Diversity and Endogenous Knowledge of Aphrodisiac Plants in South and Central Benin

Ismaël Akossibe Batcho (ismaelbatcho@gmail.com)
Laboratory of Botany, Applied Plant Ecology and Forest Genetics https://orcid.org/0000-0003-0888-7796
Eben-Ezer Baba Kayodé Ewédjè
Laboratory of Botany, Applied Plant Ecology and Forest Genetics
Hounnankpon Yédomonhan
Laboratory of Botany and Plant Ecology, University of Abomey-Calavi
Aristide Cossi Adomou
Laboratory of Botany and Plant Ecology, University of Abomey-Calavi

Research

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Abstract

Background: The use of aphrodisiac plants is a very common and ancient practice in Africa. This study, conducted in central and southern Benin, aimed to document endogenous knowledge related to flora, valorization, promotion and conservation of plants species used for aphrodisiac purposes.

Methods: Data were collected using ethnobotanical and market surveys from 134 people followed by observations.

Results: A total of 138 aphrodisiac plants species were recorded, including 72 from Center Benin and 20 from South Benin while 46 species were common to both areas. These species belong to 124 genera from 59 families mostly represented by Fabaceae (14.49%), Euphorbiaceae (8.76%), and Poaceae (4.38%). The predominant biological type was Phanerophytes (57.25%). The chorological analysis identified a dominance of Sudano-Guinean (26.09%), Pantropical (24.64%) and Guinea-Congolian species (19.57%). Aphrodisiac plants were used for 220 recipes to treat eight affections from which the common was sexual weakness (88.80%). Roots (33.12%) and leaves (20.13%) were the most used parts. The maceration (44.76%) and oral route (88.11%) were the main galenic form and the main mode of administration, respectively.

Conclusion: This flora represents a raw material for subsequent phytochemical characterization to identify new aphrodisiac properties, leading to produce Improved Traditional Medicines against sexual disorders.

Background

Since ancient times, herbs have played an important role in the treatment of various diseases world-wide (Abudayyak et al. 2015). The traditional medicine always constitutes the main recourse of the rural people to maintain health (Gbesso et al. 2016; Punchay et al. 2020). According to the World Health Organization (WHO), more than 80% of people rely on traditional medicine for their primary health care needs (Ahouansikpo et al. 2016). Factors such as poverty and illiteracy still militate against availability and accessibility of conventional medical services (Wood et al. 2011). In addition, the population growth in the developing countries has led to increase in demand for traditional medicines (Ladoh-Yemeda et al. 2016).

In Africa, traditional medicinal plants are a therapeutic resource used by a large population to treat various diseases (Angone et al. 2009; Dougnon et al. 2017; Lagnika et al. 2016; Laleye et al. 2015; Soladoye et al. 2010). A large number of these tropical plants produce secondary metabolites which confer them several medicinal properties like anti-oxidant, anti-inflammatory, anti-cancer, anti-microbial, aromatic, lactogenic and aphrodisiac (Akouedegni et al. 2012; Kambalé 2012). 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). According to Fauzi et al. (2019), any substance that arouses sexual desire or libido is known as aphrodisiac. There is no older therapy and effective than medicinal plants to improve human sexuality (Strasbourg 2008). Sexual activity has been universally recognized as a vital component of a normal and healthy lifestyle and general well-being (Singh et al. 2013; Ondele et al. 2015).

In order to develop, preserve or regain their own sexual capacities and to stimulate their partner's desire, men and women turn to natural products, such as traditional herbs, that produce aphrodisiac effects for sexual enhancement (Abudayyak et al. 2015; Gbankoto et al. 2015). In Africa, polygamists often refer to aphrodisiac plants to maintain their sexual fertility. Aphrodisiac herbs alter specific neurotransmitters or sex hormones (Abudayyak et al. 2015). They have little or very little side effects (Malviya et al. 2011) comparatively to Sildenafil Citrate (Viagra), a successful drug that modifies the heamodynamics in the penis with side effects like headache, flushing, dyspepsia and nasal congestion (Singh et al. 2010).

Sexual dysfunction is indeed a serious public health problem that affects 15–30 million men worldwide, and reaching 10%-52% of men and 25%-63% of women (Abudayyak et al. 2015). Male impotence also called Erectile dysfunction (ED) is a common medical condition that affects the sexual life of millions men worldwide (Singh et al. 2013). It is characterized by the inability to develop or maintain an erection of the penis and occurs commonly in middle aged and older men. Sexual dysfunction is caused by various factors such as personal life styles (chronic alcohol abuse, cigarette smoking), androgenic deficiency, ageing, psychological disorders, fear of sex, stroke, side effects of some psychiatric medications, antidepressants and chronic medical conditions like diabetes and pulmonary cancer (Gbankoto et al. 2015; Sumalatha et al. 2010). Its treatment involves several natural aphrodisiac potentials. It is therefore necessary to undertake investigations on the use of the natural aphrodisiacs.

Some studies were conducted on natural aphrodisiac plants across the world (Abudayyak et al. 2015; Ipona et al. 2018; Kambalé 2012; Talaa 2009; Singh et al. 2013). However, in the Republic of Benin, to date, apart from studies conducted by Gbankoto et al. (2015) and Gbesso et al. (2016) exclusively on *Caesalpinia bonduc* (L.) Roxb. and *Borassus aethiopum* Mart. respectively, there is no scientific studies concerning ancestral knowledge on aphrodisiac plants nevertheless used by all classes of age.

