International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Ethnobotanical Survey of Medicinal Plants Used in the Treatment of Malaria in the Rural Commune of Luozi

Muzola Biakenga Joachim[1], Bunga Luzaya André[2], Idrissa Assumani Zabo[3], Mananga Ngoma Faustin Frédéric[4],

[1,2]Higher Institute of Rural Development of Luozi (ISDR – LUOZI), DRC
[3]National Pedagogical University, Kinshasa, DRC;
[4]University of Boma, Kongo central, DRC

Abstract

This work presented the results of an ethnobotanical survey carried out in the Rural Commune of Luozi on the use of medicinal plants. Indeed, the results highlighted the frequent use of medicinal plants with a diversity including 15 species belonging to 13 families. The most used parts were the leaves 80% followed by the roots, fruits and bark 20%. Infusion was the predominant preparation method accounting for 53%, followed by fumigation 20%, oil 13%, juice 7% and decoction 7%.

As for the analysis of quantitative indices, the cultural importance index varied between 0.04 and 0.56. Plants with a high IC index were: Cassia same 0.56, Bridelia micrantha 0.48, Senna occidentalis 0.48, Nauclea latifolia 0.44 and Ocimum gratissimum 0.32. However, only one plant had a FL value of 56% recorded for Cassia same.

Keywords: Ethnobotanical survey, medicinal plants, malaria.

INTRODUCTION

Natural products are of great interest as raw materials intended for different sectors of activity such as cosmetics, pharmacy, agri-food, phytosanitary and industry [1]. Thus, the use of herbal remedies has recently experienced unprecedented popularity. More and more people are looking for "natural" medicines and it even seems that plant-based cosmetics and cleaning products are increasingly used today [2]. Furthermore, many populations for health care [3] use several remedies every day. Likewise for the population of Luozi Rural Commune, given the diversity of medicinal plants with great therapeutic power, they adopt plant medication for various pathologies; and in this range, an important place is noted occupied by malaria.

The overall objective of this work is to present the results of an ethnobotanical survey, carried out in the Rural Commune of Luozi, focused on the plants used in treatments against malaria by Traditional Practitioners, herbalists and the local population. Specifically, this survey aims to:

- Collect as much information as possible regarding the medicinal plants used by the local population to treat malaria;
- Know the frequency of use of medicinal plants by the said population;

- Know the different parts of these plants used for the therapy of this disease;
- Determine other uses of these plants apart from therapy against malaria [4].

MATERIALS AND METHODS

1. MATERIAL

1.1 Plant material

In this study, the plant material consists of different medicinal plants identified in traditional medicine, which treat Malaria in the Rural Commune of Luozi.

1.2 Teaching material

To carry out our study, we used the following teaching materials:

- The papers where we entered the survey questionnaire;
- The notepad for all annotations;
- Ballpoint pen and eraser pencil for writing on the ground;
- The motorcycle for traveling from door to door, from one avenue to another and from one neighborhood to another;
- A computer to enter the report and/or the final document of the investigation.

2. STUDY ENVIRONMENT

The rural commune of Luozi is the capital of the Territory bearing the same name. It extends on the right bank of the Congo River. Set back from the Matadi-Kinshasa national road. It is separated by 110 km from the Kimpese site. Luozi is also located 245 km northeast of the city of Matadi and 350 km southeast of Kinshasa, the country's capital [5].

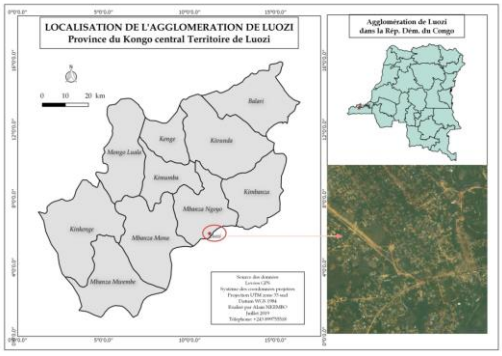

Figure 1. Location of the rural commune of Luozi

3. METHODS USED

The methodology consisted of;

- Prepare an investigation sheet in the form of a questionnaire (questions concerning the informant, the medicinal plant cited and questions concerning the use of said plant);
- Collect data in the field;
- Identify the plants mentioned.

1. Interview

The study carried out for this work involved the participation of 30 herbalists and 20 people from the local population of the Rural Commune of Luozi, during a period of one month (from August 1 to 30, 2024). In fact, a questionnaire was distributed two days before his recovery.

2. Data analysis

The collected data was then organized into a table to form an internal database and then analyzed using various quantitative indices.

