

# Variability between Socio-cultural Groups and Generations of Traditional Knowledge of the Use of *Euphorbia poissonii* Pax in Benin

Gbodja Houéhanou François Gbesso<sup>1\*</sup>, Jhonn Logbo<sup>1</sup>, Jacques Evrard Charles Aguia Daho<sup>2</sup>

<sup>1</sup>Horticultural Research and GreenSpace Planning Unit - Laboratory of Plant, Horticultural and Forestry Sciences -School of Horticulture and Green Space Management (EHAEV) - National University of Agriculture (UNA) - BP 43 Kétou - Bénin

<sup>2</sup>Plant Biotechnology Research Unit, Crop Production and Seed Science - Laboratory of Plant, Horticultural and Forestry Sciences - School of Plant and Seed Management and Productions - National University of Agriculture (UNA) - BP 43 Kétou - Bénin

\*Corresponding author's email: fr.gbesso [AT] gmail.com

---

**ABSTRACT**— *This study was conducted in the Municipality of Savalou to assess endogenous knowledge related to the use of Euphorbia poissonii in the Mahi and Nago ethnic groups. The survey was conducted through individual interviews with 112 people. The Relative Frequency, the Use Value, Fidelity and Cultural Importance index were used to assess the importance of each use. Correspondence analysis (CA) was used to describe the relationship between the categories of use and ethnicities and between the parts used of the plant and the ethnic groups. The analysis showed that the plant, Euphorbia poissonii, falls under three levels of major medicinal use, including: medicinal use of the stem, sap and leaf, which is the most common practice of the Mahi sociocultural group (UV=1.58) like Nago (UV=1.35). It helps to effectively treat measles (FL=23.08), incurable wounds (FL=22.30) and scorpion sting (FL=22.30). Powder, infusion and decoction are the forms of preparation of the products most used by the skin. The two socio-cultural groups all hold and effectively various knowledge of the use of different derivatives of the plant. The importance and increasing use of Euphorbia poissonii puts this plant under various pressures and threats from the population and it has no conservation measures to this day. Finally, this study not only alerts but also provides a scientific basis to define strategies for the conservation and protection of this neglected species.*

**Keywords** — *Euphorbia poissonii*, endogenous knowledge, medicinal use, ethnic groups, Savalou

---

## 1. INTRODUCTION

Ethnobotany is the empirical study of the socio-cultural interaction between plants and peoples. According to the World Health Organization (WHO), about 65-80% of the world's population in developing countries depend mainly on plants for primary health care due to poverty and lack of access to modern medicine [1].

In recent decades there has been a growing interest in the study of medicinal plants and their traditional use in different parts of the world. In Africa, the use of medicine and traditional pharmacopoeia is a common and ancestral practice. Currently, nearly 80% of Africa's population uses local plants for treatment and does not have access to modern medicines. Plant care is known and practiced in Africa for a long time, as they exploit knowledge transmitted orally from generation to generation [2].

Rural African communities have traditional knowledge of the value and properties of many plant species [3]. Forest resource management policies can only be sustainable if they incorporate the social, cultural and economic values that local communities associate with them. In this sense, ethnobotanical studies appear to be a good approach to understanding, in a given region, the uses as well as socio-cultural perceptions of forest resources by local populations [4].

Endogenous knowledge, an essential component of biodiversity conservation [5], is important both in improving people's daily lives and in decision-making for resource management [6]. Ethnobotanical studies identify local uses of plant species. This knowledge is the basis of all approaches to providing effective solutions to threats to these species at the local community level [7]. These studies, which focus on the socio-cultural importance or use value of this species, do little to inform the actual diversity of uses observed according to socio-cultural groups [8-11].

It is with a view to valuing and making sustainable use of the species that this study was initiated and aims to evaluate the ethnobotanical knowledge of the species held by the Mahi and Nago socio-cultural groups of the Municipality of Savalou. The study environment ranges from 7°34'06'' to 8°12'34'' north latitude and between 1°37'34'' and 2°8'12'' of eastern longitude. It covers an area of 2674 km<sup>2</sup>. The Municipality of Savalou is located in a

climatic zone of transition between the sub-equatorial and the humid tropical of the type of Sudan-Guinean characteristic of a savannah vegetation. The rocky nature of the soil is a favourable habitat for *Euphorbia poissonii*.

