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# Ethnobotanical study of medicinal plants traditionally used in the treatment of sexual dysfunctions in Benin

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## Abstract

Sexual dysfunction or sexual disorder is a serious medical condition that affects both men and women. It has a strong impact on the patient's life quality and can threaten the stability of the couple's relationship. However, side effects of synthetic molecules, poverty and illiteracy give a new impetus to natural products, such as traditional herbs, that produce aphrodisiac effects for sexual enhancement. This study was carried out to document medicinal plants and recipes used against sexual dysfunctions in Benin. Data were collected using ethnobotanical and market surveys from 272 informants followed by observations. A total of 148 aphrodisiac plant species belonging to 133 genera from 64 plant families were recorded. Aphrodisiac plant species were mainly herbs (31.08%) and tree (27.70%) mostly represented by Fabaceae (13.51%). 64 of them have previously been evaluated scientifically while 37 aphrodisiac plants were reported for the first time. 33 plant species were the most commonly used. Aphrodisiac plant parts root (31.92%) and leaves (20.19%) were mostly used for 324 recipes to treat seven (7) ailments of which the common was sexual weakness (86.40%). The maceration (38.72%), powder (29.79%) and oral route (92.92%) were the main galenic forms and the main mode of administration, respectively. The findings will serve as a reference for the selection of plants for further pharmacological, toxicological, and phytochemical investigations in developing new plant-based drugs used for the treatment of sexual dysfunctions.

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## Introduction

It is now well-recognized that sexual health is important to overall health and well-being (Kassier *et al.*, 2013). The Global Better Sex Survey (GBSS) reports the sexual needs and desires of men and women worldwide (Mulhal *et al.,* 2008). For both, satisfaction with different aspects of sex is important and strongly associated with satisfaction of general health, relationships and other aspects of wellbeing (Dean *et al.,* 2013). Thus, sexual dysfunction or sexual disorder is a serious medical condition that affects both men and women and can be caused by physiological or psychological factors (Ajao *et al., 2019*). According to Gupta *et al.,* (2019), there are three basic types of sexual dysfunction; disorders of desire which takes the form of inadequate sexual desire (libido) in both sexes, disorders of excitement (or arousal) in men (impotence) and disorders of orgasm includes difficulty achieving orgasm in both men and women but more common among men.

Erectile dysfunction (ED) is still a major problem in many couples around the world in general and in sub-Saharan Africa in particular; it represents a serious problem of public health (Ipona *et al.,* 2018**).** Worldwide, an estimated 150 million men suffer from ED (Togola *et al.,* 2020).

This is expected to double by 2025 and the majority of cases will be recorded in the African population (Yovwin *et al*., 2015). ED affects potentially men who tend to be 50 years old (Ipona *et al.,* 2018)**.** Young men also have high prevalence rates for maintaining or developing sexual dysfunction over time (Akre *et al*., 2014). For women, low or absent sexual desire is the most common sexual disorder and its prevalence peaks during midlife (Kingsberg and Woodard, 2015). Many treatments with synthetic molecules are currently available to alleviate these disorders, but they create serious undesirable side effects. For example, acute secondary effects of sildenafil (Viagra), a first-line pharmacotherapy for erectile dysfunction (ED), include headache, heartburn, skin flush, and vision changes (Karaarslan, 2020; Demoze *et al.,* 2021).

In addition, factors such as poverty and illiteracy still militate against the availability and accessibility of conventional medical services (Wood *et al.,* 2011). As a result, individuals turn to natural products, such as traditional herbs, that produce aphrodisiac effects for sexual enhancement (Abudayyak *et al.,* 2015). The term aphrodisiac is derived from Greek mythology, where Aphrodite was the goddess of love and beauty (Babu *et al.,* 2017). An aphrodisiac is described as any substance (food or drug) that arouses the sexual instinct, induces venereal desire and increases pleasure and performance (Malviya *et al.,* 2011).

There is no older therapy and effective than medicinal plants to improve human sexuality (Strasbourg, 2008). Medicinal plants have historically proven their value as a source of molecules with therapeutic potential, and nowadays still represent an important pool for the identification of novel drug leads (Atanasov *et al., 2015).*

It is therefore necessary to undertake investigations on the use of natural aphrodisiacs.

Benin Republic is rich in around 2807 plant species (Akoègninou *et al.,* 2006); however, to date, a few was documented as possessing aphrodisiac properties (Gbankoto *et al.,* 2015; Gbesso *et al.,* 2016). No scientific studies are focusing on ancestral knowledge of aphrodisiac plants although used by all classes of age.

The present study aimed at filling this gap and documenting endogenous knowledge relating to the flora and recipes of plants used as aphrodisiacs in Benin.

## Materials and methods

*Study area*

The study was conducted in the Republic of Benin, located in West Africa between 6°15′–12°25′N and 0°40–3°55′E (Fig. 1). It covers a total area of 114,763 km2 with a population estimated at 10,008,749 inhabitants (INSAE, 2016). The climate of Benin is hot and humid (Ahokpossi, 2018).

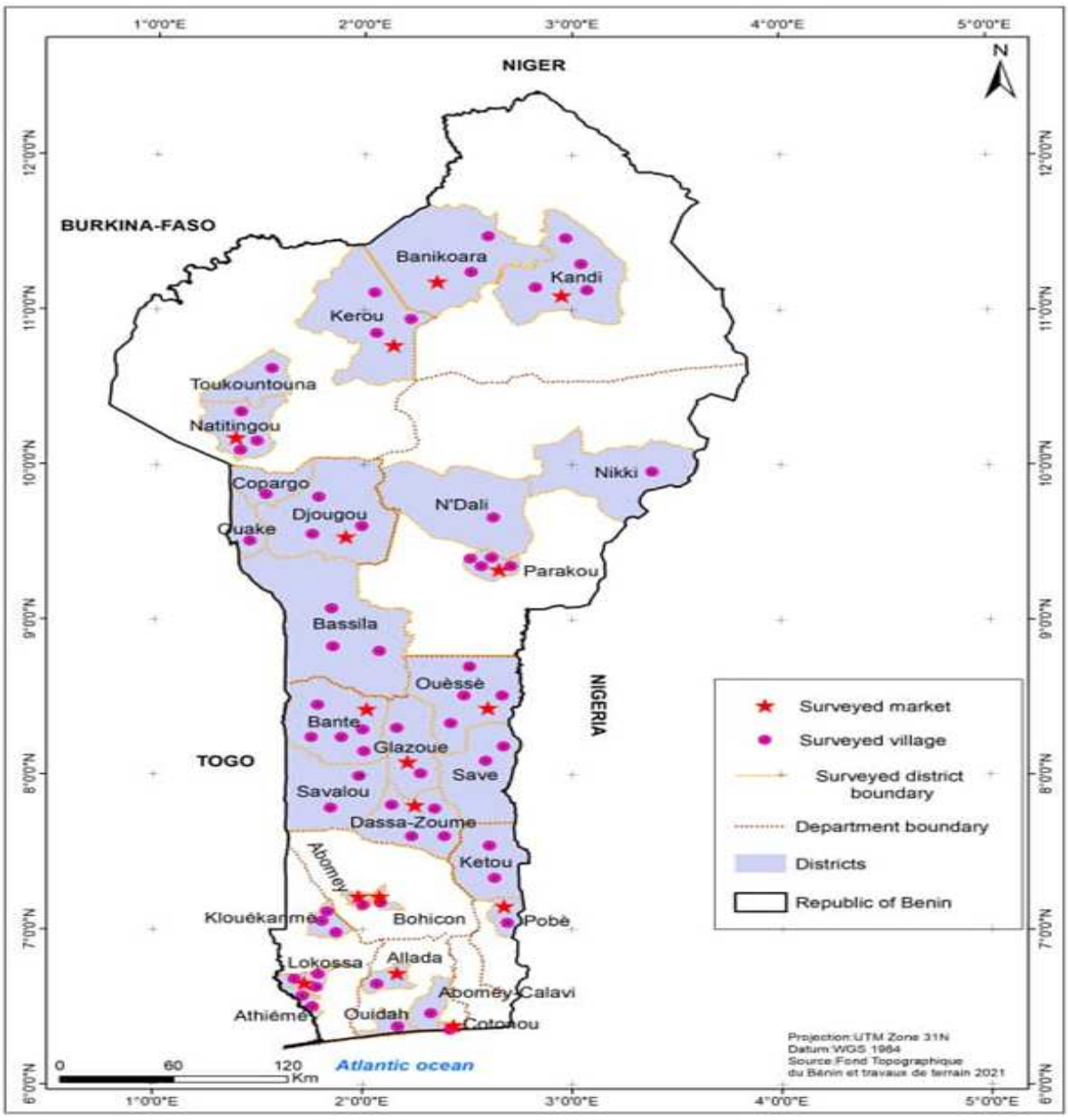


**Fig. 1**. Location of the survey sites.

The southern part of the country has a subequatorial climate with two rain seasons and two dry seasons. Annual mean temperature ranges from 26 to 28°C and annual rainfall varies between 800 to 1400 mm (Yabi and Afouda, 2012). The northern section is characterized by a truly Sudanian climate with a unimodal rainfall regime. The mean annual rainfall is less than 1000 mm and the temperature mean is 27.5°C (Gnanglè *et al.,* 2011). Central Benin is characterized by a Sudano-Guinean climate with unimodal rainfall from May to October, and an annual total rainfall varying between 900 and 1100 mm (Gnanglè *et al.,* 2011). The vegetation mainly consists of savannahs, grasslands, farmlands, and fallows intermingled with small islands of closed forest (semi-deciduous forest and swamp forest) and the patchwork of woodlands (Adomou, 2005).

They are the source of aphrodisiac plants for people. The main ethnic groups are: Adja and related, Fon and related, Yoruba and related, Bariba and related, Dendi and related, Otamari and related, Yoa Lokpa and related and Peulh and related (INSAE, 2017). Human activities are mainly agriculture and trade. Others such as farming, market gardening fishing, crafts and tourism are also done.

*Sampling*

Sites surveyed were chosen based on the major sociolinguistic groups in each district and the presence of particular people such as traditional healers, polygamists (considered as the main users of aphrodisiac plants), herb sellers, hunters and farmers who had more experience with aphrodisiac plants. Considering these two fundamental criteria, sixty-one (61) villages and eighteen (18) markets were selected in the three climatic zones after the exploratory survey. The sample size of the informants in each climatic zone was determined according to the formula of Dagnelie (Dagnelie, 1998): $n = U^2_{1-\alpha/2} \times p(1-p)/d^2$ where, *n* is the sample size of surveyed people considered in each region; $U^2_{1-\alpha/2}$ is the value of the normal random variable for a probability value of α=0.05, $U_{1-\alpha/2}$= 1.96; *p* is the proportion of people who knew and already had used at least one aphrodisiac plant and *d* is the expected error margin of any parameter to be computed from the survey, which was fixed at 0.08. Under those assumptions, the sample size (n) is equal to 57; 165 and 50 informants respectively in Guinean, Sudano-Guinean and Sudanian zones. Thus, a total of 272 informants were surveyed throughout the study area. The "snowball" method (Johnston and Sabin, 2010) was used to identify the majority of people surveyed per village. However, people were reticence and that lead to a bit number of informants in some villages. Sellers of medicinal herbs surveyed in markets were selected based on two criteria which are the greatest number of medicinal plant parts sold (Ambé *et al.,* 2015) and the presence of aphrodisiac plant parts in their display.

*Ethnobotanical data collection*

Data were collected using ethnobotanical and market surveys followed by direct observations of aphrodisiac plants in their habitat. Individual interviews technique using a questionnaire was applied (Albuquerque *et al.*, 2014). In each village, interviews were conducted with the help of a local translator at the informant's house. Firstly, permission was obtained from local authorities. Data collection included socio-demographic characteristics (social attributes, age, gender, ethnic group, religion, main activity, marital status, etc.), perception of informants on aphrodisiac plants in general (local designations and their meaning, gender which use them, sexual dysfunctions treated and causes) and aphrodisiac recipes (vernacular names of plants, parts used, associated ingredients, diseases treated, mode of remedy preparation and administration). Market data were related to aphrodisiac plants sold (inventory, parts used, preparation methods, and posology). Through the market survey, the interview was followed by aphrodisiac plant parts purchasing that are placed in a herbarium.

*Plant identification*

After interviews, preliminary identification of the plants was done in the field with help of traditional healers, hunters or medicinal plants collectors, combining the use of botanical books such as "Flore du Bénin" (De Souza, 2008), "Les nouveaux ordres des Angiospermes (Utilités des espèces)" (Akoègninou *et al.*, 2011), "Flore Analytique du Bénin" (Akoègninou *et al.,* 2011), and "Guide des adventices d'Afrique de l'Ouest" (Akobundu and Agyakwa, 1989). Afterward, herbarium specimens were prepared and photographs were taken to confirm identification at the Laboratory of Botany, Applied Plant Ecology and Forest Genetics (ENSBBA of Dassa-Zoumé) and in the National Herbarium of Benin (University of Abomey-Calavi).

*Data analysis*

*Plant diversity and citation*

Ethnobotanical and market survey data were analyzed through descriptive statistical as frequency and mean (±sd). Results are presented through tables and figures. The diversity of aphrodisiac plants used was appreciated based on the species richness. Thus, Shannon-Weaver Diversity Index (Dajoz, 1985) was determined to assess the specific diversity level of these plants in the study area. Its formula is: $H' = -\sum(ni/N)\log_2(ni/N)$ with ni = number of aphrodisiac plants identified in zone i and N = total number of aphrodisiac plants recorded throughout the study area.

The plant families importance value (FIV) was calculated for each family, using the formula

$$FIV=\frac{FC(Family)}{N}\times 100$$

where FC is the number of informants mentioning the family, N is the total number of informants involved in the study (Napagoda *et al.,* 2018). We applied the Relative Frequency of Citation (RFC) according to Pardo de Santayana, (2008) to evaluate the importance of each species. RFC (%)$=\frac{FC}{N}\times 100$ with FC: number of people having quoted the species; and N: total number of interviewed people.

