

Ethno-Botanical data on KAPOK (*Ceiba pentandra* Gaertn.), MAHOGANY (*Khaya senegalensis*), and NEEM (*Azadirachta indica* A. Juss.) from the Far-North Region of Cameroon

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Abstract— In this study, questionnaires were used in the Extreme North Region of Cameroon in order to gather information on the oilseeds *Ceiba*, *Khaya* and *Azadirachta*. These oilseeds are part of the biodiversity of the area and this paper brings more knowledge on the virtues of the tree as experienced by the local population. Data gathered here will serve much in the study and valorization of the oilseeds. Results of the inquiry show that *Ceiba*, *Khaya* and *Azadirachta*, have a wide range of medicinal uses and applications.

Keywords— *Azadirachta indica* A. Juss., *Ceiba pentandra* Gaertn., *Khaya senegalensis*, oilseed, vernacular names.

I. INTRODUCTION

The Far-North Region of Cameroon is rich in biodiversity with numerous kinds of trees that play a major role as a shade to the blazing sun overhead. Among such trees are *Ceiba*, *Khaya* and *Azadirachta*.

Ceiba pentandra Gaertn. (kapok) is an imposing tree that can attain heights of up to 40m or even 60m in Africa [1, 2]. Its smooth trunk is covered with large conical thorns. The fruit is a 10-30 cm long hanging elliptical capsule. It opens up into five valves permitting the appearance of a whitish cotton like fluff called kapok as well as brown grains that are spread away by the wind [3].

Khaya senegalensis (Mahogany) is of the Meliaceae family, commonly known as Senegal mahogany. *Khaya senegalensis* are big trees that can attain heights of 30-

35m [4]. It is an evergreen tree that typically grows to a diameter at breast height of 1.5 m, with a clean bole of 8–16 m. Its bark is grey, at times scaly. The leaves are made up of 4-6 pairs of oblique folds. The tree is used in carpentry, notably for canoe construction and also in medicine against stomach ache [2] and as an anti-malarial treatment [5]. Its natural distribution extends from Mauritania and Senegal, Burkina Faso, east to northern Uganda [6].

Azadirachta indica A. Juss. (neem) is a tropical evergreen tree (deciduous in drier areas) native to Indian sub-continent. This tree is the most researched tree in the world [7]. It has great potential in the fields of pest management, environment protection and medicine. *Azadirachta* is a large tree growing about 25 m in height with semi-straight to straight trunk, 3 m in girth and spreading branches forming a broad crown [8, 9, 10]. An *Azadirachta* tree normally starts fruiting after 3-5 years. In about 10 years it becomes fully productive. From the tenth year onwards it can produce up to 50 Kg of fruits annually [11].

These oilseeds are widely used worldwide in diverse ways. Ethnobotanical studies reveal that *Khaya* is a multipurpose tree with a variety of economic and environmental values [12]. It is one of the major timber species in West Africa owing to its hard and fungus, and termite-resistant red wood [6]; and *Ceiba* is used in the manufacture of plywood in India [13]. *Azadirachta* bark serves in the control of several types of soil pests [14, 10].

Despite all these uses, to the best of our knowledge, little ethnobotanical study has been done on these plants in the Far-North region of Cameroon. A first part of the investigations was done by [15] on the kapok tree exclusively. But, his work did not cover all the divisions although these trees are found everywhere. This paper aims at bringing out some of the empirical data known only to the local population. This information will be helpful to the general public and the cosmetic world in particular, since so far such data is not available concerning the Far-North region of Cameroon.

II. MATERIALS AND METHOD

2.1. Preparation and administration of questionnaires

A preliminarily tested questionnaire was used to obtain information on the description of the methods of oil extraction. The questionnaire was administered to selected producers in the localities of Maroua, Mokolo, Kaele and Yagoua (table 1). These localities correspond to the administrative centres of Diamare, Maya Tsanaga, Mayo Kani and Mayo Danay divisions, respectively (fig.1). The choice of these localities was drawn from locally obtained information and from preliminary tests which present these localities as areas of high production of these oils. In each locality, at least 10 persons were randomly chosen and interviewed.

The questionnaire comprised general information on the respondents (age, sex, division), general knowledge on the tree (abundant location, methods of fruit harvest and storage), general uses of the plants (leaves, fruits, roots, back, wood), extraction and uses of the oil from the seeds.

