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# Recipes and Treatments in Traditional Herbal Medicine to the Kaamba Community of Madingou, Congo

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***Authors' contributions***

*This work was carried out in collaboration between all authors. Author VK designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors JCM and MYLS managed the analyses of the study. Author ENM managed the literature searches. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aims:** Studying the recipes in popular use of medicinal plants by Kaamba community settled in savannah and their analyses.
**Study Design:** It highlights the socio-cultural basis of this society through phytotherapeutic data.
**Place and Duration of Study:** The ethnobotanical study was carried out in Madingou (in the South Congo) within the Kaamba community. Data obtained from direct interviews conducted in August and September 2015 in Madingou.
**Methodology:** For each health problem cited, the plant name, the used parts, the modes of preparation and administration of recipes were recorded. The plants were identified in the herbarium (IEC), Brazzaville. The relative importance of the plants was established based on the number of citations and events occurred in the recipes. There are 32 informants, including 22 women, age range being 15 to 70 years, delivered their knowledge unconditionally.

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**Results:** This survey concerns 80 vascular plants harvested in the savannah, along the rods, and around the houses. The analysis shows that 70 medicinal recipes in simple and complex. These potions cover 43 diseases and symptoms corresponding to 11 spheres of diseases and organs. The decoction (44.4%) is the dominant and de facto pharmaceutical form (65.3%). The most cited diseases have a prevalence ranging from 31.3 to 68.8% and are related to childhood.
**Conclusion:** Therapeutic knowledge is very immense in primary health care, but this potential is eroded by several factors, such as the anarchic urbanization of the environment favouring the depletion of taxa by the destruction of habitats and the rural exodus responsible for the exile of young people in search of a better well-being.

*Keywords: Congo; ethnobotany; recipes; treatments; traditional knowledge; diseases and symptoms.*

## 1. INTRODUCTION

Since antiquity, humans around the world have used biodiversity at their fingertips, managing them sparingly to satisfy their daily needs [1,2,3]. It was by exploiting this biodiversity, both animal and herbal, that they obtained the comfort necessary for their subsistence and the well-being. These include food, medicines, tools, clothing, utensils, habitats, etc. Like animals, it is in the diet that man unconsciously self-administers natural aids. By experimenting empirically with the phytotherapeutic properties of different plants, a natural selection of useful taxa was highlighted [2].

According to WHO in [4], traditional medicine is "the set of all knowledge and practices, whether explicable or not, transmitted from generation to generation, orally or in writing, used in a human society to diagnose, or eliminate an imbalance in physical, mental, social, moral and spiritual well-being ". Traditional therapist is "a person who is recognized by the community in which he or she lives, as competent to provide health care, through the use of plant, animal and mineral substances, and other methods, based on the sociocultural basis and religious, as well as knowledge, behavior and beliefs".

The biodiversity of the tropical world in general and sub-Saharan Africa in particular is proportionately associated with therapeutic diversity. Notwithstanding a weakness in pathophysiology, African phytotherapy offers an impressive range of traditional knowledge [2,3]. Thus, over the centuries, this infinity of empirical knowledge has always been used by human communities as a therapeutic source. Since the transmission of knowledge is oral, the knowledge acquired is transmitted from generation to generation. Despite the fact that we find the first written documents mentioning drugs such as opium and jusquiame, about 4000 BC, the distillation of endogenous knowledge remains the domain of orality in Africa.

For several decades, several works have been devoted to medicinal plants and traditional herbal medicine. It follows that many plants have shown: (i) proven therapeutic effects; (ii) and more than one identified active ingredient [5,6,7]. They are a major authenticated source of active ingredients, as noted: Approximately 119 chemicals used as major drugs in 62 therapeutic classes are extracted from 91 plant species [6]; on the top of 25 pharmaceutical products in the world in 1995, 12 were of natural origin [5]. The medicinal plants are an invaluable source of new molecules for the pharmaceutical industry [7]. In 1999, about 139,000 secondary metabolites were identified in the natural products dictionary and about 4,000 new ones are recorded each year. Finally, from 1983 to 2000, the Institute of Pharmacognosy and Phytochemistry at the University of Lausanne (Switzerland) revealed that 47 plants out of 1337 harvested in Africa, whose phytochemistry was established, analysis of 4679 extracts, Identify and isolate 263 constituents, including 75 new ones [4].

The use of traditional medicine is booming around the world and its interest is more than manifested. By way of examples, it is noted that in China herbal medicines play a popular role in health care, as in the case of Chile & Columbia. In India, 65% of the rural population uses ayurveda and medicinal plants in primary health care. In developed countries, traditional, complementary and alternative medicines are increasingly successful. Thus, the percentage of the population using these medicines at least once is 48% in Australia, 31% in Belgium, 70% in Canada, 49% in France, and 42% in the United States of America. In sub-Saharan Africa and the Republic of Congo, more than 80% of the population uses endogenous individual

knowledge or traditional therapists for primary health care [2,3,4,8].

The objective of this study is to focus on (i) the therapeutic potential of Congolese biodiversity, especially savannahs, and (ii) endogenous knowledge related to herbal medicine, associated with the surrounding populations.

## 2. MATERIALS AND METHODS

### 2.1 Study site

Madingou, capital of the Bouenza Prefecture, is bordered by limestone and plateaux hills and altitude varies from 200 to 700 m [9]. The altitudinal range between 100 and 400 m (Fig. 1).

