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Ethnological studies on melliferous plants of the Soudano-Sahelian Zone of Chad

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Abstract

The melliferous plants of Chad are less known despite their diversity. The main objective of the study is to contribute to a better understanding of these plants and their use by the local population. An ethnobotanical study of melliferous plants was carried out in the region of Guera (Chad). Melliferous plants were classified following their traditional medicinal uses. These plants have many local uses: as fuelwood, medicinal and timber. 51 medicinal melliferous plants identified were distributed into 16 families among which trees were abundantly used. The most represented family was *Mimosaceae*. 17 melliferous plants were used in pharmacopeia. The monospecific preparation was frequently used. The leaves and bark were commonly used. 20 diseases listed were treated with beeplants. The most common diseases were the respiratory and digestive tract. Fifteen beeplants, spontaneous and cultivated species were used in the human and/or animal consumption, seven were used as timber and fuelwood.

Keywords: Melliferous plants, biological type, ethnobotany, uses, Chad

1. Introduction

Honey is a nutritive element produced by melliferous bees from the nectar of flowers, the pollen and/or secretions comes from the living part of plants [1]. Even if these is no transfer of active principle from plants to honey a similar mechanism to that of homeopathic potentialisation is envisaged. There exist therefore specific honey previewed for certain pathology [2]. Honey as such a very complex natural product containing more than 200 substance that participate in our equilibrium. It therefore has a non-negligible in our nutrition and equally in medicine [2]. Apart from these general faculties, each honey has medicinal virtues of the dominant flowers of melliferous plants. This is why it is necessary to carry out research on the medicinal importance of honey. Plants have been the basis of many traditional medicine systems throughout the world for thousands of years and continue to provide mankind with new remedies [3].

Beeplants form part of vegetal resources with multiple virtues that has to be protected against bush fires, destructors agricultural practices and anarchical cutting down of trees for fuel [4]. Beekeeping is an effective means to generate monetary incomes that support the livelihood of rural communities. They play a great role in the dynamics of ecosystems through pollinating insects [5]. The sustainable management of plant resources in general, and melliferous plants in particular includes among other things a better knowledge of the resources and their rational exploitation. Melliferous plants are amongst these important resources [6].

The ethnobotanical information besides listing the traditional uses of plants, helps ecologists, pharmacologists, taxonomists, watershed and wild life managers in their efforts for improving the wealth of area [7]. The Ethnobotanical research addresses the characterizing traditional knowledge to establish priorities with the local community to ensure that the local values are translated into rational use of resources and effective conservation of biological diversity and cultural knowledge [7]. Many such studies have been done on the ethnobotany of medicinal and other useful plants of the countries [8-12]. However there is no research based on the melliferous plants and their ethnological exploitation. The objectives of this study was to study the ethno-medicinal use of bee floral resources in Guera region of the sudano-sahalian zone of Southern Chad.

2. Material and method

2.1 Presentation of the study zone

The region of Guéra (09°32'- 13°00' latitude North and Longitude East 17°00'- 20°00'), is a geographic transition zone between pastoral sahelian in the North and the agricultural Sudanian in the South. It has a surface area of 61280 km² with a population of 553795 inhabitants [13]. The climate is of the Sudano-Sahelian type with the annual rainfall between 300 to 900 mm/.. The hydrography is made up of some few streams which favors the circulation of underground water. The average annual temperature is 29.5°C. The average annual minimum temperature is in the month of December-January (18 °C) and maximum in the month of March (40 °C). The vegetation is from woody form to clear savanna according to latitude and relief. The natural vegetation is woody Savannah with *Acacia*. The major ethnic group in this region is Hadjarai. The economy of this region is based on cereals production (sorghum and maize) accompanied by groundnuts and sesames cultivated by women [13]. Apiculture is practiced extensively.

