

# HABITATS AND UTILIZATIONS OF *Lippia multiflora* MOLDENKE : LOCAL PERCEPTION OF FOUR ETHNIC GROUPS FROM BENIN (WEST AFRICA)

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## ABSTRACT

The purpose of this study is to assess the local knowledge on the habitats and uses of *Lippia multiflora* in Benin. A total of 180 households distributed in four ethnic groups in the Sudano-Guinean (Mahi, Bariba and Peulh) and the Sudanian zones (Boo and Peulh) in Benin were surveyed. The perception of the local population on the habitats and use of the species was assessed. Pearson Chi-square Test was used to test the independency of the use of the species according to the ethnic groups. Correspondence Analysis was used to assess the relationship between the organs used and the ethnic groups. Results revealed that *L. multiflora* was mentioned abundant in fallow and savanna. The use value of the species was 0.65 for food, 0.50 for medicine versus 0.03 for handicraft. Mahi ethnic group used mainly the leaves of the plant species for health care, while Boo and Peulh used mainly the inflorescences as food (sauce, soup and tea). Bariba ethnic group used the stems for handicraft. Diseases treated by the species were stomach ache, fever, malaria, toothache, high blood pressure, wound, physical weakness of baby, itch, reduced lactation activity after birth and diverse attacks. Valorization programs can then be based on those utilizations according to ethnic groups in Benin.

**Key words :** *Lippia multiflora*, local knowledge, food and medicinal uses, biogeographic zones in Benin, ethnic groups.

## RESUME

### **HABITATS ET UTILISATIONS DE *Lippia multiflora* MOLDENKE : PERCEPTION LOCALE DE QUATRE GROUPES ETHNIQUES AU BENIN (AFRIQUE DE L'OUEST)**

La présente étude vise à identifier les habitats et les utilisations de *Lippia multiflora* sur la base des connaissances ethnobotaniques des populations locales. Une enquête a été menée auprès de 180 ménages appartenant à quatre groupes ethniques dans la zone soudano-guinéenne (Mahi, Bariba et Peulh) et dans la zone soudanienne (Boo et Peulh) au Bénin. Les résultats ont montré que *L. multiflora* est abondante dans les jachères et les savanes. La valeur d'usage alimentaire de l'espèce est de 0,65, celle médicinale est de 0,50 contre 0,03 pour l'artisanat. Les Mahi utilisent principalement les feuilles pour la santé, tandis que les Boo et les Peulh utilisent principalement les inflorescences comme aliments (sauce, soupes et thé). Les Bariba sont les seuls à utiliser les tiges à des fins artisanales. Les maladies traitées par l'espèce sont les maux de ventre, la fièvre et le paludisme, les maux de dents, l'hypertension, les blessures, la faiblesse physique chez le nouveau-né, les démangeaisons, la faible montée lactée après accouchement et les diverses crises. Des programmes de valorisation doivent être à présent

conçus et basés sur ces divers usages selon les groupes ethniques.

**Mots clés :** *Lippia multiflora*, connaissances locales, usages alimentaire et médicinale, zones biogéographiques du Bénin, groupes ethniques.