#### 2.1.1 Physical geographic of site

The study site, located between 4° and 5° South latitude, evolves under the transitional equatorial climate known as "Bas-congolais" [10,11]. Two seasons (Fig. 2), with a warm and humid rainy season showing a slowdown from January to February and two rainfall peaks in (i) November and (ii) March and April are noticed. The annual rainfall ranges from 1000 to 1200 mm. The dry and cool season runs from June to September [12]. The average annual temperatures are from of 25℃, with low thermal amplitudes. The average relative humidity is about 80% and it varies very little between the two seasons.

The vegetation is of grassy savannah type and sometimes consists of an herbaceous stage (*Hyparrhenia* sp., *Andropogon* sp., *Panicum* sp.) and a shrub floor of 2-5 meters where *Annona senegalensis, Bridelia ferruginea*, and especially *Hymenocardia acida* on schisto-calacar soils [12].

#### 2.1.2 Population and economic activities

Madingou, with a predominantly peasant population, is the most populous district of the Congo. Its density is 106.4 inhabitants / $km^2$ compared to 25.2 inhabitants/ $km^2$ at the regional level and 10.8 inhabitants/ $km^2$ at the national level [13]. The district of Madingou, is home to two urban communes and the framework of the study is the urban commune of Madingou and partly the district of Madingou.

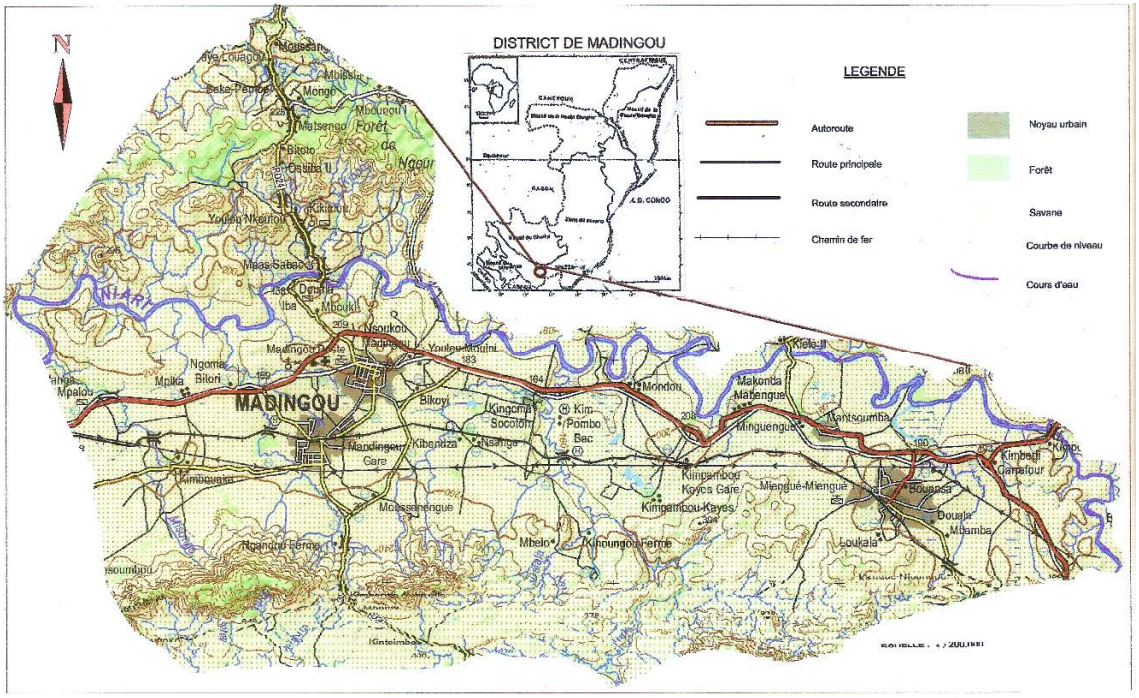



**Fig. 1. Localization and geographical situation of the District of Madingou, in South of Congo**

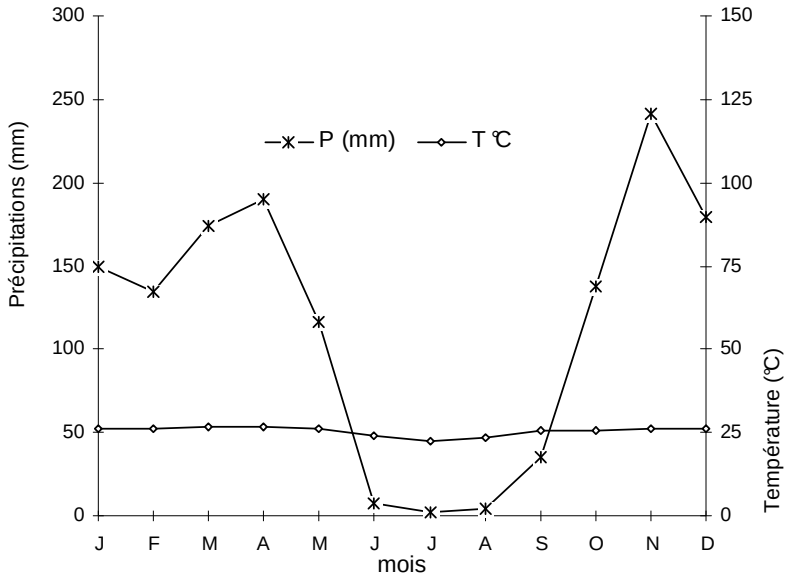



**Fig. 2. Ombrothermal diagram of the study area**

## 2.2 Materials

The ethnobotanical study took place from September to October 2015. The ethnobotanical investigation is based on the knowledge of the different members of the Kaamba ethnic group who have knowledge about the virtues of plants.