2.2 Ethnobotanic investigation

Semi-structured interviews were realized with beekeepers during the rainy season in six villages of Guera region, precisely in Melfi and Mangalme divisions. The targeted ethnic groups were the Kenga, Djonkhor and Moubi which are the dominant ethnic groups of the region. A questionnaire with closed, open and oriented questions were established in order to appreciate the peasant endogenous knowledge on the different uses of melliferous plants. 300 respondents were interviewed. The main axis of the questionnaire was based on the knowledge and description of plants foraged by bees and used in others activities by the local population. Unfamiliar plants were identified using botanical field guides. All the identified plants were classified according to the ethnobotanics criteria: medicinal melliferous plants, food and fuel wood. The specimens have been identified consulting several available literatures [14, 15].

3. Results and Discussion

3.1 Ethnobotanical uses of beeplants

A total of 35 beeplants in the Guera region have multiple functions. Apart for providing nectar and/or pollen to bees, they are equally valorized by the population in the domain of traditional medicine (54.28%), food (45.71%), timber and fuel wood (62.85%). Some species are recorded as useful, while some taxa appear in more than one use; there are species that are both medicinal, food and fuelwood. Nikolić & Rešetnik [16] on their research on plant uses in Croatia recorded that the highest number of useful plants is related to medicine, plants used for food and bee plants. Senbeta *et al.* [17] shared the common uses of plant in the coffee forests of Ethiopia, plants for medicine, food and honey were frequent.

3.2 Melliferous medicinal Plants

From 35 plants visited by bees in Guera region, only 19 are used in traditional pharmacopoeia (Table 1). They are *Mangifera indica*, *Sclerocarya birrea*, *Balanites aegyptiaca*, *Tamarindus indica*, *Isobertinia doka*, *Annogeissus Leocarpus*, *Guiera senegalensis*, *Cordia Africana*, *Terminalia schimperiana*, *Azadirachta indica*, *Khaya senegalensis*, *Acacia ataxacantha*, *Acacia senegal*, *Acacia seyal*, *Acacia sieberiana*, *Prosopis africana*, *Ziziphus mauritiana*, *Citrus aurantifolia* and *Citrus limon*. These plants are divided into eight botanical families: Anacardiaceae, Rutaceae, Rhamnaceae, Mimosaceae,

Meliaceae, Combretaceae, Balanitaceae, Cesalpiniaceae. The most represented family is Mimosaceae (29.41%) with five species (*Acacia ataxacantha*, *A. senegal*, *A. seyal*, *A. sieberiana*, *Prosopis africana*).

3.2.1 Botanical types of melliferous medicinal Plants

The Botanical type identified were well represented by trees (70.59%) and shrubs (29.41%), meanwhile no herb was identified as a medicinal. The same result were obtained in the Khagrachari district in Bangladesh for plants used in folk medicine by Chakma communities [3]. However it is in discordance with that of Mpondo *et al.* [18] where it is herbaceous that constituted the majority of medicinal plants for the Douala population in Cameroon.

3.2.2 Therapeutics preparation

The therapeutic modes of preparations were monospecific and multispecific. The monospecific modes which was the most frequent is done with the use of plant parts or the whole plants in some cases. For multispecies, three plants were used in combination for the treatment of hypertension and diabetes: *Sclerocarya birrea*, *Momordica charantia* and *Moringa oleifera*.

3.2.3 Diseases treated

A number of 39 diseases were treated with these 35 beeplants (Table 1) in the region of Guéra.