## 2. MATERIALS AND METHODS

### 2.1. Plant material

*Euphorbia poissonii* is a species that grows on rocky and stony soils, and on the rocky hills of the dry savannah. It cultivated and often found in fields and box gardens. [12-14].



Photo 1: *Euphorbia poissonii* individual in the natural environment in the study area

### 2.2. Sampling

The probabilistic stratified sampling method [15-16] was used. It consists of dividing the study area into different strata and associating the same number of respondents. Thus, the 14 boroughs are considered strata of strata, five (05) sites have been visited, and two (2). In each of the strata, five health practitioners and three herbal sellers were consulted. A total of 70 traditional practitioners and 42 saleswomen, for a total of 112 respondents (Table 1).

Table 1. Sample Size by Sociocultural Groups and Gender

Sociocultural Group	Sex		
	Women	Men	Total
Mahi	30	45	75
Nago	12	25	37
Total	42	70	112

### 2.3. Ethnobotanical surveys

The surveys were conducted at different sites in the boroughs (strates) of the study area. The data were collected from traditional practitioners and sellers through individual interviews based on a semi-structured questionnaire [17].

### 2.4. Data analysis

The age classes proposed by [18]: "young people" (16-29 years), "adults" (30-59 years) and "old men" (age > 59 years) were used according to different socio-cultural groups. In order to assess ethnobotanical knowledge and the uses of *Euphorbia poissonii* populations between the two ethnic groups, the following indices were calculated:

Relative Frequency (FR): The Relative Frequency was calculated to assess the relative importance of each use of the plant. It is expressed in the form:

$$FR = 100 * \frac{n}{N}$$

n: The number of people who responded to a given usage category; N: Total number of people surveyed.

Cultural Importance Index: In order to assess the preference of uses, the Cultural Importance Index (CI) of each category of use was calculated within each subgroup according to the formula [19]:

$$CI_{i,k} = UV_{is} \frac{\sum_{j=1}^{ni} x_j}{n_i}$$

where  $x_j$  is the high score given by the category of use considered by a subgroup respondent to the species  $n_i$  the total number of respondents within the subgroup (i) et  $UV_{is}$  the frequency of use of the species. The value of the species total cultural importance index was calculated according to the formula [20]:

$$CI_t = \sum_{i=1}^k IP_{i,k}$$

Fidelity level Index (FL): The Fidelity level was used to assess the level of fidelity of plant use in the treatment of a given disease within different socio-cultural groups. It was calculated using the formula [21]:

$$FL = 100 \frac{S}{N}$$

s: The number of people who have provided an answer to a specific use of a part of the plant for a given remedy;  
N: Total number of people surveyed. Only uses with a FL of 5% in at least one of the socio-cultural groups are presented.

In addition, a Correspondence Analysis (CA) was conducted using the convergence tables with the R software to describe not only the relationship between socio-cultural subgroups and categories of use but also the relationship between the socio-cultural subgroups and the parties used.

### 3. RESULTS

#### 3.1. *Euphorbia poissonii* uses domains

*Euphorbia poissonii* is generally used in three use categories (Table 2). The use of *Euphorbia poissonii* organs as poison is the most common (FR = 100%), followed by medicinal use (FR = 79.05% for Mahi and FR = 75% for Nago) and magic medicine (FR = 22.30% for Mahi and FR = 17.31% for Nago). The highest usage values are observed for medicinal uses in both the Mahi socio-cultural group (UV= 1.53) and the Nago socio-cultural group (UV= 1.35). It should be noted that the value of "poison" use is the same among the two socio-cultural groups.