The material consists of medicinal plants, in daily use by the Kaamba ethnic group. Species identification was done in situ for both current taxa and the national herbarium (IEC) for those which could not be identified in the field. Applied ordination is APG III [14] and the taxonomic nomenclature adopted is derived from Lebrun and Stork [15]. The names of diseases and symptoms are taken as given by the informants. The definitions and classifications used for the diseases and symptoms treated comply with WHO standards [16].

During this inventory, the plant parts used, symptoms and the diseases treated were noted down. In addition to these aspects, the investigation covers medication preparation, dosage and mode of administration.

## 2.3 Populations Surveyed

In the absence of professional healers and traditions, the informant group relies on those who use these practices. Its basically consists of adults and the elderly. The number of informants does not depend on the importance of the locality in terms of resident, but rather on the number of individuals possessing endogenous knowledge about the medicinal virtues of the plants. There are 32 informants, including 22 women.

## 2.4 Methods of Study

The method of study is based on three complementary phases: (i) The bibliographic review; (ii) Data collection in the field; (iii) the participatory ethnobotanical survey.

The bibliographical review made it possible to make the inventory on the ethnobotanical works, in the world and especially in Congo and our edition. It follows that the studies have a generalizing character, which does not reveal the specificities of ethno-linguistic groups.

The collection of field information which are the 2 parts- specify: (i) custom interviews and focus groups that involve both genres. Interviews are semi-informative and based on an open-ended interview guide, with no influence on informant response [17].

The participatory approach consists of identifying the resource and knowing the associated properties. This procedure makes it possible to select and authenticate the information received and to materialize it by observing the tangible signs of exploitation. The participatory approach to ethnobotany involves tracking specimen

collection, potion preparation and administration, whenever possible.

## 3. RESULTS

### 3.1 Floristic Data

The floristic inventory revealed 80 species for 72 genera and 33 families, 63.6% of which were dicotyledons and 36.4% of monocotyledons (Table 1). The Fabaceae (16.25%) are the most representative. Most of the families are with one species each. They make up the majority (51.5%) and the respective contribution is 1.25%.

The analysis of this phytotherapeutic cohort shows that 26.5% are allochtones and mostly cultivated. As for the remaining 74.5%, there are nitrophytes, ruderals and species from the hut gardens and / or orchards, and the surrounding savanna. This floristic diversity covers aspects related to the traditional phytopharmacopoeia.

The citation rate of the species used in traditional herbal medicine varies from 3.1 to 68.7%. Species with a citation rate greater than or equal to 40% correspond to 19% of the inventory with a majority having more than 50% citations (Table 1).

**Table 1. Synopsis of useful plants and types of uses in the Madingou terroir**

| N° | Taxon | Family | Vernacular name | Part use | Number of citations |
|---|---|---|---|---|---|
| 1. | *Mimosa pigra* L. | Fabaceae | Kikengui | Leaf | 5 (15.6%) |
| 2. | *Kalanchoe crenata* (Anders.) Harv. | Crassulaceae | Yuka | Leaf | 1 (3.1%) |
| 3. | *Ageratum conyzoides* L. | Asteraceae | lukaya lua koki | Leaf | 18 (56.2%) |
| 4. | *Solanum melongena* L. | Solanaceae | Binsoukoudou | Leaf | 18 (56.2%) |
| 5. | *Boerhaavia diffusa* L. | Nyctaginaceae | Nsolokoto | Tuber root | 18 (56.2%) |
| 6. | *Senna occidentalis* (L.) Link. | Fabaceae | Kinkadimina | Leaf Root | 5 (15.6%) |
| 7. | *Vitex madiensis* Oliv. | Verbenaceae /Lamiaceae | Mfilou | Dry leaf | 13 (40.6%) |
| 8. | *Indeterminate* | Indeterminate | musinga musitu | Root | 4 (12.5%) |
| 9. | *Sarcocephalus latifolius* (Smith) Bruce | Asteraceae | Mutumbi | Root | 14 (43.7%) |
| 10. | *Vernonia amygdalina* Del. | Asteraceae | Munduri-nduri | Leaf, Root | 9 (28.1%) |
| 11. | *Moringa oleifera* Lam. | Moringaceae | Murenga | Leaf, Root, Bark, Seed | 8 (25%) |
| 12. | *Arachis hypogaea* L. | Fabaceae | Nguba | Seed | 8 (25%) |
| 13. | *Adansonia digitata* L. | Acanthaceae | mukondo | Root | 11 (34.4%) |
| 14. | *Momordica charantia* L. | Cucurbitaceae | Dimbussi-mbussi | Leaf | 9 (28.1%) |
| 15. | *Desmodium gangeticum* L. *DC.* | Fabaceae | Dintata | Leaf | 4 (12.5%) |
| 16. | *Aspilia kostchyi* (Sch. Bip.) Oliv. | Asteraceae | Mudjodi | Leaf | 2 (6.2%) |
| 17. | *Vernonia* sp. | Asteraceae | Lubangu-bangu lua kento | Leaf | 7 (21.9%) |
| 18. | *Saccharum officinarum* L. | Poaceae | musié | Leaf | 8 (25%) |
| 19. | *Desmodium velutinum* (Wilid.) DC. | Fabaceae | Lubata-bata | Leaf | 9 (28.1%) |
| 20. | *Ocimum gratissimum* L. | Lamiaceae | Mansusu-nsusu | Leaf | 3 (9.4%) |
| 21. | *Zea mays* L. | Poaceae | Masangu | Stigma (style) | 9 (28.1%) |
| 22. | *Pennisetum purpureum* Schum. | Poaceae | Madiadia | Leaf | 5 (15.6%) |
| 23. | *Citrus limon* (L.) Burm.f. | Rutaceae | Dingumu | Root | 18 (56.2%) |
| 24. | *Quisqualis hensii* (Enql. & Diels) Exell | Combretaceae | Lusumbi-sumbi | Leaf | 4 (12.5%) |
| 25. | | | Muwissi | Leaf | 2 (6.5%) |
| 26. | *Manihot esculenta* Crantz | Euphorbiaceae | Ntomba | Leaf | 4 (12.5%) |
| 27. | *Bambusa vulgaris* Schrad. | Poaceae | Hesé | young shoots | 8 (25%) |
| 28. | *Sida acuta* Burm. F. | Malvaceae | Ntumvumvu | Leaf | 2 (6.5%) |
| 29. | *Chromolaena odorata* (L) King & Robinson | Asteraceae | Kikandimina | Leaf | 5 (15.6%) |

