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

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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 km². 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 is cultivated and often found in fields and box gardens. [12-14].

![Photo 1: Euphorbia poissonii individual in the natural environment in the study area](image)

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).

| Sociocultural Group | 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:

\[ FR = 100 \times \frac{n}{N} \]

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]:

\[ CI_{t,k} = UV_{tk} \times \frac{\sum_{j=1}^{n_t} x_j}{n_t} \]
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 \( UVi,s \) the frequency of use of the species. The value of the species total cultural importance index was calculated according to the formula [20]:

\[
CI_k = \sum_{i=1}^{k} IP_{i,k}
\]

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.

| Use Categories      | Parties Used   | FR (%)         | UV Mahi | UV Nago |
|---------------------|----------------|----------------|---------|---------|
| Medicinal           | Leaf, Bark, Stem, Sap | 79.05          | 1.53 ± 0.82 | 1.35 ± 0.85 |
| Medico-magic        | Leaf, Bark, Stem, Sap | 22.30          | 0.41 ± 0.79 | 0.34 ± 0.75 |
| Poison              | Sap             | 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.
Captions: M= Mahi, N= Nago, H= Man, F=Woman, J=Young, A= Adult, V=Old.

Figure 1. Projection of Euphorbia poissonii use categories and socio-cultural groups on factors 1 and 2

3.3. The cultural importance of Euphorbia poissonii within socio-cultural groups

Table 3 shows the values of cultural relevance indices calculated by subgroups. Medicinal use has the highest cultural relevance index among Mahi (CI=6.45) and Nago (CI=6.35). It is followed by the use of poison with respectively as CPI value between 5.16 and 6. The medico-magic use of the species comes last in both groups with CI=1.49 and CI=1.21 respectively. Considering these different values of the cultural relevance index, we can conclude that for local populations medicinal and poison uses are the most important. The medical-magic use remains a minority among these local populations.

| Sociocultural Group | CI  |
|---------------------|-----|
|                     | Poison | Medicinal | Medical-magic |
| Mahi                | 5.16   | 6.45      | 1.49          |
| Nago                | 6      | 6.35      | 1.21          |

3.4. Therapeutic importance of Euphorbia poissonii organs by sociocultural group

In this study, twenty-one specific uses of Euphorbia poissonii organs were revealed by the local populations of the Municipality of Savalou. However, only sixteen significant uses with Fidelity Levels (FL ≥ 5%) are presented. Within the Mahi sociocultural group, nine significant uses are reported, while within the Nago sociocultural group, fourteen significant uses are reported (Table 4).

The analysis of the table shows that leaves, bark, stem and sap are the organs or parts of the plant used to treat certain diseases and symptoms. The use of the leaf in the treatment of swelling of a part of the body (FL=31.76) and wounds (FL=22.30) and of the stem in the treatment of measles (FL=16.22) and incurable wounds (FL=17.57) are the most important uses within the Mahi socio-cultural group whereas at the level of the Nago sociocultural group, it is the uses of leaves in the treatment of swelling of a part of the body (FL=21.15); sap in the treatment of scorpion stings (FL=22.30) and stem in the treatment of measles (FL=23.08) and incurable wounds (FL=21.15). Thus, the use of the species in the treatment of measles, swelling of a part of the body and incurable wounds are the most important. In the medico-magic field, the use during the rituals of implantation of the deities is the most frequent.
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 |      |
|        | Decoction           | Measles          | 5      | 5.77 |      |
|        |                     | Incurable wound  | 9.46   | 5.77 |      |
| Leaf   | Infusion/Decoction  | Swelling of a part of the body | 31.76 | 21.15 |
|        |                     | Incurable wound  | -      | 13.46|
|        |                     | Wounds           | 22.30  | 11.54|
|        | Powder              | Fever            | -      | 5.77 |
|        |                     | Scorpion sting   | 5      | 19.23|
|        |                     | Panaris          | 8.78   | 11.54|
|        |                     | Snake bite       | -      | 5.77 |
|        |                     | Rest of the navel|       | 10.14|
| Sap    | 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 ≥ 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 ethno-botanical 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-magical 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 *Syneapalum 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.

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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).

[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., Dainou, 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

[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:PVATBE]2.0.CO;2

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