## INTRODUCTION

Non Timber Forest Products (NTFPs) play a major role for local people and significantly contribute to their subsistence needs (foods and health) or come as additional source of income and job (FAO, 2013). The NTFPs constitute a biological base of worldwide food security and means of subsistence (Loumeto, 2010). Among them, *Lippia multiflora* Moldenke through its organs plays an important role for local population. *L. multiflora* is a woody shrub that belongs to Verbenaceae family. Its maximal height is 4m (Akoegninou *et al.*, 2006). It regenerates by stump occasioning several stems growth per stump. Stems are subglabres or getting scattered hairs. Stems are clear brown ; more or less smooth, yellow to greenish fibrous slices. Branches are angular and downy, green to crimson or yellowish. The leaves, green bluish, have a stronger camphor odor at bruising. The leaves superior face is smooth with little visible nervations. The apex is very obtuse (Akoegninou *et al.*, 2006 ; Bornet *et al.*, 2008). The inflorescences are stacked by several whorls of glomerules (0.5-1 cm) composed by whitish flowers (Bornet *et al.*, 2008). The plant flowers and fructifies from December to February (Akoegninou *et al.*, 2006 ; Bornet *et al.*, 2008). *L. multiflora* naturally spreads in Sudano-guinean and Sudanians savannas in West Africa (Akoegninou *et al.*, 2006 ; Oussou *et al.*, 2008). It can also grow in Guinean savannas (Bornet *et al.*, 2008). It is a wild spontaneous species of fallows (Foumier *et al.*, 2001 ; Konan *et al.*, 2010) and savannas often viewed on talus, generally on battleship or gritty soils. *L. multiflora* is annually disturbed by fire but always regenerates by stump roots (Akoegninou *et al.*, 2006). *L. multiflora* is important for the local people because of its multiple food and medicinal properties (Loumeto, 2010 ; Adou *et al.*, 2011 ; Alui *et al.*, 2011 ; Etou-Ossibi *et al.*, 2012 ; Diomandé *et al.*, 2014). The decoction and aqueous extract of the leaves contain an essential oil used against affections (Adjanohoun *et al.*, 2002 ; Avlessi *et al.*, 2005 ; Alui *et al.*, 2009, 2011 ; Adou *et al.*, 2011, 2012 ; Etou-Ossibi *et al.*, 2012 ; Kunle *et al.*, 2012). The essential oil from the leaves has insecticide, larvicide, fungicide and bactericide actions

(Oladimeji *et al.*, 2000 ; Moses *et al.*, 2009 ; Bassole *et al.*, 2010 ; Niamketchi *et al.*, 2016 ; Konan *et al.*, 2016). The leaves of *L. multiflora* are widely sold on market in Côte d'Ivoire and also exported in others countries in Africa and Europe (N'guessan *et al.*, 2010). The use varies from one ethnic group to another even in the same county. However, limited researches focused on the medicinal use of the decoction and essential oil of the leaves in Benin (Adjanohoun *et al.*, 2002 ; Avlessi *et al.*, 2005) ; while knowledge on the habitat and ethnic specific ethnobotanical (food, medicinal, and cultural) importance on the organs of *L. multiflora* are lacking. Addressing these gaps of knowledge will help to set up sustainable management and use of the species also according to socio-cultural groups. Thus, the present study aims to assess the knowledge of local communities on the habitat of the species and the use of its different organs according to the ethnic groups.

## MATERIALS AND METHODS

### STUDY AREA

The study was carried out in the Sudano-Guinean and Sudanian zones of Benin (Figure 1), where the species is widely spread (Akoegninou *et al.*, 2006). The survey was conducted in the district of Savalou and Tchaourou in the Sudano-Guinean zone and the district of Segbana in the Sudanian zone (Figure 1).