The present study aims at filling this gap and to document traditional uses of aphrodisiac plant species in Central and South Benin. The following specific questions were addressed: (1) What is the diversity of plant species used as aphrodisiacs in the study area? How similar is the knowledge of aphrodisiac plants between locations and sociocultural groups? (2) What are the most reported species and how consistent is their citation across the study area? (3) What are the plant parts and traditional preparation methods used? (4) What sexual dysfunction are aphrodisiac plants more used for?

Methods

Study area

The study was conducted in Southern and Central Benin (West Africa), precisely in the administrative districts of Abomey, Bohicon, Dassa-Zoumé, Savalou, Glazoué, Savè (Central Benin) and Ouidah, Cotonou, Kétou, Pobè, Abomey-calavi, Allada, Klouékanmè (South Benin) (Fig. 1). Study area is located between 6°21' and 8°14' North latitude and between 01°49' and 02°41' East longitude. Climate in Southern zone is subequatorial 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). Central Benin is characterized by a Sudano-Guinean climate with annual rainfall ranging from 800 to 1200 mm (Adam and Boko 1993). The vegetation mainly consists of savannahs, grasslands, farmlands, and fallows intermingled with small islands of closed forest (semi-deciduous forest and swamp forest) (Adomou 2005). They are source of aphrodisiac plants for people. According to the national statistic, the population of all surveyed districts is estimated to 3,526,182 inhabitants (INSAE 2016). The main ethnic groups are: Mahi, Fon, Idaatcha, Tchabè, Adja, Nago, Holli and Aïzo. People activities are mainly agriculture, farmed, fishing, hunting, trade, craft, transport, exploitation of firewood, products transformation and medicinal plants harvesting.

Sampling

Choice of sites surveyed was based on sociolinguistic groups that dominated the villages and the presence of a category group of people such as traditional doctors, polygamists (considered as the main users of aphrodisiac plants), herb sellers, hunters, farmers, and resource people who hold endogenous knowledge on aphrodisiac plants. Considering these two fundamental criteria, nineteen (19) villages and six (6) markets were selected after exploratory survey. The sample size of the respondents in central and southern of Benin was determined according to the formula of Dagnelie (1998): n where, n is the sample size of surveyed people considered in each region; is the value of the normal random variable for a probability value of α = 0.05, = 1.96; p is the proportion of people who know and had already used at least one aphrodisiac plant (the value of p is respectively 0.82 and 0.92 in Central and South Benin; result from a preliminary survey) and d is the expected error margin of any parameter to be computed from the survey, which is fixed at 0.08. Under those assumptions, the sample size (n) equal to 90 people in Central Benin and 44 people in South Benin. Thus, a total of 134 respondents were surveyed throughout the study area. The “snowball” method (Johnston & Sabin, 2010) was used to identify majority of people surveyed per village. However, people were reticence in some villages leading sometimes to a very low number of respondents. Sellers of medicinal herbs surveyed in markets were selected based on two criteria: the great number of medicinal plant parts sold (Ambé et al. 2015) and the presence of aphrodisiac plant organs in their display.

Ethnobotanical Data Collection

Data were collected using ethnobotanical and market surveys followed with direct observations of aphrodisiac plants in their habitat. Structural individual interviews technique using a questionnaire was used. In each village, interviews were conducted with the help of a local translator. Data collection included socio-demographic characteristics (name, age, sex, ethnic group, religion, main activity, etc.), list of aphrodisiac plants used, supply habitats and organ harvesting period; status (wild, cultivated, weed) of each plant, forms of usage, knowledge related to the medicinal properties (diseases treated, plant organs used, associated ingredients, the mode of remedy preparation and administration) and causes of sexual dysfunction symptoms. Market data were related to aphrodisiac plants sold (inventory, organs used, preparation methods, and posology). Throughout the market survey, the interview was followed by aphrodisiac plants parts purchasing that are placed in a herbarium (Adomou et al. 2012).

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 "Les nouveaux ordres des Angiospermes (Utilités des espèces)" (Akoègninou et al. 2011), "Flore Analytique du Bénin" (Akoègninou et al. 2006), "Arbres, arbustes et lianes des zones sèches d’Afrique de l'Ouest" (Arbonnier 2009) and "Guide des adventices d’Afrique de l’Ouest" (Akobundu & 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 National Herbarium of Benin (University of Abomey-Calavi).

Data analysis

Data from ethnobotanical and market surveys were analyzed through descriptive statistical as frequency, mean (± sd); some results were presented using figures and tables. Synthesis in tabular form was done in order to perform results. We applied the Relative Frequency of Citation (RFC) according to Tardìo and Pardo de Santayana (2008) to assess the importance of each species and determine the commonly used aphrodisiac plants. RFC = *FC/N* with FC: number of people having quoted the species; and N: total number of interviewed people.

The response rate by use categories was calculated using the following formula: F = *S/N x 100*, with F the response rate for a given use, S the number of informants who mention a given use of the species and N the number of informants participating in the study.

The Shannon-Weaver Diversity Index (Dajoz 1985) was computed to assess the level of specific diversity of aphrodisiac plants used 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.

In order to compare the diversity of aphrodisiac species inventoried in central Benin to that of south Benin, the Student's t-test and the Mann-Whitney test were performed using the software Minitab 17.

The similarity index of Jaccard (Jaccard, 1908) was determined as: $SJ = N_{XY}/[(N_X + N_Y) - N_{XY}]$ with N_x= number of species in southern Benin, N_y=number of species in central Benin and N_{xy} the number of common species to two areas. This allowed us to calculate the similarity rate between the two zones (SJ x 100).

The endogenous knowledge on aphrodisiac plants was evaluated for all sociocultural groups computing knowledge indices (KI) analogous to the use value of Phillips and Gentry (1993) as follows: KI=*s/n* with S = number of useful aphrodisiac species cited by a given sociocultural group and n = number of informants within the sociocultural group.

