harmonization with the international system.

Data collection

In each district surveyed, two types of data were collected: the first related to the identification of the respondent (ethnicity, sex, age, level of education, religion, marital status, etc.) and the second related to the knowledge of aromatic and medicinal plants provided by the herbalists (vernacular names of the plants, characteristic features of the aromatic plant, the difference between aromatic and medicinal plants, plant drugs used). During this phase of field investigation, the various discussions were conducted in an open manner and without time limits to allow the herbalists to freely express their knowledge.

Data processing

The collected data are entered in the Excel spreadsheet to have a database. These data were used to calculate means, variances, frequencies to build tables. R 643.4.0 software is used for linear regression, multivariate analysis etc. The Relative Citation Frequency (RCF) of species (Tardio and Pardo-De-Santaynia, 2008) is calculated as follows

$FRC = FC/N$; FC: Frequencies of quotations; FRC: Relative Frequencies of Quotation; N: Number of respondents. Jaccard Similarity Index is calculated to compare sociolinguistic groups. This index measures the similarity of the sociolinguistic groups taken two by two with regard to the knowledge of aromatic plants. It was calculated for each group of species according to the following formula:

$J = C / (A + B - C)$ with A: number of species of aromatic plants cited by sociolinguistic group A; B: number of species of aromatic plants cited by sociolinguistic group B; C: number of species of aromatic plants common to both groups A and B. If $J \leq 40\%$; the ethnic groups have different knowledge about aromatic plants. If on the other hand $J > 40\%$; the ethnic groups have similar knowledge about aromatic plants.

Results

Endogenous knowledge of aromatic medicinal plants

The surveys carried out among the phytotherapists made it possible to note that 98% of the phytotherapists surveyed in the various district know and use aromatic and medicinal plants. Thus, 23 species of aromatic plants are listed and used. They are divided into 17 families and 21 genera (Table 1). The most represented families are Lamiaceae (15%), Annonaceae (15%), Alliaceae (11%), and Rutaceae (7%). According to the results, 100% of five (5) ethnic groups (Idaasha, Mahi, Nago, Fon and Pheul) know and use more plants. The vernacular names of the identified aromatic plants and their frequency of citation are summarized in Table 1. The plants with a frequency of citation (FRC) of more than 50% are: *Ocimum canum*; *Ocimum gratissimum*; *Momordica Charantia*; *Chenopodium ambrosioides*; *Hyptis suaveolens*; *Lippia multiflora* Moldenke; *Lippia rugosa*; *Xylopi aethiopica*; *Heliotropium indicum*; *Securidaca longepedunculata*. These plants are the most frequently used in the treatment of ailments.

Table 1: Vernacular names and citation frequencies of aromatic plants

Scientific names	Idaash	Nago	Mahi	FRC
<i>Ocimum canum</i> L.	Ina- éwé/Hisihisi	Owofi	Akeman	0,88
<i>Ocimum gratissimum</i> L.	Alibara	Simonba	Tchao	0,84
<i>Momordica Charantia</i> L.	Kpalari	Kpalari	Yinssikin	0,82
<i>Chenopodium ambrosioides</i> L.	Odanmaira	Orèdjougou	Godo	0,67
<i>Hyptis suaveolens</i> L.	Ewéidjako	Couloubi	Sansoukpèman	0,66
<i>Lippia multiflora</i> Moldenke	-	-	akalala	0,65
<i>Lippia rugosa</i> L. A.Chev.	Kanhoun	Kinhoun- kinhoun	Aglala	0,62
<i>Xylopi aethiopica</i> (Dunal) A. Rich.	Oroun	Aroun	Kpejelekou	0,58
<i>Heliotropium indicum</i> L.	Ogbolarouko	Igbéako	Koclosoudèkpadja	0,55
<i>Annona senegalensis</i> Pers. Pers.	Otribobo	Ambo	Nyiglwé	0,52
<i>Allium ascalonicum</i> auct. non Strand	Mansa Kpikpa	Amansa elewe	Masa winiwini	0,5
<i>Securidaca longepedunculata</i> Fresen.	Kpatalè	Ikpata	Atakpa Wanlwi	0,49
<i>Ocimum basilicum</i> L.	Akohoun	Akohoun	Kohoun	0,43
<i>Zanthoxylum zanthoxyloides</i>	Eguiatta	Eguiatta	Hetti	0,36

(Lam.)