We explored the similarity of plant knowledge among climatic zones using Jaccard Similarity Index (Jaccard, 1908) as:

$SJ=N_{xy}/[(N_x+N_y)-N_{xy}]$ with $N_x$= number of species present in zone x, $N_y$=number of species present in zone y and $N_{xy}$ the number of species shared by the two zones. This allowed us to calculate the similarity rate between two climatic zones (SJ x 100).

*Informants' agreement on aphrodisiac plants recipes used*

The Informant Consensus Factor (ICF) was calculated for each sexual dysfunction treated to identify the agreement level of informants on the reported cures; $ICF=Nuc-Ns/Nuc-1$ with *N*uc as the number of use citations in each category and *N*s the number of species (Houéhanou *et al.,* 2016). Moreover, the Fidelity Level (FL) (Houéhanou *et al.,* 2016) were also determined to assess fidelity allocated to the use of each species in sexual disorders treatment. $FL=Fc/Ft\times 100$ where *F*c is the frequency of species citation for a particular ailment and *F*t is the total number of species citations.

*Commonly used species selecting*

Priority aphrodisiac plants were selected based on the values of frequency species citation (FC) and the contribution of each plant in the formulation of the recipes (Cpr). An aphrodisiac plant is considered as a priority if it has been cited at least by ten (10) informants and involved in five (05) recipes at least (FC≥10 and Cpr≥1.55).

The Cpr was calculated by the formula:

$$Cpr=\frac{Nr}{Nt}\times 100$$

where *Nr* is the number of recipes implicating the plant and *Nt* the total number of recipes.

*Credible recipes selecting*

The recipes frequency (Fr) value allowed the identification of credible recipes for each sexual dysfunction treated. So, credible recipes are those with the highest Fr value. It is calculated by the following formula: $Fr=\frac{Ncr}{N}\times 100$ where Ncr is the number of one recipe citations treating a given sexual dysfunction and N the total number of all the recipes citations treating this disorder.

*Effects of demographic factors on knowledge of informants*

The effect of gender, age, occupation, marital status, education level and climatic zone on the number of aphrodisiac plants cited was evaluated using t-test, Wilcoxon test, one-way ANOVA test and Kruskal-Wallis test depending on the distribution of the data set. Statistical tests were carried out in the R statistical software, version 2.2.1 (http://www.Rproject.org/)

*Ecological data processing*

Ethnobotanical data were completed followed by ecological information such as the growth form of each aphrodisiac plant (herb, climber, shrub, or tree) and their status (cultivated, agrosystem, or Spontaneous) in the Benin area.

**Results and discussions**

*Socioeconomic Background of the respondents*

The socioeconomic profile of the respondents is provided in Table 1. A total of 272 people were interviewed. Most of them were men (88.60%) aged 30-59 years (65.07%). They belong to 22 ethnic

groups with the predominance of Idaatcha (14.71% of respondents), Mahi (14.34% of respondents), Bariba (11.76% of respondents), Fon (11.76% of respondents) and Nago (6.25% of respondents). Respondents were mostly traditional healers (35.66% of respondents) and farmers (25% of respondents) who live mainly with two (02) wives at least (56.43% of respondents).

*Diversity of aphrodisiac plant species used in the Republic of Benin*

Informants reported a total of 148 aphrodisiac plant species belonging to 133 genera from 64 plant families (Table 2). This recorded is very high and important as revealed by the Shannon-Weaver Diversity Index value (H'=1.39 bits; 0.5 <H' <4.5) and also when compared to those obtained by similar studies in neighboring countries such as the Democratic Republic of Congo (40 species, Ipona *et al.,* 2018), Mali (16 species, Togola *et al.,* 2020), Nigeria (24 species, Faleyimu and Oso, 2012), Morocco (118 species, Talaa, 2009) and Uganda (33 species, Kamatenesi-Mugisha, and Oryem-Origa, 2005). The high diversity of aphrodisiac plants recorded confirms the importance of endogenous knowledge for human health care and suggests that the flora of the study area is rich in aphrodisiac plant species. Of the 148 reported plant species, 122, 74 and 65 were cited in Sudano-Guinean, Sudanian and Guinean climatic zone respectively.

The similarity index was relatively high between Sudano-Guinean and Sudanian zone (SJ=43.07%) and between Sudano-Guinean and Guinean zones (SJ=40.60%) while it was 37.62% between climatic zones Sudanian and Guinean.

**Table 1.** Demographic data of informants.

| Parameter | Characteristics | Number | Percentage (%) |
|---|---|---|---|
| Gender | Male | 241 | 88.60 |
| | Female | 31 | 11.40 |
| | Total | 272 | 100 |
| Age | 20-29 | 31 | 11.40 |
| | 30-59 | 177 | 65.07 |
| | ≥60 | 64 | 23.53 |
| | Total | 272 | 100 |
| Marital status | Polygamists | 136 | 56.43 |
| | Monogamous | 86 | 35.68 |
| | Single | 14 | 5.81 |
| | Widower | 5 | 2.07 |
| | Total | 241 | 100 |
| 1Education level | Illiterates | 86 | 31.62 |
| | Primary level | 65 | 23.9 |
| | Secondary level | 61 | 22.43 |
| | High level | 39 | 14.34 |
| | literates | 21 | 7.72 |
| | Total | 272 | 100 |
| Occupation | Traditional healers | 97 | 35.66 |
| | Farmers | 68 | 25.00 |
| | Public servants | 34 | 12.50 |
| | Craftsmen | 26 | 9.56 |
| | Herb sellers | 24 | 8.82 |
| | Traders | 10 | 3.68 |
| | Students | 7 | 2.57 |
| | Hunters | 6 | 2.21 |
| | Total | 272 | 100 |
| Source of medicinal nowledge | Family members | 186 | 68.38 |
| | Friends | 43 | 15.81 |
| | Media/Books | 29 | 10.66 |
| | Spiritual intuitions | 14 | 5.15 |
| Total | | 272 | 100 |

Furthermore, the most represented plant family was Fabaceae including 20 species (13.51%) followed by Euphorbiaceae (10 species, 6.76%), Malvaceae (7 species, 4.73%) and Poaceae (6 species, 4.05%) (Fig. 2). Thirty-four (34) plant families (22.97%) were relatively less represented (1 species). The plant family importance value was high in Fabaceae (55.88%), Arecaceae (33.46%), Euphorbiaceae (22.79%), Annonaceae (22.43%), Musaceae (19.85%) and Clusiaceae (16.91).

**Table 2**. List of aphrodisiac plants species use in Benin, their growth forms, used parts and previous citations.

| Botanical name | Family | Vernacular names | Growth forms | Status | Used parts | Traditional uses | FC | RFC (%) | Previous citations |
|---|---|---|---|---|---|---|---|---|---|
| *Abelmoschus esculentus* (L.) Moench** | Malvaceae | Févi (Fo), Ila (Id) | Herb | Cultivated | Fruits | SW, LS | 3 | 1.10 | Gupta *et al.*,, 2019; Elkhalifa *et al.*, 2021 |
| *Abrus precatorius* L.**+ | Fabaceae | Viviman (Fo), Odjou êga (Id) | Climber | Spontaneous | Leafy stems | SW, EE, LS, LL | 12 | 4.41 | Gupta *et al.*, 2019; Garaniya & Bapodra 2014 |
| *Acacia nilotica* (L.) Willd. ex Delile ssp. adstringens (Schumach. & Thonn.) Roberty** | Fabaceae | Bani (Ba), Nep Nep (Fr) | Tree | Agrosystem | Seeds | V | 1 | 0.37 | Gupta *et al.*, 2019 |
| *Acacia polyacantha* Willd. ssp. campylacantha (Hochst. ex A.Rich.) Brenan* | Fabaceae | Egui èdè (Na), Boko-saka (Ba) | Tree | Spontaneous | Latex | LS | 1 | 0.37 | No records |
| *Acridocarpus smeathmannii* (DC.) Guill. & Perr.***+ | Malpighiaceae | Gbanguinan (Fo) | Tree | Spontaneous | Roots | SW, EE | 21 | 7.72 | Kale *et al.*, 2018 |
| *Adansonia digitata* L.* | Bombacaceae | Sonnan (Ba) Egui otché (Id) | Tree | Agrosystem | Barks, Fruits, Peduncle | SW, EE, RP | 5 | 1.84 | No records |
| *Aframomum melegueta* (Roscoe) K. Schum.***+ | Zingiberaceae | Atakoun (Fo) Iro guirou (Ba) | Herb | Cultivated | Fruits, Seeds | SW, EE, LS, I | 33 | 12.13 | Mbongue *et al.*, 2012 |
| *Allium cepa* L.***+ | Alliaceae | Ayoma (Fo), Mansa (Id) | Herb | Cultivated | Bulbs | SW, EE, RP | 14 | 5.15 | Adeyemi *et al.*, 2017 |
| *Allium sativum* L.*** | Alliaceae | Ayo (Fo), Ail (Fr) | Herb | Cultivated | Bulbs | SW, EE, LS | 9 | 3.31 | Adeyemi *et al.*, 2017 |
| *Aloe vera* (L.) Burm. f.*** | Asphodelaceae | Aloès (Fr) | Herb | Cultivated | Leaves | SW | 4 | 1.47 | Jadhav *et al.*, 2020 |
| *Amaranthus spinosus* L.** | Amaranthaceae | Tètè ounon (Fo) | Herb | Spontaneous | Roots | SW | 1 | 0.37 | Gupta *et al.*, 2019 ; Abid *et al.*, 2017 |
| *Ananas comosus* (L.) Merr.** | Bromeliaceae | Ananas (Fr) | Herb | Cultivated | Fruits | SW | 1 | 0.37 | MacDonald *et al.*, 2016 |
| *Annona senegalensis* Pers.**+ | Annonaceae | Gniglo (Fo), Otribobo (Id), Bahtokor (Ba), Winrébou (Wa), Nanmoubou (Nt) | Shrub | Spontaneous | Leaves, Roots | SW, LS | 18 | 6.62 | Togola *et al.*, 2020 |
| *Anogeissus leiocarpa* (DC.) Guill. & Perr.*** | Combretaceae | Hlihontin (F), Fiébou (Nt), Kagara | Tree | Spontaneous /Agrosystem | Roots | SW, EE | 3 | 1.10 | Ademosun *et al.*, 2019 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (Ba) | | | | | | | |
| *Anthocleista vogelii* Planch.* | Loganiaceae | Klotohou (Lo), Akpa odo (Na) | Tree | Spontaneous | Roots | SW | 2 | 0.74 | No records |
| *Arachis hypogea* L.** | Fabaceae | Aziin (Fo), Ahorzii (Id) | Herb | Cultivated | Seeds | SW, I | 2 | 0.74 | Gupta *et al.,* 2019 ; Togola *et al.,* 2020 |
| *Aristolochia albida* Duch.** | Aristolochiaceae | Kaba tèkè (Ba) | Climber | Spontaneous | Roots | SW | 1 | 0.37 | Gupta *et al.,* 2019 |
| *Azadirachta indica* A.Juss.** | Meliaceae | Kininitin (Fo), Neem (Fr) | Tree | Cultivated | Leaves | SW | 1 | 0.37 | Gupta *et al.,* 2019 |
| *Balanites aegyptiaca* (L.) Delile* | Zygophyllaceae | Kpakpakabou (Wa) | Shrub | Spontaneous | Barks,Roots,Flowers | SW | 1 | 0.37 | No records |
| *Bambusa vulgaris* Schrad. ex Wendel* | Poaceae | Idawé (Id), Bambou (Fr) | Herb | Spontaneous /Cultivated | Roots | SW | 1 | 0.37 | No records |
| *Boerhavia diffusa* L.*** | Nyctaginaceae | Gbadjèwin/Gbagbada (Fo) | Herb | Spontaneous | Roots | SW, I | 1 | 0.37 | Gurav *et al.,* 2020 |
| *Borassus aethiopum* Mart.***+ | Arecaceae | Agontin (Fo), Egui Agbon (Id), Rônier (Fr) | Palm tree | Agrosystem/ Cultivated | Hypocotyl, Roots | SW, EE, I, F | 31 | 11.40 | Gbesso *et al.,* 2016 |
| *Bridelia ferruginea* Benth.*** | Euphorbiaceae | Egui ira (Id) | Shrub | Spontaneous | Roots, branches | SW, F | 2 | 0.74 | Watcho *et al.,* 2010 |
| *Caesalpinia bonduc* (L.) Roxb.***+ | Fabaceae | Adjikoun (Fo), Egui adji (Id) | Shrub | Cultivated | Roots | SW, EE, LS, I | 64 | 23.53 | Gbankoto *et al.,* 2015 |
| *Calotropis procera* (Aiton) W.T. Aiton** | Asclepiadaceae | Amon man (Fo) | Shrub | Cultivated | Roots | SW | 1 | 0.37 | Sumanasinghe *et al.,* 2016 |
| *Capsicum annuum* L.**+ | Solanaceae | Tahounbo olobéré (Id), Takii (Fo) | Herb | Cultivated | Fruits | SW, I, V | 9 | 3.31 | Gupta *et al.,* 2019 |
| *Carica papaya* L.**+ | Caricaceae | Aguidi akor (Id; Tch), Papaye tibou (Wa) | Herb | Cultivated | Roots, Seeds, Flowers | SW, EE, I, V | 11 | 4.04 | Gupta *et al.,* 2019 |
| *Carissa spinarum* L.**+ | Apocynaceae | Ahanzo (Fo) | Shrub | Spontaneous | Roots, Barks, Leaves | SW, EE, I | 11 | 4.04 | Demoze *et al.,* 2021 |
| *Carpolobia lutea* G. Don***+ | Polygalaceae | Aviatin (Fo), Atchouintchouin (Ho), | Shrub | Spontaneous /Agrosystem | Roots; Stem | SW, EE, I | 16 | 5.88 | Dare *et al.,* 2015 |
| *Cassia sieberiana* DC.** | Fabaceae | Agbélékogbaroun (Ich); Simssan (De) | Tree | Cultivated | Roots, Latex, Barks | SW | 6 | 2.21 | Gupta *et al.,* 2019 |
| *Cassytha filiformis* L.*** | Lauraceae | Kolakpa kolèssè (Na); Agbégbékan (Fo); Korssopayou (Wa) Wonanboachi (Nt) | Climber | Spontaneous | Stem | SW, LS | 7 | 2.57 | Agbodjento *et al.,* 2020 |
| *Ceiba pentandra* (L.) Gaertn.** | Bombacaceae | Gédéhonsou (F), Fromager | Tree | Spontaneous /Cultivated | Barks | SW | 1 | 0.37 | Nkouam *et al.,* 2017 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (Fr) | | | | | | | |
| *Cerathoteca sesamoides* Endl.** | Pedaliaceae | Goufounon (An) | Herb | Spontaneous /Cultivated | Leaves | LS | 1 | 0.37 | Abubakar *et al.,* 2020 |
| *Cissus populnea* Guill. & Perr.***+ | Vitaceae | Assankan (Fo), Gborgorlor (An), Obè ordè (Id), Orlor (Na) | Climber | Spontaneous | Stems, Roots | SW, EE, LS | 24 | 8.82 | Ojekale *et al.,* 2015 |
| *Cissus quadrangularis* L.** | Vitaceae | Assan (Fo) | Climber | Spontaneous | Roots, Stem, Leaves | LS | 1 | 0.37 | Gupta *et al.,* 2019 |
| *Citrus aurantifolia* (Christm. & Panzer) Swingle**+ | Rutaceae | Klétin (Fo), Demounou tiibou (Wa), Nemounou (Ba) | Shrub | Cultivated | Fruits | SW, EE, LS | 16 | 5.88 | Enejoh *et al.,* 2015 |
| *Citrus sinensis* Osbeck** | Rutaceae | Yovozin (Fo), oranger (Fr) | Tree | Cultivated | Fruits | SW | 1 | 0.37 | Jejurkar *et al.,* 2020 |
| *Cocos nucifera* L.***+ | Arecaceae | Agokintin (Fo), Kpaakpa (Ba), Cocotier (Fr) | Palm tree | Cultivated | Fruits, Roots | SW | 20 | 7.35 | Prakash *et al.,* 2015 |
| *Cola acuminata* (P. Beauv.) Schott & Endl.***+ | Malvaceae | Obi (Id), Vi (Fo) | Tree | Spontaneous /Cultivated | Seeds | SW, EE, LS | 17 | 6.25 | Ademiluyi *et al.,* 2018 |
| *Cola nitida* (Vent.) Schott. & Endl.***+ | Malvaceae | Golotin (Fo), Goro (Id) | Tree | Spontaneous /Cultivated | Barks, Seeds | SW, EE, LS, I | 13 | 4.78 | Ademiluyi *et al.,* 2018 |
| *Colocasia esculenta* (L.) Schott*** | Araceae | Manganri (Id) | Herb | Cultivated | Stem (Tuber) | SW | 1 | 0.37 | Ribeiro *et al.,* 2018 |
| *Combretum glutinosum* Perr.* | Combretaceae | Mangbèvidé (Fo) | Tree | Spontaneous | Flowers | SW | 1 | 0.37 | No records |
| *Combretum micranthum* G.Don* | Combretaceae | Vrai kinkéliba (Fr) | Shrub | Spontaneous | Leaves, Roots | SW | 4 | 1.47 | No records |
| *Commelina benghalensis* L.* | Commelinaceae | olirékou (Id) | Herb | Spontaneous | Roots | SW | 1 | 0.37 | No records |
| *Commiphora africana* (A.Rich.) Engl.* | Burseraceae | Oridji (Id) | Shrub | Spontaneous /Cultivated | Leaves | SW | 1 | 0.37 | No records |
| *Corchorus olitorius* L.** | Malvaceae | Yoryor (Id) | Herb | Cultivated | Leaves | SW | 1 | 0.37 | Mahajan & Gajare 2012 |
| *Crossopteryx febrifuga* (G.Don) Benth.** | Rubiaceae | Orgbor/Ayin yin (Na), Bobian (Ba) | Shrub | Spontaneous | Barks, Roots | SW | 2 | 0.74 | Valentin *et al.,* 2020 |
| *Ctenium newtonii* Hack.* | Poaceae | Koradouré (Wa) | Herb | Spontaneous | Leaves | I | 1 | 0.37 | No records |
| *Curculigo pilosa* (Schum. &Thonn.) Engl.*** | Hypoxidaceae | Kôrômi (Ho) | Herb | Spontaneous | Roots (Tuber) | SW, LS | 6 | 2.21 | Adefegha *et al.,* 2018 |
| *Cymbopogon citratus* (DC.) Stapf*** | Poaceae | Tchaman (Fo), éwé ti (Na), Citonnelle (Fr) | Herb | Cultivated | Leaves, Stem | SW, LS, LL | 6 | 2.21 | Akpoka *et al.,* 2019 |
| *Cyperus esculentus* L.***+ | Cyperaceae | Ofio (Id), Fio (Fo), souchet (Fr) | Herb | Cultivated | Stem (Tuber) | SW, EE, LS, I | 32 | 11.76 | Allouh *et al.,* 2015 |