2.1 Citation value (NC)

Number of times a given species was mentioned.

2.2 Citation frequency (CF)

The FC was obtained using the following formula: FC = (Number of times a given species was mentioned / total number of times all species were mentioned) X 100.

2.3 The Cultural Importance Index (CI)

IC is used to assess the cultural significance of each taxon. It is obtained by summing the number of people having mentioned a given use (UR) (or having reported a given use), for a species divided by the total number of people surveyed (N), according to the formula:

$$IC = \frac{\sum UR}{N}$$

2.4 Ethnobotanical use value

The use value of each species or Use Value species (UVs) can be calculated according to the following simplified formula from Cotton (1996):

$$UVs = \frac{U}{N}$$

Where U designates the number of uses where the species(s) is mentioned and N, the number of informants having mentioned the species(s).

RESULTS AND DISCUSSION

1. Demographic characteristics of informants

Table 1: Demographic characteristics of informants

Age Range	Herbalist	Person
40 – 50	4	00
51 – 60	16	5
61 – 70	4	8
71 – 80	6	5
81 – 90	00	2
91 – 100	00	00
Total	**30**	**20**

Our investigation is based on a sample of 50 informants including 30 herbalists and 20 ordinary people. The age group with the greatest number of informants is 51 to 60 years old (16 herbalists and 5 people), or 42%, followed by that of 61 to 70 years old (4 herbalists and 8 people), or 24%, that of 71 to 80 years old (6 herbalists and 5 people), or 22%, that of 40 to 50 years old (4 herbalists and 00 person), i.e. 8% and finally that of 81 to 90 years old (00 herbalist and 2 people), i.e. 4%.

2. Diversity of medicinal plants used against malaria

Table 2: The different medicinal plants used against malaria Bark

N°	GENRE AND SPECIES	FAMILY	USEFUL PART	METHOD OF PREPARATION	FC	IC	FL
1	Nauclea latifolia	Rubiaceae	Leaf	Infusion	14%	0,44	44%
2	Lantana viburnoides	Verbenaceae	Leaf	Infusion	2%	0,08	8%
3	Cassia grandis	Fabaceae	Leaf	Infusion et fumigation	18%	0,56	56%
4	Bridelia micrantha	Phyllanthaceae	Leaf	Infusion	16%	0,48	48%
5	Gymnanthemum amygdalinum	Asteraceae	Bark	Decoction	4%	0,12	12%
6	Vernonia amygdalina	Asteraceae	Leaf	Infusion	3%	0,08	8%
7	Carica papaya	Caricaceae	Leaf	Juice	1%	0,04	4%
8	Chromolaena odorata	Asteraceae	Leaf	Fumigation	1%	0,04	4%
9	Ocimum gratissimum	Lamiaceae	Leaf	Dye and oil	10%	0,32	32%
10	Elaeis guineensis	Arecaceae	Fruit	oil	8%	0,24	24%
11	Allium satium	Liliaceae	Pod	Infusion	1%	0,04	4%
12	Millettia versicolor	Fabaceae	Leaf	Fumigation	1%	0,04	4%
13	Moringa oleifera	Moringaceae	Leaf	Infusion	4%	0,12	12%
14	Senna occidentalis	Fabaceae	Leaf	Infusion	16%	0,48	48%
15	Saccharum officinarum	Poaceae	Leaf	Infusion	1%	0,04	4%

FC = Citation Frequency, CI = Cultural Importance Index, FL = Loyalty Level

3. Most cited medicinal plants

Each informant had the opportunity to name all the medicinal plants they use to treat malaria, which meant that an average of three plants were cited per informant.

To do this, 28 respondents out of the 50 cited Cassia same, or 18%; 24 on the other hand cited Bridelia micrantha, i.e. 16%, and another 24 cited Senna occidentalis, i.e. 16% each; 22 informants cited Nauclea latifolia, or 14%, and 16 respondents cited Ocimum gratissimum, or 10%. The other ten species represent 26%.

$$\mathbf{fc} = \frac{\mathbf{n}}{\mathbf{N}}\mathbf{x100}$$

Where fc is the Citation Frequency, n is the number of respondents who cited the plant and N the total number of respondents during the survey.