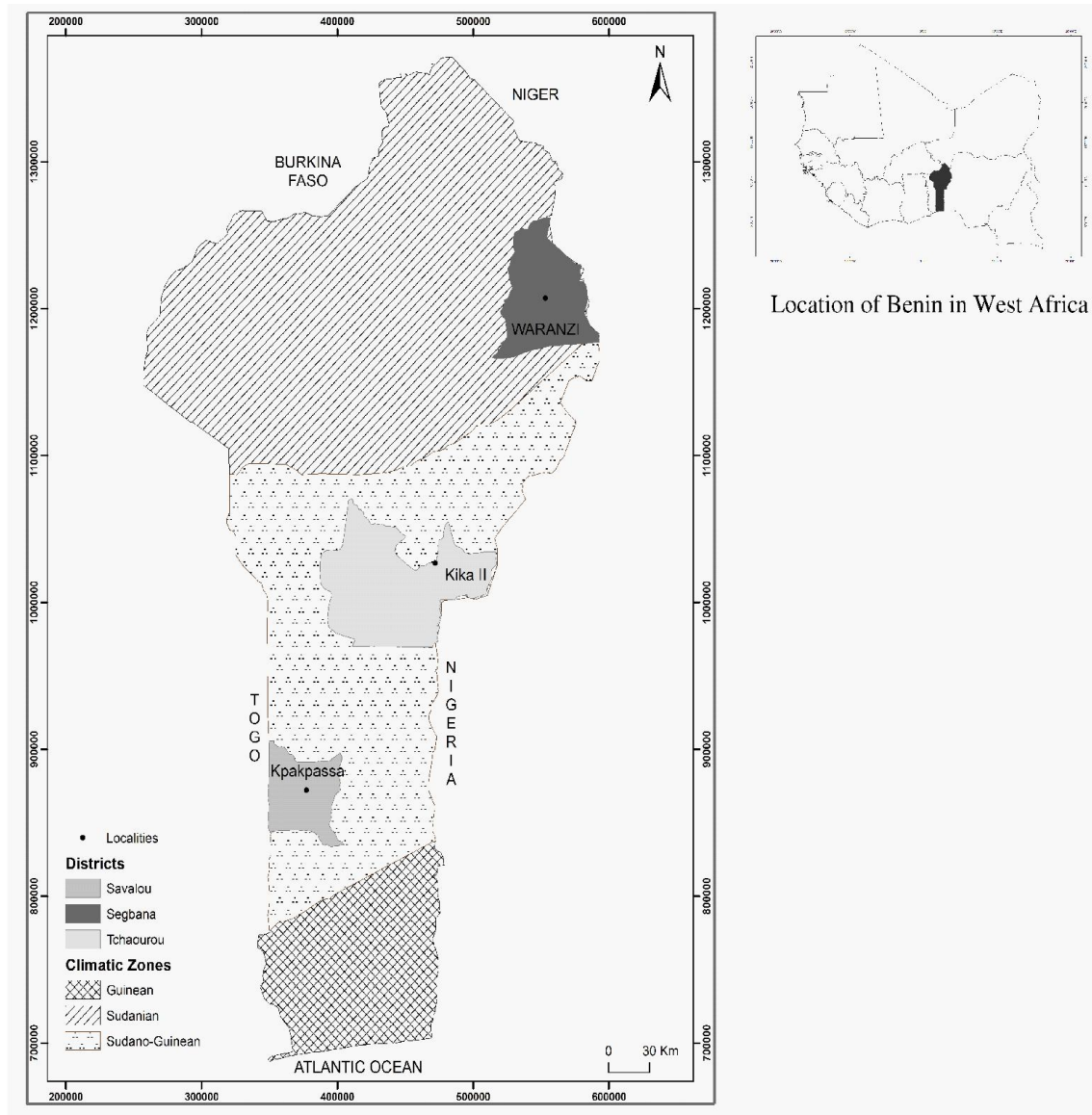
The Sudano-Guinean zone is characterized by a sub humid climate with two seasons. One dry season (November to March) and one rainy season (April to October). The annual average rainfall is 1164.31 mm. The average temperature is 28.01 °C and the relative humidity is 62.7 % (ASECNA, 2010). The soil is ferruginous in the zone. The vegetation of this zone is characterized by dry dense forests and gallery forests (Sinsin *et al.*, 2010).

In the Sudanian zone, the climate is semi-arid with one rainy season and one dry season. Annual average rainfall is 1039.05 mm, the average temperature is 28.6 °C, and the relative humidity is 55.23 % (ASECNA, 2010). The soil in this zone is ferruginous. The vegetation is

widely dominated by continue Graminaceae savanna (Andropogonae). Dry dense island forests of *Anogeissus leiocarpa* and woodland of *Isoberlinia* spp are noticed (Sinsin *et al.*, 2010).