| N° | Taxon | Family | Vernacular name | Part use | Number of citations |
|---|---|---|---|---|---|
| 30. | *Lycopersicon esculenta* Mill. | Solanaceae | Tumatu | Leaf | 8 (25%) |
| 31. | *Alchornea cordifolia* Mill. Arg. | Euphorbiaceae | Mubunzi | Leaf | 2 (6.5%) |
| 32. | *Terminalia catappa* L. | Combretaceae | Damier | Bark | 4 (12.5%) |
| 33. | *Acanthospermum hispidium* DC. | Asteraceae | Madiata ma mutele | Whole plant | 1 (3.1%) |
| 34. | *Persea americana* Miller | Lauraceae | Muvoco | Leaf<br>Kernel | 13 (40.6%) |
| 35. | *Annona muricata* L. | Annonaceae | mucorossol | Leaf | 18 (56.2%) |
| 36. | *Eucalyptus citriodora* Hook. | Myrtaceae | Eucalyptus | Leaf | 18 (56.2%) |
| 37. | *Dacryodes edulis* (G.Don) Lam. | Burseraceae | Musafu (Safoutier) | Fresh leaf<br>Dry leaf | 8 (25%) |
| 38. | *Lantana camara* L. | Verbenaceae | mulantana | Leaf | 9 (28.1%) |
| 39. | *Ficus* sp. | Moraceae | Musanda | Leaf | 8 (25%) |
| 40. | *Hibiscus sabdariffa* L. | Malvaceae | Nkinkula | Leaf | 3 (9.4%) |
| 41. | *Vigna unguculata* (L.) Walpers | Fabaceae | Ndamba | Valve | 5 (15.6%) |
| 42. | *Elaeis guineensis* Jacq. | Arecaceae | Ba | Fruit<br>Juice<br>Palm oil | 12 (37.5%) |
| 43. | *Musa x sapientum* L. | Musaceae | Makonda | inflorescentiel axis | 3 (9.4%) |
| 44. | *Bidens pilosa* L. | Asteraceae | nkongui nza ngoulou | Leaf | 6 (18.7%) |
| 45. | *Citrus sinensis* (L.) Osbeck. | Rutaceae | Mulala | Leaf | 1 (3.1%) |
| 46. | *Gossypium hirsutum* L. | Malvaceae | Cotonnier | Leaf | 1 (3.1%) |
| 47. | *Cola acuminata* (P. Beauv.) Schott & Endl.<br>*Cola nitida* (Vent.) Schott & Endl. | Malvaceae | Mukasu | Nut | 10 (31.2%) |
| 48. | *Spondias monbin* L. | Anacardiaceae | Mungengue | Leaf | 12 (37.5%) |
| 49. | *Senna siamea* (Lam.) Irwin & Barneby | Fabaceae | Acassia | Roots | 3 (9.4%) |
| 50. | *Carica papaya* L. | Caricaceae | Mulolo wa mbakala | Roots | 6 (18.7%) |
| 51. | *Curculigo pilosa* (Schum. & Thomn.) Engl. | Hypoxidaceae | Ba dia nseke | Tuber roots | 5 (15.6%) |
| 52. | *Millettia versicolor* Welw. ex Back | Fabaceae | Loubota | Roots<br>Leaf | 12 (37.5%) |
| 53. | *Gardenia ternifolia* Schum. Thonn | Rubiaceae | kilembe nzau | Roots<br>Leaf | 9 (28.1%) |
| 54. | *Zingiber officinale* Rosc. | Zingiberaceae | Tangawiss | Stem | 1 (3.1%) |
| 55. | *Aframomum melegueta* (Roscoe) K. Schum. | Zingiberaceae | Nungu za nzo | Seed | 1 (3.1%) |
| 56. | *Mangifera indica* L. | Anacardiaceae | Mumanga wa Kongo | Bark | 14 (43.8%) |
| 57. | *Bridelia ferruginea* Benth. | Phyllanthaceae | Kihala | Bark | 14 (43.8%) |
| 58. | *Ficus* sp. | Moraceae | Kikuyu-kuyu | Leaf | 6 (18.7%) |
| 59. | *Ceiba pentandra* (L.) Gaertn. | Malvaceae | Mufuma | Young leaf | 9 (28.1%) |
| 60. | *Costus lucanusianus* J. Braun / *C.* sp. | Costaceae | Munkuissa | Whole Plant | 22 (68.7%) |
| 61. | *Ananas comosus* (L.) Merr. | Bromeliaceae | Fubu | Leaf | 8 (25%) |
| 62. | *Cymbopogon citratus* L. | Poaceae | Citronnelle | Leaf | 18 (56.2%) |
| 63. | *Eriosema psoralioides* (Lam.) G. Don | Fabaceae | Mukassa kabi wa mbakala | Leaf | 1 (3.1%) |

