Ethnobotanical and floristical study of medicinal plants in the Minkouala village, Gabon

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PLAN

• INTRODUCTION
• MATERIALS AND METHOD
• RESULTS
• DISCUSSIONS
• CONCLUSION AND THE WAY FORWARD
INTRODUCTION: definition

- NTFPs: goods and services, other than timber, derived from renewable forest resources which enable people to meet their basic needs (food, health, construction, crafts, cultural, etc.) and the marketing benefits primarily to village communities.
INTRODUCTION: problem

• Being considered *minor*, there is hardly any attention paid to them in terms of inventory, management, conservation and related research.

• Similarly, the necessary skill base in the management and utilisation of these resources is poorly developed.
INTRODUCTION: ethnobotany

• The aim of ethnobotany is to study how and why people use and conceptualize plants in their local environments.
• The two questions most asked are:
  • (1) how and in what ways people use nature and
  • (2) how and in what ways people view nature
INTRODUCTION: objectives

• To gather data on the traditional use of medicinal plants in the Minkouala village;

• To characterize the recipes cited: plant parts used, pharmaceutical forms, modes of administration of recipes, association of plants in recipes;
INTRODUCTION: objectives

• To assess the abundance of medicinal plants in the forest: density, stock, biomass;
• To characterize the useful flora: geographic distribution, biological forms, habitat preferences, modes of scattering of seeds.
RESEARCH TEAM

• Dr Jean Lagarde BETTI, University of Douala, Cameroon;
• Dr Olga Diane YONGO, University of Bangui, Central African Republic (CAR);
• Mr Diosdado OBIANG MBOMIO, INDEFOR, Equatorial Guinea;
• Dr Donald MIDOKO IPONDA, IRET, Gabon
• Mr Alfred NGOY, IRET, Gabon;
• Christian MIKOLO YOBO, IRET, Gabon
THE STUDY SITE

- Surveys were conducted in 10 villages;
- Minkouala is one of those villages;
- Minkouala is situated at 20 km from Makokou, in the road Makokou – Libreville.
- Minkouala village has about 2 000 inhabitants, composed mainly of the Fang ethnic group.
METHOD: Ethnobotanical surveys in villages (10 villages)

- Direct interviews among villagers: ailments treated, plants parts used, pharmaceutical forms, mode of administration;
- 15 households investigated in Minkouala;
Ethnobotanical surveys in villages

• 3 missions effectuated
• At least 12 young persons trained in conducting ethnobotanical surveys
• 4 ethnic groups
• 10 villages prospected
METHOD: Gathering of botanical samples and identification of plants in the herbarium
METHOD: inventories in the forest

• Assessment of the abundance of plants in the forest:
• The surrounding forest is a mixture of primary and secondary forests.
• It is estimated at 10,000 ha of forests, with the production forest occupying 5,000 ha.
• The area has already been subject to forest logging and mining activities.
METHOD: Sampling design

Two sites of production forest were delimitated in the Minkouala village, separated by the road Makokou – Libreville. Site A (up) has 2 000 ha and site B (down) has 3 000 ha.
METHOD: Sampling design

• We used a Global Positioning System (GPS) and vegetation maps to settle our sampling plots.
• The sampling was systematic and stratified to 1 degree when the statistical unit is the plot;
• The samples or plots of 0.5 ha are distributed systematically throughout the entire population.
METHOD: Sampling design

• The systematic disposal of plots allows to assume that the intensity of sampling for each stratum is proportional to its area in the forest;

• In practice, sampling was carried out along straight and continuous axes or transects...
METHOD: Sampling design

• These transects are oriented along a predetermined cardinal direction but are systematically arranged in such a way that they are mostly parallel, equidistant and perpendicular to the general direction of the main road linking Makokou to Libreville;

• The mapping activity allowed us to distinguish four main forest types: the primary forest, the secondary forest, the swamp forest and the cultures (agricultural areas)
METHOD: Sampling design

- Rectangular plots arranged along a transect are contiguous and measure 200 m in the direction of the transect (length) and 25 m in the direction perpendicular to the transect (width);
- The distance between two consecutive lines is 800 m. A total of 4 km of lines was planned per site.
RESULTS