<i>Allium sativum</i> L.	Ayo	Ayu	Ayo	0,35
<i>Cymbopogon citratus</i> (DC.) Stapf	Ofrin	Ewéiti	Tcha	0,35
<i>Zingiber officinale</i> Griff.	Atalè	Atalè	Dotan	0,3
<i>Crassocephalum crepidioides</i> (Benth)	Gbolo	Gbolo	Kogbo	0,3
<i>Piper guineense</i> Schum. et Thonn.	Idjayé	Ata iyere	Linlinkou	0,27
<i>Allium cepa</i> L.	Masa	Amansa	Masa	0,25
<i>Olox subscorpiodea</i> Oliv.	Miitin	Akpatcha	Kiviman	0,21
<i>Monodora myristica</i> (Geartn).	Ariwo	Ariwo	Sasalikouin	0,19
<i>Uvaria chamae</i> P.Beauv.	Yaha	Yaha	Yaha	0,17

Jaccard similarity index (J)

The analysis of Table 2 allows us to say that the different sociolinguistic groups have a similar knowledge about aromatic plants ($J \geq 40$), only that the similarity differs according to each sociolinguistic group.

Comparative ethnicities	Idaasha and Mahi	Idaasha and Nago	Mahi and Nago
Index J	86%	90%	95%

Table 2: Jaccard similarity indices

Diseases treated with aromatic and medicinal plants

Table 3 shows the aromatic and medicinal plants with the different ailments treated, the drugs used in the phytomedicines, and the modes of preparation of phytomedicines. A total of 24 medicinal plants were identified in the study area. These plants are used daily by herbalists and the general population to season sauces and to treat ailments.

Table 3. Plants identified, drugs used, preparations made and conditions treated

Species	Families	Org	Preparation	Diseases and conditions
<i>Allium ascalonicum</i> auct. non Strand	Alliaceae	Bu/Fe	Sauce (gold)	Flavouring, Angina, Aid digestion
<i>Allium cepa</i> L.	Alliaceae	Bu/Fe	Maceration (Bu/Fe) (Spread) Sauce (gold)	Anti-snake, Infection, Angina
<i>Allium sativum</i> L.	Alliaceae	Bu	Sauce (gold)	Aromatizing, Cough, aids digestion
<i>Annona senegalensis</i> Pers.	Annonaceae	R/Fe/E	Leaves (pocket)	Anti-snake,