| N° | Taxon | Family | Vernacular name | Part use | Number of citations |
|---|---|---|---|---|---|
| 64. | *Desmodium ramossissimum* G. Don *D. adscendens* (Sw.) DC. | Fabaceae | Mundanda nzila | Leaf | 1 (3.1%) |
| 65. | *Abrus precatorius* L. | Fabaceae | Ngéngélé kuma | Leaf | 8 (25%) |
| 66. | *Nicotiana tabacum* L. | Solanaceae | Nsunga | Dry leaf | 1 (3.1%) |
| 67. | *Leonotis nepetaefolia* var. *africana* J.K.Morton | Verbenaceae / Lamiaceae | Malamu ma songui | Leaf | 7 (21.9%) |
| 68. | *Tithonia diversifolia* (Hem.) A. Gray | Asteraceae | munduri-nduri | Leaf | 6 (18.7%) |
| 69. | *Crossopterix febrifuga* Benth. | Verbenaceae / Lamiaceae | Mukakati | Bark | 13 (40.6%) |
| 70. | *Brillantaisia patula* T. Anders. | Acanthaceae | Lemba-lemba | Leaf | 8 (25%) |
| 71. | *Allium sativum* L. | Alliaceae | Ail | | 22 (68.7%) |
| 72. | *Citrus paradisii* Macfad. | Rutaceae | Pamplemousse | Fruit | 8 (25%) |
| 73. | *Morinda lucida* Benth. | Rubiaceae | Mussiki | Leaf, Roots | 5 (15.6%) |
| 74. | *Pentaclethra macrophylla* Benth. | Fabaceae | Mpanzu | Valve | 3 (9.4%) |
| 75. | *Millicia excelsa* (welw.) C. Berg | Moraceae | Mbuyu | Leaf | 12 (37.5%) |
| 76. | *Abrus* sp. | Fabaceae | Nguenga | Leaf | 1 (3.1%) |
| 77. | *Newbouldia laevis* (P.Beauv.) Seem. | Bignoniaceae | Mumpéssé-mpéssé | Bark | 1 (3.1%) |
| 78. | *Annona senegalensis* var. *arenaria* (Thonn.) Sillans | Annonaceae | Mulolo nséké | Leaf, Bark | 7 (21.9%) |
| 79. | *Psidium guajva* L. | Myrtaceae | Mungueleso | Leaf | 13 (40.6%) |
| 80. | *Crinum cf. zeylanicum* (L.) L. | Amaryllidaceae | Halaba | Bulb | 1 (3.1%) |

## 3.2 Recipes and Composition

There are 70 identified recipes and about 40 diseases and symptoms (Table 2). The ratio of informants and phytotherapeutic recipes shows that 20% of recipes are individual, known per one person (Fig. 3). The simple recipes (one plant) constitute 70% and the remaining 30% are mixed (associating more than one plant). The simple recipes cover 3.1 to 31.3% citations, compared to 3.1 to 68.8% of the mixed.

**Table 2. Distribution and preparation of recipes for diseases by combining the mode of administration and the number of quotations**

| Illnesses and symptoms | Recipes composition | Recipes preparation | Voice of administration | Number of citations |
|---|---|---|---|---|
| Measles | 1 +42 | Trituration | General bath, oral | 5 (15.6%) |
| | 6+73 | | | 5 (15.6%) |
| Haemorrhoids | 2 | Softening, trituration and expression | Rectal (local application) | 1 (3.1%) |
| | 54+55+56 | Decoction | Oral | 1 (3.1%) |
| Bronchitis | 3+4+5 | Trituration, contusion | Oral | 18 (56.2%) |
| Malaria | 6/9/23 | Decoction | Oral | 14 (43.8%) |
| | 11+12 | | | 8 (25%) |
| Arterial high blood pressure | 47 | (pulpation) Raw | Oral | 10 (31.3%) |
| Arterial low blood pressure | 7/27/ 34+18 | Decoction | Oral | 8 (25%) |
| | 72 | (pulpation) Raw | | |
| Sexual Asthenia | 8 | (pulpation) Raw | Oral | 4 (12.5%) |
| | 52+53+50 | Decoction | | 6 (18.8%) |
| Typhoid | 10/21 | Decoction | Oral | 4 (12.5%) |

