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Ethno-Botanical Survey and Ecological Study of Medicinal Plants Traditionally Used Against Erectile Dysfunction in Democratic Republic of the Congo

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Abstract

The aim of this work was to document medicinal plants used in Traditional Medicine for the management of erectile dysfunction. It was done in the western part of the Democratic Republic of the Congo (DRC), between December 2017 and February 2018. To achieve this goal, a survey was conducted using a pre-established survey form which allowed us to have information on the traditional use of medicinal plants in the treatment of above mentioned disease. 40 plant species belonging to 38 genera and 27 families were inventoried in the medicinal flora of the western part of DRC. 46% of inventoried medicinal plants were found in the forest, trees were the most morphological types (38%) while phanerophytes were the most biological type (80%). Maceration was the used method of preparation while the root (42%) is the part of the plant mostly used. Pantropical species (33%) are predominant in the medicinal flora studied. Four botanical families (Rubiaceae, Apocynaceae, Clusiaceae and Leguminosae) out of the 27 possess 35% of listed species. The recipes are administered to patients by oral route. The western part of DRC is rich in medicinal plants knowledge. Therefore, conservation and promotion of such indigenous knowledge by encouraging laboratory research is required in the study area.

Keywords

Erectile Dysfunction, Medicinal Plants, Indigenous Knowledge, Ethnobotany

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1. Introduction

Erectile dysfunction is still a major problem in many couples around the world in general and in sub-Saharan Africa in particular and it represents a serious problem of public health. It is a disease that potentially affects men who tend to age 50 years old of which causes vary between one individual to another [1]. Nowadays, this disease which is the inability to achieve or maintain sufficient satisfactory sexual performance requires the use of plants because no sufficient

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modern treatment is available for its management [2]. According to the World Health Organization (WHO), more than 80% of the African population uses traditional medicine to relieve their primary health issues. The use of medicinal plants for various health problems is not only a choice but is also linked to poverty due to and the high costs of modern medicines [3-5]. The Democratic Republic of the Congo (DRC) is a reservoir of biodiversity, both animal and vegetal [6]. Its flora is full of medicinal plants of biopharmaceutical relevance and capable of supplying new lead molecules. However, this flora is not treated and used the same way in different provinces. While for some regions, such as Katanga, fairly comprehensive studies have already been carried out [7], for others, however, these studies are far from complete: this is the case of the North-West of the DRC. In fact, zoo/ethno-pharmacological studies of these plants for their scientific validation are very encouraging, as evidenced by the research findings of last ten years [4, 8-17]. The aim of the current research was to document medicinal plants used in Traditional Medicine for the management of erectile dysfunction in the western part of DRC, and to evaluate their ecological characteristics (morphological types, biological types, phytogeographic distributions and biotopes).

2. Material and Methods

The study was conducted between December 2017 and February 2018. It consisted of a survey of 60 people over 50 years old and with proven knowledge of the traditional Congolese pharmacopoeia. This survey, carried out with the help of a questionnaire previously prepared and intended for traditional healers and other people, most of them old people who have knowledge on the use of medicinal plants in general and aphrodisiacs in particular. This has made it possible to obtain information on the vernacular names of the plants traditionally used in the management of erectile dysfunction, their method of preparation as well as their route of administration.

The identification of the plants was carried out by comparison using herbarium exsicata at the Herbarium of the Laboratory of Systematic Botany and Plant Ecology, Department of Biology, University of Kinshasa.

The ecological data have been described as follows: Morphological type: Tree (A), Shrub (Arb), Annual herb (Ha), Perennial herb (Hv), Liana (Lia); Biological type: microphanerophytes (Mcph), mesophalerophytes (Msph), rhizomatous geophytes (Grh), climbing phanerophytes (Phgr), nanophanerophytes (Nph), dressed therophytes (Thdr), lianous phanerophytes (Lph), tuberous geophytes (Gt) and climbing therophytes (Thgr). Phytogeographic distribution: Pantropical species (Pan), Guinean-Congolian species (GC), Afro-tropical species (A-tr), Low Guinean-Congolian species (BGC), Congolese species (Cong), Afro-American species (A-am), Guinean species (Guin), Soudano-zambezean species (SZ) and Guinean-Congolian and Soudano-zambezean transition (GC-SZ)

3. Results and Discussion

The list of inventoried plants used against erectile dysfunction is presented in table 1 below.

Table 1. Ecological data on inventoried plants.