The main ethnic groups in the study area are Mahi and Bariba in the Sudano-Guinean zone ; Boo in the Sudanian zone. Peulh is also one important ethnic group present in the two biogeographic zones. Mahi represented 11 % of the population in the Sudano-Guinean zone

with agriculture, breeding, fishing, trade, handicraft and transport as main activities. Bariba constituted 24 % of the population in the Sudano-Guinean zone with agriculture, breeding, and traditional food processing as main activities. Boo ethnic group constituted 51 % of the population in the Sudanian zone with the same main activities as Bariba. Peulh ethnic group represented 14 % of the population in the Sudanian and Sudano-Guinean zones. The principal activity of this ethnic group is the livestock breeding.



**Figure 1 :** Map of Benin showing the study area  
*Carte du Bénin montrant le milieu d'étude*

## DATA COLLECTION

### Sampling

In each of the three localities, 30 persons were randomly selected and asked if they know the species and at least one of its use. The normal approximation of the binomial distribution (Dagnelie, 1998) was used to determine the sample size (n).

$$n = \frac{U_{1-\alpha/2}^2 \times p(1-p)}{d^2}$$

where  $U_{1-\alpha/2}$  is the value of the normal random variable at probability value of  $1-\alpha/2$ . For a probability value of 0.975 (or  $\alpha = 0.05$ ),  $U_{1-\alpha/2} \approx 1.96$ ;  $p$  (0.33 to 0.96) is the proportion of informants who know at least one use of the species;  $d$  is the margin error of the estimation of any parameter to be computed from the survey. A value of 8% was considered. A total of 180 households detailed as 19 for Mahi ethnic group in the Sudano-Guinean zone, 92 for Boo ethnic group in the Sudanian zone, 43 and 26 respectively for Bariba and Peulh ethnic groups spread on the three surveyed localities were then randomly selected and surveyed in both biogeographic zones.

### Survey

Data were collected using semi-structured questionnaires. The head of each household was interviewed when an elderly individual was not found. The interviews were conducted in the local languages with translations when necessary. Questions were mainly related to: (a) the habitat of *Lippia multiflora* and local perception on its abundance, (b) local name (according to the respondent's language) of the species and (c) parts of the plant harvested and their respective uses according to the ethnic groups.

## DATA ANALYSIS

The frequencies of citation of the different habitats according to the ethnic groups were computed to evaluate the local population perception on the predominant habitats of the species. The frequencies of citation of the diseases treated by *L. multiflora* in the study area were also computed using Excel and Minitab. The use value of the species (UVs) was calculated according to the simplified formula of Phillips and Gentry (1993).