The most common diseases were diarrhea, worms, rheumatism, dental caries and hemorrhoids, and with 20.51; 17.94; 15.38; 12.82 and 10.25% respectively. Generally most of the plants treat several diseases. *Mangifera indica* was the most requested plant, it treats 13 diseases and the most frequent diseases were tooth ache, cough, dysentery, diarrhea and hemorrhoids. *Annogeissus Leocarpus* and *Prosopis Africana* followed with nine diseases each. The most common were childhood diarrhea, fever, cough, rheumatism, hemorrhoids, bronchitis, and dysentery. Sala Uddin *et al.* [3] reported in Bangladesh the same diseases treated by the Chakma community of Khagrachari district. Mpondo *et al.* [18] in his work on the actual state of rural and urban populations identified 68 medicinal plants classified in ten groups. Digestive plants and those used for the treatment of sexually transmitted diseases were the most diversified with ten plants species each. Seven of our plants were also been reported by Jiofack *et al.* [19], but the posology and the diseases treated were different. The decoction of the bark of *Mangifera indica*, the leave of *Sclerocarya birrea*, the ripe fruit of *Balanites aegyptiaca*, the bark of *Isobertinia doka*, the seeds and leaves of *Azadirachta indica* were respectively used for the treatment of rheumatism and typhoid, skin diseases and diabetes, goiter, food poisoning and malaria. The powder of the bark of *Annogeissus leiocarpus* used to treat amoeba and *Guiera senegalensis* for hypertension. In the Sudan Savanna area of northeastern of Nigeria, Dukku [20] signaled that the beeplant *Guiera senegalensis* is preserved for its medicinal value; and that the seed oil and aqueous extracts of stem bark and leaf of *Khaya senegalensis* are traditionally used to treat abdominal complaints and skin diseases. The antitussive action of *Citrus limon* and the effect against sore throat of *Citrus aurantifolia* were identified in Douala [18].

3.2.4 Plant organs used in medicine

Generally all the parts of plants were included into the medicinal preparations (Fig. 4). However, the leaves (29.54%) and the bark (27.27%) were the most commonly

used compared to the pulp and the fruit 02.27% each. This result was in accordance with those obtained by Sala Uddin *et al.* [3], Laohudumaye [21], Mpondo *et al.* [18] and Jiofack *et al.* [19]. This result can be explained by the fact that the leaves were highly solicited in traditional medicine because they were rich in active substances. They were the seat of photosynthesis and chlorophyll assimilation. The barks were equally used after the leaves because they are rich on chemicals substance since the barks are in communication between the roots and leaves [22]. The underground positions of the roots facilitate the preservation of the active substances from other organs. The active agents were chemical which were very labile to light [22]. This result also confirms those obtained in Morocco [23]. These authors report that the sheets were used in high quantity up to 30% parts. According to Sala Uddin *et al.* [3], the use of root can be considered as unfriendly because it needs to eradicate or abolish the whole plant, the aerial parts of the plant (leaf, flower, fruit, and seed) can be used without eradicating the plant and can be considering as an outstanding way to conserve them.

3.3 Melliferous food plants

Fifteen beepplants listed are used as human and/or animal food (Table 1). It is made up of spontaneous species (*Balanites aegyptiaca*, *Tamarindus indica*, *Acacia senegal*, *Ziziphus mauritiana*, *Ziziphus mucronata*) and cultivated species (*Mangifera indica*, *cucumis satuvis*, *Manihot esculentus*, *Arachis hypogea*, *Hibiscus sabdariffa*). Poaceae with three species (*Pennisetum glaucum*, *Sorghum bicolaum*, *Zea mays*) is the most represented family, followed by Rutaceae (*Citrus aurantifolia* and *Citrus limon*). The most consumed organs are the fruits (37.25%) and seeds (31.25%) (Fig. 3). These results are comparable with those obtained in the Democratic Republic of Congo [24]. The leaves and fruits of *Ziziphus mauritiana*, *Balanites aegyptiaca* and *Zea mays* were consumed by animals. Nine forms of consumption were recorded (Fig. 4). The highest forms are the raw forms (33.82%), followed by the boiled forms (14.70%). The consumption in the form of soup was the lowest with only 2.91%. These local species, in the wild stage contribute to the food security of the socio-economic wellbeing of the local populations in Cameroon [25].