The Informant Consensus Factor (ICF) was calculated for each category to identify the agreements of the informants on the reported cures for sexual dysfunction symptoms; ICF=$Nuc - Ns/Ncu - 1$ 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 x 100* where *F*c is the frequency of citation of a species for a specific ailment and *F*t is the total number of citations of the species.

Ecological data treatment

Ethnobotanical data were completed following ecological informations such as: morphological types (Tree, Shrub, Under-shrub, Annual grass, Perennial grass and Liana used by authors Kambalé (2012) and Ngbolua et al. (2017); biological types according to Raunkiaer (1934) and phytogeographic types (chorological) defined by White (1983).

Results

Demographic data

Most of respondents were men (94.78%). They speak Mahi, Fon, Idaatcha, Adja, Nago, Aïzo, Holli or Tchabè with the predominance of the ethnic groups Mahi (23.13% of respondents), Fon (21.64% of respondents) and Idaatcha (20.90% of respondents). Most of them are traditional doctors (26.87% of respondents) and farmers (12.69% of respondents) who live mainly with two (02) wives at least (45.67% of respondents). Regarding education, the majority of respondents had primary level (31.75% of respondents) while 19.84% were illiterates.

People surveyed were 24 to 92 years with an average of 46 (± 14) years. The majority were between 44 and 53 years of age.

Inventory of aphrodisiac plant species

Investigations revealed that a total of 138 plant species (Table 1, Appendix) from 124 genera and 59 plant families were cited to possess aphrodisiac properties. The level of aphrodisiac plants diversity is important in the study area (H'=1.70 bits; 0.5 < H' <4.5), revealing that both areas harbor similar plant diversity (32.62%). Statistic analyses showed no significant difference between both areas in terms of number of species recorded (W = 35.5, P = 0.67) as well as for average plant families's number recorded (ddl = 6, T = 1.19, p = 0.28). Families mostly represented were Fabaceae including 20 species (14.49%), Euphorbiaceae (12 species, 8.76%), and Poaceae (6 species, 4.38%). Many families (76.27%) were relatively less represented (1–2 species).

Table 1
List of aphrodisiac plants recorded and their traditional uses

No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
1	*Abelmoschus esculentus* (L.) Moench	Févi (Fon), Ila (Idaatcha)	Malvaceae	Annual herb	Th	Pt	Fruitsuits	Sperm deficiency	C
2	*Abrus precatorius* L.	Viviman (Fon), Odjou êga (Idaatcha)	Fabaceae	Liana	Lnph	SG	Leaves, Seed	Sexual weakness, Azoospermia	M D
3	*Acacia polyacantha*	Egui èdè (Tchabè)	Fabaceae	Tree	mPh	SZ	Sap	Sperm deficiency	P
4	*Acridocarpus smeathmannii* (DC.) Guill. & Perr.	Gbanguinan (Fon)	Malpighiaceae	Tree	Lmph	GC	Roots	Sexual weakness	M
5	*Afraegle paniculata* (Schumach. & Thonn.) Engl.	Egui agogo (Idaatcha)	Rutaceae	Tree	mph	At	Roots	Sexual weakness	M
6	*Aframomum melegueta* (Roscoe) K. Schum.	Atakoun (fon) Ata (Idaatcha)	Zingiberaceae	Perennial herb	Gr	GC	Seed	Impotence, sperm deficiency, Sexual weakness	M P M
7	*Allium cepa* L.	Manssa (Idaatcha)	Liliaceae	Perennial herb	Gb	Pt	Bulb	Sexual weakness, non-development of penis	D M
8	*Allium sativum* L.	Ayo (Idaatcha)	Liliaceae	Perennial herb	Gb	Pt	Bulb	Sexual weakness	M
9	*Aloe vera* (L.) Burm. f.	Aloès	Asphodelaceae	Perennial herb	Ch	SZ	Laeves	Sexual weakness, Frigidity	M
10	*Amaranthus spinosus*	Tètè ounon (Fon)	Amaranthaceae	Annual herb	Th	Pt	Roots	Sexual weakness	D
11	*Ananas comosus* (L.) Merr.	Ananas	Bromeliaceae	Annual herb	Hc	Pt	Fruits	Sexual weakness	C
12	*Annona senegalens*is Pers.	Gniglo (Fon)	Annonaceae	Shrub	nph	SZ	Laeves, Roots	Sperm Deficiency, Sexual Weakness	T M
13	*Anogeissus leiocarpa* (DC.) Guill. & Perr.	Hlihon (Fon)	Combretaceae	Tree	mPh	S	Roots	Sexual weakness	M
14	*Arachis hypogea* L.	Aziin (Fon)	Fabaceae	Annual herb	Th	SG	Seed	Sexual weakness	C
15	*Bambusa vulgaris* Schrad. ex J.C. Wendl.	Idaatchawé (Idaatcha)	Poaceae	Perennial herb	Gr	SG	Roots	Sexual weakness	M
16	*Biophytum petersianum* Klotzsch	Kpatèman (Idaatcha)	Oxalidaceae	Annual herb	Th	SG	Laeves	Sexual weakness	M
17	*Blumea viscosa* (Mill.) V.M.Badillo	Azuman (Fon)	Asteraceae	Perennial herb	Th	S	Laeves	incapacity	T
18	*Boerhavia diffusa* L.	Gbadjèwin/Gbagbada (Fon)	Nyctaginaceae	Annual herb	Th	Pt	Whole plant	Sexual weakness	M
19	*Borassus aethiopum* Mart.	Agonté (Fon), Egui Agban (Idaatcha)	Arecaceae	Tree	mPh	SZ	Fruits, Roots	Sexual weakness, Impotence	C D
20	*Bridelia ferruginea* Benth.	Ira (Idaatcha)	Euphorbiaceae	Shrub	mph	SG	Roots, Laeves	Sexual weakness	D

Biological types : Th = Thérophytes, Hc = Hemicryptophytes, Ge = Geophytes, Ch = Chaméphytes, Ph = Phanérophytes, MPh = megaphanérophytes, mPh = mes nanophanérophytes; **Chorology** : GC = Guineo-Congolese, S = Sudanese, SG = Sudano-Guinean transition, SZ = Sudano-Zambezian, At = Tropical Africa, Pt = P.