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|---|---|---|---|---|---|---|---|---|---|
| *Daucus carota* L. ssp. sativus (Hoffm.) Arcang.*** | Apiaceae | Carotte (Fr) | Herb | Cultivated | Roots (Tubers) | SW | 1 | 0.37 | Molkara *et al.*, 2018 |
| *Desmodium gangeticum* (L.) DC. var. gangeticum*** | Fabaceae | Ayikpéilè (Tch) | Shrub | Spontaneous | Roots | SW | 5 | 1.84 | Gurav *et al.*, 2020 |
| *Desmodium velutinum* (Willd.) DC.*** | Fabaceae | Trèdavor (Fo), Souannongbi ni (Ba) | Herb | Spontaneous | Leaves, Roots | SW, LS | 4 | 1.47 | Mafo *et al.*, 2020 |
| *Detarium microcarpum* Guill. & Perr.** | Fabaceae | Irédé (Ich) | Tree | Spontaneous | branches | EE | 1 | 0.37 | Borokini & Clement 2012 |
| *Dioscorea alata* L.** | Dioscoreaceae | Aga (Id), Kpètè (Fo) | Climber | Spontaneous /Cultivated | Stem (Tuber) | SW, EE, LS | 8 | 2.94 | Dey *et al.*, 2016 |
| *Dioscorea dumetorum* (Kunth) Pax* | Dioscoreaceae | Léfé (Fo) | Climber | Spontaneous /Cultivated | Stem (Tuber) | SW, EE | 3 | 1.10 | No records |
| *Dioscorea praehensilis* Benth.* | Dioscoreaceae | Igname mâle (Fr) | Climber | Spontaneous | Stem (Tuber) | SW | 1 | 0.37 | No records |
| *Dioscorea rotundata* Poir.* | Dioscoreaceae | Kokoro (Ida) | Climber | Cultivated | Stem (Tuber) | SW | 1 | 0.37 | No records |
| *Diospyros mespiliformis* Hochst. ex A.DC.* | Ebenaceae | Wibi (Ba), Kinwi (Fo) | Tree | Spontaneous | Roots, Barks | SW | 2 | 0.74 | No records |
| *Elaeis guineensis* Jacq.**+ | Arecaceae | Egui êkpê (Ida), Détin (Fon), Palmier à huile (Fr) | Palm tree | Cultivated/A grosystem | Flowers, Roots, Seeds | SW, LS, I | 17 | 6.25 | Reddy *et al.*, 2019; Kambalé 2012 |
| *Entada africana* Guill. & Perr.*** | Fabaceae | Igba arisso (Id) | Tree | Spontaneous | Roots | SW | 1 | 0.37 | Mvondo *et al.*, 2019 |
| *Entada gigas* (L.) Fawcett & Rendle* | Fabaceae | Gbagbada (Fo) | Climber | Spontaneous | Seeds | LS | 1 | 0.37 | Foster *et al.*, 2020 |
| *Erythrina senegalensis* DC.*** | Fabaceae | Oshishè (Id) | Tree | Spontaneous /Cultivated | Roots, branches | SW, EE | 2 | 0.74 | Nnama *et al.*, 2017 |
| *Euphorbia hirta* L.** | Euphorbiaceae | Iyankoun ayira (Id) | Herb | Spontaneous | Leaves | SW | 1 | 0.37 | Gupta *et al.*, 2019 ; Kambalé 2012 |
| *Evolvulus alsinoides* (L.) L.** | Convolvulaceae | Tibitiré (Id), Zounkorman (Fo) | Herb | Spontaneous | Leaves | I | 1 | 0.37 | Gupta *et al.*, 2019 ; Bhatt *et al.*, 2021 |
| *Flacourtia indica* (Burm. f.) Merr.* | Flacourtiaceae | Gbohounkadj ê (Fo) | Shrub | Spontaneous | Roots | SW | 1 | 0.37 | Gnanasekar 2015 |
| *Flueggea virosa* (Roxb.ex Willd) Voigt.** | Euphorbiaceae | Kortorman (Fo), Sinssiyan (Ba) | Shrub | Spontaneous | Roots, Leaves | SW | 4 | 1.47 | Gupta *et al.*, 2019 |
| *Garcinia kola* Heckel***+ | Clusiaceae | Ahowétin (Fo), Iwo (Id), Goror (Ba) | Tree | Agrosystem/c ultivated | Seeds | SW, EE, LS, RP | 46 | 16.91 | Obiandu *et al.*, 2018 |
| *Gardenia erubescens* Stapf & Hutch.**+ | Rubiaceae | Kankranbor (Ida), Dakpla (Fo), Kikiyiba (If) | Shrub | Spontaneous | Roots | SW, EE, I | 13 | 4.78 | Sabo *et al.*, 2018 |
| *Gomphrena celosioides* Mart.* | Amaranthaceae | Dawawé/Adi o (Fo) | Herb | Spontaneous | Leaves | SW | 1 | 0.37 | No records |
| *Heliotropium indicum* L.** | Boraginaceae | KoKlosou adinkpèchè | Herb | Spontaneous | Leaves, Flowers, | SW, I | 2 | 0.74 | Ahmed 2017, Koffuor *et al.*, 2012 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | (Aj) | | | Roots | | | | |
| *Holarrhena floribunda* (G. Don) T. Durand & Schinz* | Apocynaceae | Lètin wiwi (Fo) | Tree | Spontaneous | Barks | V | 1 | 0.37 | No records |
| *Hymenocardia acida* Tul.** | Euphorbiaceae | Oroukpa (Id) | Shrub | Spontaneous | Roots, Barks | SW, I | 4 | 1.47 | MacDonald *et al.,* 2016, Valentin *et al.,* 2020 |
| *Icacina oliviformis* (Poiret) Raynal,* | Icacinaceae | Azonkwin (Fo) | Shrub | Spontaneous | Roots (Tubers) | I | 2 | 0.74 | Seidu *et al.,* 2019 |
| *Imperata cylindrica* (L.) P. Beauv.***+ | Poaceae | Sè (Fo), Igan (Id), Chiendent (Fr) | Herb | Spontaneous | Rhizomes | SW, EE, LS, I | 20 | 7.35 | Nwokike *et al.,* 2020 ; Gaikwad *et al.,* 2019 |
| *Ipomoea batatas* (L.) Lam.*** | Convolvulaceae | Dankali (Ba), Patate douce (Fr) | Climber | Cultivated | Roots (Tubers) | SW | 3 | 1.10 | Majid *et al.,* 2019 |
| *Irvingia gabonensis* (Aubry-LeComte ex O'Rorke)** | Irvingiaceae | Igui Oro (Na) | Tree | Cultivated | Seeds | SW | 1 | 0.37 | Adegbehingbe *et al.,* 2017 |
| *Jatropha curcas* L.** | Euphorbiaceae | Adjagbogbo (Aj), Yonkpontin (Fo), Boukatounou (Ba) | Shrub | Cultivated | Leaves | SW, RP | 6 | 2.21 | Singh *et al.,* 2012; Semenya & Potgieter 2013 |
| *Khaya senegalensis* (Desr.) A. Juss.**+ | Meliaceae | Agao (Na), Kahi (Pe), Hèlemon (Lo), Fèlè (De) | Tree | Spontaneous /Cultivated | Roots, Barks | SW, EE | 14 | 5.15 | Gupta *et al.,* 2019 ; Ipona *et al.,* 2018 |
| *Kigelia africana* (Lam.) Benth.*** | Bignoniaceae | Tortorlor (Ich), Kpandor (Na), Gnankpo (Id) | Tree | Spontaneous | Fruits, Barks | SW, V | 6 | 2.21 | Micheli *et al.,* 2020 |
| *Lagenaria siceraria* (Molina) Standl.** | Cucurbitaceae | Gbaka (Ba), Calebasse (Fr) | Climber | Cultivated | Fruits | SW | 1 | 0.37 | Demoze *et al.,* 2021 |
| *Lantana trifolia* L.* | Verbenaceae | Tiyindarha (Wa) | Shrub | Spontaneous | Roots (Tubers) | SW, I | 1 | 0.37 | No records |
| *Launaea taraxacifolia* (Willd.) Amin ex C. Jeffrey*** | Asteraceae | Gnantoto (Fo) | Herb | Spontaneous /Cultivated | Leaves, leafy stem | SW | 3 | 1.10 | Adejuwon *et al.,* 2015 |
| *Lawsonia inermis* L.** | Lythraceae | Henné (Fr) Lali (Na) | Shrub | Cultivated | Roots, Leaves | LL | 1 | 0.37 | Kumari *et al.,* 2015 |
| *Lippia multiflora* Moldenke** | Verbenaceae | Tchaga (Ich) | Herb | Spontaneous /Cultivated | Roots | V | 1 | 0.37 | Mathur 2013 |
| *Lophira lanceolata* Tiegh. ex Keay*** | Ochnaceae | Orkpao (Na), Bolagan (An), Faux kaité (Fr) | Tree | Spontaneous | Barks | SW, EE | 3 | 1.10 | Etuk *et al.,* 2009 |
| *Luffa cylindrica* M. Roem.* | Cucurbitaceae | Eponge végétale (Fr) | Climber | Spontaneous | Leaves | SW | 1 | 0.37 | No records |
| *Mallotus oppositifolius* (Geisel.) Müll.Arg. var. oppositifolius** | Euphorbiaceae | Ayindja (Id) | Shrub | Spontaneous | Roots | SW | 1 | 0.37 | Nwaehujor *et al.,* 2014 |