• A total of 15 informants with an average age of 54 years old including 11 women and 4 men were interviewed in the Minkouala village.
• Those informants cited a total of 174 citations and 65 plant species in the treatment of 31 ailments.
Evolution of the number of plants with the number of informants

\[ y = 2.833x + 23.1 \]

\[ R^2 = 0.9492 \]
Ailments cited

Malaria appears to be the most important ailment treated in the general pharmacopoeia. This may be due by the fact that, Gabon as far as Cameroon are both located in the high risk zone of malaria, zone C.
Villagers have through experience observed that plant parts such as barks, leaves and roots are sites of bio-synthesis and sites of storage of secondary metabolites.
Chenopodium ambrosioides
(against intestinal worms)
The plant species for which the recipes allow a long conservation (storage: oil, powder) will be less vulnerable compared to those which must be used immediately like decoction and maceration
Modes of administration of recipes

![Chart showing modes of administration with corresponding percentages]
Plants cited

A good activity of *A. bonnei* (IC50 < 4 µg/ml) was revealed against *Plasmodium falciparum* FcB1/Colombia. *Carica papaya*’s use against malaria is justified by the presence of high concentrations of active compounds in the seeds. *A. chlorantha* is active against *Plasmodium yoelii nigeriensis*.
### Sampling parameters

#### Table 5. Sampling parameters

<table>
<thead>
<tr>
<th>Site</th>
<th>Line n°</th>
<th>Length (Km)</th>
<th>Number of plots</th>
<th>sampling area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>2</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>2</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>4</td>
<td>2</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>1</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>2.5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>10</td>
<td>50</td>
<td>25</td>
</tr>
</tbody>
</table>
Density of medicinal plants

Table 6. Density of medicinal plants found in the Minkouala forest

<table>
<thead>
<tr>
<th>Plant</th>
<th>Number of stems recorded</th>
<th>Citations in local medicine</th>
<th>Sampling area (ha)</th>
<th>Density (number of stems/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musanga cecropiodes</td>
<td>144</td>
<td>2</td>
<td>25</td>
<td>5.76</td>
</tr>
<tr>
<td>Dialium pachyphyllum</td>
<td>83</td>
<td>1</td>
<td>25</td>
<td>3.32</td>
</tr>
<tr>
<td>Uapaca guineensis</td>
<td>41</td>
<td>1</td>
<td>25</td>
<td>1.64</td>
</tr>
<tr>
<td>Macaranga monandra</td>
<td>30</td>
<td>1</td>
<td>25</td>
<td>1.2</td>
</tr>
<tr>
<td>Coula edulis</td>
<td>27</td>
<td>2</td>
<td>25</td>
<td>1.08</td>
</tr>
<tr>
<td>Pausinystalia johimbe</td>
<td>23</td>
<td>1</td>
<td>25</td>
<td>0.92</td>
</tr>
<tr>
<td>Piptadeniastrum africanum</td>
<td>22</td>
<td>1</td>
<td>25</td>
<td>0.88</td>
</tr>
<tr>
<td>Alchornea floribunda</td>
<td>15</td>
<td>5</td>
<td>25</td>
<td>0.6</td>
</tr>
<tr>
<td>Manniophyton fulvum</td>
<td>13</td>
<td>3</td>
<td>25</td>
<td>0.52</td>
</tr>
<tr>
<td>Zanthoxylon heitzii</td>
<td>12</td>
<td>1</td>
<td>25</td>
<td>0.48</td>
</tr>
<tr>
<td>Alstonia boonei</td>
<td>11</td>
<td>16</td>
<td>25</td>
<td>0.44</td>
</tr>
<tr>
<td>Croton oligandrus</td>
<td>11</td>
<td>1</td>
<td>25</td>
<td>0.44</td>
</tr>
<tr>
<td>Coula edulis</td>
<td>10</td>
<td>2</td>
<td>25</td>
<td>0.4</td>
</tr>
<tr>
<td>Pterocarpus soyauxii</td>
<td>9</td>
<td>5</td>
<td>25</td>
<td>0.36</td>
</tr>
</tbody>
</table>