No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
21	*Caesalpinia bonduc* (L.) Roxb.	Adjikoun /Adji (Fon)	Fabaceae	Shrub	mph	GC	Roots	Premature ejaculation, Sexual weakness	M
22	*Caesalpinia pulcherrima* (L.) Sw.	Orgeuil de chine	Fabaceae	Shrub	mph	SG	Roots	Frigidity	M
23	*Calotropis procera* (Aiton) W.T. Aiton	Amon man (Fon)	Asclepiadaceae	Shrub	mph	SG	Roots	Sexual weakness	M
24	*Capsicum frutescens* L.	Tahounbo olobéré (Idaatcha)	Solanaceae	Annual herb	Th	Pt	Fruits	Sexual weakness,	P C
25	*Carica papaya* L.	Aguidi (Idaatcha)	Cariaceae	Shrub	mph	Pt	Roots, Fruits	Sexual weakness	M D
26	*Carissa spinarum* L.	Ahanzo (fon)	Apocynaceae	Shrub	nph	PAL	Roots	Sexual weakness	M
27	*Carpolobia lutea* G. Don	Aviatin (Fon)	Polygalaceae	Shrub	mph	GC	Roots	Sexual weakness, Premature ejaculation	M
28	*Catharanthus roseus* (L.) G. Don	Pervenche de Madagascar	Apocynaceae	Annual herb	Th	SG	Whole plant	Sexual weakness	M
29	*Ceiba pentandra* (L.) Gaertn.	Fromager	Bombacaceae	Tree	MPh	Pt	Barks	Sexual weakness	D
30	*Cerathoteca sesamoides* Endl.	Agbor (Idaatcha), caloulou (Tchabè)	Pedaliaceae	Annual herb	Ch	SZ	Laeves	Sexual weakness	P
31	*Cissus populnea* Guill. & Perr.	Djawawa, Orbè ordè (Idaatcha), Assankan (fon)	Vitaceae	Liana	LHc	S	Stem, Roots	Azoospermia, Sexual Weakness	P
32	*Cissus quadrangularis* L.	Assan (Fon)	Vitaceae	Liana	Lmph	SZ	Stem	Sexual weakness	P
33	*Citrus arantium* L.	Mandarinier	Rutaceae	Tree	mph	SG	Fruits	Sexual weakness	C
34	*Citrus aurantifolia* (Christm. & Panzer) Swingle	Klétin (Fon)	Rutaceae	Shrub	mph	SG	Fruits	Sexual weakness	C
35	*Citrus lemon* L.	Oranger	Rutaceae	Shrub	mph	GC	Fruits	Sexual weakness	C
36	*Cocos nucifera* L.	Cocotier	Arecaceae	Shrub	mph	Pt	Fruits	Sexual weakness, Premature ejaculation	P C
37	*Cola acuminata* (P. Beauv.) Schott & Endl.	Obi (Idaatcha)	Sterculiaceae	Shrub	mPh	GC	Seed	Sexual weakness, Impotence	M
38	*Cola nitida* (Vent.) Schott. & Endl.	Goro (Idaatcha), Golo (Fon)	Sterculiaceae	Shrub	mPh	GC	Seed	Sexual weakness	C
39	*Commelina diffusa* Burm. f.	Handoukpo (Fon)	Commelinaceae	Annual herb	Hc	Pt	Laeves	Sexual weakness	D
40	*Commelina erecta* L. ssp. Erecta	Olirékou (Idaatcha)	Commelinaceae	Annual herb	Hc	Pt	Roots	Sexual weakness	C
41	*Commiphora africana* (A.Rich.) Engl. var. africana	Oridji (Idaatcha)	Burseraceae	Shrub	mph	SZ	Laeves	Sexual weakness	D
42	*Connarus africanus* Lam.	Ganganlissè (Fon)	Connaraceae	Shrub	mph	GC	Roots	Sexual weakness	C
43	*Croton gratissimus* Burch.	Djélélé (fon), Adjêkofolé (Idaatcha)	Euphorbiaceae	Shrub	mph	SG	Laeves	Sexual weakness	P