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|---|---|---|---|---|---|---|---|---|---|
| *Manihot esculenta* Crantz**+ | Euphorbiaceae | Logo (Ba), Finyin (Fo), Adjagoun (Id), Manioc (Fr) | Shrub | Cultivated | Roots | SW, LS, I | 30 | 11.03 | Togola *et al.*,, 2020 |
| *Momordica charantia* L.*** | Cucurbitaceae | Badoman (De) | Climber | Spontaneous | Leafy stem | F | 1 | 0,37 | Obiandu & Achinike 2020 |
| *Mondia whitei* (Hook. f.) Skeels*** | Asclepiadaceae | Tchirigoun (Fo) | Climber | Spontaneous | Roots | SW | 5 | 1.84 | Watcho *et al.*, 2015 |
| *Monodora myristica* (Gaertn.) Dunal*+ | Annonaceae | Sassalikoun (Fo), Ariwo (Id) | Tree | Spontaneous | Seeds | SW, EE, LS | 16 | 5.88 | No records |
| *Moringa oleifera* Lam.***+ | Moringaceae | yorouyara (Ba), Yovokpatin (Fo), Moringa (Fr) | Shrub | Cultivated | Seeds, Roots, Leaves | SW, EE | 14 | 5.15 | Prabsattroo *et al.*, 2015 |
| *Musa sapientum* auct. div.***+ | Musaceae | Kokoé aloga (Fo), Agbagba (Na), Bananier plantain (Fr) | Herb | Cultivated | Fruits | SW, EE, LS, I | 54 | 19.85 | Alabi *et al.*, 2013 |
| *Newbouldia laevis* (P.Beauv.) Seemann ex Bureau*** | Bignoniaceae | Kpatin (Fo), Hysope (Fr) | Shrub | Spontaneous /Cultivated | Leaves | I | 1 | 0.37 | Akomolafe *et al.*, 2018 |
| *Ocimum canum* L.** | Lamiaceae | Héhétchou (Aj) | Herb | Spontaneous /Cultivated | Leaves, leafy stem | SW, I | 3 | 1.10 | Tshilanda *et al.*, 2019 |
| *Ocimum gratissimum* L.*** | Lamiaceae | Tchiayo (Fo), Gnandodoui (Aj) | Herb | Spontaneous /Cultivated | Roots, Leaves | SW, V | 4 | 1.47 | Ojo *et al.*, 2019 |
| *Pachycarpus lineolatus* (Decne.) Bullock*+ | Asclepiadaceae | Agboaguin (Fo), Tchéffé (Ida), Sonrouwroboou (De) | Herb | Spontaneous | Rhizomes | SW, EE, LS, I | 16 | 5.88 | No records |
| *Parkia biglobosa* (Jacq.) R. Br. ex G. Don** | Fabaceae | Egui Igba (Id) | Tree | Spontaneous /Agrosystem | Barks | SW | 1 | 0.37 | MacDonald *et al.*, 2016 |
| *Paullinia pinnata* L.*** | Sapindaceae | Adaklordor (Fo), Gbogboawiya (Id) | Climber | Spontaneous | Roots | SW, I | 5 | 1.84 | Baffoe *et al.*, 2021 |
| *Pergularia daemia* (Forssk.) Chiov.* | Asclepiadaceae | Orgbor founfoun (Na) | Climber | Spontaneous | Leaves | SW | 1 | 0.37 | No records |
| *Pericopsis laxiflora* (Benth. ex Baker)* | Fabaceae | Sinaférikou (Ba), Ishèdoun (If) | Tree | Spontaneous | Leaves, Roots, Barks | SW, RP | 3 | 1.10 | No records |
| *Persea americana* Mill.** | Lauraceae | Avocatier (Fr) | Tree | Cultivated | Seeds | SW | 1 | 0.37 | Paniagua-Zambrana *et al.*, 2020 |
| *Phoenix dactylifera* L.***+ | Arecaceae | Dattier (Fr), Giyofopor (An) | Palm tree | Spontaneous | Fruits | SW, EE | 19 | 6.99 | Abedi *et al.*, 2012 |
| *Phyllanthus amarus* Schumach. & Thonn.*** | Euphorbiaceae | Tèyinsso (Nago), Sobarou (Ba) | Herb | Spontaneous | Roots, Leaves | SW, LS, I | 6 | 2.21 | Azubuike *et al.*, 2018 |

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|---|---|---|---|---|---|---|---|---|---|
| *Picralima nitida* (Stapf.) T. & H.Durand** | Apocynaceae | Ayokpè (Fo) | Tree | Spontaneous | Barks | SW | 1 | 0.37 | Awodele *et al.*, 2019 |
| *Piliostigma thonningii* (Schumach.) Milne-Redh.** | Fabaceae | Kparounman (Id) | Shrub | Spontaneous | Barks | EE | 1 | 0.37 | Emmanuel *et al.*, 2017 |
| *Piper guineense* Schumach. & Thonn.*** | Piperaceae | Linlinkoun (Fo), Idjayé (Id) | Climber | Spontaneous | Fruits | SW, EE, LS, I | 8 | 2.94 | Ochei *et al.*, 2017 |
| *Piper nigrum* L.*** | Piperaceae | Moussoro (De), Poivre (Fr) | Climber | Spontaneous | Fruits | SW | 1 | 0.37 | Septiyorini *et al.*, 2020 |
| *Plumbago zeylanica* L.*** | Plumbaginaceae | Dangblan (Fo) | Shrub | Spontaneous /Cultivated | Roots | I | 1 | 0.37 | Onen *et al.*, 2021 |
| *Prosopis africana* (Guill. & Perr.) Taub.**+ | Fabaceae | Kakêtin (Fo), Acacayin (Id), Sorba (Ba) | Tree | Spontaneous | Roots, Leaves, Stem | SW, EE, LS, I, LL, V | 23 | 8.46 | MacDonald *et al.*, 2016 ; Togola *et al.*, 2020 |
| *Pseudocedrela kotschyi* (Schweinf.) Harms*** | Meliaceae | Tchaklikli (Fo), Bississonbou (Ba) | Tree | Spontaneous | Roots, Barks | SW, EE, V | 4 | 1.47 | Ojewale *et al.*, 2014; |
| *Psidium guajava* L.*** | Myrtaceae | Goyavier (Fr) | Tree | Cultivated | Roots | SW | 2 | 0.74 | Uboh *et al.*, 2010 |
| *Pteleopsis suberosa* Engl. & Diels* | Combretaceae | Okroukrou (Id) | Shrub | Spontaneous | Leaves, Barks | SW, LS | 2 | 0.74 | No records |
| *Pterocarpus erinaceus* Poir.** | Fabaceae | Tém (Lo), Sooda (Wa), Tona (Ba) | Tree | Spontaneous | Roots, Barks | SW, I | 6 | 2.21 | Segla *et al.*, 2015 |
| *Raphia sudanica* A. Chev.* | Arecaceae | Kpako (Na) | Palm tree | Spontaneous | Fruits | SW | 4 | 1.47 | No records |
| *Rourea coccinea* (Thonn.ex Schumach.) Benth.*** | Connaraceae | Sèssèguérou (Ba), Ganganlissè (Fo), Tchihountoboui (Aj) | Shrub | Spontaneous | Leaves | SW, LS | 5 | 1.84 | Agbodjento *et al.*, 2020 |
| *Saccharum officinarum* L.*** | Poaceae | Léké (Fo) | Herb | Cultivated | Stem | LL | 1 | 0.37 | Gurav *et al.*, 2020 |
| *Sarcocephalus latifolius* (Sm.) E. A. Bruce****+ | Rubiaceae | Kodor (Fo), Igbêssin (Id) | Shrub | Spontaneous | Roots | SW, EE | 15 | 5.51 | Méa *et al.*, 2017 |
| *Scoparia dulcis* L.** | Scrophulariaceae | Manmarou (Ba), Oyin (Na), Odoundoun (Id) | Herb | Spontaneous | Leaves, Leafy stem | SW, LL | 4 | 1.47 | Reddy *et al.*, 2012 |
| *Securidaca longepedunculata* Fres.*** | Polygalaceae | Ikpata (Tch), Bissaha (Lo), Sorwan (Ba), Souan (De) | Shrub | Spontaneous | Roots, Barks | SW | 6 | 2.21 | Chika *et al.*, 2017 |
| *Senna occidentalis* (L.) Link* | Fabaceae | Kpaja-kpaja (Na); Yayinor (Wa); Faux kinkéliba (Fr) | Herb | Spontaneous | Roots, Leaves | SW | 2 | 0.74 | No records |
| *Sida acuta* Burm.f. ssp. carpinifolia (L.f.) Borss.Waalk.*** | Malvaceae | Adoman (Fo) | Herb | Spontaneous | Leaves | SW, EE | 2 | 0.74 | Semwal *et al.*, 2015 |
| *Sida cordifolia* L.*** | Malvaceae | Eshôkoutou | Herb | Spontaneous | whole | I | 1 | 0.37 | Gurav *et al.*, 2020 |

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|---|---|---|---|---|---|---|---|---|---|
| | | abo (Tch) | | | plant | | | | |
| *Smilax kraussiana* Meisn.*** | Smilacaceae | Lalalouhou (Lo) | Herb | Spontaneous | Leaves | SW | 1 | 0.37 | Nwafor & Oniyide 2017 |
| *Solanum nigrum* L.*** | Solanaceae | Kotoroku (Wa) | Herb | Spontaneous | Leaves | I | 1 | 0.37 | Omojokun *et al.*, 2019 |
| *Sterculia setigera* Delile* | Malvaceae | Olaoko (Na) | Tree | Spontaneous | Roots | SW | 2 | 0.74 | No records |
| Stereospermum kunthianum Cham.* | Bignoniaceae | Gbékpatin (Fo) | Tree | Spontaneous | Roots | SW | 1 | 0.37 | No records |
| *Syzygium aromaticum* (L.) Merr. & L. M. Perry***+ | Myrtaceae | Atikingbadota (Fo), Karoufou (Ba) | Tree | Spontaneous /Cultivated | Flowers | SW, LS, I | 11 | 4.04 | Ahmad *et al.*, 2004 |
| *Talinum triangulare* (Jacq.) WiIld.* | Portulacaceae | Glasséman (Fo), Caloulou (Tch) | Herb | Spontaneous | Leaves | SW | 3 | 1.10 | No records |
| *Tamarindus indica* L.***+ | Fabaceae | Djêvivi (Fo), Gouyèmou (An), Poussika (Wa) | Tree | Spontaneous /Agrosystem | Roots, branches, Barks | SW, EE, I | 12 | 4.41 | Rai *et al.*, 2018 |
| *Tetrapleura tetraptera* (Schumach. & Thonn.) Taub.*** | Fabaceae | Aïdan ôtôror (Na) | Tree | Spontaneous | Fruits | SW | 4 | 1.47 | Adelakun *et al.*, 2021 |
| *Tragia senegalensis* Müll.Arg.* | Euphorbiaceae | Azor (Fo), Wérékpékpé (Id) | Climber | Spontaneous | Leaves | SW | 4 | 1.47 | No records |
| *Trema orientalis* (L.) Blume syn *Trema guineensis* (Schumach. & Thonn.) Ficalho* | Celtidiaceae | Afêfè (Id) | Tree | Spontaneous | Leaves | SW | 1 | 0.37 | Parvez, *et al.*, 2019 |
| *Tribulus terrestris* L.*** | Zygophyllaceae | Ishakoro (Id) | Herb | Spontaneous | Fruits | SW | 1 | 0.37 | Gauthaman & Ganesan 2008 |
| *Triclisia subcordata* Oliv.* | Menispermaceae | Viaka (Aj), Oshougban (Na) | Climber | Spontaneous | Roots | SW, I | 2 | 0.74 | No records |
| *Uapaca togoensis* Pax* | Euphorbiaceae | Farou (Ba), Wawo (Na) | Tree | Spontaneous | Barks, Roots | SW, I | 4 | 1.47 | No records |
| *Uvaria chamae* P. Beauv*** | Annonaceae | Egui Yaha (Id), Ayadaha (Fo) | Climber | Spontaneous | Roots, Leaves | SW, EE, LS | 5 | 1.84 | Owaba *et al.*, 2021*** |
| *Vernonia amygdalina* Delile*** | Asteraceae | Amanvivè (Fo) | Shrub | Spontaneous /Cultivated | Leaves | SW | 2 | 0.74 | Omojokun *et al.*, 2019 |
| *Vernonia cinerea* Sch. Bip*** | Asteraceae | Houssikoussin (Fo) | Herb | Spontaneous /Cultivated | Leaves | SW | 1 | 0.37 | Pomjunya *et al.*, 2017 |
| *Vitellaria paradoxa* C.F. Gaertn. ssp. Paradoxa* | Sapotaceae | Egui êmi (Id), Karité (Fr) | Tree | Spontaneous /Agrosystem | Roots, Barks | SW, V | 3 | 1.10 | Ojo *et al.*, 2021 |
| *Voacanga africana* Stapf.** | Apocynaceae | Agbossou ningla (Fo) | Shrub | Spontaneous | Roots | SW, EE | 6 | 2.21 | Brunetti *et al.*, 2020 |
| *Ximenia americana* L.** | Olacaceae | Iwéwé oko (Id) | Shrub | Spontaneous | Roots | SW | 1 | 0.37 | Togola *et al.*, 2020 |
| *Xylopia aethiopica* (Dunal) A. Rich.***+ | Annonaceae | Kpédjélékoun (Fo), Orhoun (Id) | Tree | Spontaneous | Fruits | SW, EE, V | 22 | 8.09 | Adienbo *et al.*, 2013 |
| *Zanthoxylum zanthoxyloides* (Lam.) | Rutaceae | Egui ata (Id), Hêtin (Fo), | Shrub | Spontaneous | Roots, Stem, | SW, I | 14 | 5.15 | Ombito 2021 |

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|---|---|---|---|---|---|---|---|---|---|
| Zepernick & Timler* | | Salé salé (If) | | | Leaves, Barks | | | | |
| *Zea mays* L.***+ | Poaceae | Maïs (Fr) | Herb | Cultivated | Fruits | SW, EE | 13 | 4.78 | Carro-Juárez *et al.*, 2017 |
| *Zingiber officinale* Roscoe***+ | Zingiberaceae | Dotè (Fo), Atalè (Id), Ataribo (Ba), Gingembre (Fr) | Herb | Cultivated | Rhizomes | SW, EE | 21 | 7.72 | Alhowiriny *et al.*, 2013 Gurav *et al.*, 2020 |

Botanical name:

*Aphrodisiac use of specie cited for the first time,

** Aphrodisiac use of specie previously cited but not yet confirmed scientifically,

***Aphrodisiac use of specie already evaluated scientifically +Commonly used species; Vernacular names: Fo=Fon, Id=Idaatcha, Ba=Bariba, Na=Nago, Fr=French, Wa=Waama, Nt=Natimba, Tch=Tchabè, Ho=Holli, Ich=Itcha, De=Dendi, An=Anii, If=Ifè, Aj=Adja, Lo=Lokpa, Pe=Peulh; Traditional uses: SW=Sexual weakness, SD= Lack of sperm, EE= Early ejaculation, I= Sexual Impotence, LL= Lack of libido, RP= Reduced penis size,

V= Vaginitis;

FC= Number of people having quoted the species; RFC= Relative Frequency of Citation.