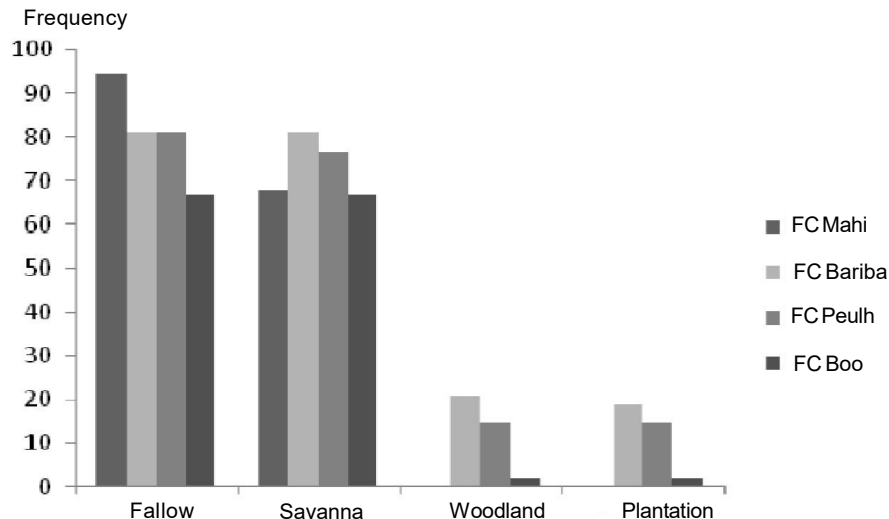
$$UV_s = \frac{\sum_i^n U_{is}}{n_s}$$

where  $UV_s$  is the total use value of the species but named categorical use value when many uses were concerned (Thomas, 2008),  $U_{is}$  is the number of uses of the species mentioned by informant  $i$  and  $n_s$  is the total number of informants. Three categories of uses (food, medicine and cultural) were considered in this study for the calculation of the use value. The total use value corresponds to the sum of use values per category (UV food, UV medicine and UV cultural). Pearson Chi-square Test was used to analyze the independency of the use values of the species regarding the different ethnic groups. Correspondence Analysis (CA) was used to describe the relationship between the species' organs harvested for the different uses by the ethnic groups. All the analyses were performed using SAS software (SAS, 2008).

## RESULTS

### LOCAL PERCEPTION ON THE HABITAT OF *Lippia multiflora* IN SUDANO GUINEAN AND SUDANIAN ZONES IN BENIN

Four different types of habitat (fallow, savanna, woodland, and plantation) were mentioned by the informants (Figure 2). Among them, fallow and savanna were the most important habitats (68 to 95% of citation) where the target species spread well according to the four ethnic groups.



FC = Frequency of Citation

**Figure 2 :** Frequency of citation of the type of habitat within which *L. multiflora* occurs

*Fréquence de citation des types d'habitats dans lesquels on trouve *L. multiflora**

#### USES OF *Lippia multiflora* ACCORDING TO ETHNIC GROUPS

Different names were used by local populations according to their ethnic group for *L. Multiflora* (Table 1). These different names indicate somehow the uses of the plant by local populations. Indeed, while the name in « mahi » indicates that the species is a good medicinal plant, the name in Boo indicates its food value. The use value of the species varied according to the category considered. The food and medicine use categories had the highest use values (0.65 and 0.50 respectively) ; while handicraft had the lowest use value (0.03). In general, *L. multiflora*

had high use value ( $UV_{total} = 1.18 \geq 1$ ) which is an expression of the importance of the species for local populations. The Pearson Chi-square test revealed that the uses were independent from one ethnic group to another (Khi-2 value=5 and  $P=0.08$ ). The main uses of the species' plant parts (leaves and inflorescences) for food purposes were for tea and soup. The most treated diseases by the plant according to the local perception were particularly : stomach ache (51 %), fever (16 %), malaria (13 %), wound (5 %), physical weakness of baby (5 %), itch (4 %), reduced lactation (3 %), toothache (1 %), hypertension (1 %) and diverse attacks (1 %) (Table 2).

**Table 1 :** Names of *L. multiflora* according to different ethnic groups in sudano-guinan and sudanian zones.

*Noms de *L. multiflora* selon les différents groupes ethniques dans les deux zones biogéographiques.*

Ethnic groups	Name in local language	Meaning
Mahi	Aklala (Eglatin)	Instantaneous anti-malaria and anti-spasmodic plant
Bariba	Gueguessoko	Heavy plant in appearance but light in reality
Peulh	Nounougouelade	Bush variety
Boo	Towenandossinan	Empty-handed hunter soup

**Table 2 :** Food and medicinal importance of *L. multiflora* in the sudano-guinean and sudanian zones in Benin*Importance alimentaire et médicinale de L. multiflora dans les zones soudano-guinéenne et soudanienne au Bénin*