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
44	*Croton lobatus* L.	Alovi aton (Fon)	Euphorbiaceae	Annual herb	Th	SG	Laeves	Sexual weakness	T
45	*Curculigo pilosa* (Schum. &Thonn.) Engl.	Kôrômi (Nago)	Hypoxidaceae	Tree	Gr	PAL	Roots	Sexual weakness	M
46	*Cymbopogon citratus* (DC.) Stapf	Tcha â man (Fon)	Poaceae	Annual herb	Hc	SG	Laeves, Stem	Sexual weakness	M
47	*Cyperus esculentus* L.	Ofio (Idaatcha), Fio (fon)	Cyperaceae	Annual herb	Gt	Pt	Roots	Sexual weakness, Impotence, Azoospermia	M P
48	*Daniellia oliveri* (RolLaeves) Hutch. & Dalzie	Egui iya (Idaatcha)	Fabaceae	Tree	mPh	SZ	Sap	Sexual weakness	C
49	*Daucus carota* L. ssp. sativus (Hoffm.) Arcang.	Carotte	Apiaceae	Liana	Gt	Pt	Roots	Sexual weakness	P
50	*Desmodium gangeticum* (L.) DC.	Ayikpéilè (Tchabè)	Fabaceae	Under-shrub	nph	PAL	Roots	Sexual weakness	M
51	*Desmodium velutinum* (Willd.) DC.	Trèdavor (Fon)	Fabaceae	Tree	Ch	PAL	Roots	oligospermia	P
52	*Detarium senegalense* J.F. Gmel.	Adjêkofolé Koriko (Idaatcha)	Fabaceae	Tree	mPh	SG	Roots	Sexual weakness	D
53	*Dioscorea alata* L.	Aga (Idaatcha)	Dioscoreaceae	Liana	Gt	SG	Tubersbers	Sexual weakness	P
54	*Dioscorea dumetorum* (Kunth) Pax	Léfé (Fon)	Dioscoreaceae	Liana	Gt	SZ	Tubersbers	Sexual weakness	P
55	*Dioscorea praehensislis*	Igname sauvage	*Dioscoreaceae*	Liana	Gt	SG	Tubersbers	Sexual weakness	D
56	*Dioscorea rotundata* Poir.	Kokoro (Idaatcha)	Dioscoreaceae	Liana	Gt	SG	Tubersbers	Azoospermia	P
57	*Drypetes floribunda* (Müll.Arg.) Hutch.	Assokara (Nago)	*Euphorbiaceae*	Tree	mph	GC	Roots	Sexual weakness	D
58	*Elaeis guineensis* Jacq.	Egui êkpê (Idaatcha)	Arecaceae	Tree	mPh	GC	Roots, Sap, Seed	Sexual weakness	C
59	*Entada africana* Guill. & Perr.	Igba arisso (Idaatcha)	Fabaceae	Tree	mPh	SZ	Roots	Sexual weakness	M
60	*Erythrina senegalensis* DC.	Oshishè (Idaatcha)	Fabaceae	Tree	mph	SG	Stem	Sexual weakness	C
61	*Eugenia aromaticum* (L.) Merr. & L. M. Perry	Atikingbadota (Fon)	Myrtaceae	Tree	mph	At	Flowers	Sexual weakness	P M
62	*Euphorbia hirta* L.	Iyankou ayira (Idaatcha)	Euphorbiaceae	Annual herb	Th	SG	Laeves	Sexual weakness	D
63	*Evolvulus alsinoides* (L.) L.	Tibitiré (Idaatcha), Zounkorman (Fon)	Convolvulaceae	Annual herb	Th	Pt	Laeves	Sexual weakness	P
64	*Flacourtia indica* (Burm. f.) Merr.	Gbohounkadjê (Fon)	Flacourtiaceae	Shrub	mph	GC	Laeves	Sexual weakness	D
65	*Flueggea virosa* (Roxb.ex Willd) Voigt.	Wadjédjé (Idaatcha), Tchaké-chaké (Fon)	Euphorbiaceae	Under-shrub	nph	Pt	Roots, Laeves	Frigidity, Sexual weakness	D
66	*Garcina kola* Heckel	Ahowé (Fon), Iwo (Idaatcha)	Clusiaceae	Tree	mPh	GC	Seed	Sexual weakness	C

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67	*Gardenia erubescens* Stapf & Hutch.	Kankranbor (Idaatcha), Dakpla (Fon)	Rubiaceae	Shrub	nph	S	Roots, Seed	Sexual weakness, Impotence	P M
68	*Glycine max (*L.) Merr.	soja	Fabaceae	Annual herb	Th	SG	Seed	Azoospermia	P
69	*Gomphrena celosoides* Mart.	Dawawé (Fon)	Amaranthaceae	Annual herb	Th	Pt	Laeves	Sexual weakness	M
70	*Heliotropium indicum* L.	Crête de coq	Boraginaceae	Annual herb	Th	SG	Laeves, Flowers	Sexual weakness	T
71	*Hexalobus crispiflorus* A.Rich.	Igui Akpado (Nago)	Annonaceae	Tree	mPh	SG	Sap	azoospermia	P
72	*Holarrhena floribunda* (G. Don) T. Durand & Schinz	Lètin wiwi (Fon)	Apocynaceae	Tree	mph	SG	Barks	Frigidity	D
73	*Hymenocardia acida* Tul.	Orokpa (Idaatcha)	Euphorbiaceae	Tree	mph	SZ	Roots	Sexual weakness	M
74	*Hyphaene thebaica* (L.) Mart.	Palmier fourchu	Arecaceae	Tree	mPh	SZ	Fruits	Sexual weakness	C
75	*Icacina oliviformis* (Poiret) Raynal,	Azonkwin (Fon)	Icacinaceae	Under-shrub	nph	SG	Roots	Impotence	P
76	*Imperata cylindrica* (L.) P. Beauv.	Sè (Fon), Igan (Idaatcha)	Poaceae	Annual herb	Hc	Pt	Rhizomes	Sexual weakness	M
77	*Irvingia gabonensis* (Aubry-LeComte ex O'Rorke)	Egui Oro (Nago)	Irvingiaceae	Tree	MPh	GC	Seed	Sexual weakness	P M
78	*Jatropha curcas* L.	Yonkpontin (Fon)	Euphorbiaceae	Shrub	mph	GC	Laeves	Sexual weakness	D
79	*Khaya senegalensis* (Desr.) A. Juss.	Caïlcedrat	Meliaceae	Tree	mPh	S	Barks	Sexual weakness, Premature ejaculation	M
80	*Kigelia africana* (Lam.) Benth.	Gnanblikpo (Idaatcha)	Bignoniaceae	Tree	mph	SG	Laeves, Fruits	Non-development of the penis, Sexual weakness	D
81	*Launea taraxacifolia*	Gnantoto (Fon)	Asteraceae	Annual herb	Th	SZ	Whole plant	Sexual weakness, Frigidity	C M
82	*Luffa cylindrica* M. Roem.	éponge végétale	Cucurbitaceae	Liana	Lnph	Pt	Laeves	Sexual weakness	T
83	*Mallotus oppositifolius* (Geiseler) Müll. Arg.	Ayindja (Idaatcha)	Euphorbiaceae	Shrub	mph	PAL	Stem	Impotence	M
84	*Manihot esculenta* Crantz	Manioc	Euphorbiaceae	Under-shrub	nph	Pt	Roots	Sperm Deficiency, Sexual Weakness, Impotence	C
85	*Mondia whitei* (Hook. f.) Skeels	Tchirigoun (Fon)	Asclepiadaceae	Liana	Lmph	SG	Roots	Sexual weakness	M
86	*Monodora myristica* (Gaertn.) Dunal	Sassalikoun (Fon)	Annonaceae	Tree	mPh	GC	Seed	Sexual weakness, Premature ejaculation	M
87	*Moringa oleifera* Lam.	Lagalaga (Idaatcha), Yovokpatin (Fon)	Moringaceae	Shrub	mph	SZ	Seed, Laeves, Barks	Sexual weakness	M