3.4 Melliferous timber and/or fuelwood plants

A part from medicinal and food uses, melliferous plants are also used as timber and fuelwood (Table 1). A total of 22 plants (62.85% of the total of plants) were used as timber and fuelwood in the region of Guera. Mimosaceae is the most represented family, all species were used in this category. Rhamaceae followed with three species. These species were sawn and used for the fabrication of different furniture. Sometimes the wood of these species is used in crafts. Sawdust from the wood planer is used in households for cooking. Wood species such as *Ziziphus mauritiana*, *Ximenia americana*, *Tamarindus indica* and *Azadirachta indica* are used as firewood or charcoal production. The wood is the part which is most used with about 61.7%, followed by the leaves (47.2%), barks (41.7%) and roots (38.9%). For certain species, several parts of the plants can be used (Table 1), the trunk for charcoal and fire wood, the leave and bark for the construction (*Mangifera indica* L. *Sclerocarya birrea*). In the Sudanian region of Cameroon, Mapongmetsem *et al.* [25] reported a similar result with the Guidar and Boum ethnies. In Benin species such as *Azadirachta indica* and *Mangifera indica* were used as timber and fuelwood [26]. In the Nigeria

country, *Khaya senegalensis* wood yields are used for the high quality timber [20]. In the region of Guera, the trunk of *Mangifera indica*, *Sclerocarya birrea*, *Tamarindus indica*, *Anogeissus leocarpus*, *Guiera senegalensis*, *Azadirachta indica*, *Khaya senegalensis* and some Mimosaceae were sawn and used in the form of plants that is used for the fabrication of different furniture. Sometimes the wood of these species is used in crafts. Sawdust from the wood planer is used in households for cooking. Wood species such as *Ziziphus mauritiana*, *Ximenia americana*, *Tamarindus indica* and *Azadirachta indica* are used as firewood or charcoal production. Schweitzer [4] noted that, over the three kinds of utilization of the plant parts or organs, the use in the new traditional beehives construction represented 55.5%, made with barks, tree trunks, plaited straws or twigs in traditional beekeeping in Burkina Faso.