**Table 2.** *Euphorbia poissonii* use Categories

Use Categories	Parties Used	FR (%)		UV	
		Mahi	Nago	Mahi	Nago
<b>Medicinal</b>	Leaf, Bark, Stem, Sap	79.05	75	1.53 ± 0.82	1.35 ± 0.85
<b>Medico-magic</b>	Leaf, Bark, Stem, Sap	22.30	17.31	0.41 ± 0.79	0.34 ± 0.75
<b>Poison</b>	Sap	100	100	1 ± 0.00	1 ± 0.00

#### 3.2. Relationship between socio-cultural groups and categories of use

The first two axes of the CA (Fig. 2) comprise 100% of the initial variance. These two axes were used to describe the relationship between socio-cultural groups and categories of use. Analysis of the contributions as well as the quality of the representation of socio-cultural groups and categories of Use of *Euphorbia poissonii* on each axis of the factor plan indicates that the socio-cultural subgroups MAH, MAF, NJH, NAH and NVH have a strong contribution and good quality of representation on the factor axis 1, while the MVH and MVF subgroups have good contributions and representational qualities on the factor axis 2. As for the categories of use, medicinal and poison uses have contributed greatly to the formation of Axis 1 and are well represented, while the category of medical-magic use has a good contribution and quality of representation on factor axis 2. Axis 1 is that of the medicinal and poison uses of *Euphorbia poissonii*, while axis 2 is that of the medico-magic uses of *Euphorbia poissonii*. The projection of different categories of use and socio-cultural subgroups in the CA axis systems (Fig. 2) show that Adult Men and Women Mahi (MAH and MAF) and Young Men Nago (NJH) cite the use of the species as poison, while Adults and Old Men Nago (NAH and NVH) reveal more the medicinal uses of the species. However, the old Mahi women and men (MVF and MVH) indicate more the medico-magical uses of the species. Some socio-cultural subgroups are not associated with a particular category of use and are not circled in Figure 1.



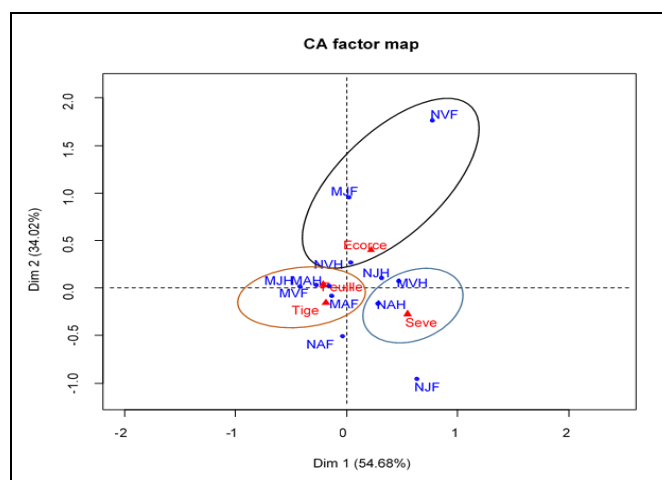
**Table 4.** Organs used, method of preparation, forms of use, treated disease and Fidelity Level (FL) of the uses of *Euphorbia poissonii* in the Municipality of Savalou.

Organs	Mode of Preparation	Treated diseases	FL(%)	
			Mahi	Nago
Bark	Powder	Goiter	-	5.77
		Measles	5	-
Leaf	Decoction	Incurable wound	9.46	5.77
		Swelling of a part of the body	31.76	21.15
	Infusion/Decoction	Incurable wound	-	13.46
		Wounds	22.30	11.54
Sap	Powder	Fever	-	5.77
		-	5	19.23
	-	Panaris	8.78	11.54
	-	Snake bite	-	5.77
	-	Rest of the navel	-	10.14
Rod	Powder	Measles	16.22	23.08
		Gale	-	9.62
		Crisis	5	5.77
		Epilepsy	8.78	-
	Infusion/Decoction	Incurable wound	17.57	21.15

NB: Only uses with a FL  $\geq$  5% in at least one of the socio-cultural groups are presented. All preparations are administered by skin