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
88	*Musa sapientum* auct. div.	Kokoé aloga (Fon)	Musaceae	Perennial herb	Gt	GC	Fruits	Sexual weakness, Azoospermia, Impotence	P
89	*Newbouldia laevis* (P.Beauv.) Seemann ex Bureau	Kpatin (Fon), Hysope	Bignoniaceae	Shrub	mph	GC	Laeves	Sexual weakness	M
90	*Ocimum canum* L.	Héhétchou (Adja), Hissihissi (Idaatcha)	Lamiaceae	Annual herb	Th	Pt	Laeves	Sexual weakness	M
91	*Ocimum gratissimum* L.	Tchiayo (Fon), Gnandodoui (Adja)	Lamiaceae	Under-shrub	nph	Pt	Laeves	Sexual weakness	M
92	*Olax subscorpiodea* Oliv.	Mitin (Fon)	Olacaceae	Shrub	mph	GC	Roots	Sexual weakness	M
93	*Opilia celtidifolia*	Atchuntchun (Holli)	*opiliaceae*	Liana	Lmph	SZ	Roots	Sexual weakness,	M
94	*Pachycarpus lineolatus* (Decne.) Bullock	Agboaguin (fon) Tchéffé (Idaatcha)	Asclepiadaceae	Perennial herb	Gr	SG	Roots	Sexual weakness	M
95	*Parkia biglobosa* (Jacq.) R. Br. ex G. Don	Egui Igba (Idaatcha)	Fabaceae	Tree	mPh	S	Seed	Sexual weakness	C
96	*Paullinia pinnata* L.	Adaklordor (Fon)	*Sapindaceae*	Liana	Lmph	At	Roots	Sexual weakness	M
97	*Pavetta crassipes* K.Schum.	Dakplassou (Fon)	*Rubiaceae*	Shrub	mph	SZ	Roots	Sexual weakness	M
98	*Periploca nigrescens* Afzel.	Orgbor founfoun (Tchabè)	Asclepiadaceae	Liana	Lmph	GC	Laeves	azoospermia	T
99	*Persea americana* Mill.	Avocatier	Lauraceae	Shrub	mPh	GC	Seed	Sexual weakness	M
100	*Phoenix dactylifera* L.	Dattier	Arecaceae	Shrub	mph	SG	Fruits	Sexual Weakness,, Sperm Deficiency	C
101	*Phyllantus amarus* Schumach. & Thonn.	Tèyinsso (Nago)	Euphorbiaceae	Annual herb	Th	Pt	Whole plant	Azoospermia, Sexual Weakness	D M
102	*Piliostisgma reticulatum* (DC.) Hochst.	Kparounman (Idaatcha)	Fabaceae	Shrub	mph	S	Laeves	Sexual weakness	D
103	*Piper guineense* Schumach. & Thonn.	Linlinkoun (Fon), Idjayé (Idaatcha)	Piperaceae	Liana	LmPh	GC	Fruits	Sexual weakness,	P M
104	*Plumbago zeylanica* L.	Dangblan (Fon)	Plumbaginaceae	Shrub	mph	SG	Roots	Sexual weakness	M
105	*Prosopis africana* (Guill. & Perr.) Taub.	Kakê (Fon), Acacayin (Idaatcha)	Fabaceae	Tree	mPh	S	Barks, Stem, Roots	Sexual weakness, Impotence	M
106	*Pseudocedrela kotschyi* (Schweinf.) Harms	Tchaklikli (fon)	Meliaceae	Tree	mph	S	Roots	Sexual weakness	M
107	*Psorospermum febrifugum* Spach	Amnlanmi (Fon)	Clusiaceae	Shrub	mph	SG	Laeves	Sexual weakness	D
108	*Pteleopsis suberosa* Engl. & Diels	Okroukrou (Idaatcha)	combretaceae	Shrub	mph	SZ	Laeves	Sexual weakness	T
109	*Pterocarpus erinaceus* Poir.	Akpékpé (Idaatcha)	Fabaceae	Tree	mPh	S	Barks	Sexual weakness	P