N°	Scientific Name (Family)	Vernacular Name (Dialecte)	Used parts	Ecological Characteristics			
				MT	BT	PD	Biotope
01	*Cyathula prostrata* (L.) Blume (Amaranthaceae)	Ndongolongo (Ngwaka)	Root	Ha	Thdr	Pan	Rud, Cult
02	*Mangifera indica L. (Anacardiaceae)*	Manga (Lingala)	Bark	A	Msph	Pan	Cult
03	*Mondia whitei* (Hook.f.) Skeels (Apocynaceae)	Kimbiolongo (Lingala)	Leaves, root	Lia	Phgr	GC	Fo
04	*Tabernaemontana crassa* Benth. (Apocynaceae)	Ilelemo (Lomongo)	Root	A	Msph	GC	Fo
05	*Tabernanthe iboga* Baill. (Apocynaceae)	Elongola (Makutu)	Root	arb	Mcph	BGC	Fo
06	*Sansevieria trifasciata* Prain (Asparagaceae)	Ndama (Ngwaka)	Root	Hvi	Gérh	GC	Cult
07	*Garcinia huillensis* Welw. (Clusiaceae)	Kisima (Kikongo)	Bark, root	arb	Mcph	GC	Cult, Sav
08	*Garcinia kola Heckel* (Clusiaceae)	Likasu (Lingala)	Fruit	A	Msph	GC	Sav
09	*Symphonia globulifera* L.f. *(Clusiaceae)*	Gambeli (Ngwaka)	Bark	A	Msph	A-am	Fo
10	Tetracera alnifolia Willd. (Dilleniaceae)	Yoka (Ngwaka)	Bark, root	Lia	Lph	A-tr	Fo, Sav
11	*Alchornea floribunda* Müll. Arg. (Euphorbiaceae)	ILando (Lingala)	Root	arb	Mcph	Pan	Fo
12	*Abrus precatorius* L. (Leguminosae)	Dengodengo (Lingala)	Leaves	Lia	Phgr	Pan	Fo
13	*Albizia gummifera* (J. F. Gmel.) C. A. Sm. (Leguminosae)	Iyamba (Mongo)	Leaves	A	Mcph	A-tr	Cult
14	*Mucuna pruriens* (L.) DC. *(Fabaceae)*	Matshatsha (Lingala)	Seed	Ha	Thgr	Pan	Cult
15	*Mostuea hirsuta* (T. Anderson ex Benth.) Baill. (Gelsemiaceae)	Gwela (ngwaka)	Seed	arb	Nph	A-tr	Fo
16	*Dichrostachys cinerea* (L.) Wight & Arn. (Leguminosae)	Nsendi-mwanga (Kikongo)	Root	arb	Mcph	Pan	Sav
17	*Erythrophleum suaveolens* (Guill. &Perr.) Brenan (Leguminosae)	Bopomi (Kikonda)	Bark	A	Msph	Cong	Fo
18	*Strychnos icaja* Baill. (Loganiaceae)	Mbondobololo (Lingala)	Bark	Lia	Phgr	A-tr	Fo