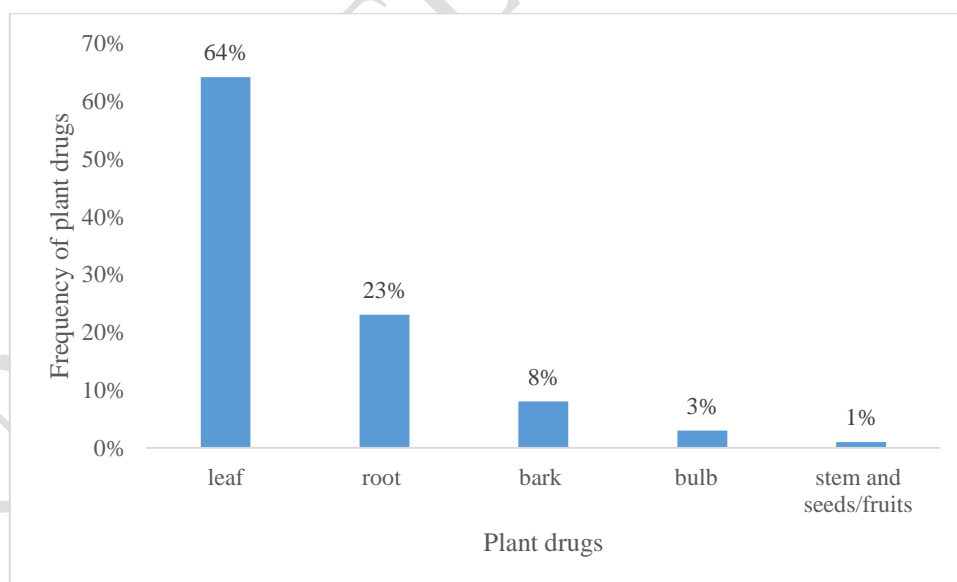
<i>Monodora myristica</i> (Geartn).	Annonaceae	R/ Fr	Decoction (Bath, Gold) Decoction (gold) Market	dizziness, stress Intestinal worms, infection, cyst
<i>Uvaria chamae</i> P.Beauv.	Annonaceae	R/Fe/E	Decoction (bath, gold)	Fever, body aches, kidney pain
<i>Xylopi aethiopica</i> (Dunal) A. Rich.	Annonaceae	Fr/Fe	Sauce (gold) Maceration (gold)	Flavouring, a recipe activator
<i>Crassocephalum crepidioides</i> (Benth)	Asteraceae	Fe/R	Sauce (gold) Maceration (gold)	Flavouring, Used by women alert
<i>Heliotropium indicum</i> L.	Boraginaceae	Fe/Fl	Decoction or trituration of leaves (gold)	Sexual weakness, Coughing in babies, Hypotension
<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	Fe/Gr	Trituration (past) Grain (gold)	Skin lesion, abscesses Deworming of poultry,
<i>Combretum collinum</i> Fresen.	Combretaceae	R/F/E	Decoction (bath, gold)	Awakening the Baby, Jaundice, Fatigue
<i>Lippia multiflora</i> Moldenke	Verbenaceae	Fe / Fr	Sauce / Decoction	High blood pressure
<i>Momordica Charantia</i> L.	Cururbitaceae	Fe/Fr	Trituration or maceration	Stomach ache, Hernia, Itching
<i>Hyptis suaveolens</i> L.	Lamiaceae	Fe/T	Decoction (bath, gold)	Baby bath, insecticide, jaundice
<i>Ocimum basilicum</i> L.	Lamiaceae	Fe/R	Sauce Trituration	Aromatizer Meat preservative
<i>Ocimum canum</i> L.	Lamiaceae	Fe/R	Trituration (bath, past)	Purification and disinfectant
<i>Ocimum gratissimum</i> L.	Lamiaceae	Fe/Pe	Sauce or trituration	Flavouring, Digestion, Intestinal worms
<i>Khaya senegalensis</i> (Desr.) A. Juss. (Desr.) A. Juss.	Meliaceae	E/Fe/R	Decoction/Maceration (Gold/Bath)	Purification, Disinfectant, Baby's first bath
<i>Musa sapientum</i> auct. div.	Musaceae	Fr/Fl	Powder (Gold)	Memory aid, Sexual weakness, Paralysis
<i>Musa</i> sp L.	Musaceae	Fr/Fe/R	Powder (Gold)	Sexual weakness, checklist
<i>Olox subscorpiodea</i> Oliv.	Olacaceae	R/Fe	Decoction (bath, gold)	Protection, Child development,

				Palu
<i>Piper guineense</i> Schum. et Thonn	Piperaceae	Gr	Decoction (gold)	Flavouring, Angina, Fibroma, Intestinal worms
<i>Cymbopogon citratus</i> (DC.) Stapf	Poaceae	Fe/Pe	Decoction or Maceration (Gold)	Flavouring, Convalescence, Lack of blood
<i>Securidaca longepedunculata</i> Fresen.	Polygalaceae	R/E	Racine at your fingertips Decoction (Bath, gold)	Antivenomous, Sexual weakness, Protection

Preparations: Gold: Oral; Dec: Decoction; Mac: Maceration

Diseases and ailments treated by the inventoried plants

Table 3 presents the different diseases treated by the 24 plants inventoried with the methods of preparation and use. In total, 20 disease symptoms or conditions were identified. The ailments treated by the majority of the plants are Fever, attacks, and seizures; tooth decay, conjunctivitis, constipation, tastes and their odor, aches, arousals, digestion facilitator, internal and external hemorrhoids, hernia, hypotension and hypertension, inflammation, skin lesion, stomach ache, snakebite, malaria, wounds, painful period, intestinal worms and vomiting. The frequency of plant drugs used is as follows: leaf (64%), root (23%), bark (8%), bulb (3%), stem and seeds/fruits are weakly used. Fugue 2 reflects the frequency of drug use.



Fugue 2. Frequency of drug use

As regards the methods of preparation, trituration is the most used method (46%); decoction (28%). Maceration and powdering of plant drugs are in equal proportion (13%). Infusion is poorly represented.