This is not surprising considering the greatest number of medicinal plants commonly used from these taxa to treat several diseases in Benin and neighboring countries (Adomou *et al.,* 2012; Laleye *et al.,* 2015; Ambé *et al.*, 2015). Fabaceae is especially reported as the third largest flowering plant family in the world (Ahmad *et al.,* 2016). Moreover, several ethnobotanical studies mentioned these taxa as containing more aphrodisiac plant species (Ipona *et al.,* 2018; Ajao *et al.,,* 2019; Togola *et al.,* 2020; Valentin *et al.,* 2020). Furthermore, plants from these families were known to contain active metabolites which might also be the reason for their efficacy to treat sexual dysfunctions. However, assuming that medicinal properties are not randomly distributed in plant phylogenies (Saslis-Lagoudakis *et al.,* 2011), these findings need to be confirmed through bioscreening potential and bioinformatics approaches for example. More specifically, aphrodisiac plants from these dominant families especially those threatened in Benin (Adomou, 2005) should be more studied for their sustainable use.

**Table 3.** List of commonly used aphrodisiac plants.

| Aphrodisiac plant species | Plant families | Vernacular names | Parts used | Ailments Treated | FC | Cpr (%) |
|---|---|---|---|---|---|---|
| *Caesalpinia bonduc* (L.) Roxb. | Fabaceae | Adjikoun (Fo), Egui adji (Id) | Roots | SW, EE, LS, SI | 64 | 9.91 |
| *Musa sapientum* auct. div. | Musaceae | Kokoé aloga (Fo), Agbagba (Na), Bananier plantain (Fr) | Fruits | SW, EE, LS, SI | 54 | 11.76 |
| *Garcinia kola* Heckel | Clusiaceae | Ahowétin (Fo), Iwo (Id), Goror (Ba) | Seeds | SW, EE, LS, RP | 46 | 8.98 |
| *Aframomum melegueta* (Roscoe) K. Schum. | Zingiberaceae | Atakoun (Fo) Iro guirou (Ba) | Fruits, seeds, | SW, EE, LS, SI, F | 33 | 8.36 |
| *Cyperus esculentus* L. | Cyperaceae | Ofio (Id), Fio (Fo), souchet (Fr) | Stem tubers | SW, EE, LS, SI | 32 | 7.43 |
| *Borassus aethiopum* Mart. | Arecaceae | Agontin (Fo), Egui Agbon (Id), Rônier (Fr) | Hypocotyls, Roots | SW, EE, SI | 31 | 5.26 |
| *Manihot esculenta* Crantz | Euphorbiaceae | Logo (Ba), Finyin (Fo), Adjagoun (Id), Manioc (Fr) | Root tubers | SW, LS, SI | 30 | 6.19 |
| *Cissus populnea* Guill. & Perr. | Vitaceae | Assankan (Fo), Gborgorlor (An), Obè ordè (Id), Orlor (Na) | Stems, Roots | SW, EE, LS | 24 | 5.26 |
| *Prosopis africana* (Guill. & Perr.) Taub. | Fabaceae | Kakêtin (Fo), Acacayin (Id), Sorba (Ba) | Stems, Roots, Leaves | SW, EE, LS, SI, LL, V | 23 | 4.95 |
| *Xylopia aethiopica* (Dunal) A. Rich. | Annonaceae | Kpédjélékoun (Fo), Orhoun (Id) | Fruits | SW, EE, V | 22 | 4.95 |
| *Acridocarpus smeathmannii* (DC.) Guill. & Perr. | Malpighiaceae | Gbanguinan (Fo) | Roots | SW, EE | 21 | 3.41 |
| *Zingiber officinale* Roscoe | Zingiberaceae | Dotè (Fo), Atalè (Id), Ataribo (Ba), | Rhizomes | SW, EE | 21 | 4.64 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Gingembre (Fr) | | | | |
| *Cocos nucifera* L. | Arecaceae | Agokintin (Fo), Kpaakpa (Ba), Cocotier (Fr) | Fruits, Roots | SW | 20 | 4.33 |
| *Imperata cylindrica* (L.) P. Beauv. | Poaceae | Sè (Fo), Igan (Id), Chiendent (Fr) | Rhizomes | SW, EE, LS, SI | 20 | 4.95 |
| *Phoenix dactylifera* L. | Arecaceae | Dattier (Fr), Giyofopor (An) | Fruits | SW, EE | 19 | 3.41 |
| *Annona senegalensis* Pers. | Annonaceae | Gniglo (Fo), Otribobo (Id), Bahtokor (Ba), Winrébou (Wa), Nanmoubou (Nt) | Leaves, Roots | SW, LS, V | 18 | 1.86 |
| *Cola acuminata* (P. Beauv.) Schott & Endl. | Malvaceae | Obi (Id), Vi (Fo) | Seeds | SW, EE, LS | 17 | 3.41 |
| *Elaeis guineensis* Jacq. | Arecaceae | Egui êkpê (Ida), Détin (Fon), Palmier à huile (Fr) | Roots, Flowers, Seeds | SW, LS, SI | 17 | 4.64 |
| *Carpolobia lutea* G. Don | Polygalaceae | Aviatin (Fo), Atchouintchouin (Ho), | Roots, Stems | SW, LS, SI | 16 | 2.79 |
| *Monodora myristica* (Gaertn.) Dunal | Annonaceae | Sassalikoun (Fo), Ariwo (Id) | Seeds | SW, EE, LS | 16 | 3.10 |
| *Pachycarpus lineolatus* (Decne.) Bullock | Asclepiadaceae | Agboaguin (Fo), Tchéffé (Ida), Sonrouwrobou (De) | Rhizomes | SW, EE, LS, SI | 16 | 3.72 |
| *Sarcocephalus latifolius* (Sm.) E. A. Bruce | Rubiaceae | Kodor (Fo), Igbêssin (Id) | Roots | SW, EE | 15 | 1.24 |
| *Allium cepa* L. | Alliaceae | Ayoma (Fo), Mansa (Id) | Bulbs | SW, EE, PR | 14 | 3.10 |
| *Khaya senegalensis* (Desr.) A. Juss. | Meliaceae | Agao (Na), Kahi (Pe), Hèlemon (Lo), Fèlè (De) | Bark, Roots | SW, EE | 14 | 2.17 |
| *Moringa oleifera* Lam. | Moringaceae | yorouyara (Ba), Yovokpatin (Fo), Moringa (Fr) | LeavesSeeds, Roots | SW, EE | 14 | 3.72 |
| *Cola nitida (*Vent.) Schott. & Endl. | Malvaceae | Golotin (Fo), Goro (Id) | Seeds, Barks | SW, EE, LS, SI | 13 | 2.48 |
| *Gardenia erubescens* Stapf & Hutch. | Rubiaceae | Kankranbor (Ida), Dakpla (Fo), Kikiyiba (If) | Roots | SW, EE, SI | 13 | 4.02 |
| *Zea mays* L. | Poaceae | Maïs (Fr) | Fruits | SW, EE | 13 | 3.72 |
| *Abrus precatorius* L. | Fabaceae | Viviman (Fo), Odjou êga (Id) | Stem leafy | SW, LS | 12 | 3.10 |
| *Tamarindus indica* L. | Fabaceae | Djêvivi (Fo), Gouyèmou (An), Poussika (Wa) | Root Branches, Barks | SW, EE, SI | 12 | 3.72 |
| *Carica papaya* L. | Caricaceae | Aguidi akor (Id; Tch), Papaye tibou (Wa) | Roots | SW, EE, SI | 11 | 2.48 |
| *Carissa spinarum* L. | Apocynaceae | Ahanzo (Fo) | Roots, Bark, Leaves | SW, EE, SI | 11 | 1.55 |
| *Syzygium aromaticum* (L.) Merr. & L. M. Perry | Myrtaceae | Atikingbadota (Fo), Karoufou (Ba) | Flowers | SW, LS, SI | 11 | 1.55 |

FC: Frequency species citations; Cpr: Contribution of the plant to aphrodisiac recipes;
Ethny: Fo=Fon, Id= Idaatcha , Ba= Bariba , Na=Nago, Fr=French, Wa= Waama , Nt= Natimba , Tch = Tchabè , Ho= Holli , Ich =Itcha, De= Dendi , An= Anii , If= Ife
Ailments treated: SW= Sexual weakness, EE= Early ejaculation, LS= Lack of Sperm, SI= Sexual impotence, LL= Lack of libido, RP= Reduced penis size, V= Vaginitis.

Considering the total of 148 aphrodisiac plants recorded, sixty-four (64, 43.24% of all recorded plants) included *Acridocarpus smeathmannii* (DC.) Guill. & Perr. (Kale *et al.,* 2018), *Allium cepa* L. (Adeyemi *et al.,* 2017), *Aloe vera* (L.) Burm. f. (Jadhav *et al.,* 2020), *Borassus aethiopum* Mart (Gbesso *et al.,* 2016), *Caesalpinia bonduc* (L.) Roxb (Gbankoto *et al.*, 2015), *Cissus populnea* Guill. & Perr. (Ojekale *et al.,* 2015), *Musa sapientum* auct. div. (Alabi *et al.* 2013) (Table 2) have previously been evaluated scientifically, thus lending credence to the folkloric usage of the plants. So, toxicological tests are required to demonstrate the safety of these plant parts used. Forty-seven plant species (47, 31.76% of all recorded species) have been cited as possessed aphrodisiac properties and are usually used in traditional medicine but not yet confirmed clinically (Table 2). They include species such as *Abelmoschus*

*esculentus* (L.) Moench (Gupta *et al.,* 2019), *Annona senegalensis* Pers. (Togola *et al.,* 2020), *Aristolochia albida* Duch. (Gupta *et al.,* 2019), *Carissa spinarum* L. (Demoze *et al.,* 2021), *Cerathoteca sesamoides* Endl. (Abubakar *et al.,* 2020), *Dioscorea alata* L. (Dey *et al.,* 2016), *Manihot esculenta* Crantz (Togola *et al.*, 2020) etc. These results attest that informants hold a good knowledge of plant species with aphrodisiac properties. This study reports for the first time the aphrodisiac use of 37 plants (25% of all recorded species) included *Combretum glutinosum* Perr., *Combretum micranthum* G.Don, *Dioscorea rotundata* Poir., Lantana trifolia L., *Monodora myristica* (Gaertn.) Dunal, *Tragia senegalensis* Müll.Arg. etc. (Table 2, Appendix). As a result, scientific evaluation of these claimed species is needed in order to uncover important leads in the fight against sexual dysfunction.

**Table 4.** List of credible aphrodisiac recipes (Ncr≥2).

| Ailments treated | Credible recipes | | | Fr (%) | Ncr |
|---|---|---|---|---|---|
| | Composition | Preparation mode | Administration and dosage form | | |
| Sexual weakness | *Caesalpinia bonduc* roots + "Sodabi" | Maceration | Drink one to two glass of 40 mL a few minutes before having sexual intercourse | 6.7 | 15 |
| | Unripe fruits of *Musa sapientum* + sugar cubes | Powdering | Oral one tablespoon once daily with porridge until cure | 6.25 | 14 |
| | *Manihot esculenta* roots | Powdering | Orally taken during a week to strengthen his sexual vigor | 4.02 | 9 |
| | *Cissus polpunea* stem | Powdering | Oral one tablespoon once daily with porridge or cow milk until cure | 3.57 | 8 |
| | *Garcinia* kola seeds | Chewing | One or two seeds are chewed and fluid swallowed a few minutes before having sexual intercourse | 3.57 | 8 |
| | Leaves of *Annona senegalensis* | Trituration + lemon juice | Drink the solution sometimes to keep his virility | 2.68 | 6 |
| | Hypocotyls of *Borassus aethiopum* | Prepared | Oral eat sometimes | 2.23 | 5 |
| | Roots of *Desmodium gangeticum* + preferred alcoholic drink | Maceration | Drink two glass of 40 mL twice daily until cure | 2.23 | 5 |
| | Hypocotyls of *Borassus aethiopum* + *Cocos nucifera* kernel + alcoholic drink | Maceration | Drink one glass of 40 mL a few minutes before having sexual intercourse | 1.79 | 4 |
| | Hypocotyls of *Borassus aethiopum* + *Caesalpinia bonduc* roots + *Elaeis guineensis* roots + *Garcinia kola* seeds + *Cyperus esculentus* tubers + "Sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 1.79 | 4 |
| | *Zingiber officinale* rhizomes | Powdering | Oral one teaspoon once each morning with warm porridge during one week | 1.79 | 4 |
| | Unripe fruits of *Musa sapientum* + *Cocos nucifera* kernel (cut into slices) + *Phoenix dactylifera* fruits + *Cyperus esculentus* tubers + *Borassus aethiopum* hypocotyls + Tonic/ fermented starch liquid/ "Sodabi" | Maceration | Drink one or two glass of 40 mL a few minutes before having sexual intercourse | 1.79 | 4 |
| | *Cyperus esculentus* tubers | Chewing | Oral chewed and fluid swallowed | 1.79 | 4 |
| | *Sarcocephalus latifolius* Roots + water | Maceration | Drink the solution sometimes to strengthen his sexual vigor | 1.79 | 4 |
| | *Garcinia kola* seeds + *Caesalpinia bonduc* roots + Cyperus esculentus tubers + "Sodabi" | Maceration | Drink two glass of 40 mL daily until cure | 1.34 | 3 |
| | *Carica papaya* male flowers/roots + alcoholic drink | Maceration | Drink two glass of 40 mL daily until cure | 1.34 | 3 |
| | *Carissa spinarum* roots + "Sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 1.34 | 3 |