### 3.5. Relationship between socio-cultural subgroups and used parties

The first two axes of the CA (Figure 2) account for 88.69% of the initial variance. These two axes were used to describe the relationships between the socio-cultural groups and parts of *Euphorbia poissonii* used. Analysis of the contributions as well as the quality of the representation of socio-cultural groups and parts of *Euphorbia poissonii* on each axis of the factor plan indicates that the socio-cultural subgroups MAH, MAF, MVH, NAH and MJH have a strong contribution and a good quality of representation on the factor axis 1, while the MJF, NVH and NVF subgroups have good contributions and representational qualities on the factor axis 2. As for the organs of *Euphorbia poissonii* used by local populations, the sap, leaf and stem have a strong contribution to the formation of axis 1 and are well represented, while the bark has a good contribution and quality of representation on factor axis 2. Axis 1 is the one that opposes the use of the sap organ to the uses of the leaf and stem organs of *Euphorbia poissonii*, while axis 2 is that of the uses of the bark of *Euphorbia poissonii*. Projection of the organs of the species used and socio-cultural subgroups into the CA axis systems (Figure 2) show that Adults and Old Mahi Women and Young Mahi Men (MJH) tend to use the leaves of the species more, so that Adult Men Nago (NAH) and Old Men Mahi (MVH) prefer the use of sap. It should be noted that old women and old men Nago (NVF and NVH) and Young Women Mahi (MJF) indicate more the uses of the bark of the species.



**Captions:** M= Mahi, N= Nago, H= Man, F=Woman, J=Young, A= Adult, V=Old.

**Figure 2.** Projection of the used parts (organs) of *Euphorbia poissonii* and socio-cultural groups on factors 1 and 2



#### 4. DISCUSSION

The medicinal knowledge and uses of *Euphorbia poissonii*, such as poison, are most frequently reported by local populations such as Mahi and Nago. This reveals possible uses of the species. The organs of *Euphorbia poissonii* are used in the treatment of 21 diseases or symptoms of which only 9 significant uses taking into account the fidelity index (FL) of these specific uses. This number of uses is well below the number of uses of different species with ethnobotanical potential reported in the Benin literature [22, 9, 23, 11, 24].

This number is due to the small number of categories of use of the species as well as the low consideration given to the species by populations. Indeed, it is the mere invocation of the name of the species from certain people in the commune of Savalou arouses mistrust and anger because the name of the species and the uses of the species in the collective consciousness are associated with negative thoughts. The species is considered a poison and is associated with cult practices in erecting deities for many people. However, in this study, other uses (treatment of incurable wounds, measles) are reported and show that despite the toxicity of the plant, medicinal uses can be made of the organs of the plant including its stem. But these uses are all administered through the skin. This confirms the toxicity of the species and the precautions that local populations take in its use. The uses of the species also vary according to the age and socio-cultural group of people' belonging. Thus, people of a certain age and the sociocultural group Mahi have more knowledge of medical-magic uses while adult Mahi and Nago reveal more medicinal uses. This confirms the thesis that certain knowledge, especially spiritual or magical, remains the property of the initiates and the elderly. These results show that very few areas of use are associated with the species and disprove the hypothesis relating to the specific objective 1 But allow us to confirm the hypothesis relating to the specific objective 2 because the uses of the organs dependent on the user's age group of belonging.

The study reveals that deforestation, wildfires and to some extent agricultural clearing are the main threats to *Euphorbia poissonii*. Previous studies report similar trends in wildlife population degradation factors. Indeed, the works of [22]. on *Sclerocarya birrea* ; [23]. on the *Synsepalum dulcificum* and [24]. on the *Cola millenii* showed that wildfires and clearing were the main causes of degradation of indigenous species populations. Despite the threat factors to the populations of *Euphorbia poissonii*, local communities such as the Mahi socio-cultural group and Nago do not have endogenous measures to preserve the species. Only the presence of the species in the places of worship of the deities constitute the forms of conservation of the species. No form of conservation of the species, in the agro systems has been evoked by the local communities that systematically cut off its individuals during the work of installing the fields. The only natural habitats of the species today remain saxicoal environments that are not accessible to local communities for the installation of crop fields.

#### 5. ACKNOWLEDGEMENT

We would like to thank the people and authorities who facilitated the collection of data as part of this study. To all those who contributed to the writing of this article for their remarks and suggestions that were taken into account in the final version of the text. We also present our gratitude to the anonymous reviewers who have improved the scientific quality of this article.

