

# Contribution to the Study of the Exploitation of Plant Species for Medicinal Use in the Democratic Republic of Congo

<sup>1</sup>Darceline Anangi Mokea and <sup>2,3</sup>Nsalambi Vakanda Nkongolo

<sup>1</sup>Doctoral Program in Agricultural and Forestry Research, University of Santiago de Compostela, Lugo, Spain

<sup>2</sup>School of Science, Navajo Technical University, Crownpoint, NM 87313, United State of America

<sup>3</sup>Faculty Institute of Agronomic Sciences of Yangambi, BP 1232 Kisangani, Tshopo Province, Democratic Republic of Congo

## ABSTRACT

**Background and Objective:** Medicinal plants are part of the health system in several countries. However, with the advent of climate change, some of these plants are disappearing. The exploitation of plant species for medicinal use in the villages of Yaboya II and Yasekwe, Turumbu Sector in Isangi territory, Tshopo Province, Democratic Republic of Congo was investigated. **Materials and Methods:** The survey technique based on a questionnaire coupled with documentary analysis was used. The age of the respondents varied between 20 and 70 years, the majority of respondents were men, i.e., 54.80% against 45.2% of women. The respondents were mostly (51.6%) of primary education level. **Results:** Twenty-two botanical families were inventoried by local populations for pharmacopeia needs, but the Fabaceae and Euphorbiaceae families were the most exploited at 14.29% each, followed by Rubiaceae with 8.57%, Meliaceae and Apocynaceae with 5.716% each. The bark was the part most used by local populations and cooking was the most used mode of consumption. **Conclusion:** Given that several diseases are cured, to satisfaction, by these medicinal plants, it would therefore be appropriate to help local populations to better manage this natural resource at a time when climate change is threatening.

## KEYWORDS

Medicinal plants, health system, Fabaceae, Euphorbiaceae, climate change, Turumbu, Democratic Republic of Congo

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## INTRODUCTION

Medicinal plants are an important component of health care for most of the world's population. They are the main medical material for 70-95% of citizens in most developing countries and are increasingly used by many people residing in the richest countries<sup>1,2</sup>. The contribution of medicinal plants to modern human medicine and their crucial role in traditional medicine have been documented by many authors. Numerous investigations have confirmed the presence of useful biological activities in thousands of species of medicinal plants or demonstrated health benefits in clinical trials<sup>3</sup>. Moreover, medicinal plants are widely used in traditional veterinary medicine<sup>4</sup>, in which improving the health of livestock has clear advantages



for the economic security of their owners. In addition, millions of people earn their living as traditional healers or collectors or sellers of medicinal plants. Finally, the collection and trade of medicinal plants is an important source of income for rural and urban populations, as the value of the global export trade of herbal ingredients has recently been estimated at over of 32.6 billion US dollars per year<sup>5</sup>. However, due to climate change and other threats, many plant species are or will soon be threatened with local or global extinction. A recent study reported that nearly 600 plant species have disappeared over the past 250 years<sup>6</sup>. Even without climate change, wild plant populations are threatened worldwide by human activities, particularly habitat destruction and fragmentation<sup>7-10</sup> which create small, isolated plant populations that are at a higher risk of local extinction<sup>11</sup>. Additional threats include the introduction and spread of invasive species and exotic pathogens<sup>12-14</sup> and increased herbivores resulting from the disappearance of top predators<sup>15</sup>. The Democratic Republic of Congo (DRC) is one of the Central African countries with the most significant portion of undisturbed forests. Therefore, the sustainable exploitation of non-timber forest products, such as the harvesting of the seeds, leaves and bark of medicinal plants present in these forests, could contribute not only to the preservation of a significant part of the biological diversity of tropical forests but also to the improvement of many local communities thanks to the creation of incomes and the equitable distribution of the wealth of the forest. This work aims to contribute to the study of the exploitation of plant species for medicinal use in the Turumbu Region. The specific objectives were to: (i) Inventory the different plant species for medicinal use by the Turumbu Community, (ii) Study the different parts or organs used and their mode of use and (iii) Determine the harvesting techniques used.