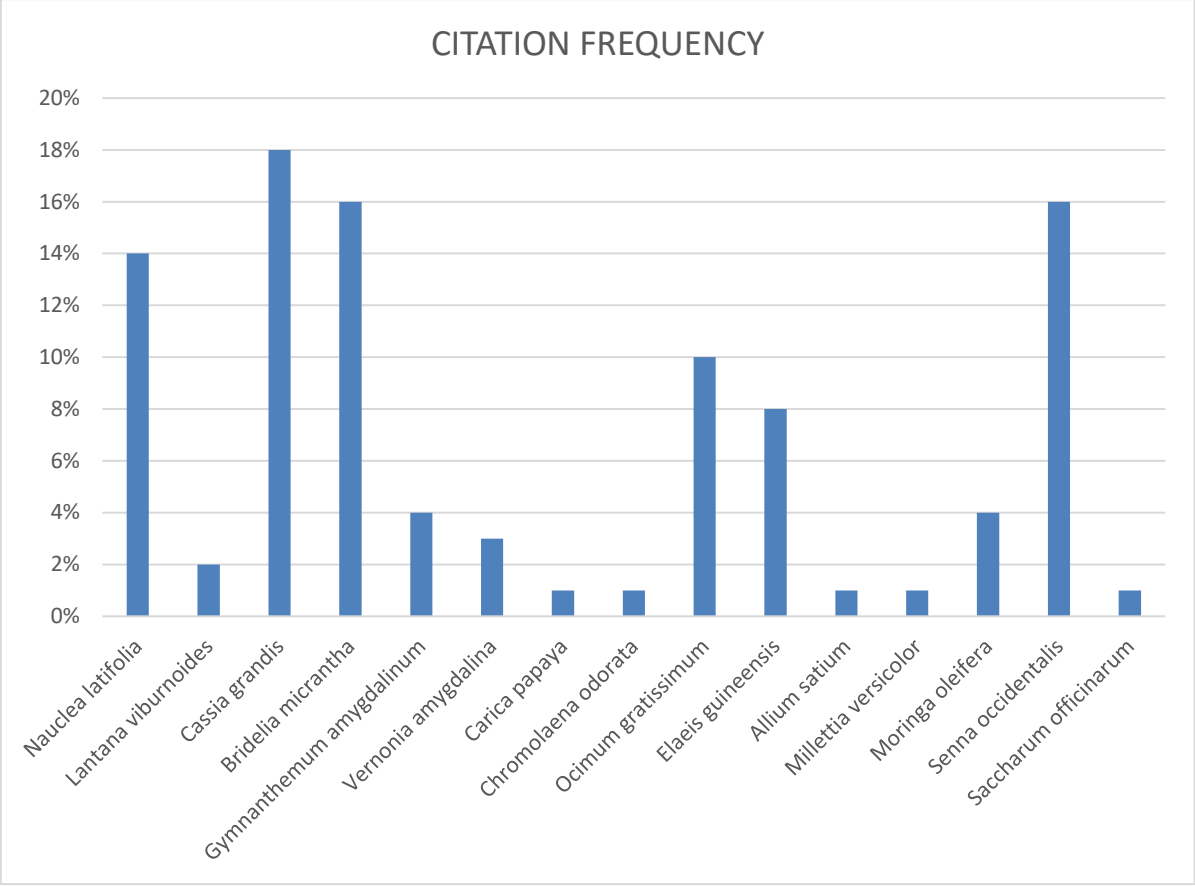

Figure 2: Plant citation frequency

Cassia same is an evergreen species, which keeps its vegetation all year round and is among the dominant species in the rural commune of Luozi, it is present in almost all of the plots. This is why it is used more during two seasons (dry and rainy).

Bridelia micrantha is such a sought after species, very therapeutic, but rare. Senna occidentalis is a species much used during the rainy season because it is a deciduous species which dries and disappears during the dry season.

On the basis of 15 medicinal plants belonging to 13 plant families and identified in the Rural Commune of Luozi were listed for the treatment of malaria. Many species belong to the families Fabaceae, Asteraceae, Rubiaceae, Verbenaceae, Phyllanthaceae, Caricaceae, Lamiaceae, Arecaceae, Liliaceae, Moringaceae and Poaceae. Most of the species identified as antimalarial plants are woody species, mainly phanerophytes. On the other hand, the main ingredients identified for the preparation of remedies are the leaves, bark and roots used in infusion and decoction most often administered orally.

4. Parts of medicinal plants used

The most commonly used parts are the leaves, 12 plants, or 80%, followed by roots, fruits and bark, 3 plants, or 20%. Which does not exclude the importance of other parts of plants because they are also rich in active compounds. However, this dominance is explained by the fact that traditional knowledge transmitted and inherited is based more on practical experience than on scientific data. Furthermore, the aerial part of the plant is more easily accessible, which facilitates its collection, and also helps preserve plant species [6] [7].