| Illnesses and symptoms | Recipes composition | Recipes preparation | Voice of administration | Number of citations |
|---|---|---|---|---|
| | 11+12 | (pulpation) Raw | | 5 (15.6%) |
| Rheumatism | 11/22/80 | Decoction | Oral | 5 (15.6%) |
| Burr | 13+42 | carbonization | Topical (local application) | 11 (34.4%) |
| Asthma | 14 | Trituration | Oral | 2 (6.3%) |
| | 14+61+70 | Decoction | | 6 (18.8%) |
| Yellow fever | 15+50 | Decoction | Oral | 4 (12.5%) |
| Headache | 16 | Trituration | Oral | 2 (6.3%) |
| Abdominal pains | 17 | (pulpation) Raw | Oral | 7 (21.9%) |
| | 11+12 | (pulpation) Raw | | 3 (9.4%) |
| Diarrhoea | 19/15 | Contusion, filtration | Oral | 9 (28.1%) |
| Dizziness | 20 | Trituration, expression | Nose and eyes instillation | 1 (3.1%) |
| Flu | 36 | Decoction | Oral | 6 (18.8%) |
| | 23+35+62 | | | 12 (37.5%) |
| Dysentery | 32/24/13 | Decoction | Oral | 4 (12.5%) |
| Filariasis | 26/25 | Contusion, Crush | Topical | 2 (6.3%) |
| Stomach Pains | 28 | (pulpation) | Oral | 2 (6.3%) |
| | 77 | Raw, Maceration | | 1 (3.1%) |
| Splenomegaly | 52 | Contusion, Crushing | Oral | 5 (15.6%) |
| Sinusitis | 30 | Trituration | Oral | 1 (3.1%) |
| Tooth decay | 66 | calcination, contusion | Oral | 1 (3.1%) |
| | 31 | Decoction | | 2 (6.3%) |
| Abdominal washing | 33 | Contusion, Crushing | Oral | 1 (3.1%) |
| Cough | 76 | contusion, Crushing | Oral | 1 (3.1%) |
| | 34+35+36+37+38+39 | Decoction | | 8 (25%) |
| Furunculosis | 5 +40+41 | Contusion, Softening, carbonization | Topical (local application) | 3 (9.4%) |
| Costal pain | 42+44 | Trituration | Topical (Local application) | 16 (32%) |
| Fracture | 43 | Crushing (Massage lukewarm) | Topical (local application) | 3 (9.4%) |
| Head that heats | 45 | Decoction | Oral | 1 (3.1%) |
| Otitis | 46 | Trituration, expression | Oral | 1 (3.1%) |
| Mastites | 75 | Decoction | Oral | 3 (9.4%) |
| | 48 | (pulpation) raw | | 9 (28.1%) |
| Whitlow | 51 | Contusion, Crushing | Topical (local application) | 5 (15.6%) |
| Constipation | 52 | Decoction | Oral | 10 (31.3%) |
| Gingivitis | 53 | Decoction | Oral | 1 (3.1%) |
| Painful rule | 57 | Decoction | Sitting bath | 1 (3.1%) |
| Anaemia | 53/58/78 | Decoction | Oral | 6 (18.8%) |
| Vomiting | 59 | Contusion | Oral | 9 (28.1%) |
| Chickenpox | 60+71 | Crushing, Thinning | General bath, Oral | 22 (68.8%) |
| Conjunctivitis | 63+64+42 | Trituration, expression | Eyes instillation | 1 (3.1%) |
| Headaches | 30+67 | Trituration, expression | Nose instillation | 7 (21.9%) |
| Intestinal helminthiasis Mycosis | 68 | Contusion, filtration | Oral, Topical (Local application) | 6 (18.8%) |
| Amoebic diarrhoea | 7+34+56+57+69+79 | Decoction | Oral | 13 (40.6%) |
| Haemorrhage | 78 | Crushing | Rectal (Local application) | 1 (3.1%) |
| Skinning | 29 | Trituration | Local application | 5 (15.6%) |

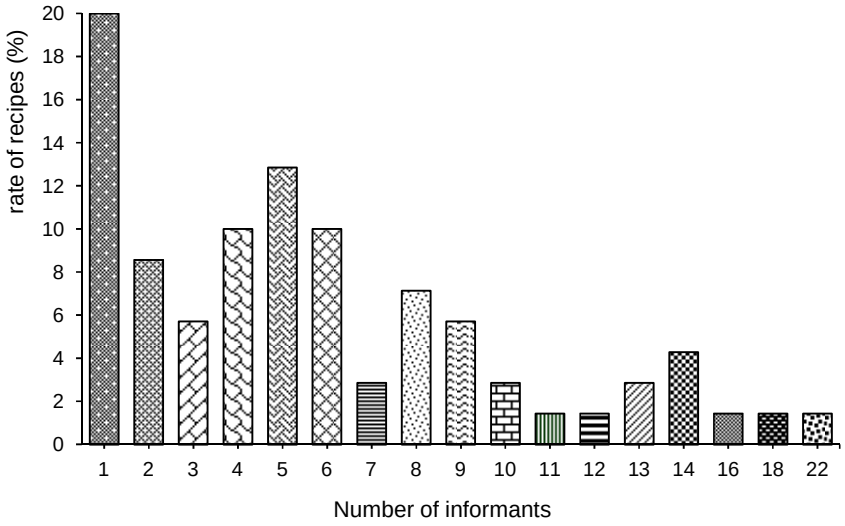



**Fig. 3. Relationship between recipes and number of citations by informants**

### 3.3 Method of Preparation and Administration of Phytomedicines

The ethnobotanical study highlights 10 types of preparations, pharmaceutical forms, the decoctions of which are the most used form with 44.44% of citations. The least used are 2.2% citations (Fig. 4A). Apart from the recipes relating to sexual asthenia and measles which involve alcoholic solvents (liqueurs and palm wine), water remains the main solvent. Palm oil, for its part, is used as an excipient or as an adjuvant for the treatment of furunculosis, costal pain and ringworm.

The inventory revealed 6 routes of administration of therapeutic potions (Table 2). Analysis of the prevalence rate of the different modes of administration of therapeutic potions shows a clear dominance of oral ingestion (Per os) with 65.31%. Finally, the least cited are at 2.04% (Fig. 4B).