N°	Scientific Name (Family)	Vernacular Name (Dialecte)	Used parts	Ecological Characteristics			
				MT	BT	PD	Biotope
19	*Sida acuta* Burm.f *(Malvaceae)*	Kuluyenda (Kimongo)	Leaves	s/arb	Nph	Pan	Rud
20	*Dorsteniap silurus* Welw.(Moraceae)	-	Leaves	Hv	GéRh	A-tr	Cult
21	*Boerhavia diffusa* L. (Nyctaginaceae)	Magbatu (Ngombe)	Leaves	Hvi	Gétub	Pan	Rud
22	*Microdesmis puberula* Hook.f. ex Planch. (Pandaceae)	Isisike (Kimongo)	Root	arb	Mcph	Cong	Fo
23	*Barteria fistulosa* Mast. (Passifloraceae)	Bonkomkomo (Kimongo)	Leaves	arb	Mcph	BGC	Fo
24	*Pentadiplandra brazzeana* Baill. (Pentadiplandraceae)	Bosimi (Kikonda)	Root	Lia	Lph	GC	Fo
25	*Carpolobia alba* G. Don *(*Polygalacea)	Bonseke (Kimongo)	Root, fruit	arb	Mcph	Pan	Fo
26	*Polygala acicularis* Oliv. (Polygalaceae)	Lusambi (Kikongo)	Leaves, Root, Bark	Han	Thdr	GC-SZ	Cult
27	*Maesopsis eminii Engl. (Rhamnaceae)*	Bosongu (Kimongo)	Bark	A	Msph	SZ	Fo, Sav
28	*Craterispermum laurinum* (Poir.) Benth (Rubiaceae)	Ganya (Ngwaka)	Root	arb	Mcph	BGC	Fo, Sav
29	*Gardenia ternifolia* Schumach. & Thonn. (Rubiaceae)	Kilembanzau (Kikongo)	Bark, leaves	arb	Mcph	Pan	Sav
30	*Heinsia crinita* (Afzel.) G. Taylor *(*Rubiaceae*)*	Iyaku (Kimongo)	Root	arb	Mcph	Guin	Fo
31	*Leptactina latifolia* K. Schum. (Rubiaceae)	Kisiamuna (Kikongo)	Root	A	Msph	Pan	Fo
32	*Pausinystalia johimbe* (K. Schum.) Pierre ex Beille (Rubiaceae)	Yohimbe (Français)	Bark	arb	Mcph	GC	Fo
33	*Citrus limon* (L.) Osbeck (Rutaceae)	Lilala (Kimongo)	Root	A	Msph	Pan	Cult
34	*Allophylus timorensis* (DC.) Blume (Sapindaceae)	Talekusi (Ngwaka)	Bark	arb	Mcph	BGC	Fo, Fo
35	*Pancovia laurentii* (De Wild.) Gilg ex De Wild. *(Sapindaceae)*	Kabalangonda (Ngwaka)	Root	A	Msph	Cong	Fo
36	*Synsepalum dulcificum* (Schumach. &Thonn.) Daniell (Sapotaceae)	Bomonga (Ntomba)	Bark	arb	Mcph	GC	Fo
37	*Schwenckia americana* L. (Solanaceae)	tumpa di nkombo (Kikongo)	Root, leaves	Ha	Thdr	A-am	Rud
38	*Lippia multiflora* Moldenke *(Verbenaceae)*	Bulukutu (Lingala)	Leaves	A	Nph	GC	Sav
39	*Cissus aralioides* (Welw. ex Baker) Planch. *(Vitaceae)*	Boseisei (Kimongo)	Leaves	Lia	Lph	Pan	Fo
40	*Zingiber Officinale* Roscoe (Zingiberaceae)	Tangawisi (Lingala)	Rhizome	Hv	Grh	GC	Cult

(Legend: MT: Morphological type, BT: Biological type, PD: Phytogeography distribution)

The table 1 shows that 40 plant species were identified and they belong to 38 genera and 27 families.

Figure 1 below gives different parts used for the preparation of recipes.

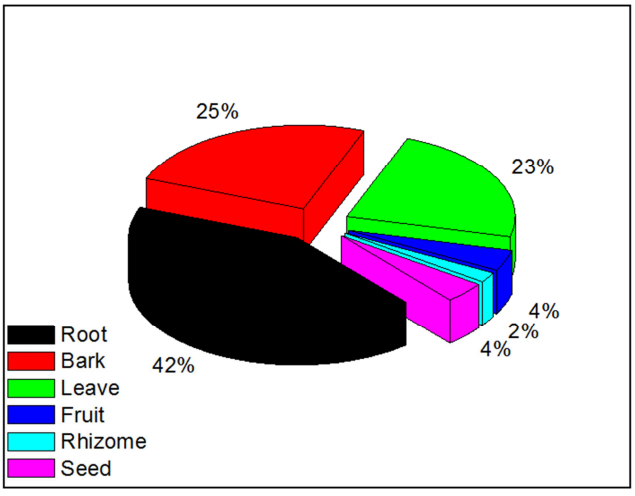

Figure 1. Used parts of different plants for the preparation of recipes.

From above, it is clearly shown that roots (42%) are the most used part of different plants utilized to relieve erectile dysfunction in this part of DRC. They were followed by barks (25%), leaves (23%), fruits and seeds (4% each) and rhizomes (2%). The large-scale use of roots is a dangerous practice as it would contribute to the erosion of these plant resources.

Different ecological characteristics of the identified medicinal flora are given in the figures below (figures 2-6).

The morphological types of inventoried taxa are displayed in the figure below.