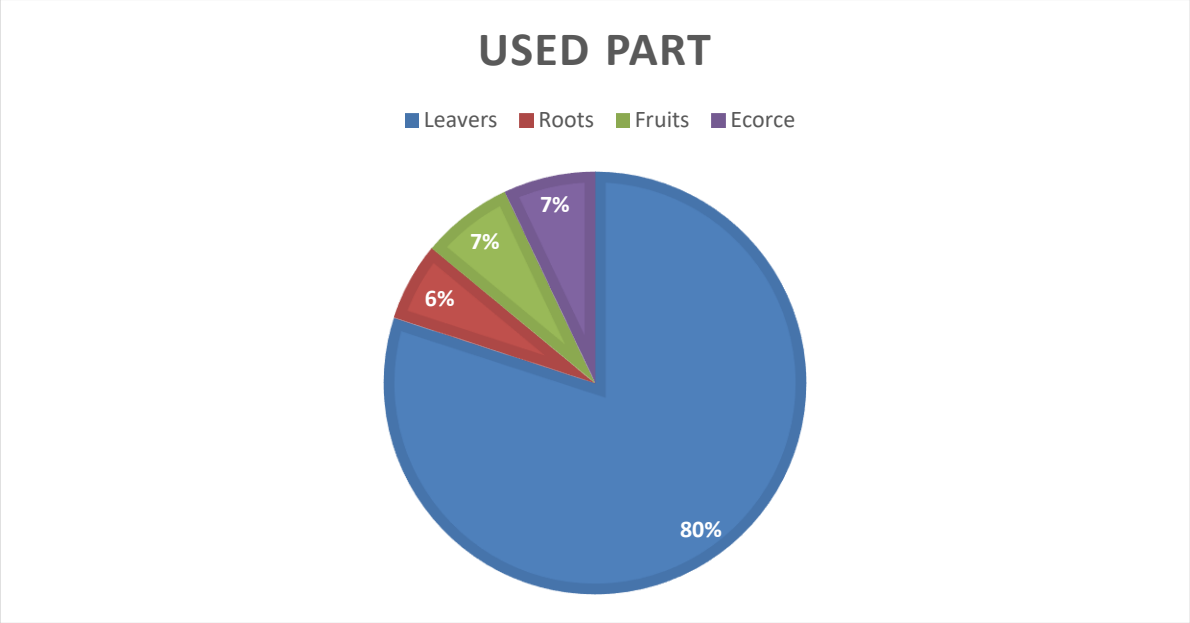

Figure 3: part of the plant used

5. The most used preparation methods

The results of our survey indicated that plants used in traditional remedies to treat malaria are generally administered orally, with a predominance of infusion (53%), followed by fumigation (20%), oil (13), juice (7%) and decoction (7%), Herbalists recommend the simultaneous use of certain plants, either in the form of mixtures or by combining them with adjuvants. For example:

- In newborns, we recommend using a mixture of crushed Ocimum gratissimum leaves with Elaeis guineensis nut oil, massaging the entire body;
- The mixture of leaves of Nauclea latifolia, Lantana viburnoides, Cassia same, Chromolaena odorata and Ocimum gratissimum boiled together is used by fumigation. This treatment is also used in the fight against the CORONA Virus;
- Honey has been widely cited as an adjuvant mixed with the infusion of Gymnanthemum amygdalinum and/or Bridelia micrantha to reduce the bitter taste of these plants.
- Saccharum officinarum juice is mixed with crushed Allium satium and the infusion of Vernonia amygdalina;
- A local pharmacist makes a nutraceutical based on Cassia same, Nauclea satifolia, Senna occidentalis prepared by decoction mixed with food excipients for an Anti-malaria, Antipyretic, Analgesic and Antioxidant much requested by the population of the rural commune.