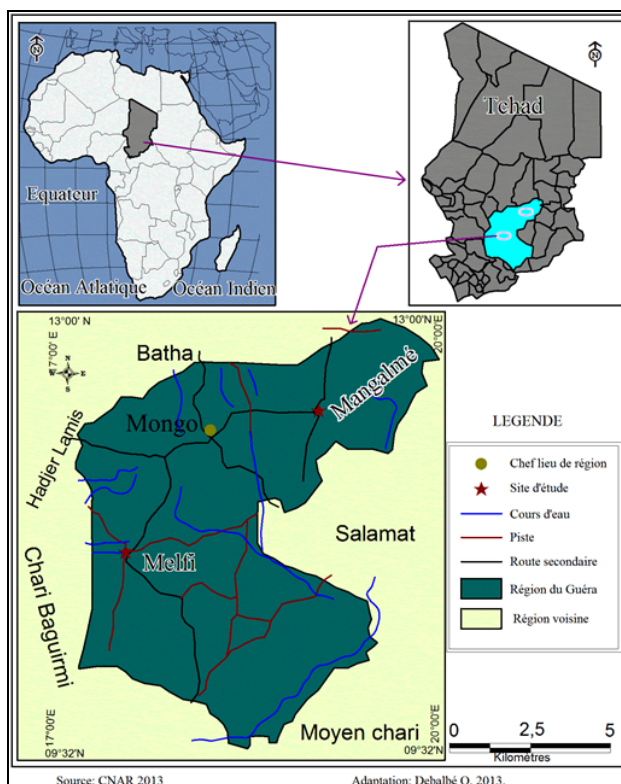


Fig 1: Map showing the localisation of the study zone

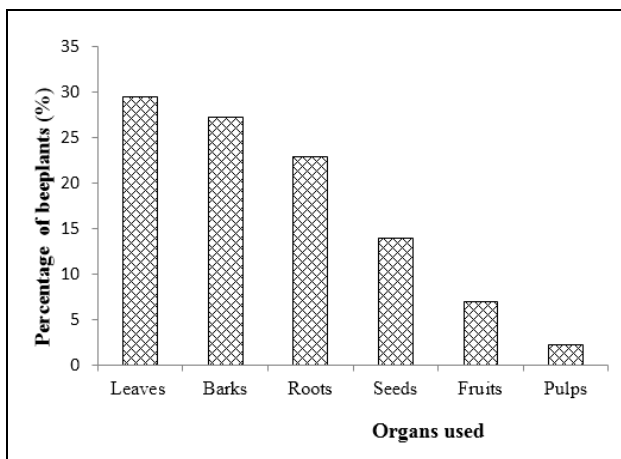


Fig 2: Proportion of plants organs used in traditional medicine

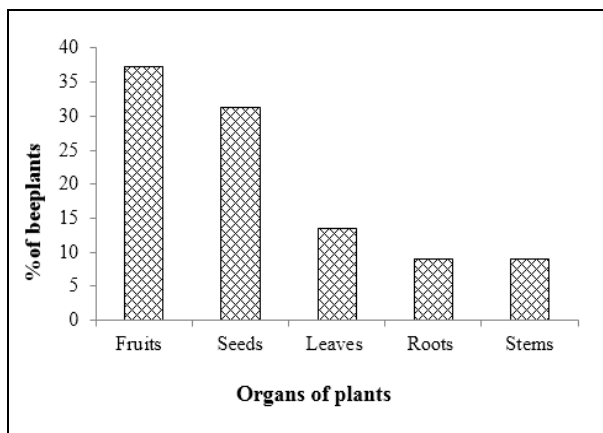


Fig 3: Organs of melliferous plants consumed

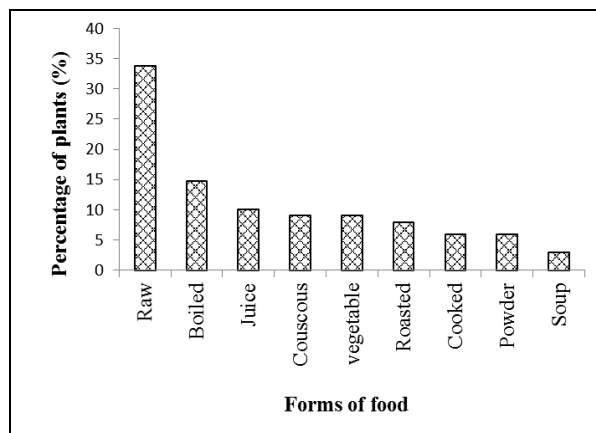


Fig 4: Different forms of food consumed

Table 1: list of beaplants used in ethno-medicinal in Chad.