| | | | | |
|---|---|---|---|---|
| *Musa spientum* unripe fruits + *Dioscorea alata* tubers + sugar cubes | Powdering | Oral one teaspoon twice daily until cure | 1.34 | 3 |
| *Imperata cylindrica* Rhyzomes + honey + 3 sugar cubes + "sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 1.34 | 3 |
| *Caesalpinia bonduc* roots (10 cm) | Chewing | Oral use as a toothpick in the evening | 0.89 | 2 |
| *Acridocarpus smeathmanii* roots + *Pachycarpus lineolatus* roots + *Caesalpinia bonduc* roots + *Garcinia kola* seeds + Mondia *whitei* roots + Fermented starch liquid/*Cocos nucifera* wine / "sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Abrus precartorius* leaves | Trituration + honey | Orally taken one per week | 0.89 | 2 |
| *Acridocarpus Smeathmanii* roots + "Sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Caesalpinia bonduc* roots + *Cyperus esculentus* tubers + *Sarcocephalus latifolius* roots + *Acridocarpus smeathmannii* roots + *Garcinia* kola seeds + "Sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Annona senagalensis* roots/leaves | Powdering | Oral one tablespoon once daily with porridge | 0.89 | 2 |
| *Prosopis africana* dried stem (cut into slices) + *Caesalpinia bonduc* roots + 9 small *Raphia sudanica* fruits + "sodabi" | Maceration | Drink one glass of 40 mL twice daily (morning & evening) until cure | 0.89 | 2 |
| *Prosopis africana* roots + *Capsicum annum* fruits + salt + burrowing squirrel penis + sheep penis | Powdering | Oral one teaspoon once each morning with warm porridge during one week | 0.89 | 2 |
| Cassytha *filiformis* stems+ *Musa sapientum* unripe fruits | Powdering | Orally taken once daily with warm porridge | 0.89 | 2 |
| *Zanthoxylum zanthoxyloides* leaves | Trituration + lemon juice | Drink the solution each evening during one month | 0.89 | 2 |
| *Cocos nucifera* fruit kernel + sheep penis + burrowing squirrel | Powdering | Orally taken with warm porridge | 0.89 | 2 |
| *Elaeis guineensis* roots + *Cocos nucifera* roots + *Khaya senegalensis* barks + *Phoenix dactylifera* fruits + tonic or preference alcoholic drink | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Eugenia aromaticum* buds | Powdering + honey | Oral one teaspoon with honey or lemon juice a few minutes before having sexual intercourse | 0.89 | 2 |
| *Garcinia kola* seeds + *Xylopia aethiopica* fruits + *Monodora myristica* seeds + "Sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| Whole plant of *Phyllanthus amarus* + "sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Prosopis africana* dried stem (cut out in small pieces) + rooster penis + sugar cubes +" sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Pterocarpus erinaceus* barks + sugar cubes | Powdering | Orally taken with warm porridge daily until cure | 0.89 | 2 |
| Zanthoxylum *zanthoxyloides* root barks + "sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Curculigo pilosa* roots + *Carpolobia lutea* roots + *Gardenia erubescens* roots+ burrowing squirrel penis+ sheep penis + preference alcohol drink | Maceration | Drink one glass of 40 mL twice daily until cure | 0.89 | 2 |
| *Cocos nucifera* roots + *Moringa oleifera* roots + fermented starch liquid | Maceration | Oral one teacup of 200 mL once a day until cure | 0.89 | 2 |
| *Cymbopogon citratus* stem | Chewing | Oral use as a toothpick in the evening | 0.89 | 2 |

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|---|---|---|---|---|---|
| | *Uapaca togoensis* roots (10 cm) | Chewing | Oral use as a toothpick in the evening | 0.89 | 2 |
| | Dried *Zea mays* cobs + sheep penis + goat penis | Powdering | Oral one teaspoon with porridge once daily | 0.89 | 2 |
| Early ejaculation | *Musa sapientum* unripe fruits + sugar cubes + burrower squirrel penis | Powdering | Orally take one teaspoon with warm porridge daily until cure | 14.29 | 3 |
| | *Moringa oleifera* leaves + *Zingiber officinale* rhizomes + "sodabi" | Maceration | Drink one glass of 40 mL twice daily until cure | 9.52 | 2 |
| Lack of libido/ Anaphrodisia | *Abrus precartorius* leaves | Trituration | Drink the juice | 30 | 3 |
| | *Cymbopogon citratus* leaves | Decoction | Orally taken as a tea daily to maintain his libido | 20 | 2 |
| Lack of sperm | *Annona senegalensis* leaves | Trituration + lemon juice | Drink the solution with milk or not twice a week | 22.22 | 6 |
| | *Rourea coccinea* leaves | Powdering | Oral use with porridge / Tapioca/ milk | 14.81 | 4 |
| | *Abelmoschus esculentus* fruit + salt | Chewing | Chew and absorb the juice | 11.11 | 3 |
| | *Dioscorea alata* tubers + sugar cubes | Powdering | Oral one teaspoon with porridge once daily | 11.11 | 3 |
| | Manihot *esculenta* fresh tubers | Chewing | Chew and absorb the juice | 7.41 | 2 |
| | *Cissus populnea* roots + fermented starch liquid | Maceration | Oral one teacup of 200 mL once daily until cure | 7.41 | 2 |
| Reduced penis size | *Kigelia africana* fruit (cut into slices) + water | Maceration | Penis massage daily twice (morning and evening) just after having bath until get total satisfy | 57.14 | 4 |

**Sodabi:* a sort of alcohol drink locally made in Benin from distilled palm wine; Fr: recipes frequency Ncr: number of one given recipe citations.

*Growth forms of aphrodisiac plants reported*

The growth forms of the reported species were herbs (31.08%), tree (27.70%), shrub (22.97%), climber (14.86%) and palm tree (3.38%) (Fig. 3). Similar results have been reported for aphrodisiac plants used in Ethiopia (Demoze *et al.,* 2021). Congruent with this result Ahmad *et al.,* (2009) suggested that plants with herbaceous life forms are the most commonly used in traditional medicine all over the globe due to their wide distribution and easy collection. In addition, the highest use of herbaceous plants as compared to other growth forms could be due to their accessibility, the higher possibility of obtaining pharmacologically active compounds, and the sociocultural beliefs and practices of healers to treat the ailment (Abebe *et al*., 2020).

**Table 5**. List of aphrodisiac plants and parts sold.

| Aphrodisiac plants | Parts sold | Plant status | Aphrodisiac plants | Parts sold | Plant status |
|---|---|---|---|---|---|
| *Abrus precartorius** | Leafy stem | | *Garcina kola* * | Seeds | EW |
| *Acridocarpus smeathmannii* * | Roots | EN | *Gardenia erubescens** | Roots | |
| *Aframomum melegueta* * | Fruits | | *Khaya senegalensis** | Barks | EN |
| *Allium cepa** | Bulbs | | *Kigelia africana* | Fruits | VU |
| *Allium sativum* | Bulbs | | *Lophira lanceolata* | Barks | |
| *Aristochia albida* | Roots | | *Mondia whitei* | Roots | EN |
| *Borassus aethiopum** | Fruits | VU | *Monodora myristica* * | Seeds | EN |
| *Caesalpinia bonduc* * | Roots | EW | *Musa sapientum** | Fruits | |
| *Capsicum annum* | Fruits | | *Pachycarpus lineolatus* * | Rhizomes | |
| *Carissa spinarum** | Roots | VU | *Paullinia pinnata* | Roots | |
| *Carpolobia lutea** | Roots | | *Phoenix dactylifera** | Fruits | |

| | | | | |
|---|---|---|---|---|
| *Cassia sieberiana* | Roots | *Phyllanthus amarus* | Leafy stem | |
| *Cassytha filiformis* | Stem | *Piper guineense* | Fruits | |
| *Cissus populnea** | Stem | *Prosopis africana** | Stem | |
| *Cocos nucifera** | Fruits | *Sarcocephalus latifolius** | Roots | |
| *Cola acuminata* * | Seeds | *Securidaca longepedunculata* | Roots | |
| *Cola nitida** | Seeds | *Syzygium aromaticum** | Flowers | |
| *Curculigo pilosa* | Roots | *Tetrapleura tetraptera* | Fruits | |
| *Cyperus esculentus** | Tubers | *Uvaria chamae* | Roots | |
| *Dioscorea alata* | Tubers | *Voacanga africana* | Roots | EN |
| *Dioscorea dumetorum* | Tubers | *Xylopia aethiopica* * | Fruits | VU |
| *Entada gigas* | Seeds | *Zanthoxylum zanthoxyloides* | Roots | EN |
| | | *Zingiber officinale** | Rhizomes | |

* Commonly used species; EN= Endangered, VU= Vulnerable, EW= Extinct in the Wild.

Aphrodisiac plant species were spontaneous (62.79%) and cultivated (31.40%) in the study area while 5.81% were found in agro systems. This shows that most aphrodisiac plants are wild and more harvested from natural ecosystems.

*Plant parts and manner of use*

The most common plant part used was root (68 species, 31.92%) followed by leaves (43 species, 20.19%), bark (26 species, 12.21%), fruits (19 species, 8.92%), stem (19 species, 8.92%), seeds (13 species, 6.10%) and rhizome/bulb/latex (10 species, 4.69%). The less represented parts were flowers (5 species, 2.35%), leafy stem (5 species, 2.35%) and the whole plant (1 species, 0.47%) (Fig. 4). These results were well illustrated by the greatest amount of roots observed among different plants parts sold through the surveyed markets. Similarly, in another studies, it was reported that the root was the predominant plant part used for erectile dysfunction (Kambalé, 2012; Ipona *et al.,* 2018; Togola *et al.,* 2020; Valentin *et al.,* 2020). Therefore, the root appears as the plant part that contains more aphrodisiac-active ingredients. Leaves mostly used for aphrodisiac purposes were also cited by similar studies (Ajao *et al.,* 2019; Demoze *et al.,* 2021). This can serve basis for future phytochemical studies on underutilized parts such as leaves of species that only roots were usually used in aphrodisiac recipes in order to limit their destruction. Contrary to the devastating effect that the use of roots can cause to plant biodiversity, the high frequency of leaves used in recipes is a great advantage for the preservation of plant biodiversity because they are less dangerous apart from the flowering delay due to allocations.

Medicinal plant parts used in aphrodisiac recipes were prepared in various forms. The most frequent mode was maceration (38.72%) followed by powder (29.79%), decoction (11.28%), raw (10.64%), trituration (5.32%), soap (1.91%), juice (1.49%) and calcineration (0.85%) (Fig. 5). This is congruent with Ipona *et al.,* (2018) who reported maceration as the main route of aphrodisiac remedies preparation. However, these results are contrary to a decoction or chewing obtained by similar studies as the main mode of aphrodisiac remedies preparation (Kambalé, 2012; Ajao *et al.*, 2019; Togola *et al.*, 2020; Valentin *et al.,* 2020). Compared to these studies, our findings can result in the fact that the Benin Republic is not an Islamic country, so alcohol drinking is not an interdiction.

The maceration is alcoholic in most cases with the local drink “sodabi”. For the present study, alcoholic maceration was the most suitable for aphrodisiac active compounds extracting from roots and made the use of remedies for a long time.

**Table 6.** Means of aphrodisiac plants cited among education level, climatic zones and gender of informants.

| Factors | Modalities | Mean of plant number cited | P value |
|---|---|---|---|
| *Education level* | Illiterates | 4.98±4[b] | Df= 4, F= 4.20, p=0.001 |
| | Primary level | 3.52±2.76[a] | |
| | Secondary level | 4.54±4.91[ab] | |
| | High level | 3.87±2.40[ab] | |
| | literates | 7.09±3.74[c] | |
| *Climatic zones* | Guinean zone | 3.65±2.49[a] | |
| | Sudano-Guinean zone | 4.26±3.80[a] | Df= 2, chi-squared= 9.518, p= 0.008 |
| | Sudanian zone | 6.41±4.69[b] | |
| *Gender* | Male | 4.06±3.51[a] | Df =269, T= 19.23, p<0 |
| | Female | 8.16±4.61[b] | |
| *Occupation* | Traditional healers | 5.53±4.5[c] | |
| | Farmers | 2.70±1.47[a] | Df=7, chi-squared= 84.54, p<0 |
| | Public servants | 3.41±3.03[a] | |
| | Craftsmen | 2.61±1.41[a] | |
| | Herb sellers | 10.30±3.24[b] | |
| | Traders | 3±1.82[a] | |
| | Students | 3.71±3.03[a] | |
| | Hunters | 3.5±1.76[a] | |
| *Marital status* | Monogamous | 4,41±4,41 | |
| | Polygamists | 3,72±2,74 | |
| | Single | 3,42±2,47 | Df= 3, F= 1.17, p= 0.323 |
| | Widower | 2,40±1,51 | |
| *Category of age* | Adult | 4,77±4,14 | |
| | Old | 4,50±3,58 | Df=2, F=1.97, p=0.142 |
| | Young | 3,29±2,25 | |

*means±sd followed by the similar letter in the same factor are not significantly different at $p < 0.05$.

According to Lévy and Garnier (2006), the consumption of alcohol in moderate quantities could constitute substance-lifting inhibitions, which could amplify sensations and contribute to increased sexual arousal. Chikere *et al.,* (2011) reported also that alcohol drinking enhances pleasure during the period of sex. But studies are needed in order to find a more suitable solvent for the human body other than alcohol which can be one cause of sexual weakness (bad quality and excessive drinking). This study suggests powdering as an alternative to alcohol. In agreement with this study, several ethnobotanical studies mentioned the oral route as the main administration route for erectile dysfunction (Togola *et al.,* 2020; Valentin *et al.,* 2020; Demoze *et al.*, 2021). Ingredients included parts of wild animals (ivory and elephant penis, buffalo horn, horse penis, striped ground squirrel penis etc.), penis of domestic animals (sheep, dog, rooster, duck etc.), mineral and similar elements (kaolin, white stone, spike etc.) and others elements such as eggs, cow's milk, honey, lemon juice, palm oil, sugar cube, shea butter, snail etc. They are sometimes associated in recipes to make them more efficiency. This is very dangerous and can lead to these wild animals' disappearance. Sensitization actions are needed in order to discourage this practice from reducing animal biodiversity.