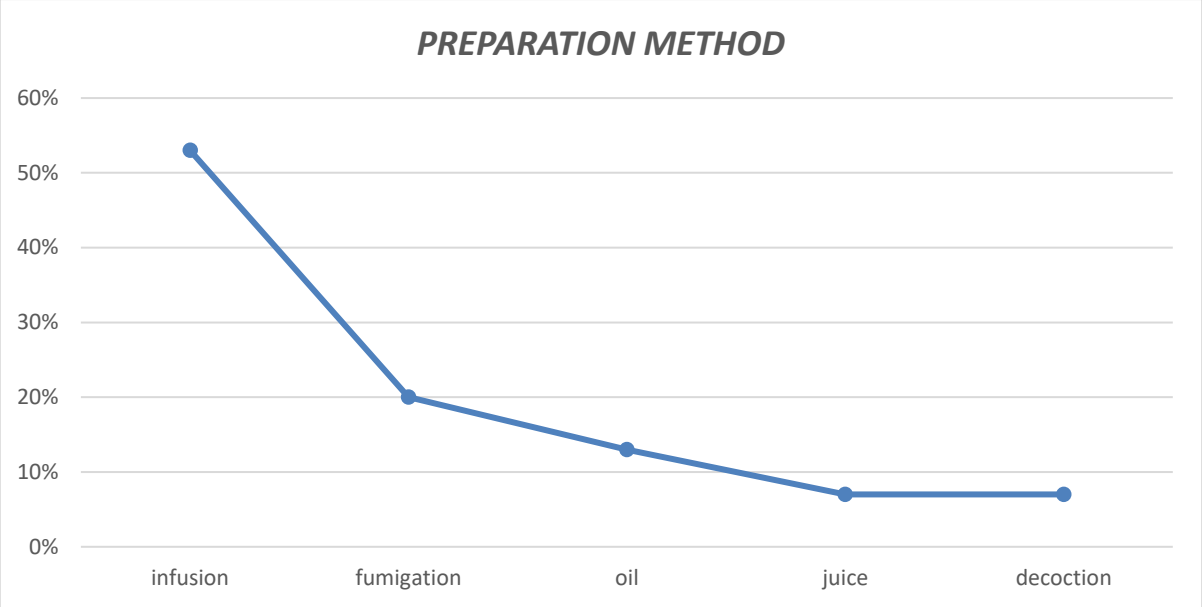

Figure 4: Preparation method

6. Quantitative data analysis

6.1. The Cultural Importance Index (CI)

In our study, the cultural importance index varied between 0.04 and 0.56. Plants with a high IC index were: Cassia same (0.56), Bridelia micrantha (0.48), Senna occidentalis (0.48), Nauclea latifolia (0.44) and Ocimum gratissimum (0.32). The high IC Index of each plant indicates the significant importance of the latter in the traditional practices of the population studied, thus designating it as being the most recommended, used and known by the population which may reflect the recognition of its medicinal properties.

However, lower CIs were reported for Allium satium (0.04), Millettia versicolor (0.04), Chromolaena odorata (0.04), Carica papaya (0.04) and Saccharum officinarum (0.04).

6.2. Ethnobotanical use value

The use value of each species or Use Value species (UVs) cannot be calculated because the survey did not make it possible to quantify the number of times that the species different plants were used by each informant surveyed.

6.3. Loyalty level (FL)

Regarding this index we attributed particular importance and significance to plants with a FL value greater than or equal to 50. However, only one plant had a FL value of 56% recorded for Cassia same.

The first thing that follows from a high LF value is that the plant in question is widely recognized and used within the population studied to treat malaria.

In addition, this plant vegetates all year round and is found in almost all plots in the rural commune of Luozi. It is therefore among the dominant species of the said rural commune.

CONCLUSION

The ethnobotanical study carried out in the rural commune of Luozi, on medicinal plants used in the treatment of malaria, by herbalists and the local population, is of capital importance.

Despite the progress made in modern medicine, traditional medicine remains a valuable source, which allows the transmission of an ancestral heritage of in-depth knowledge on the properties of plants, in

particular those used for the treatment of malaria. This is confirmed by the results of the demographic data which revealed the predominance of the age group which has the greatest number of informants is 51 to 60 years old (16 herbalists and 5 people), or 42%, followed by that which goes from 61 to 70 years old (4 herbalists and 8 people), or 24%, that of 71 to 80 years old (6 herbalists and 5 people), or 22%, that of 40 to 50 years old (4 herbalists and 00 people), i.e. 8% and finally that of 81 to 90 years old (00 herbalists and 2 people), i.e. 4%.

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The results of this study highlighted the important knowledge on the use of medicinal plants in the treatment of malaria by the inhabitants of the rural commune of Luozi, which represents a source of valuable information which contributes to the enrichment of scientific knowledge, while preserving and promoting these traditional practices. The implementation of ethnobotanical studies offers an ideal reference framework for conserving and promoting this heritage. It makes it possible to create databases, which open up new research perspectives, in disciplines such as: pharmacy, medicine, biology and chemistry. Several authors, such as Dilmi M. 2021, DOUKHANE Roumeissa, 2018 and BeddarWafa, 2021 have investigated medicinal plants that treat diseases of the digestive system and the skin. We are the first to study malaria disease in the Luozi Territory, in central Kongo.

An 80-year-old woman told us that she had not swallowed a single tablet or been injected for almost 30 years. On the contrary, she always uses medicinal plants with fewer health problems. This justifies the therapeutic value of these plants.

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