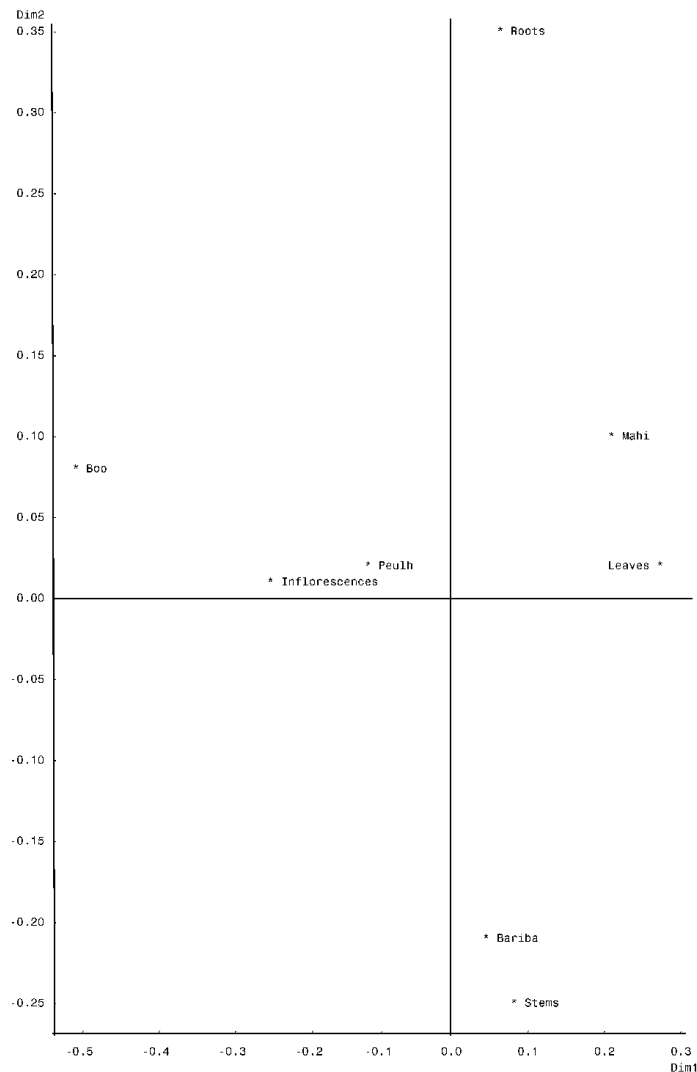
Diseases	Organs used	Mode of preparation	Mode of treatment	Dose, posology
Stomach ache and reduced lactation	Leaves	Decoction	Drink	¼ litre three times per day during 3 days
	Leaves	Decoction	Drink	¼ litre three times per day during 3 days
	Inflorescence	Soup	Food	Regular consummation of soup until recovery
Fever, malaria, wound, and itch	Leaves	Decoction	Drink and bath	¼ litre three three times per day during 3 days with regular bath until recovery
Physical weakness of babies	Leaves	Decoction	Bath	Regular bath for baby during 3 months after childbirth
Toothache	Leaves	Decoction	Drink and bath	Regular bath for mouth until recovery
Hypertension and diverse attacks	Leaves	Decoction	Drink	¼ litre three times per day during 3 days until recovery

Correspondence Analysis (CA) performed to describe the relationship between ethnic groups and the plant organs harvested for the different uses revealed that the first two axes were highly significant and explained 98.45 % of the total information related to the variables considered (the organs harvested and the ethnic groups, Table 3). Considering axis 1, CA showed that the ethnic group of Mahi was associated with

leaves while Peulh and Boo ethnic groups were associated with inflorescences (Figure 3). In fact, the ethnic group of Mahi used the leaves for health care while the ethnic group of Boo and Peulh used the inflorescences for soup seasoning. Concerning the axis 2, Bariba ethnic group was associated with the stems and roots of the species (Figure 3). Indeed, only Bariba ethnic group used the stems and the roots of the plant for handicraft (powder for gun).

**Table 3 :** Contribution and representation of the variables on the two Correspondence Analysis axes*Contribution et représentation des variables sur les axes de l'Analyse Factorielle des Correspondances*

Variables	Axe 1		Axe 2	
	Contribution	Representation	Contribution	Representation
Mahi	0.32	0.81	0.24	0.17
Bariba	0.00	0.03	0.69	0.95
Peulh	0.03	0.66	0.00	0.03
Boo	0.62	0.96	0.05	0.02
Inflorescences	0.44	0.44	0.00	0.00
Leaves	0.53	0.53	0.00	0.00
Stems	0.01	0.01	0.50	0.88
Roots	0.00	0.00	0.48	0.89