The most common route of administration of aphrodisiac plants recipes was oral route (92.92%) followed by penis application (4.57%), vagina application (1.83%), body scarring (0.46%) and anal route (0.23%) (Fig. 6). Semilar results were found by several previous studies (Iponal *et al*., 2018; Togola *et al.,* 2020; Valentin *et al.,* 2020; Demoze *et al.*, 2021).

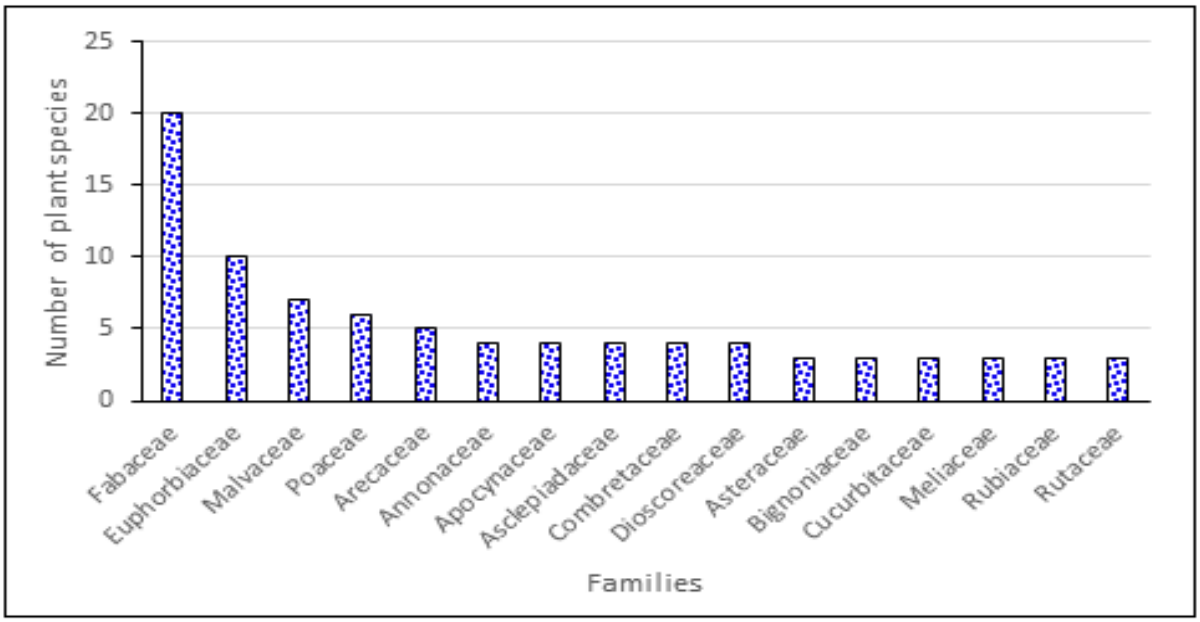


**Fig. 2.** Diversity of aphrodisiac plants, for families with more than two species.

*Disorders frequently treated by aphrodisiac plants and consensus evaluation on remedy*

The total of 148 aphrodisiac plants recorded were used in the formulation of 324 recipes to treat mainly seven (7) ailments of which sexual weakness (86.40%) was the more frequent. Other sexual disorders treated were lack of sperm (14.71%), early ejaculation (11.03%), sexual impotence (9.56%), lack of libido (5.15%), reduced penis size (3.68%), vaginitis (2.57%), and vaginal dryness (0.37%). Informants agreed more in the treatment of sexual weakness (ICF=0.75>0.5) and vaginitis (|ICF|= 0.57>0.5). The informant consensus factors for the other ailments treated were 0.44, 0.29, 0.27, -0.41 and -0.26 respectively for reduced penis size, lack of libido, lack of sperm, sexual impotence and early ejaculation.

These results are congruent with McCabe *et al.* (2016) concerning premature ejaculation and erectile dysfunction as the most common sexual dysfunctions for men. In addition, erectile dysfunction is a serious public health problem that affects 150 million men in the world (Togola *et al.,* 2020). Women's ailments less cited may be due to their less representativeness in this study. It is possible that the proportion of women who speak out on an issue in traditional medicine is influenced by the subject himself, and in this case, sexual dysfunction is more easily discussed topic for men than women (Valentin *et al.,* 2020).

Recipes involved one (1) to sixteen (16) aphrodisiac plants with two (2±1) plants on average per recipe. Aphrodisiac plants with the highest Fidelity Level (100%) accounted for 56.08% (83/148) of all species recorded. High degree of consensus was observed among informants on the use of important number of aphrodisiac plants (64 species, 43.24%) to treat sexual weakness.

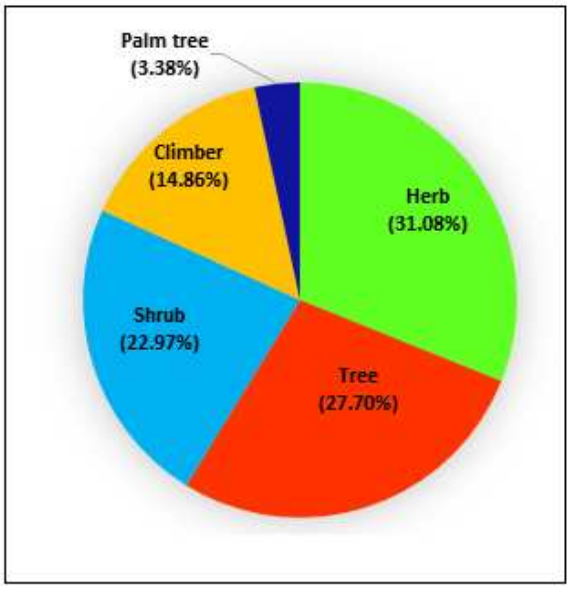


**Fig. 3.** Growth forms of inventoried taxa.

These species included *Sarcocephalus latifolius* and *Moringa oleifera* cited among the commonly used

species. For sexual impotence treated, nine (9) species received a high degree of informants' consensus (FL=100%). They were *Boerhavia diffusa* L., *Ctenium newtonii* Hack., *Evolvulus alsinoides* (L.), *Icacina oliviformis* (Poiret) Raynal, *Lantana trifolia* L., *Newbouldia laevis* (P.Beauv.) Seemann ex Bureau, *Plumbago zeylanica* L., *Sida cordifolia* L., and *Solanum nigrum* L. Early ejaculation was more treated with *Detarium microcarpum* Guill. & Perr., *Piliostigma thonningii* (Schumach.) Milne-Redh. (FL=100%, each) and *Sida acuta* Burm.f. ssp. *carpinifolia* (L.f.) Borss.Waalk. (FL=50%), the lack of sperm was more treated with *Cerathoteca sesamoides* Endl., *Entada gigas* (L.) Fawcett & Rendle (FL=100%, each) and *Abelmoschus esculentus* (L.) Moench (FL=66.67%), the reduced penis size was more treated with *Kigelia africana* (Lam.) Benth. (FL=66.67%), vaginitis was more treated with *Holarrhena floribunda* (G. Don) T. Durand & Schinz, *Acacia nilotica* (L.) Willd. ex Delile ssp. *adstringens* (Schumach. & Thonn.) Roberty and *Lippia multiflora* Moldenke (FL=100%, each) while the lack of libido was more treated with *Lawsonia inermis* L. and *Saccharum officinarum* (FL=100% each). The highest fidelity level (100%) obtained for some aphrodisiac plant species indicates that each of them was used to treat only one ailment. Lots of them were only cited by one informant.

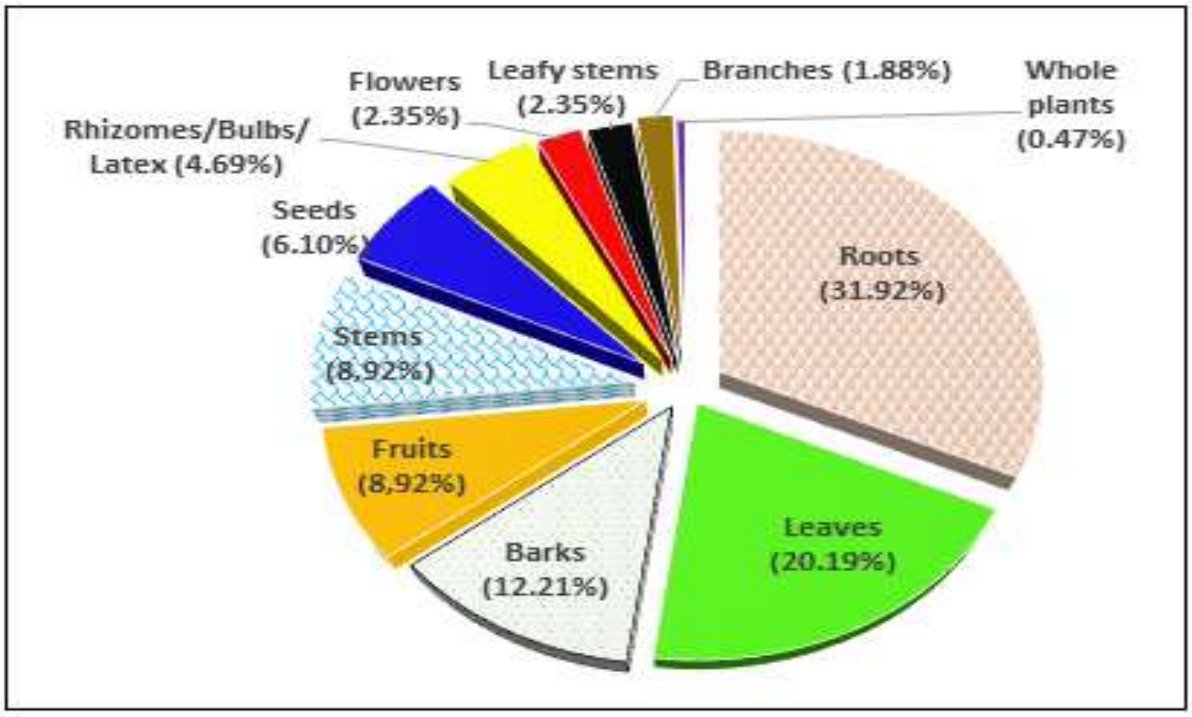


**Fig. 4.** Percentages of aphrodisiac plants parts used.

*Aphrodisiac plants commonly used*

Based on the criteria defined, 33 plants were picked out as priority aphrodisiac plants and therefore commonly used in the study area. They included species such as *Caesalpinia bonduc* (L.) Roxb. (64 citations, Cpr=9.91%), *Musa sapientum* L. (54 citations, Cpr=11.76%), *Garcina kola* Heckel (46 citations, Cpr=8.98%), *Aframomum melegueta* (Roscoe) K Schum. (33 citations, Cpr=8.36%), *Cyperus esculentus* L. (32 citations, Cpr= 7.43%), *Borassus aethiopum* Mart. (31 citations, Cpr=5.26%) (Table 3).

Aphrodisiac properties of twenty-two (22) species among them were already confirmed scientifically. These plants could be considered as promising candidates for the development and evaluation of new aphrodisiac remedies formulations. Nevertheless, to the best of our knowledge, no scientific study has been carried out to explore aphrodisiac properties of species *Manihot esculenta* (30 citations), *Prosopis africana* (23 citations), *Annona senegalensis* (18

citations), *Elaeis guineensis* (17 citations), *Monodora myristica* (16 citations), *Pachycarpus lineolatus* (16 citations), *Khaya senegalensis* (14 citations), *Gardenia erubescens* (13 citations), *Abrus precatorius* (12 citations), *Carica papaya* (11 citations) and *Carissa spinarum* (11 citations). In addition, species *Manihot esculenta, Monodora myristica* and *Pachycarpus lineolatus* were cited for the first time. Clinical trials are urgently necessary to demonstrate the effectiveness of their aphrodisiac bioactive compounds and strengthen these traditional use.

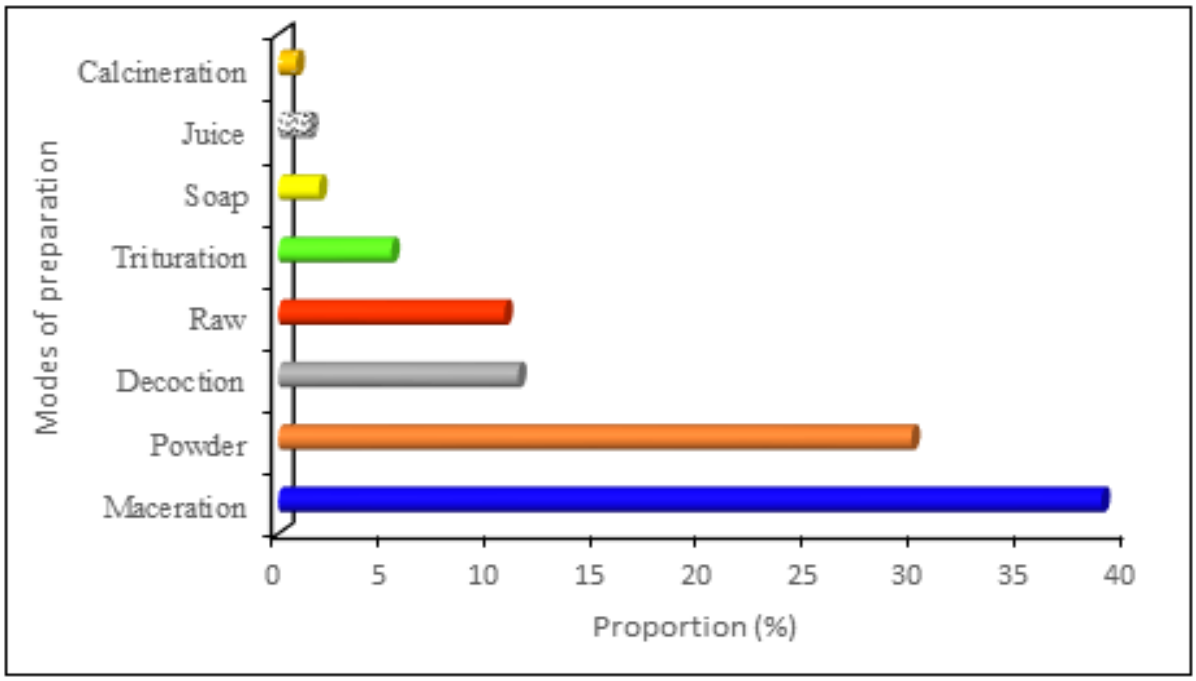


**Fig. 5.** Modes of recipes preparation reported to treat sexual dysfunction.

*Credible recipes*

By considering the values of recipes frequency, 42 recipes were selected as credible for sexual weakness out of the 224 recipes provided in total for that ailment. The number of credible recipes was 6/28 recipes cited, 2/21 recipes cited, 2/10 recipes cited and 1/7 recipes cited respectively for lack of sperm, early ejaculation, lack of libido and reduced penis size (Table 4). There were no high values of recipes frequency for sexual impotence (26 recipes recorded) and vaginitis (5 recipes recorded). Each recipe has been cited only once. The highest values of recipes frequency were obtained for the fruit of *Kigelia africana* (Fr= 57.14%) involved in the treatment of penis size reducing and for the leaves of *Abrus precartorius* (Fr= 30%) used for lack of libido recipes. As far as the lack of sperm treatment is concerned, the drinking of *Annona senegalensis* leaves juice after trituration received the high frequency (Fr= 22.22%).