#### 6. REFERENCES

- [1] Awoyemi, O.K.; Ewa, E.E., Abdulkarim, I.A.; & Aduloju, A.R. "Ethnobotanical Assessment of Herbal Plants in Southwestern Nigeria", Academic Research International, Vol. 2, No. 3, pp.50-57, 2012. [http://www.savap.org.pk/journals/ARInt./Vol.2\(3\)/2012\(2.3-05\)](http://www.savap.org.pk/journals/ARInt./Vol.2(3)/2012(2.3-05)) .
- [2] Kanta, V., Unnati, S., Ritu, M. 2011. "A review on aids and herbal remedies", International, Journal of Research in Ayurveda & Pharmacy, vol 2, issue 6, pp. 1709-1713 2011. DOI <https://ijrap.net/admin/php/uploads/699>
- [3] Moupela, C.J., Doucet, L., Daïnou, K., Meunier, Q., Vermeulen, C., "Essais de propagation par semis et marcottage aérien de *Coula edulis* Baill. et perspectives pour sa domestication", Bois et Forêts des Tropiques, vol. 318, N° 4, pp. 3-13, 2013.
- [4] Agbogidi, O.M., "Ethno-botanical survey of the non-timber forest products in Sapele Local Government Area of Delta State, Nigeria", African Journal of Plant Science, vol. 4, issue 3, pp. 183-189. 2010.
- [5] Pilgrim, S., Smith, D., Pretty, J., "A cross regional assessment of the factors affecting ecoliteracy. Implications for policy and practice", Ecological Applications, vol. 17, issue 6, pp. 1742-1751. 2007. [www.https://doi.org/10.1890/06-1358.1](http://www.https://doi.org/10.1890/06-1358.1)
- [6] Campos, M.T., Ehringhaus, C., "Plant virtues are in the eyes of the beholders: a comparison of known palm uses among indigenous and folk communities of south western Amazonia", Economic Botany, vol. 57, pp. 324-344, 2003. [https://doi.org/10.1663/0013-0001\(2003\)057\[0324:PVAITE\]2.0.CO:2](https://doi.org/10.1663/0013-0001(2003)057[0324:PVAITE]2.0.CO:2)