### 3.4 Classification of Diseases and Symptoms

From the forty diseases and symptoms treated, 9 (20%) are cited with a prevalence between 31.3 and 68.8%. In terms of recipes, 12 (17.14%) are involved and correspond to the most cited (Fig. 5). However, grouped into spheres of diseases and organs, the 9 main diseases and symptoms are divided into 5 units, in which infectious and parasitic diseases are prevalent with 4 ailments (amoebic diarrhoea, chickenpox, malaria and ringworm). It is followed by diseases: respiratory system with influenza and bronchitis; circulatory system with high blood pressure; the digestive system with constipation; And, symptoms, and poorly defined morbid conditions with side points (Fig. 5). For all these 9 dominant diseases, apart from malaria and amoebic diarrhoea, which have respectively 3 and 2 recipes, only one recipe is cited for the other diseases. Besides malaria and high blood pressure, all the others are infantile diseases.

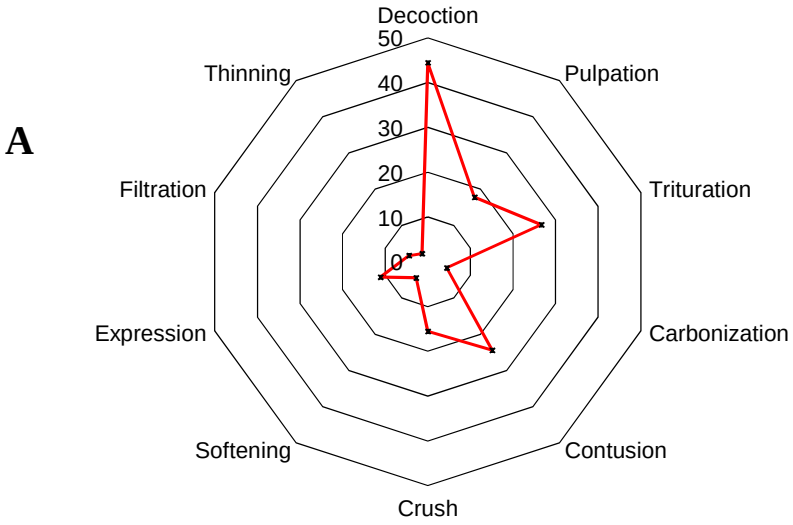
## 4. DISCUSSION

### 4.1 Floristic Analysis

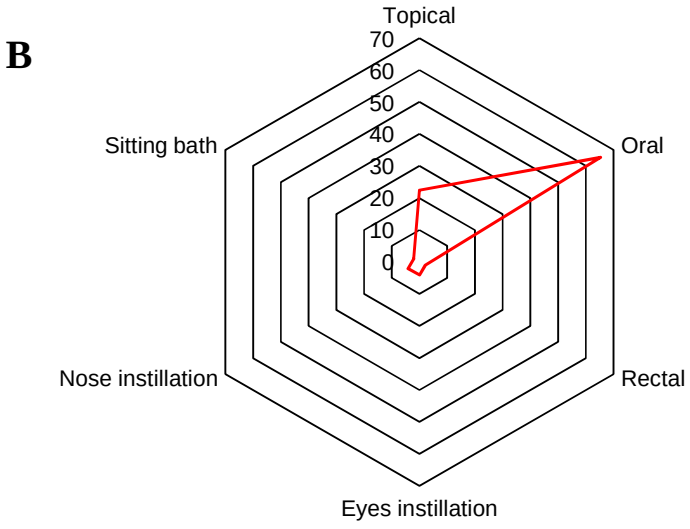
A quick comparison of the number of useful species between forest and savannah ecosystems shows that it is in favour of the first city. Nevertheless, the savannahs, especially in the Niari valley, are full of significant phytotherapeutic potential. (1) shrubs for 14% (*Crossopterix febrifuga, Bridelia ferruginea, Annona senegalensis, Psorospermum febrifugum, Vitex madiensis, Alchornea cordifolia, Millettia versicolor, Sarcocephalus latifolius, Gardenia ternifolia, Eriosema psoralioides, Ficus* sp.); (ii) 5% herbaceous plants (*Pennisetum purpureum, Curculigo pilosa, Crinium cf. zeylanicum, Mimosa pigra*). The therapeutic properties associated with the different species are exploited by the populations of their range [18,19,20].

### 4.2 Ethnosociological Analysis

The traditional pharmacopoeia of the Kaamba ethnic group is based, to a large extent, on known revenues of the majority of informants. However, some recipes are individual secrets and are cited by at most one of the informants. They are properties intrinsic to families and / or arise from an initiation or ethno-linguistic mixing. For the most part, these recipes remain simple to use and the gains associated with family care. Role often assigned to the feminine gender, as a regent of the family and most often having custody of children [1,8]. This observation is all the more plausible since, of the 70 recipes counted and associated with the quarantine of the ailments identified, more than 2/3 are revealed by the women. Notwithstanding the fact that they dominate the informant group, several recipes are associated with childhood illnesses, which are close to 40% [1,21]. These infant diseases are among those with the highest number of citations (bronchitis, malaria, ringworm, diarrhoea, amoebic diarrhoea, influenza, chickenpox, constipation, splenomegaly, asthma, etc.).