Names and families plants	Parts uses	Ethno-medical uses
Anacardiaceae		
<i>Mangifera indica</i> L	Wood, bark, leave, fruit.	Fuel wood, trunk used to manufacture charcoal and in construction. Tree provides shade throughout. Fruit are eaten raw, dry and to made juice. Leaves are forage and are diuretic, antipyretic and treat angina, coughs, asthma, tooth decay. Bark treats dysentery, wound, skin disease and rheumatism; Fruits are anthelmintic, used for the treatment of diarrhoea and haemorrhoid.
<i>Sclerocarya birrea</i> (A. Rich.) Hochst.	Wood, fruit, bark leave, seed.	Wood used to make tool handles and mortars, as fuel wood and charcoal. Bark is used as ropes. Fruits are eaten, trees are used as hedgerows. Bark is antivenom and anti-inflammatory, treat swelling, tooth decay, nausea. Leaves treat the sore throat. Seeds are used to treat asthenia.
Balanitaceae		
<i>Balanites aegyptiaca</i> (L.) Del.	Wood, root, bark, seed, thorn, fruit, leave	Firewood; seeds are sweet and consumed raw or dried: used to make oil; soaked in water to prepared porridges; young leaves are eaten as a vegetable. Root used to treat snake bite; bark heals yellow fever, cough, epilepsy and anxiety; Thorns treat leprosy. Leaves are used for treat asthenia. Fruits are used for rheumatism
<i>Tamarindus indica</i> L.	Fruit, leave, seed, trunk, wood	Fruits are eaten raw, dry, made into juice and used for preparation of mush. Wood used in construction, as fuel wood, mortars, pestles, tool handle. Leaves and seeds are used in ophthalmology diseases.
Boraginaceae		
<i>Cordia Africana</i> Lam	Wood, leave	Firewood, Leaves are diarrhoea
Cesalpiniaceae		
<i>Delonix regia</i> (Boj.) Raf.	Wood, leave	Firewood, leaves used for malaria
<i>Isobertinia doka</i> Craib et Stapf	Bark, root	Roots are used to treat heart disease. Bark is use for intestinal worms
Combretaceae		
<i>Anogeissus leocarpus</i> (DC.) Guill. et Perr.	Wood, rootbark, bark pulp, leave.	Firewood; Rootbark is aphrodisiac. Bark treats childhood diarrhoea, fever, cough, abscesses and rheumatism; Leaves treat haemorrhoids and diarrhoea; Pulpis healing
<i>Combretum glutinosum</i> Perr. ex DC.	Wood	Firewood
<i>Guiera senegalensis</i> J.F. Gmel.	Wood, trunk, fruit, leave	Firewood; trunks is used for the frame. Fruit used for ophthalmology diseases; Leaves are used to cure leprosy, rheumatism and certain amoeba
<i>Terminalia schimperiana</i> Hochst.	leave. root	Roots are aphrodisiac and relieve pain. Leaves treat asthma, cough and headache.
Cucurbitaceae		
<i>Cucumis sativus</i> L.	Fruit	Fruit are eaten raw as vegetable and used in the preparation of gravy
Euphorbiaceae		
<i>Jatropha curcas</i> L.	Trunk	hedgerows
<i>Manihot esculentus</i> L.	Root	Roots are eaten raw, cooked, crushed when dry
Fabaceae		
<i>Arachis hypogea</i> .L.	Seed	Seed are eaten raw, boiled, dried and crushed to prepare porridge
Malvaceae		
<i>Hibiscus sabdariffa</i> Linn	Leave, fruit	Leaves are eaten raw as a vegetable and sauce preparation, fruits are transformed into juice
Meliaceae		
<i>Azadirachta indica</i> A. Juss.	Wood, root, bark, leave	Firewood; Leaves treat malaria and intestinal worms; Bark treat fever and scorpion sting; Roots are astringent.
<i>Khaya senegalensis</i> (Desr.) A. Juss.	Wood, bark, trunk	Fuel wood; trunk is used in construction, carpentry, making canoes and mortars. Bark used in tanning leather; in ophthalmology diseases and poison arrows for hunting, bark is used as antidote, treat mental illness.
Mimosaceae		

<i>Acacia ataxacantha</i> DC.	Wood, bark, leave, root	Fuel wood; fresh root are used for intestinal worms and treat wound. Powder of barks is taken to treat dental caries; Leaf extract treat cough and breathing disease
<i>Acacia mellifera</i> (Vahl) Benth.	Wood, leave, trunk	Firewood, leaves and trunks are used as forage,
<i>Acacia senegal</i> (L.) Wild.	Wood, seed, gum, bark, leave	Firewood; dried seeds are eaten. Gum are eaten raw or dry as dessert. Bark and leaves extract treat diarrhoea, ophthalmology diseases and bleeding.
<i>Acacia seyal</i> Del.	Wood, root bark	Firewood ; Root bark is used for burning
<i>Acacia sieberiana</i> DC.	Wood, root bark, leave	Firewood; Root bark are astringent and treat snake bite; Leaves treat colds.
<i>Prosopis africana</i> (Guill. Et Perr.) Taub.	Wood, root, bark, leave,	Firewood; roots treat tooth decay, bronchitis and dysentery. Bark treat intestinal worms, wounds and skin diseases. Bark and leaves treat tooth decay and rheumatism.
Rutaceae		
<i>Citrus aurantifolia</i> (Christm.) Swingle	Wood, fruit, leave, root, seed	Firewood; fruit eaten raw and processed into juice; roots are diuretic and used in psychic diseases; leaves treats diabetes. Seeds are worming.
<i>Citrus limon</i> (L.) Burm.f.	Wood, leave, root, seed	Firewood; fruit eaten raw and processed into juice; roots are diuretic and used in psychic diseases; leaves treats diabetes. Seeds are worming.
Oleaceae		
<i>Ximenia americana</i> L.	Wood, bark, fruit	Firewood and charcoal. Bark is used in tannin gleather. Fruits used as cosmetics and soap
Poaceae		
<i>Pennisetum glaucum</i> (L.) R.Br.	Stem, seeds	Stems are eaten raw as sugar cane; seeds are crushed and boiled
<i>Sorghum bicolaum</i> (L.) Moen	Stem, seed	Stems are eaten raw as sugarcane; seeds are crushed and boiled
<i>Zea mays</i> L.	Seed, stem	Seed eaten raw, cooked, crushed when dry and turned into powder for porridge, stems used as forage.
Tilliaceae		
<i>Grewia venusta</i> Fresen	Wood, trunk	Firewood
Rhamnaceae		
<i>Ziziphus abyssinica</i> Hochst. ex A. Rich	Wood, trunk, bark	Firewood; trunk used as stake, bed feet, tool handles and for charcoal. Bark are used for tanning leather.
<i>Ziziphus mauritiana</i> Lam.	Wood, root, bark, leave, Fruit	Firewood; fruit are consumed raw and dry. Roots are worming and used to treat diarrhoea and fever. Bark is used against colic. Leaves treat diarrhoea, wounds, abscesses and swelling.
<i>Ziziphus mucronata</i> Wild.	Fruit	Fruits are eaten raw or boiled
<i>Ziziphus spina-christi</i> (L.) Desf.	Wood	Firewood