## **MATERIALS AND METHODS**

**Geographic location:** This work was carried out in the Turumbu Region in 2016, on the Kisangani-Yangambi transect. The Turumbu Region is located in the northeastern part of the central basin, province of Tshopo in the Democratic Republic of Congo. Its geographic coordinates are 0° 54' North latitude and 24° 23' East longitude and 396-400 m altitude. This region is located in the middle of a forest zone with a humid equatorial climate of the Af type according to the Koppen classification. The average annual temperature is between 23 and 26°C and annual rainfall is above 1800 mm. The relative humidity varies between 80 to 90%<sup>16</sup>. The soils are ferralitic and rich in aluminum and iron oxide. The pH is generally between 4 and 5. For the present study, two villages were selected due to the size of their population.

**Survey for data collection:** Using a pre-established survey questionnaire, a set of questions and answers were given to the respondents, in order to obtain from them the information needed for this study. In total, 101 people in both villages were surveyed. The choice of the interviewees was oriented above all on age, then on availability. In relation to age, adults were more targeted, as they were supposed to have the necessary information.

**Statistical analysis:** Data were analyzed, by carrying out simple calculations of the relative frequencies expressed as a percentage, by using the equation<sup>17</sup>:

$$rf = \frac{of}{N} \times 100$$

Where:

rf = Relative frequency

of = Observed frequency

N = Number of individuals

## **RESULTS**

**Age, family and plant parts consumed:** The age of the respondents varied between 20 and 70, with a high proportion in the 20-30 age group, followed by 51-60 represented in Fig. 1. On the other hand, the age group 61-70 was the least represented. The respondents were mostly men, i.e., 54.8% against 45.2% who