Some plants like : *Ocimum canum*, *Ocimum basilicum*, *Ocimum gratissimum*, *Zingiber officinale*, *Lippia multiflora* Moldenke; *Lippia rugosa*, *Crassocephalum crepidioides*, *Allium sativum*, *Xylopia aethiopica*, *Allium Ascalonicum*, *Allium cepa*, *Piper guineense* are used to flavor sauce and food. *Ocimum canum* L. is used to purify places of worship; *Ocimum basilicum* L. is used by hunters and fishermen to preserve meat and fish respectively. Plants like *Allium sativum* L. *Xylopia aethiopica* (Dunal) A. Rich; *Allium ascalonicum* auct. non Strand; *Allium cepa* L. and *Monodora myristica* (Geartn) are plants used by Phyto therapists to accelerate and precipitate the activity of phytomedicines during their use.

Discussion

Strengths and weaknesses of the survey methodology

The ethnobotanical survey method based on individual interviews allowed us to know the importance of the use of aromatic and medicinal plants in the treatment of ailments and diseases in the hills department. This method, which requires the memory of the interviewees, could cause biases related to the personal appreciation of the respondents (Dossou *et al.*, 2012; Wedjangnon *et al.*, 2016). The importance given to the use of the species is given by individuals who implicitly take into account a personal appreciation; which often refers to their preference. Nevertheless, these methods are widely used in ethnobotany by other authors and have the privilege to bring out quite relevant results, Nguenang (2010); Dahouenon *et al.* (2017). As the frequencies of the different uses of these species for the different uses identified among herbalists are not precise, this could cause errors when assigning scores for the calculation of the various indices that can measure the importance of a species for a given sociolinguistic group or groups. It should also be noted that during the survey, exchanges were made in languages other than those mastered by the respondent, which required interpreters.

Level of knowledge on aromatic and medicinal plants

Ethnobotanical knowledge of aromatic species in the hills varies according to sociolinguistic groups on the one hand and within sociolinguistic groups on the other hand, which means that a small group of community holds most of the knowledge about the plants. These results are similar to those of Quiroz *et al.* (2014); Wedjangnon *et al.* (2016). Other studies have also shown that ethnobotanical knowledge related to plant species varies mostly with age, gender, and sociolinguistic group Ekué *et al* (2010); Fandohan *et al* (2010); Gouwaknnou *et al* (2011); Assogbadjo *et al* (2011) and Assongba (2014). This study was conducted among herbalists and it should be noted that these people were reluctant on information, this is

moreover the reason for taking a large enough sample to be able to mobilize enough information, this confirms the results of Adomou (2012), on a study conducted among women plant sellers in the market of Cotonou. The information collected shows that plant species are of great wealth for humans. In general, therefore, it can be said that sociolinguistic groups know and use the plants around them according to their way of life. It is necessary to emphasize that any plant not found in the country is imported. This is similar to that of Adomou *et al* (2012). The botanical families most found are Lamiaceae (15%) and Annonaceae (15%), these results are similar to those of Salhi *et al.* (2010) in a floristic and ethnobotanical study of medicinal plants in Morocco. Some species of aromatic plants such as *Allium sativum*; *Xylopi aethiopica*; *Allium Ascalonicum*; *Allium cepa* and *Monodaro myristica* have a particular character of accelerating the activity of recipes. This is confirmed by the findings of Adomou *et al* (2012); Dougnon *et al* (2016), which states that some drugs, especially fruits, seeds are used as auxiliary or adjuvant ingredients, enable to enhance the therapeutic action of the main components of the recipes and also enable to treat the secondary symptoms of the disease.

Conclusion

The ethnobotanical survey revealed the existence of numerous aromatic and medicinal plants used by traditional therapists who have medicinal and magico-spiritual knowledge and know well the use of plants as aliments. The study made it possible to constitute a database on the main aromatic species used by the phytotherapists of the hills in general and the district of Glazoué, Savè, and Ouesse in particular. A total of 23 species of aromatic plants were identified to treat 20 different symptoms of illness. The ethnic groups surveyed were Idaasha, Mahi, Nago, Fon, and Peuhl. These sociolinguistic groups know and use the plants for various purposes, which reveals the importance that people give to natural plant resources in the localities. The data collected will be used for the promotion of aromatic and medicinal plants with a view to discovering new active ingredients for use in therapeutics, cosmetics, perfumery, and others.

Consent

As per international standard or university standard, respondents' written consent has been collected and preserved by the authors.

NOTE:

The study highlights the efficacy of "traditional medicine" which is an ancient tradition, used in some parts of Benin. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

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