Mode's rate of preparation of the pharmaceutical forms




Mode's rate of administration of the pharmaceutical forms

**Fig. 4. Mode's rate of preparation and administration of the pharmaceutical forms**

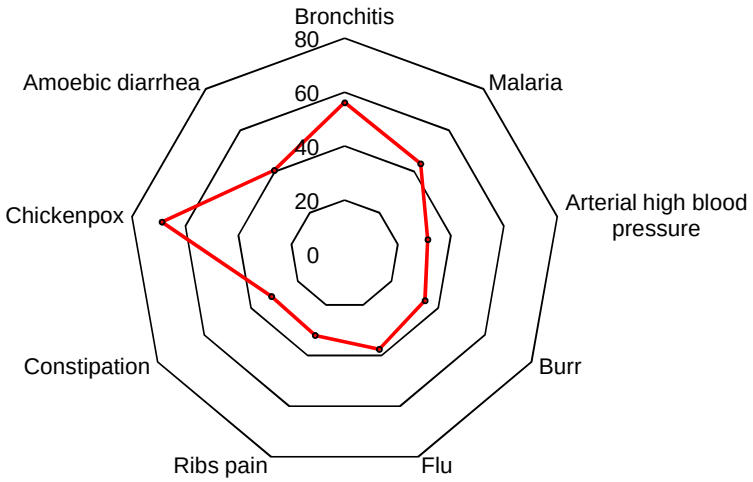



**Fig. 5. Rate of diseases and symptoms predominating according to citations**

The fact that the floristic cohort, which is the basis of these recipes, includes several non-native taxa, is the manifestation of the acquisition of new knowledge, the sociocultural base of neighboring communities. Indeed, since the transmission of knowledge is oral and transmitted from generation to generation, integration of new acquisitions within the societal foundation of knowledge is impossible without opening to the outside. The Kaamba community has capitalized on their knowledge [1,4], because of its geographical location and its position as a crossroads, with sub-prefectures populated by other ethno-linguistic groups. This benefit is reflected in the appropriation of knowledge by the domestication of local and exotic plants, such as *Moringa oleifera*, Cola sp., *Crossopterix febrifuga, Pentaclethra macrophylla*, etc.

This traditional medicine, based on the species of cultivated, ruderal and nitrophilous flora with a large phytogeographic distribution, analyzes data from the phytotherapeutic literature reveals their use for the same purposes by the populations of their area [1,20,22,23]. In addition to this very general character of the use of flora, the Kaamba ethno-linguistic community shows specific characteristics, such as the use of *Crinum cf. zeylanicum* in the treatment of rheumatism.

## 4.3 Therapeutic Weaknesses

In general, the limits of traditional herbal medicine are twofold: (i) the dosage and frequency of the catch. Regarding the assay, the weakness that has been noted since the quantification of useful plant material has repercussions on the concentrations of the active ingredient [16]. As the plant is a concentrate of active ingredients, traditional healers are unaware of the dangerous nature of using certain molecules for long or short term use. Thus, complementarity between traditional medicine and modern medicine proves useful in reducing this bias [1,4,8]. This bridge will be used to evaluate the negative effects of these products and to determine the right concentrations of use which may lead to the possible development of manufactured products, with a lower risk for consumers [4,8,24,25]; (ii) the second weakness is related to inaccuracy in the diagnosis and dosage of drugs. Indeed, every plant has a variability of its active content as a function of time and space (climatic and soil conditions, the exploited part), as points out [8].

## 4.4 Phytotherapeutic Benefits

The Kaamba community, like all others, derives significant benefits by exploiting the therapeutic virtues of plants [1,5,6,7,8,16,26]. At a time when health care and drug costs are prohibitive, especially for the lower social strata, traditional herbal medicine provides molecules that act on: (i) the central nervous system (analgesic, antipyretic, etc.); (ii) the vascular system (antihypertensive agent, hypotensive agent, etc.); respiratory system (bechic, antitussif, eupneic, etc.); digestive system (stomachic, antiemetic), laxative, antidiarrheal, healing, cutaneous antiseptic, etc.); pathogenic or parasitic organisms (anthelmintic, antidysenteric,

antimalarial, antifungal, etc.); the glandular system (aphrodisiac). Another benefit of traditional herbal medicine is the development of improved traditional medicines. These recipes from the local traditional pharmacopoeia are "drugs with defined toxicity limits, scientifically certified pharmacological activity, quantified dosage and controlled quality". This leads to significant added value by reducing the pharmaceutical bill [1,4].

This gain, an empirical legacy within reach for all communities in the world, seals the foundation of the intrinsic values of each one [1,25]. Like any emerging society, this basement has positive and / or negative extrinsic influences. This is how Kaamba has appropriated a body of knowledge well integrated into its foundation. Concomitantly with this acquisition, the sociocultural values of this society are crumbling in favor of modernism. In the case of Kaamba, and for several others, despite the salutary contributions made, the social world inexorably undermines this knowledge [1,2,3,4]. In search of the best conditions of life, the rural world empties itself of its able-bodied arms; which has the consequence of interrupting the chain of transmission of knowledge. The other phenomenon affecting the transmission of knowledge is the destruction of the ecological niches of these species, through the work carried out in the countryside without any environmental and social impact studies (physical communication infrastructures, anarchic urbanization, etc.).

## 5. CONCLUSIONS

This prospecting of man and his environment is the result of observations of the ethnobotanical component in general and more particularly the herbal medicine of the Kaamba traditional society. The interest of devoting this work to recipes and treatments in traditional herbal medicine, is that these aspects are more often less thorough and partially described in the studies on medicinal plants. This work is in line with the problem of enhancing and enhancing knowledge on empiricism and the mechanisms of exploitation and management of bioresources by traditional communities. Like all ethno-linguistic communities around the world, the Kaamba society is not on the margins of efficient exploitation of biodiversity at hand. Only this knowledge is lost following modernism which breaks the chain of transmission of knowledge. Among the incriminated facts are the rural exodus, the search for a better life, the death of the holders and the lack of written manuscripts. Note also that the pole of knowledge has shifted from the masculine to the feminine.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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