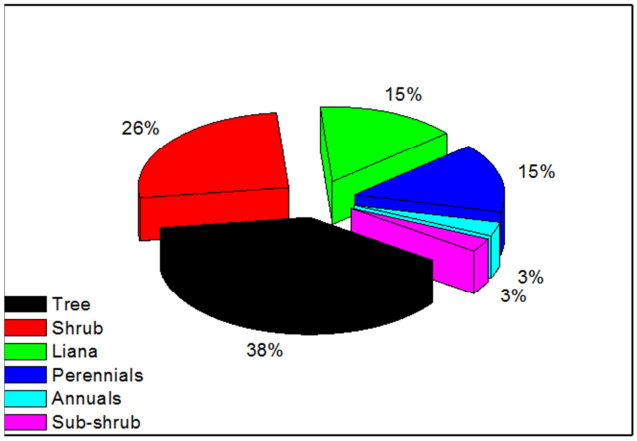

Figure 2. Morphological types.

It is clearly shown that the listed medicinal flora is mainly represented by trees (38%), and then followed by shrubs (26%), lianas and perennials 15% respectively. While the sub-shrubs and annual herbs represent each one 3% respectively. These findings are consistent with Ngbolua *et al.* [4, 11] in Kinshasa and Kikufi *et al.* [7] in Kongo Central

who both reported that the forest ecosystem is more species diverse than the non-forest ecosystems.

Figure 3 gives the biological types of the listed plant species.

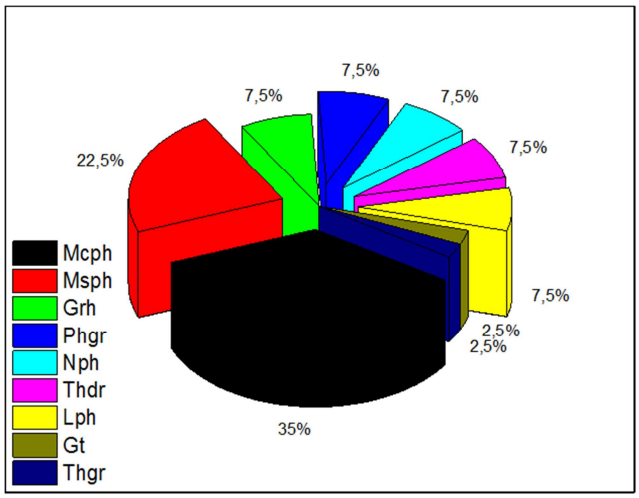

Figure 3. Biological types.

Figure 3 shows that the medicinal flora of inventoried consists of microphanerophytes (Mcph: 35%), mesophalerophytes (Msph: 22.5%), rhizomatous geophytes (Grh: 7.5%), climbing phanerophytes (Phgr: 7.5%), nanophanerophytes (Nph: 7.5%), dressed therophytes (Thdr: 7.5%), lianous phanerophytes (Lph: 7.5%), tuberous geophytes (Gt: 2.5%) and climbing therophytes (Thgr: 2.5%). The predominance of phanerophytes in the medicinal flora studied is a characteristic of tropical regions [18, 19]. In addition, the perennial characteristics of species guarantee the availability and use of these plants.

The phytogeographic distribution of listed plants is shown in figure 4 below.

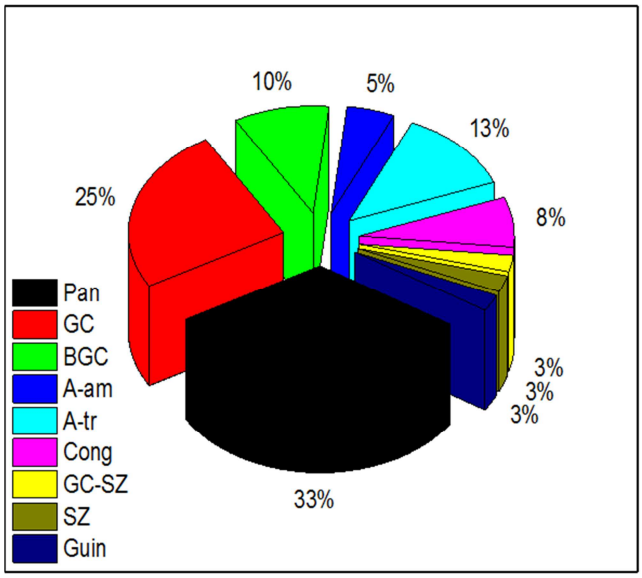

Figure 4. Phytogeographic distribution of listed plants.