4. Conclusion

A total of 36 beeplants in the Guera region are valorized by the population in the traditional medicine, food, timber and fuel wood. The most represented family was Mimosaceae. Many plants are used in multiple ways. No herb was identified as a medicinal. The most common diseases were the respiratory tract and digestive tract, *Mangifera indica* was the most requested plant with 14 diseases treated and the most frequent was tooth ache. The monospecific modes is highly used. The leaves and bark were the most commonly used parts. Fifteen beeplants, mostly spontaneous, listed are used as human and/or animal food. The most consumed organs are the fruits and the seed. Raw and boiled forms of consummation were frequent. A dozen nectar plants were used as planks, lumber, firewood or charcoal production.

5. References

- Louveaux J, Maurizio A, Vorwohl G. Methods of Melissopalynology. Bee World. 1978 ; 59(4):139-154.
- Irlande D. Le miel et ses propriétés thérapeutiques : Utilisation dans les plaies cutanées. Mémoire de Pharmacie Diplôme d'e-formation professionnelle en Apithérapie. 2010, 25.
- Sala Uddin M, Chakma JJ, Alam KMM, Uddin SB. Ethno-medico studies on the uses of plant in the Chakma community of Khagrachari district, Bangladesh. Journal of Medicinal Plants Studies. 2013; 3(1):10-15.
- Schweitzer P, Nombé I, Aidoo Kwamé, Boussim IJ. Plants used in traditional beekeeping in Burkina Faso. Open Journal of Ecology. 2013; 3(5):354-358
- Bradbear N. Le rôle des abeilles dans le développement rural. Produits forestiers non ligneux : Manuel sur la récolte, la transformation et la commercialisation des produits et services dérivés des abeilles, FAO, 2011, 248.
- Dongock ND, Pinta JY, Ngouo LV, Tchoumboue JT, Zango P. Inventaire et identification des plantes mellifères de la zone soudano-Guinéenne d'altitude de l'ouest Cameroun. Tropicultura, 2004; 22(3):139-145.
- Muhammad I, Hussain F, Sultan A. Ethnobotanical studies on plant resources of ranyal hills, District Shangla, Pakistan. Pak. J Bot. 2007; 39(2):329-337.
- Bello S, Ahanchede A, Gbehounou G, Amadji G, Aho N. Diversité floristique, ethnobotanique et taxonomie locale des mauvaises herbes de l'oignon au Nord-est du Banin. Tropicultura. 2013; 31(2):143-152.
- Malick ALY. Contribution à l'étude ethnobotanique et ethnopharmacologique des plantes médicinales sénégalaises dans le traitement de l'hypertension artérielle. Thèse de médecine. Faculté de médecine, de pharmacie et d'odonto-stamalogie. Université Cheik Anta Diop de Dakar, 2006, 130.
- Tabuti JRS, Lye KA, Dhillion SS. Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. Journal of Ethno pharmacology. 2003; (88)19-44.
- Dibong SD, Mpondo Mpondo E, Ngoye A, Kwin MF, Betti JL. Ethnobotanique et phytomédecine des plantes médicinales de Douala, Cameroun. Journal of Applied Biosciences. 2011; 37:2496-2507.
- Abbé H. Savoir endogène et utilisation des plantes médicinales dans le Mayo Rey (Nord Cameroun). Master thesis in plants biology. University of Ngaoundere (Cameroun), 2010, 71.
- Guibert B, Kakiang L. Agence française de développement. Potentialités et contraintes du développement rural dans la région du Tchad centrale,