Table.1: Number of interviews per area

Region	Town / village	Number of interviews
Far-North	Maroua	11
	Kaélé	22
	Mokolo	20
	Yagoua	22
Total	4	75

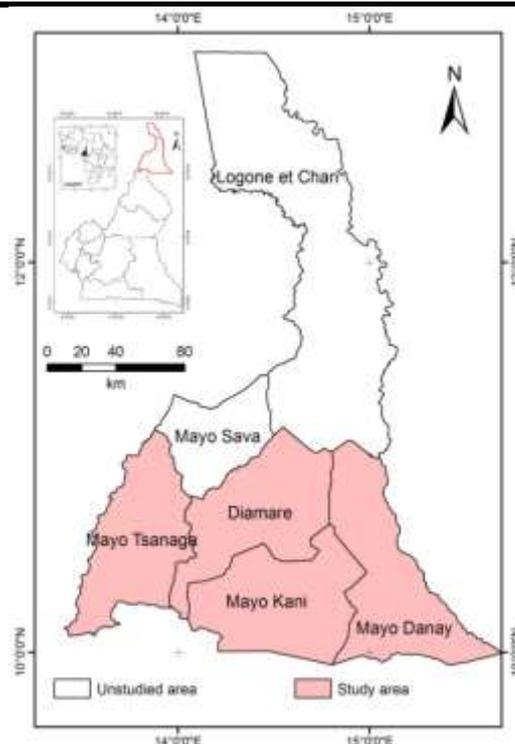


Fig.1: Demarcation of the study area by Divisions [16]

2.2. Data management and analysis

SPSS (Statistical Package Social Sciences version 20.0) software was used to manage and analyse the data collected from the field.

III. RESULTS AND DISCUSSION

3.1. Localisation

The oil seeds *Ceiba*, *Khaya* and *Azadirachta* are found in the extreme north region of Cameroon, in the four divisions that make up the study area as seen in fig.1, ie Mayo Tchanaga, Mayo Kani, Mayo Danay and Diamare with divisional headquarters Mokolo, Kaele, Yagoua and Maroua respectively.

3.2 Different vernacular names

The inquiry has also permitted the establishment of a list containing some vernacular names of the oil seeds in the different towns enclosed in the study area. This list will serve a great deal for any further study in the area as the pollster will use the home names to obtain information easier than applying the method used in this work; that is presenting only the oil seed fruit and then asking many questions in order to obtain the name of the fruit.

Table 1: Some vernacular names of the three trees

Language	Ceiba name	Azadirachta name	Khaya name
“Moundan”	Koumi	Gagné/ Numforée/ Kuzouake	Barré
“Topouri”	Munia	Gania	Bag
“Mafa”	Krumbala	Gagné/ Neema	Sindat/ Tchourai
“Massa”	Myada/ Tolouma	Gagné/ Neema/ Sardanga	Bac/ Hoina/ Gamma
“Mofule”	Krumbala	Neema/ Plemtar	Tchourai
“Fufulde”	Joye/ Bantahi/ Kapok/ Gilgangia	Gagné	Dalegé
“Bouso” (towards Chad)	Toum	Lim	Del



Fig. 2: Ceiba husk

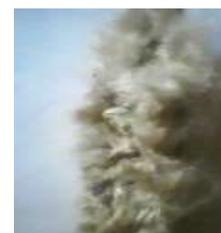


Fig.3: Ceiba fur



Fig. 4: Ceiba seeds



Fig. 5: Azadirachta kernels



Fig. 6: Azadirachta seeds



Fig. 7: Khaya seeds

3.3 Uses of the different parts of the plants

The respondents confirm that they consume the fruits of these seeds. These fruits are consumed in diverse ways in the study area. From the responses obtained, the uses of the oil seeds and the other parts of the plants are numerous and these uses show the importance of the oil seed trees to the surrounding population.

3.3.1. Fruits

The most important use for the *Ceiba* fruit (fig. 2 to 4) by the respondents is that the fur in the fruits are used to start fire; the fur is placed between two small stones and then one stone is used to strike the other with, the spark produced falls on the fur and then several sparks cause the fur to set out into. They also roast the grains in the fruits to eat and the fruits can be used as a treatment for diarrhea. The fur is mainly put in pillows and mattresses in some areas. In case of a fracture, the fruit is placed under the armpit as a support in order to relieve pain.

Regarding the *Azadirachta* fruit (fig. 5 and 6), they either chew or swallow the grains or suck the young seeds or produce oil which they consume since some of them say they do not consume the fruits. However, unlike the adults, the children at times suck the young and fresh fruits.

The *Khaya* fruits (fig.7) as stated by all the respondents (except for those in Yagoua) in the towns under study are not consumed locally in any other way than the manufacture of oil from the seeds. In Yagoua, they chew the grains which are believed to relieve from belly bite.