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
110	*Rourea coccinea* (Thonn.ex Schumach.) Benth.	Hounssitogbé (Fon), Schihountoboui (Adja)	Connaraceae	Under-shrub	nph	GC	Laeves	Sexual weakness	T
111	*Saccharum officinarum* L.	Léké (fon)	Poaceae	Annual herb	Hc	Pt	Stem	Lack of libido	C
112	*Sarcocephalus latifolius* (Sm.) E. A. Bruce	Kodor (Fon), Igbêssin (Idaatcha)	Rubiaceae	Shrub	mph	At	Roots	Sexual weakness	M
113	*Scoparia dulcis* L.	Viviman tèton (Fon)	Scrophulariaceae	Annual herb	Ch	Pt	Roots/Leaves	Sexual weakness	M P
114	*Securidaca longepedunculata* Fres.	Ikpata (Tchabè)	Polygalaceae	Shrub	mph	SZ	Roots	Sexual weakness	M
115	*Senna occidentalis* (L.) Link	Faux kinkéliba	Fabaceae	Under-shrub	Ch	Pt	Roots	Sexual weakness	M
116	*Sida garckeana* Pol. Syn Sida corymbosa R. E. Fr.	Eshôkoutou abo (Tchabè)	Malvaceae	Annual herb	Ch	GC	Whole plant	Impotence	T
117	*Solenostemon monostachyus*	Igbawo (Nagot)	Lamiaceae	Perennial herb	Th	GC	Laeves	Premature ejaculation	D
118	*Sorghum bicolor* (L.) Moench	Sorgho	Poaceae	Annual herb	nph	Pt	Barks	Sexual weakness	M
119	*Strychnos spinosa* Lam.	Amilimontin (Fon)	Loganiaceae	Shrub	mph	PAL	Stem	Sexual weakness	M
120	*Tamarindus indica* L.	Egui ayinran (Idaatcha), Djêvivi (Fon)	Fabaceae	Tree	mPh	Pt	Roots, Fruits	Sexual weakness	P
121	*Tetrapleura tetraptera* (Schumach. & Thonn.) Taub.	Aïdan ôtôror (Nagot)	Fabaceae	Tree	mPh	GC	Fruits	Sexual weakness	M
122	*Theobroma cacao* L.	Cacaoyer	Sterculiaceae	Tree	mph	GC	Fruits	Sexual weakness	M
123	*Tragia senegalensis* Müll.Arg.	Azor (Fon), Wérékpékpé (Idaatcha)	Euphorbiaceae	Liana	Lnph	S	Laeves	Azoospermia	M
124	*Trema orientalis* (L.) Blume syn Trema guineensis (Schumach. & Thonn.) Ficalho	Afèfè (Idaatcha) Jivi jivi (Fon)	Celtidiaceae	Tree	mph	Pt	Barks	Sexual weakness	D
125	*Tribulus terrestris* L.	Ishakoro (Idaatcha)	Zygophyllaceae	Annual herb	Ch	Pt	Fruits	Sexual weakness	D
126	*Trichilia emetica* Vahl	Tchivi (Fon)	Meliaceae	Tree	mph	SZ	Roots	Sexual weakness	D
127	*Triclisia subcordata* Oliv.	Viaka (Adja), Oshougban (Nago)	Menispermaceae	Liana	Lnph	SG	Roots	Sexual weakness	M
128	*Uvaria chamae* P. Beauv	Egui Yaha (Idaatcha)	Annonaceae	Shrub	mph	GC	Roots	Sexual weakness	M
129	*Vernonia cinerea* Sch. Bip	Houssikoussin (Fon)	Asteraceae	Annual herb	Th	Pt	Laeves	Sexual weakness	D
130	*Vigna subterranea* (L.) Verdc.	êkpê (Idaatchaatcha)	Fabaceae	Annual herb	Th	SG	Seed	Sexual weakness	P
131	*Vitellaria paradoxa* C.F. Gaertn. ssp. paradoxa	Egui êmi (Idaatchaatcha)	Sapotaceae	Tree	mPh	S	Barks	Sexual weakness	P

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
132	*Voacanga africana* Stapf.	Agbossou ningla (Fon)	Apocynaceae	Shrub	mph	SG	Roots	Sexual weakness	M
133	*Waltheria indica* L.	ôkôrôman (Idaatcha)	Sterculiaceae	Under-shrub	nph	Pt	Roots	Sexual weakness	D
134	*Ximenia americana* L.	Iwéwé oko (Idaatcha)	Olacaceae	Shrub	mph	Pt	Roots	Sexual weakness	D
135	*Xylopia aethiopica* (Dunal) A. Rich.	Kpédjélékoun (Fon), Orhoun (Idaatcha)	Annonaceae	Tree	mPh	SG	Fruits	Sexual Weakness, Frigidity	M P
136	*Zanthoxylum zanthoxyloides* (Lam.) Zepernick & Timler	Egui ata (Idaatcha), Hêtin (Fon)	Rutaceae	Shrub	mph	SG	Barks, Laeves	Frigidity, sexual weakness	T M
137	*Zea mays* L.	Gbado (Idaatchaactha)	Poaceae	Annual herb	Th	Pt	Seed	Sexual weakness, Sperm deficiency,	P
138	*Zingiber officinale* Roscoe	Dotè (Fon), Atalè (Idaatcha)	Zingiberaceae	Perennial herb	Gr	SG	Rhizomes	Sexual weakness, Premature ejaculation	P

Biological types : Th = Thérophytes, Hc = Hemicryptophytes, Ge = Geophytes, Ch = Chaméphytes, Ph = Phanérophytes, MPh = megaphanérophytes, mPh = mes nanophanérophytes; **Chorology** : GC = Guineo-Congolese, S = Sudanese, SG = Sudano-Guinean transition, SZ = Sudano-Zambezian, At = Tropical Africa, Pt = P.