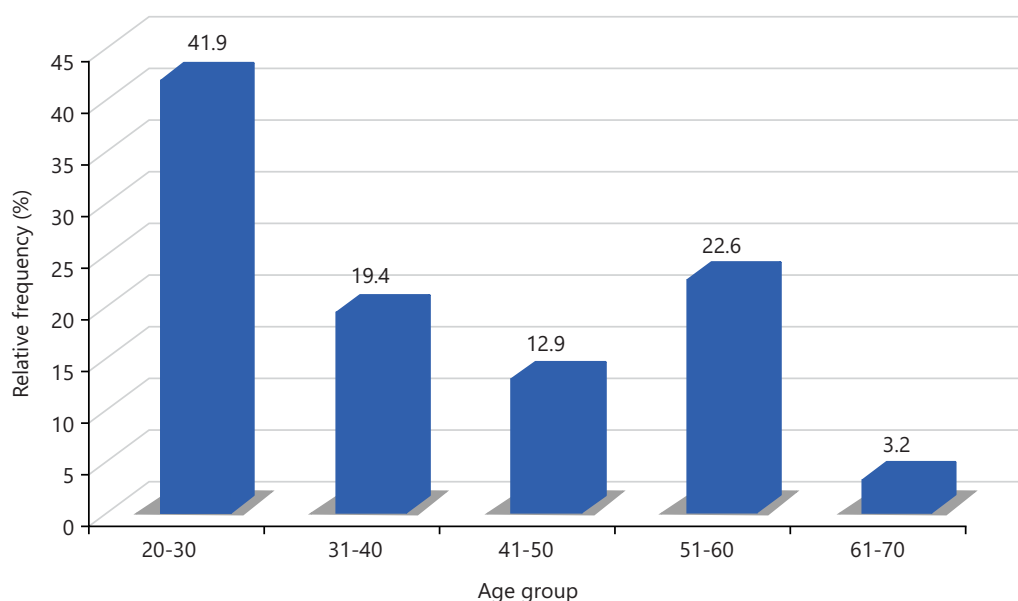


Fig. 1: Respondent's age group

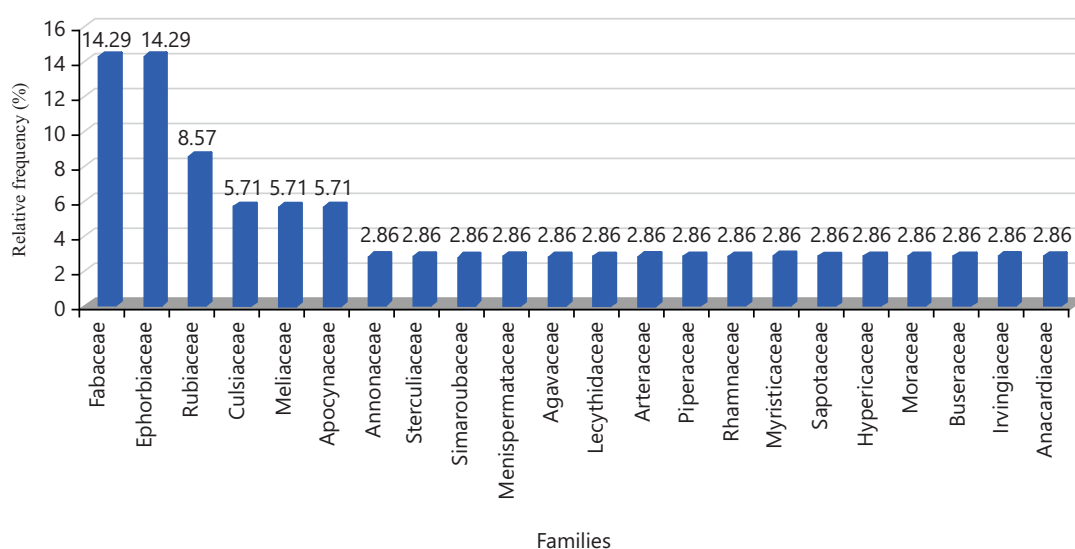


Fig. 2: Inventoried plant families

were women. The majority of the respondents had an elementary level (51.6%) of education, followed by secondary school level with 29%. On the other hand, high graduates were poorly represented, i.e., 3.2%, against no university-educated respondents. For our inventory of the medicinal plants used in the Turumbu Region, it has appeared from Fig. 2 that twenty-two botanical families were identified by the local population for their pharmacopeia needs. The analysis of this Fig. 2 showed that the Fabaceae and Euphorbiaceae families were the most exploited with 14.29% each, followed by the Rubiaceae with 8.57% and the Clusiaceae. Meliaceae and Apocynaceae with 5.716% each. The other remaining families represented only 2.86%. The different parts used by the local communities to treat their different illnesses were: The bark which is the most used part by the village population and neighboring communities of the study area (42.4%), followed by the roots (33.9%). The leaves come in third position with 20.3% while the seeds were not often consumed (3.4%).

**Mode of consumption:** Cooking is the most preferred mode of consumption (54.3%). So, most of the respondents take their plant products (medicines) in the cooked state while 45.7% still consume them raw.

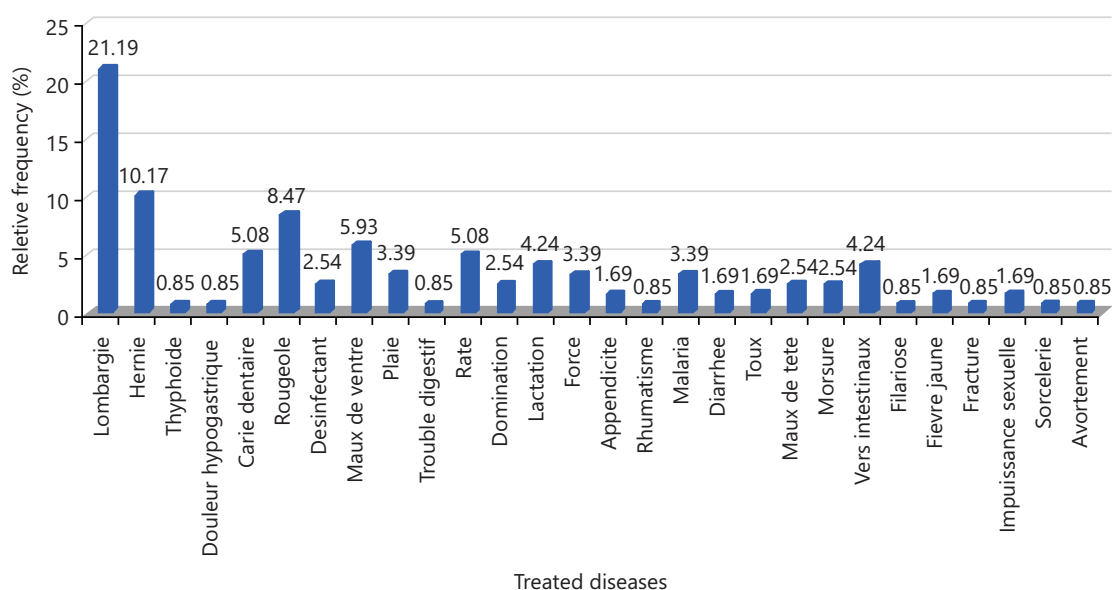


Fig. 3: Diseases treated by medicinal plants

**Diseases treated:** Several diseases were cured by medicinal plants in this study environment. Of the 35 diseases listed, lower back pain was treated by 7 species (21.19%); Hernia by 4 species (10.17%), hypogastric pain, malaria and sexual impotence are cured by 2 species (5.93%). On the other hand, filariasis and fractures were treated by 1 species (1.7%), as showed in Fig. 3.