3.3.2. Leaves

Ceiba tree leaves are boiled and the concoction obtained is drunk. Animals eat these leaves. In some places like yagoua, the leaves are cooked with groundnuts and eaten. The following are some uses as stated by the respondents for the *Azadirachta* leaves. These are similar to the uses in the UK [17]. These leaves are boiled and the concoction obtained is drunk or bathed especially for massaging pregnant women. Animals eat these leaves. The leaves also serve as a treatment for stomach ache when chewed. Unlike the fruits and husks of the *Khaya* plant, the *Khaya* leaves serve much to the local population. Animals eat them, they are chewed to treat stomach ache, boiled and the concoction obtained is drunk or bathed with.

3.3.3. Tree Back

The *Ceiba* tree back is boiled and the concoction either bathed with or drunk as treatment. The *Azadirachta* tree back in addition to bathing with or boiling the concoction, is chewed in order to regulate stomach problems. As for the *Khaya* tree back, it is also boiled and the concoction obtained is drunk and bath for treatment purposes and in addition, in Maroua it is used in the manufacture of the local hot millet drink commonly known as “bil-bil”.

3.3.4. Tree Roots

The *Ceiba* and *Azadirachta* roots are boiled and the concoction obtained is bathed with as treatment, while *Azadirachta* roots serves as firewood when dried in Maroua, *Khaya* roots are boiled and the concoction put in the water given to chickens as a medication in Yagoua. In Kaele, kapok roots also serve as wood.

3.3.5. Tree Wood

Generally, the *Ceiba* tree wood is used as fire wood, used with sand to file knives, making mortar and pestle, as firewood and as pillars. Generally, all the respondents say that the *Azadirachta* tree wood is used as fire wood when cooking and as pillars for making shades locally called “Dankie” which are very helpful when the sun is overhead. In the same way as for the other plants, the *Khaya* tree wood as the respondents in all the towns said are used as firewood and pillars for shades.

3.4 Methods of fruit harvest and storage

3.4.1. Methods of fruit harvest

Unlike the case of palm nut harvesting in which the bunches are cut from the tree and some even use sophisticated machinery as in Malaysia [18], the methods of fruit harvest here for *Ceiba*, *Khaya* and *Azadirachta* are picking the dry seeds on the floor; but in addition to this heating the seeds with a stick so that they fall to the ground and then are picked is also practiced. The harvesting methods are same since they are all tall trees that can attain heights of 30m. A few of the respondents sell the fruits when harvested and this can increase if the plant is more valorized because income may be generated through the selling of these grains.

Concerning the month of harvest of the kapok fruit, the respondents gave various answers. The apex *Ceiba*, *Khaya* and *Azadirachta* harvest are got in the months of March, April and May. This shows that the months of March, April and May are most reliable for the harvest of the dry oil seeds fruit.

Also investigated was the amount of fruit harvested per season. Results show that in Kaele they can harvest up to about 5 sacks of volume 15L of dry *Khaya* and *Azadirachta* fruits per season. In Yagoua, they talk of harvesting up to about 2 sacks of *Ceiba* fruits, 4 sacks of *Azadirachta* fruits, and 2 sacks of *Khaya* fruits per season. In Mokolo, they talk of harvesting up to about 2 sacks of *Azadirachta* fruits, and 4 sacks of *Khaya* fruits per season. Also, in Maroua, the respondents talk of harvesting up to about 3 sacks of *Azadirachta* fruits, and half a sack of *Khaya* fruits per season.

3.4.2 Methods of fruit storage

Some of the respondents testified that they sell the fruits that they have picked. This number is small because each one prefers to manufacture the oil and only the excess of

the fruits are sold when the producer is hindered or not available. However, they store up the kernels when not used in bags, these are polythene bags with holes in them commonly called “BAGCO” while others do not store up the fruits at all; they either sell them, or process them immediately into oil. Those in Kaele store up on roofs and in stainless steel pans; in Yagoua, they store up in the sun, clay pots, and cartons; in Maroua, storage is done in the sun, clay pots, on roofs; while in Mokolo, they store only in bags.

In Kaele, the *Azadirachta* grains can be stored up or kept for up to about 10 years, and 10 years for *Khaya*. Where as in Yagoua, the *Azadirachta* grains can be stored up or kept for up to about 5 years, and 5 years for *Khaya*. Then in Maroua, the *Azadirachta* grains can be stored up or kept for up to about 3 years, and 2 years for *Khaya*. Where as in Mokolo, the *Azadirachta* grains can be stored up or kept for up to about 10 years, and 10 years for *Khaya*.

3.5 Uses of the oil extracted

In the study area, there exist traditional methods to extract oil from the oilseeds, the steps of which include picking of the grains, husking, grinding, mixing with water to obtain the oil that oozes out. The following are some uses of the oil thus obtained as stated by the respondents.