*Causes of sexual dysfunction according to informants*

Several causes of sexual dysfunctions were cited by informants for both men and women. According to them, the causes of men's sexual dysfunction were mostly chronic diseases (20.83% of responses) such as hemorrhoids, diabetes, ulcers, hypertension, gonorrhea, chancroid, malaria, dysentery and hepatitis. Other causes cited were bad nutrition (19.79% of responses), mystical causes (13.54% of responses), alcoholism (11.46% of responses), intense physical activities (8.33% of responses), sex abuse (7.29% of responses), aging (5.21% of responses), others (side effects of some pharmaceutical drugs, masturbating, too long abstinence) (5.21% of responses), obesity (4.17% of responses), psychological disorders (3.13% of responses), and heredity (1.04 % of responses). Regarding women, three mainly causes were cited of which diseases mainly infections (vaginal and uterus cancer,

hemorrhoids, myoma, fibroma) were mostly represented (63.64%). These were followed by menstrual troubles (22.73%) and another category of causes (13.64%) such as menopause, excision and unsuccessful abortion. Similar studies suggested that women and men with hemorrhoids (Abdelaziz *et al.,* 2019), diabetes (Giuliano *et al.,* 2004; Shiferaw *et al.,* 2020; Djrolo *et al.,* 2021), ulcers (Keller *et al.,* 2012), cancer (Pizzol *et al.,* 2020) and hypertension (Giuliano *et al.,* 2004) had an increased prevalence of sexual dysfunction. These results suggested that sexual dysfunction treatment should be associate with these chronic diseases treatment.

*Market data*

A total of forty-five (45) aphrodisiac plants (30.40% of all recorded species) were inventoried through market surveys (Table 5). Twenty-five (25) aphrodisiac plant species commonly used (16.89% of all species) had their parts sold from which twelve (12) species fall in the Red List of IUCN due to root, bark and/or fruit overexploitation: *Garcina kola* (EW) *Acridocarpus smeathmannii* (EN), *Khaya senegalensis* (EN), *Kigelia africana* (VU), *Mondia whitei* (EN), *Borassus aethiopum* (VU), *Monodora myristica* (EN), *Caesalpinia bonduc* (EW) *Carissa spinarum* (VU), *Voacanga africana* (EN), *Xylopia aethiopica* (VU) and *Zanthoxylum zanthoxyloides* (EN). In-depth, studies must be conducted especially implications of commercial extraction in the reproductive ecology of these plant species for conservation purposes.

According to van Andel *et al.,* (2015), in order to guarantee a continuous supply of herbal medicine in the future, appropriate management plans must be designed, for which specified information on species occurrence and extraction localities is needed.

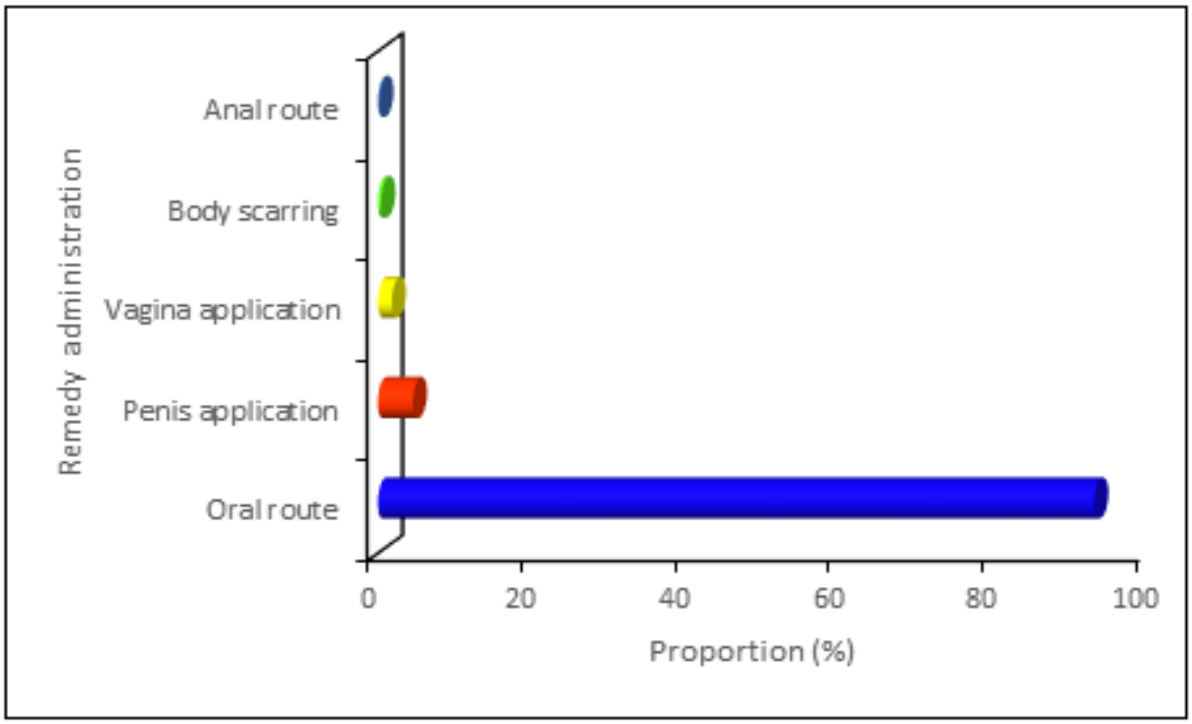


**Fig. 6.** Modes of recipes administration reported to treat sexual dysfunction.

*Effects of demographic factors on aphrodisiac plants' knowledge*

The number of aphrodisiac plants recorded varied significantly among factors such as education level (Df= 4, F= 4.20, p= 0.001), climatic zones (Df= 2, chi-squared= 9.52, p=0.008), gender (Df= 269, T= 19.23, p<0) and the occupation (Df=7, chi-squared= 84.54, p<0) of informants (Table 6). Similar results were found by Laleye *et al.*, (2015), on the use of plants in the traditional treatment of diabetes in the Republic of Benin. These results suggest that informants' knowledge of aphrodisiac plants depends

on factors such as gender, education level, location and occupation of informants. There was no significant effect on the ability of informants from different marital status (Df=3, F= 1.17, p= 0.323) and different category of ages (Df=2, F= 1.97, p= 0.142) to mention aphrodisiac plants. This surprising may be probably due to the "snowball" method (Johnston and Sabin, 2010) used to identify informants. But, considering the number of aphrodisiac plants cited individually, it appears clearly that adults (123 plants cited) and old person (87 plants cited) had quoted more plants than young (51 plants cited). Regarding education level, literates and illiterates informants mentioned a higher number of plants suggesting that they know more aphrodisiac plants (Fig. 7). Concerning climatic zones, the high mean number of aphrodisiac plants were recorded in Sudanian zone (6.41±4.69) followed by Sudano-Guinean (4.26±3.80) and Guinean zones (3.65±2.49). In addition, the mean number of aphrodisiac plants cited by women (8.16±4.61) was higher than those cited by men (4.06±3.51).

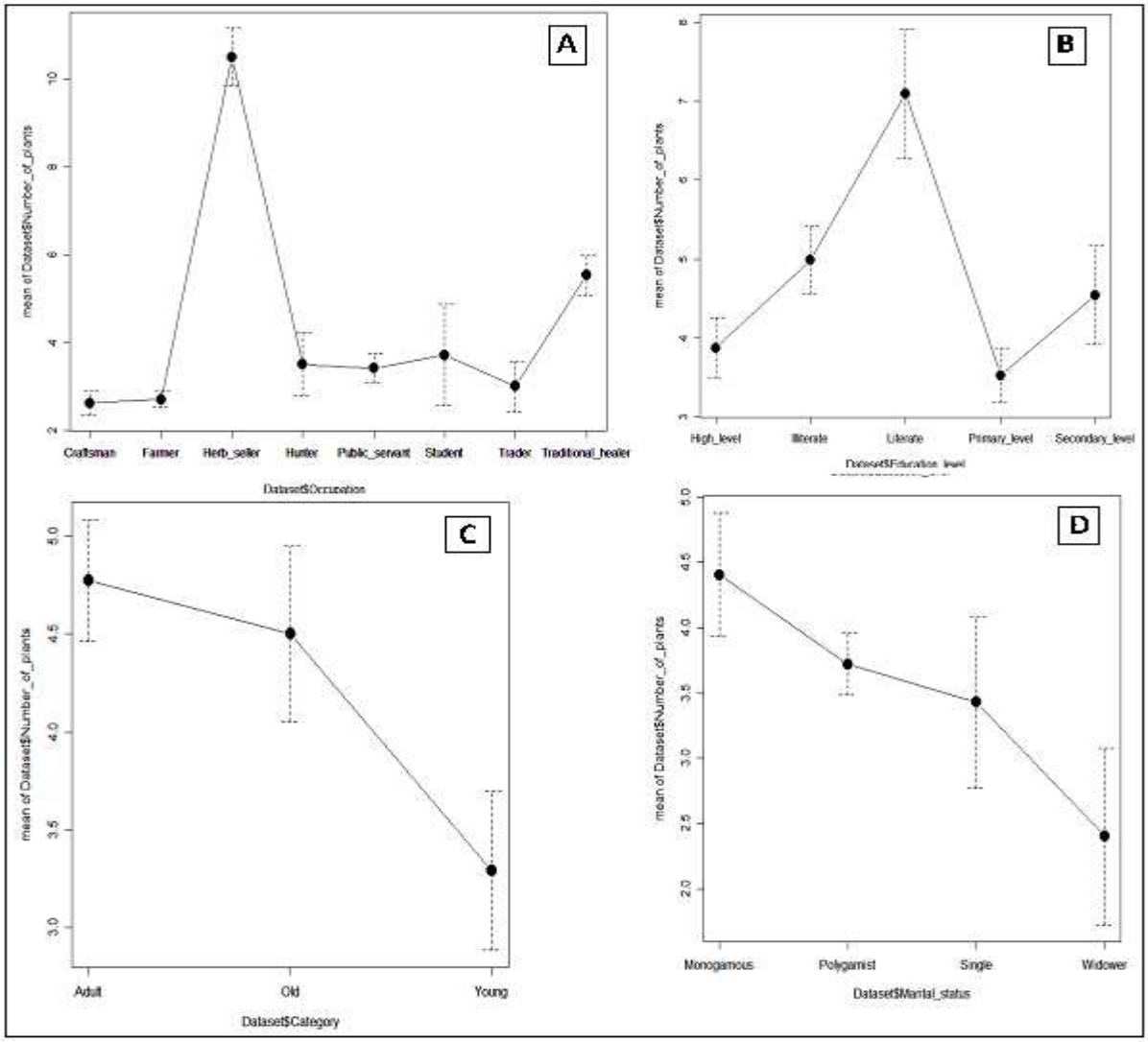


**Fig. 7.** Mean number of reported species per informant relative to (A) occupation, (B) education level, (C) age and (D) marital status.

The great number of women herb sellers involved in this study could explain that. However in term of number of plant cited, men (143 plants cited) had quoted more aphrodisiac plants than women (50 plants cited). Occupation also strongly influenced the number of plants mentioned by the informants. Herb sellers (10.30±3.24) and traditional healers (5.53±4.5) mentioned a higher number of aphrodisiac

plants suggesting that they know more medicinal plants than the others informants. It is not a surprising, because local markets of medicinal herbs concentrate, maintain and spread empirical knowledge on the use of plant genetic resources (Adomou *et al.* 2012). Furthermore, traditional healers are always included in many ethno-medicinal studies for their potential knowledge of medicinal plants and recipes (Semenya *et al.* 2012b; Laleye *et al.* 2015).

## Conclusion

The ethnobotanical survey revealed the use of 148 plant species against sexual dysfunction in the Republic of Benin. Sixty-four (64) of them have previously been evaluated scientifically and the aphrodisiac use of 38 plants was reported for the first time. Thirty-three (33) plant species were the most commonly used. Aphrodisiac plant species were mainly herbs (31.08%) and tree (27.70%). Fabaceae (20 species, 13.51%) was the dominant plant family and the most common plant part used were root (68 species, 31.92%) and leaves (43 species, 20.19%). Aphrodisiac plants were used for 324 recipes to treat seven (7) ailments of which the common was sexual weakness (86.40%).

The maceration (38.72%), powder (29.79%) and oral route (92.92%) were the main galenic forms and the main mode of administration, respectively. Knowledge of aphrodisiac plants depends on factors such as gender, education level, location and occupation of informants. The current findings may serve as references for the selection of plants for further pharmacological, toxicological, and phytochemical investigations in developing new plant-based drugs used for the treatment of Sexual dysfunction.

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