**Figure 3 :** Representation of the ethnic groups and the organs harvested for use on the two Correspondence Analysis axes

*Représentation des groupes ethniques et les organes prélevés pour usage dans le plan formé par les deux axes de l'Analyse Factorielle des Correspondances.*

## DISCUSSION

The present study revealed that *L. multiflora* is well distributed in fallow and in savanna according to local perception. This perception is confirmed by the forest inventory done by Akoegninou *et al.* (2006). The abundance of *L. multiflora* in fallow and savanna is also in accordance with the finding of Fournier *et al.* (2001) who reported that the species is a post farming indicator. The species need sun light in open land (fallow and savanna) according to Konan *et al.* (2010). When *L. multiflora* terminal and lateral buds are well lighted in single-crop farming, the branch development is very important (Konan *et al.*, 2010). The species is also adapted to fire

(Akoegninou *et al.*, 2006) which is frequent in fallow and savanna (Aubreville, 1957 ; Guillaumet and Koechlin, 1971). According to Raunkiaer (1905) mentioned by Aké Assi (1984) and Aman Kadio (2004), *L. multiflora* is a nanophanerophyte plant which develops well in savanna. The presence of the species in savanna facilitates access of the population to it, which justifies the various knowledge of the population on the target species. In fact, the different local names given to the species by the different ethnic groups in the two biogeographic zones confirm the variability in uses of the plant. For instance, the name « townandossinan » given to the species by the ethnic group of Boo meaning « empty-handed hunter soup » confirms why this

ethnic group used more the inflorescences as food. Mahi ethnic group named *L. multiflora* « aklala » meaning instantaneous anti-malaria and anti-spasmodic plant. This is supported by the fact that this ethnic group uses particularly its leaves for health care. Indeed, the plant local names indicate its uses according to ethnic groups. This is interesting since it already provides orientation on the food, medicinal and cultural importance of the species according to ethnic groups. This is in accordance with the findings of Ekissi (2014) who concluded that the use of *L. multiflora* varies through different localities and ethnic groups. Indeed, food and traditional medicine habits are passed on from generation to generation and remain attached to ethnology and culture (Wahlqvist, 2007). The same trend was observed for the use of baobab foods products (Chadare et al., 2008), the use of *Parkia biglobosa* (Koura et al., 2011), the use of *Tamarindus indica* (Fandohan et al., 2010) in Benin which vary from one ethnic group to another. The diseases treated by *L. multiflora* are stomach ache, fever, malaria, toothache, high blood pressure, wound, buton, itch and corporal weakness of baby. These diseases were also confirmed by Pascual et al. (2000), Abena et al. (2001), Adjanonhoun et al. (2002), Avlessi et al. (2005), Etou-Ossibi et al. (2012) and Bla et al. (2015). Moreover, Fah et al. (2013) found in Benin that, *L. multiflora* treats diabetes of pregnant women either alone (14.29 %) or in association with *Catharanthus roseus* and *Phyllanthus amarus* (85.71 %). The users of *L. multiflora* organs get profit from 29-36 components with antioxidant activities (Avlessi et al., 2005 ; Bassole et al., 2010).

Differences in use of this plant species would lead to set up the domestication of the species and valorization of the organs for the different ethnic groups according to their habits and culture. For example, the valorization of the leaves would focus on the Mahi ethnic group, while the Boo ethnic group would appreciate the valorization of the inflorescences.

## CONCLUSION

The present study revealed that *L. multiflora* was perceived abundant in fallow and savanna of sudano-guinean and sudanian zones of Benin. Its uses varied between different ethnic groups in the two considered biogeographic zones. The species was more used for food and medicine. Among the ethnic groups, Mahi used more the

leaves of the plant species for health care while Boo and Peuhl used more the inflorescences for food. Bariba ethnic group used more the stems for handicraft. Future researches on the management and valorization of *L. multiflora* in Benin are necessary to set up a sustainable management and valorization of the species.

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