The plants listed are widely distributed around the world as shown in the figure above. Out of the listed plants, the Pantropical species (Pan) represent 33%, followed by the Guinean-Congolian species (GC, 25%), Afro-tropical species (A-tr, 13%), Low Guinean-Congolian species (BGC, 10%), Congolese species (Cong, 8%), Afro-American species (A-am, 5%). Guinean species (Guin), Soudano-zambezean species (SZ) and Guinean-Congolian and Soudano-zambezean transition (GC-SZ) represent 3% respectively. The findings show that these plant taxa are widely distributed in Africa. Therefore, their protection should be a concerted effort at national, sub-regional and regional level based on a certain political policy.

Figure 5 below describes different types of biotopes.

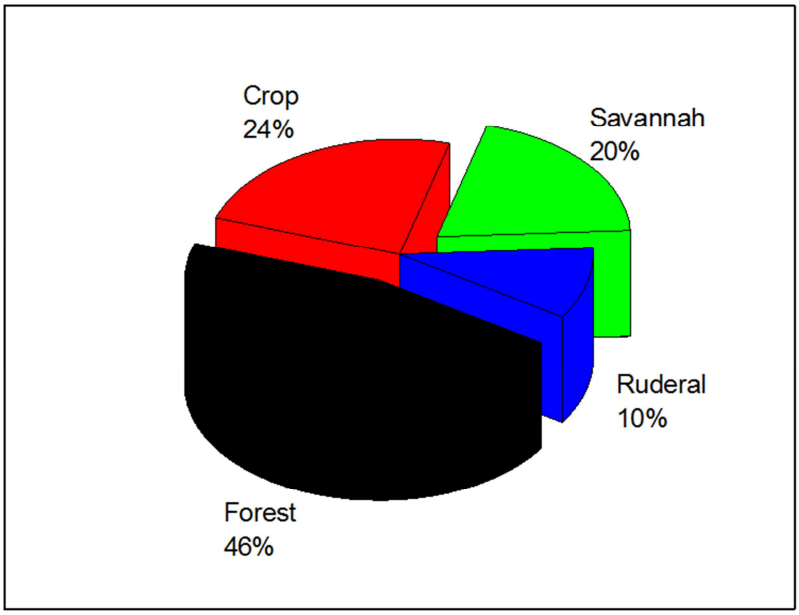

Figure 5. Types of biotope.

As described in the above figure, 20% of the listed plants were found in the savannah while 24% were cultivated plants/crops, 10% are ruderal plant species and 46% were found in the forest. While Ngbolua et *al*. [4] show a predominance of savannah species in the city of Kinshasa.

Figure 6 gives different families identified and their specific richness.