Concerning *Azadirachta* oil [17] in the area, the oil is used to treat constipation and diarrhea by taking in two or three table spoons full of *Azadirachta* oil; the oil is rubbed on body for pain relief and fatigue. Also, the oil is sold for an amount ranging between 3000 frs and 10000 frs, most of them selling at 5000 frs. Long term consumption of the oil serves for the treatment of malaria, typhoid, and heart diseases, worms, H I V and Hemorrhoids. Other diseases treated with the oil are tooth ache, ear ache. The *Azadirachta* oil also serves as an insecticide, sending away flies while it is rubbed on body of babies to treat “rouge fesses” and itches.

With respect to *Khaya* oil [12], locally, the oil is used to treat constipation and diarrhea by taking in two or three table spoons full of *Khaya* oil. It is used as well to treat malaria, worms, treat athlete’s feet, typhoid, tooth ache, ear ache, and is rubbed on the body for the relief of pains and fatigue; treat itches and “rouge fesses” by topical application in the infected areas.. It also serves as an insecticide, sending away flies. Also, the oil is sold for an amount ranging between 3000 frs and 8000 frs, most of them selling at 7000 frs. Other diseases treated are malaria, typhoid, H I V, Hemorrhoids.

IV. CONCLUSION

The information found in this paper is on *Ceiba*, *Khaya* and *Azadirachta* plants. From this paper, it is clear that the inquiry done in the Far-North region of Cameroon

reveals the presence of these oilseeds and shows how the oilseeds are virtuous to the local population, serving greatly in medicinal uses. Apart from this, other valuable information on the plants are given like the vernacular names.

REFERENCES

- [1] K. Anderson, Nature, Culture, and Big Old Trees: Live Oaks and Ceibas in the Landscapes of Louisiana and Guatemala, University of Texas Press, 2004, 199 p.
- [2] C. Wiart, 2006, Medicinal plants of Asia and the Pacific, CRC Taylor & Francis, 295p.
- [3] M. Brink, E. G. Achigan-Dako, (Editeurs), 2012. Ressources végétales de l'Afrique tropicale 16. Plantes à fibres. Fondation PROTA, Wageningen, Pays-Bas/CTA, Wageningen, Pays-Bas. 659 pp.
- [4] J. Berhaut, 1967. Flore du Sénégal- 2ème Ed. Clairafrique Dakar, 60p.
- [5] A. T. J. Ogunkunle, T. M. Oyelakin, A. O. Enitan, F. E. Oyewole, 2014. A Quantitative Documentation of the Composition of Two Powdered Herbal Formulations (Antimalarial and Haematinic) Using Ethnomedicinal Information from Ogbomoso, Nigeria Evidence-Based Complementary and Alternative Medicine; Volume 2014.
- [6] C. Ky-Dembele, M. Tigabu, J. Bayala, P. Savadogo, I. J. Boussim, P. C. Odén, 2011. Clonal Propagation of *Khaya senegalensis*: The Effects of Stem Length, Leaf Area, Auxins, Smoke Solution, and Stockplant Age, *International Journal of Forestry Research*. Volume 2011, 1-10.
- [7] P. S. Thakkar, (1997) Editorial notes. Global Neem Update 2: 1.
- [8] A. De Jussieu, 1988. *Azadirachta Indica*, Revue Bois et Forêts des Tropiques, n°217, 3^{ème} trimestre, pp 33-47.
- [9] K. Girish, B. S. Shankara, 2008. Neem – A Green Treasure. *Electronic Journal of Biology*, Vol. 4(3):102-111
- [10] Anonyme, 2013. Le margousier ou neem (*Azadirachta indica*), Formad Environnement, p18.
- [11] R.V. Kumar, V. K. Gupta, 2002. Thrust on neem is need of today. In: Employment news, July 20-26. New Delhi, India.
- [12] Bamaiyi L. J., Ndams I. S., Toro W. A., Odekina S., 2006. Effect of mahogany *Khaya senegalensis* seed oil in the control of *Callosobruchus maculatus* on stored cowpea. *Plant Protect. Sci.*, 42, 130–134.
- [13] A. H. Gentry, R. Vasquez, 1988. Where have all the *Ceibas* gone? A case history of mismanagement of a tropical forest source. *Forest Ecology and Management*, 23, 73-76.
- [14] N R C (National Research Council), 1992. *Neem: A Tree For Solving Global Problems*. National Academy Press, Washington, D.C
- [15] G. Adjoh, 2014. Etude des propriétés physico-chimiques des fruits du kapokier (*Ceiba pentandra* Gaertn.) provenant de différentes localités de la partie septentrionale du Cameroun, Mémoire de Master, Ecole Normale Supérieure de Maroua, Université de Maroua, 51p