**Harvesting techniques:** Several techniques for harvesting plants for medicinal use, some of which are harsh and expose these resources. The majority of the surveys, i.e., 59.2%, take samples for their pharmacopeia from young individual plants, against 40.8% who take them by simple extirpation. However, we believe that one or the other of the techniques used by the Turumbu communities does not reassure the sustainability of these resources because they expose them to diseases and xylophagous insects.

**Satisfaction in terms of healing:** As 72% of respondents said that they were completely cured of their illnesses by medicinal plants, compared to 27.9% who consider that these remedies acted as a tranquilizer or relief for their illnesses.

## DISCUSSION

Our study identified twenty-two botanical families with the Fabaceae and Euphorbiaceae being more exploited as compared to other families. This study's findings, in terms of medicinal plant families, were similar, to the one reported by Mpiana *et al.*<sup>18</sup> who conducted an ethnobotanical survey on medicinal plants used in the management of sickle cell disease by traditional healers in Kisangani City and Babogombe Village, two localities belonging to the Tshopo District. They reported several species with the Fabaceae family is the most exploited. Current results were also similar to those reported by Termote<sup>19</sup>, who studied wild plants for medicinal use among the Mba people of Balila in the Bengamisa Region, Tshopo Province, Democratic Republic of Congo. Termote<sup>19</sup> investigated the rapidly disappearing wild edible plants in three Turumbu Villages. These plants promoted health and preserve diversity. They identified 85 species within 70 genera and 44 families. Pathy *et al.*<sup>20</sup> focused on the medicinal plants used in Kisantu and Mbanza-Ngungu territories in the Kongo-Central Province of DR-Congo. They identified a total of 231 plants (i.e., 227 botanical species, representing 192 genera and 79 families) which were reportedly as used to treat 103 diseases. The most abundant taxa were reported for the Fabaceae family (including 11.9% of species and 10.9% of genera). Bakwaye *et al.*<sup>21</sup> recorded 195 medicinal plants made

of 165 botanical species belonging to 138 genus and 56 families with similar results to Pathy *et al.*<sup>20</sup> in terms of family. Finally, conducting an ethno-medicinal survey of medicinal plants used in the management of sickle cell disorder in Southern Nigeria, Amujoyegbe *et al.*<sup>22</sup> surveyed one hundred and seventy five plant species belonging to 70 families, of which the Fabaceae family made up 26.76% and Euphorbiaceae 16.90% forming the highest occurrence. Furthermore, it was also observed that leaves were the most common plant part used (69.10%) followed by root (15%) and stem bark (14%) in the preparation for sickle cell management. In view of these results, it is clear that the Fabaceae and Euphorbiaceae families were full of medicinal plant species highly coveted by local communities and therefore were the most exploited. It also appeared that harvesting from the vine was the technique mostly used in different farming environments. This removal can be done by partial or total debarking, by uprooting or skimming (topping).

## CONCLUSION

The objective of this study was to investigate the exploitation of plant species for medicinal use by the Turumbu Community. The results showed that plant species of the Fabaceae and Euphorbiaceae families were the most exploited. The bark was the part most used by the local populations and cooking was the most used mode of consumption. Several diseases are cured by medicinal plants. Given the large range of diseases treated by plants in our study environment, it is suggested that great care should be taken for these plant species. Furthermore, the standing sample was the most used harvesting technique. Given that the products used in pharmacopeia are taken from standing individuals, either by partial or total debarking, by uprooting or by topping, we believe that this technique is destructive, especially in the case of total debarking. We suggest to the Turumbu Community to avoid harvesting techniques that do not make it possible for the plant to survive and continue to grow. These plant species must be well protected and well managed to enable future generations to benefit from them as well.

## SIGNIFICANCE STATEMENT

A large portion of the Congolese population still depend on medicinal plants to treat their diseases given the inaccessibility to modern hospital facilities. Unfortunately, many of these plant species are disappearing due to over exploitation and climate change. This study investigated what plant species are still available to the Turumbu people, what plant part is most used and what diseases are cured. Results showed that twenty-two botanical families are still available to the Turumbu people, with the Fabaceae and Euphorbiaceae families being the most exploited. The bark was most used part and several diseases were cured to satisfaction.

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