- [7] Akpavi, S., Woegan, A.Y., Dourma, M., Tozo, K., Batawila, K., Wala, K., "Que sont devenues les plantes autrefois consommées par les divers groupes ethnoculturels du Togo?" *Agronomie Africaine*, vol. 23, N° 2, pp.147-160, 2011.
- [8] Case, R.J., Pauli, G.F., Soejarto, D.D., "Factors in Main-taining Indigenous Knowledge among Ethnic Communities of Manus Island", *Economic Botany*, vol. 59, pp.356-365, 2005. <https://doi.org/10.1663/0013-0001>
- [9] Atakpama, W., Batawila, K., Dourma, M., Pereki, H., Wala, K., Dimobe, K., Akpagana, K., Gbeassor, M., "Ethnobotanical Knowledge of *Sterculia setigera* Del. in the Sudanian Zone of Togo (West Africa)", *International Scholarly Research Network*, vol. 2012, pp.1-8. 2012. <https://doi.org/10.5402/2012/723157>
- [10] Franco, F.M., Ghani, B.A.A., Hidayati, S., "Biocultural importance of the Tanying [*Koompassia excelsa* (Becc.) Taub.] tree for the Berawan of Loagan Bunut, Sarawak, Malaysia", *Indian Journal of Traditional Knowledge*, Vol.13 issue 1, pp.63-69. 2014. <http://hdl.handle.net/123456789/26028>
- [11] Assogba, G.A., Fandohan, A.B., Salako, V.K., Assogbadjo, A.E., "Usages de *Bombax costatum* (Malvaceae) dans les terroirs riverains de la Réserve de biosphère de la Pendjari, République du Bénin", *Bois et Forêts des Tropiques*, vol. 333, pp.17-29. 2017. <https://doi.org/10.19182/bft2017.333.a31465>
- [12] Adjanohoun, E.J., Aboubakar, N., Dramane, K., Ebot, M.E., Ekperere, J.A., Enow-Orock, E.G., Focho, D., Gbilé, Z.O., Kamanyi, A., Kamsu, K.J., Keita, A., Mbenkum, T., Mbi, C.N., Mbiele, A.L., Mbome, I.L., Mubiru, N.K., Nancy, W.L., Nkongmeneck, B., Satabié, B., Sofowora, A., Tamze, V. & Wirmum, C.K., "Contribution to ethnobotanical and floristic studies in Cameroon", CSTR/OUA, Cameroon, 1996.
- [13] Neuwinger, H.D., "African ethnobotany: poisons and drugs", Chapman & Hall, London, United Kingdom, 1996.
- [14] Arbonnier, M., "Arbres, arbustes et lianes des zones sèches d'Afrique de l'Ouest", CIRAD, MNHN, UICN, 2002.
- [15] Tra Bi, Fézan H., Guy, M. Irié, Kohué, C.C. N'Gaman, et Clejesson, H.B. M., "Études de quelques plantes thérapeutiques utilisées dans le traitement de l'hypertension artérielle et du diabète : deux maladies émergentes en Côte d'Ivoire", *Sciences & Nature* Vol. 5, N°1, pp. 39 – 48, 2008.
- [16] Saraka, A.I., Camara, D., Bene, K., Zirihi, G.N., "Enquête ethnobotanique sur les Euphorbiaceae médicinales utilisées chez les Baoulé du District de Yamoussoukro (Côte d'Ivoire)", *Journal of Applied Biosciences*, Vol. 126, pp. 12734-12748. [www.https://dx.doi.org/10.4314/jab.v126i1.11](http://www.https://dx.doi.org/10.4314/jab.v126i1.11)
- [17] Klotoé, J.R., Dougnon, T.V., Koudouvo, K., Atègbo, J.M., Loko, F., Akoègninou, A., Aklikokou, K., Dramane, K., Gbeassor, M., "Ethnopharmacological survey on antihemorrhagic medicinal plants in South of Benin", *European Journal of Medicinal Plants*, Vol. 3, N°1, pp. 40-51, 2013.
- [18] Assogbadjo, A.E., Glèlè Kakaï, R., Chadare, F.J., Thomson, L., Kyndt, T., Sinsin, B., Van Damme, P., "Folk classification, perception, and preferences of baobab products in West Africa: Consequences for species conservation and improvement", *Economic Botany*, Vol. 62, pp. 74–84, 2008.
- [19] Tardío, J., Pardo-De-Santayana, M., "Cultural importance indices: A comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain)" *Economic Botany*, Vol. 62, N°1, pp. 24–39, 2008.
- [20] Camou-Guerrero, A., Reyes-García, V., Martínez-Ramos, M., Casas, A., "Knowledge and Use Value of Plant Species in a Rarámuri Community: A Gender Perspective for Conservation", *Human Ecology*, vol. 36, pp. 259–272, 2008.
- [21] Gouwakinnou, G.N., Lykke, A.M., Assogbadjo, A.E., Sinsin, B., Local knowledge, pattern and diversity of use of *Sclerocarya birrea*, *Journal of Ethnobiology and Ethnomedicine*, Vol. 7, N° 8, pp.1-9, 2011. <https://doi.org/10.1186/1746-4269-7-8>
- [22] Ayéna, AC, Agassounon, Djikpo Tchibozo, M., Assogbadjo, AE, Adoukonou-Sagbadja, H, Mensah, GA, Agbangla, C, Ahanhanzo, C., "Usages et vulnérabilité de *Pterocarpus santalinoides* L'Her. ex DC (Papilionoideae), une plante utilisée dans le traitement des gastroentérites dans le Sud du Bénin", *European Scientific of Journal*, Vol. 12, N°6, pp.1857-7881. 2016.
- [23] Lawin, I.F., Houètchégnon, T., Fandohan, A.B., Salako, V.K., Assogbadjo, A.E., Ouinsavi, C.A., "Connaissances et usages de *Cola millenii* K. Schum. (Malvaceae) en zones guinéenne et soudano-guinéenne au Bénin". *Bois et Forêts des Tropiques*, 339, 61-74, 2019. <https://doi.org/10.19182/bft2019.339.a31716>
- [24] Fandohan, A.B., Chadare, F.J., Gouwakinnou, G.N., Tovissode, C.F., Bonou, A., Djonlonkou, S.F.B., "Usages traditionnels et valeur économique de *Synsepalum dulcificum* au Sud-Bénin", *Bois et Forêts des Tropiques*, 332,2, 18-30, 2017. <https://doi.org/10.19182/bft2017.332.a31330>