According to the Pilot Integrated Management Project (API project) which has been working in the East province of Cameroon for a long time, a plant species is said to be less represented for logging when its average density is less than 0.05 stem/ha.
Diameter classes distribution of *Alstonia boonei* (Apocynaceae)
Guinean species composed of Guinean-congolesse and Congo basin species are most represented in terms of both number of plant species (50%) and citations (48.7%). The importance of guinean species confirms the position of Minkwala in the Guinean phytogeographical area. The importance of pantropical species is due to the presence of banal plants including ruderal and cultivated species in the medicinal flora.
Biological/Morphological forms

<table>
<thead>
<tr>
<th>Morphological types</th>
<th>Plant species</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small trees</td>
<td>10.7</td>
<td>13.5</td>
</tr>
<tr>
<td>Trees</td>
<td>46.4</td>
<td>41.0</td>
</tr>
<tr>
<td>Annual herbs</td>
<td>12.5</td>
<td>9.0</td>
</tr>
<tr>
<td>perennial herbs</td>
<td>12.5</td>
<td>5.1</td>
</tr>
<tr>
<td>Lianas</td>
<td>5.4</td>
<td>4.5</td>
</tr>
<tr>
<td>Schrubs</td>
<td>12.5</td>
<td>26.9</td>
</tr>
</tbody>
</table>
Cultivated plant species abound in the medicinal flora of Minkouala village. This characterizes the medicinal flora of that village, since in many areas in the Congo basin, cultivated plants are less represented among medicinal plants.
About 70% of the plants cited are scattered by animal or man. This finding shows the important role of animals in the regeneration of forests.
CONCLUSION & WAY FORWARD

• The analysis of the curve: number of informants – plants cited tends to show that our sample surveyed is not representative of the pharmacopoeia used in the Minkouala village.

• The same remark is done for what concerns the sampling intensity used to assess of the abundance of plants in the surrounding forest.
CONCLUSION & WAY FORWARD

• However, the fact that some plant species cited by Minkouala people be recognised for their activity, is a credibility index which can be attributed to the pharmacopoea of those people.

• This also illustrates the efficiency of the method used to identify medicinal plants of the Minkouala village.
CONCLUSION & WAY FORWARD

• The glaring development challenge at the back-ground of what precedes is the pressing need to:

• (1) Finalise the identification of plants cited through botanical samples collections and identification in the herbarium;

• (2) finalise data analysis in view to write papers and books;
CONCLUSION & WAY FORWARD

• (3) extend the surveys among other villagers and the specialized healers as to gather more plant species;

• (4) implement strategies to identify active chemical substances of other plant species which have not yet been investigated;
CONCLUSION & WAY FORWARD

• (5) Further researches needed as to better define the management parameters for important NTFPs including: the definition of the minimum diameter of regular fructification, the best minimum diameter of exploitability, the tariff cubage, the exact biomass of the product (fruits, fresh barks, leaves, ... to harvest sustainably)
CONCLUSION & WAY FORWARD

• (6) dress the simple management plan of the Minkouala village;
• (7) dress the simple management plan of the most important plant species such as *Alstonia boonei*, *Annickia chlorantha*, *Coula edulis*
CONCLUSION & WAY FORWARD

• (8) implement those simple management plans;
• (9) extend the study in other sites in the Congo Basin;
• (10) Assist local communities in managing their community forests;
• (11) assist in improving forest laws for what concerns NTFP in the Congo basin.
An ethnobotanical study of medicinal plants among the Baka pygmies in the Ipassa-Makokou Biosphere Reserve, Gabon.

*European Journal of Medicinal Plants (EJMP)*
PUBLICATIONS SUBMITTED

• Ethnobotanical study of medicinal plants of the Ipassa-Makokou Biosphere Reserve, Gabon: plants used for treating malaria. *Journal of Medicinal Plant Research (JMPR-12-1211)*;

• Ethnobotanical and floristical study of *Alstonia boonei* De Wild. (Apocynaceae) in the Makokou region, Oogoué-Ivindo province, Gabon. *International Journal of Agricultural Sciences (IJAS - 12 - 230)*
PUBLICATION IN PREPARATION

• Endangerment of some medicinal plants of the Makokou region, Oogoué-Ivindo province, Gabon;
THANK YOU!!!