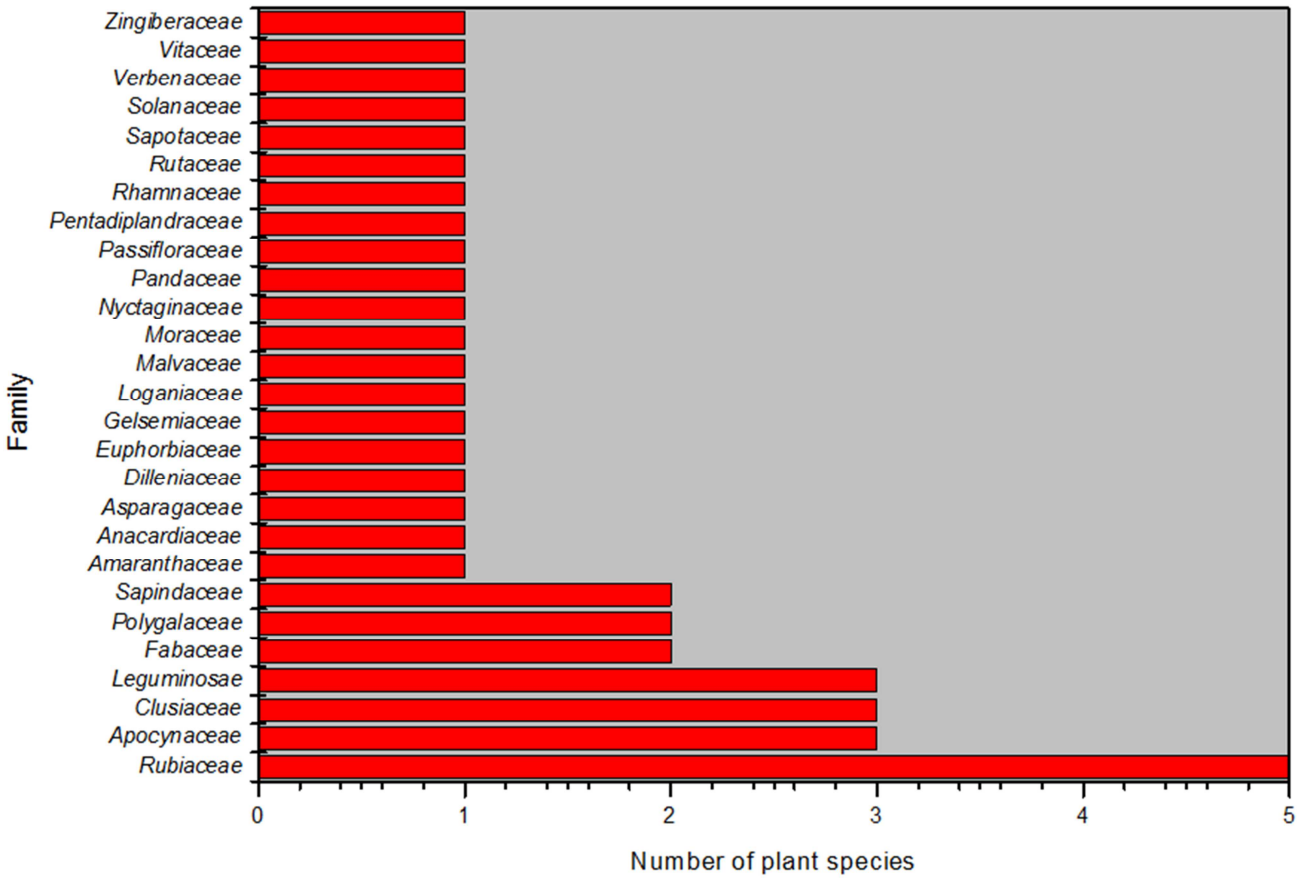

Figure 6. Different families identified and their specific richness.

As shown in the figure above, four botanical families out of the 27 possess 35% of listed species. These specific families are the following: Rubiaceae (12.5%), Apocynaceae (7.5%), Clusiaceae (7.5%) and Leguminosae (7.5%). These findings confirm the results of Mongeke et *al*. [20] who reported that Leguminosae is one of the six most represented families of angiosperms in Sud-Ubangi Province.

A recent literature search on the phytochemistry and pharmacognosy of both *Pentadiplandra brazzeana* and *Mondia whitei* (two medicinal plants among 40 inventoried in this study) using electronic databases like PubMed, PubMed Central, Science Direct and Google scholar revealed the presence of alkaloids, linked quinones, saponins, tannins and triterpenoids in both the leaves and roots of *P. brazzeana*. While anthocyanis, flavonoids and leuco-anthocyanins are present in the leaves but absent in the roots of the above mentioned plant. Findings revealed also that this plant is traditionally used in African folk medicine to treat various ailments including intestinal parasitic diseases and against Chlamydiae. The roots are used for food flour preservation. These roots smelling a raifort pungent odor are edible because of their sweet taste. The ethno-pharmacological relevance of this plant species is due to the presence of sulfur-containing phytochemicals [21]. For *Mondia whitei,* literature search revealed that the plant is traditionally used as stimulant or pain reliever.

This plant is reported to possess various biological properties like anti-oxidant, antimicrobial, antiinflammatory, antihelmintic, antipyretic, antihyperglycemic, analgesic, wound healing, antisickling and cytotoxic effects. These properties are due to the presence of numerous naturally occurring phytochemicals like tannins, alkaloids, phenols, glycosides, flavonoids and steroids [22].

4. Conclusion and Suggestions

The purpose of this study was to inventory the plant species used in the North West part of DRC for their scientific validation during future work. This study shows that 40 plant

species belonging to 38 genera and 27 families have been inventoried in the medicinal flora of the West part of DRC. 46% of inventoried medicinal plants were found in the forest, trees were the most morphological types (38%) while phanerophytes were the most biological type (80%). Maceration is the used method of preparation while the root (42%) is the part of the plant most used. Pantropical species (33%) are predominant in the medicinal flora studied. Four botanical families (Rubiaceae, Apocynaceae, Clusiaceae and Leguminosae) out of the 27 possess 35% of listed species. The recipes are administered to patients by oral route.

It is therefore desirable that thorough phytochemical and pharmacological studies be carried out on these plants for their scientific validation.

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