- oriental et méridional. 2011, 1-6.
14. Letounzey R. Notice de la carte phytogéographique du Cameroun au 1 : 500000. 1985, 60
 15. Arbonnier M. Arbres, arbustes et lianes des zones sèches d'Afrique de l'Ouest. Troisième Edition Quae, MNHN, 2009, 574.
 16. Nikolić T, Rešetnik I. Plant uses in Croatia. *Phytologia Balcanica*. 2007; 13(2):229-238, Sofia.
 17. Senbeta F, Woldemariam Gole T, Denich M, Kellbessa E. Diversity of Useful Plants in the Coffee Forests of Ethiopia. *Ethnobotany Research and Applications*. 2013; 11:049-069.
 18. Mpondo Mpondo E, Dibong DS, Priso RJ, Ngoye A, Ladoh Yemeda CF. État actuel de la médecine traditionnelle dans le système de santé des populations rurales et urbaines de Douala (Cameroun). *Journal of Applied Biosciences*. 2012; 55:4036-4045.
 19. Jiofack T, Fokunang C, Guedje N, Kemeuze V, Fongzossie E, Nkongmeneck BA *et al.* Ethnobotanical uses of medicinal plants of two ethnoecological regions of Cameroon. *International Journal of Medicine and Medical Sciences*. 2010; 2(3):60-79.
 20. Dukku UH. Identification of plants visited by the honeybee, *Apis mellifera* L. in the Sudan Savanna zone of northeastern Nigeria. *African Journal of Plant Science*, 2013; 7(7):273-284.
 21. Laohudumaye BA. Etude ethnobotanique et phytochimique des plantes utilisées dans le traitement des maladies cardio-vasculaires dans le Logone occidental (Tchad) Mémoire de Master. Université de Ngaoundere, 2012, 84.
 22. Pamplona GR. Guide des plantes médicinales. Encyclopédie, Vie et santé. France. 1999, 1:407.
 23. Rachida M, Azzedine K. Etude ethnobotanique auprès de la population riveraine de la forêt d'Amsittène : cas de la Commune d'Imin Tlit (Province d'Essaouira) : Bulletin de l'Institut Scientifique, Rabat, section Sciences de la Vie. 2007; 29:11-20.
 24. Muluwa KJ, Bostsen K. Noms et usages des plantes utiles chez les Nsong (RD Congo, Bandundu, bantou) : Göteborg Africana informel. 2008; 6:28-65.
 25. Mapongmetsem PM, Djoumessi MC, Tonleu Yemele M, Doumara GD, Fawa G, Noubissie Tchiagam JB *et al.* and Bellefontaine R. Domestication de *Vitex doniana* Sweet. (Verbenaceae): influence du type de substrat, de la stimulation hormonale, de la surface foliaire et de la position du nœud sur l'enracinement des boutures uninodales. *Journal of Agriculture and Environment for International Development - JAEID*, 2012; 106(1):23-45.
 26. Daïnou K, Vermeulen C, Doucet JL. Bois et forêts des tropiques. 2008; 298(4):13-24.