Fifteen (15) species were commonly used, the most frequently cited were *Caesalpinia bonduc* (L.) Roxb. (RFC = 0.366), *Musa sapientum* L. (RFC = 0.276), *Garcina kola* Heckel (RFC = 0.246), *Cyperus esculentus* L. (RFC = 0.179), *Borassus aethiopum* Mart. (RFC = 0.157), *Aframomum melegueta* (Roscoe) K. Schum. (RFC = 0.142), *Acridocarpus smeathmannii* (DC.) Guill. & Perr. (RFC = 0.134), *Cola acuminata* (P. Beauv.) Schott & Endl. (RFC = 0.134), *Citrus aurantifolia* (Christm. & Panzer) Swingle (RFC = 0.127), *Imperata cylindrica* (L.) P. Beauv. (RFC = 0.127), *Manihot esculenta* Crantz (RFC = 0.127), *Monodora myristica* (Gaertn.) Dunal (RFC = 0.104), *Pachycarpus lineolatus* (Decne.) Bullock (RFC = 0,104), *Gardenia erubescens* Stapf & Hutch. (RFC = 0.097) and *Xylopia aethiopica* (Dunal) A. Rich. (RFC = 0.097). According to the knowledge index (Table 2), the sociocultural group Idaatcha hold the highest knowledge on aphrodisiac plants (KI = 3.04) whilst groups Adja and Fon hold the lowest estimates (KI = 1.77 and KI = 1.59, respectively).

Table 2 Knowledge Index (KI) on aphrodisiac plants for all sociocultural groups

s = number of species cited; *n* = number of respondents

Ethnic groups	*s*	*n*	KI
Adja	23	13	1.77
Aïzo	23	9	2.56
Fon	46	29	1.59
Holli	11	5	2.20
Idaatcha	85	28	3.04
Mahi	66	31	2.13
Nagot	27	10	2.70
Tchabè	23	9	2.56

Ecological parameters of aphrodisiac plants recorded

Results from growth form analysis showed that woody plants (tree, shrub, under-shrub) constituted 58.70% of the total aphrodisiac plants species whereas herbaceous and lianas were least represented respectively with 29.71% and 11.59%. The biological spectrum (Fig. 2) showed that Phanerophytes (57.25%) were largely dominant followed by Therophytes (13.77%), Geophytes (10.14%), Chamephytes (6.52%), and Hemicryptophytes (4.35%).

The most phytogeographical types of species occurring in the study area were Sudano/Guinean (26.09%), Pantropical (24.64%), Guinean-Congolese (19.57%) and Sudano-Zambezian (13.77).

Our results also revealed that 35.42% of aphrodisiac plants species grown in natural habitats (savannah, saxicolous meadows and gallery forests etc.) while 27.92% originated from home gardens, 20.83% were found in fallow and 15.83% were domesticated and cultivated as crops.

Plant parts and uses

Parts of plants used as aphrodisiac in sexual dysfunction treatment were presented in Fig. 3. Roots (33.12% representing of herbal preparation) followed by leaves (20.13%) and fruits (12.99%) were the most used part of aphrodisiac plants. These results were illustrated by a great proportion of roots observed among different plants parts sold in the markets surveyed.

The most frequent mode of remedy preparation was maceration (44.76%, Fig. 4). This is alcoholic in most cases so that aphrodisiac plant organs (often roots) were soaked in palm wine or other alcoholic solvent for 24 to 72 hours before used. The other modes of preparation are pounding (22.38%), crudity (17.13%), trituration (6.29%), decoction (5.59%), powdering (3.15%) and calcination (0.70%). In order to make aphrodisiac remedy efficiency, some traditional healers associated different ingredients with plant parts when prepared their concoction. Ingredients included parts of wild animals (ivory and elephant penis, buffalo horn, horse penis, squirrel penis etc.), penis of domestic animals (goat, dog, rooster, duck etc.), food supplements (Eggs, cow's milk, honey, lemon juice, palm oil, sugar etc.), mineral and similar elements such as kaolin, white gravel, spike etc.

Application of the aphrodisiac remedies was generally done by oral route through drinking, porridge, others (88.11%) followed by mastication (6.99%), local application (4.20%) and anal route (0.70%) (Fig. 5). Mastication was linked to raw vegetables including vegetable brushes. Local application concerned the application on the penis (3.50%) and in the vagina (0.70%). The anal route (suppository) can be perceived here as purgation.

Disorders frequently treated by aphrodisiac plants and consensus evaluation on remedy

The total of 138 aphrodisiac plants recorded is used in the formulation of 220 recipes to treat eight (8) ailments from which sexual weakness (88.80%) was the more frequent. Other sexual disturbances treated were azoospermia (12.80%), premature ejaculation (12.80%), sperm deficiency (11.20%), impotence (8%), lack of libido (4.80%), frigidity (4%) and non-development of the penis (2.40%). Informants were agreed more in the treatment of sexual weakness (ICF = 0.75) followed by sperm deficiency (ICF = 0.67), precocious ejaculation (ICF = 0.55) and the lack of libido (ICF = 0.52). The informant consensus factors for the other ailments treated were 0.5, 0.37, 0.33 and 0.25 respectively for non-development of the penis, azoospermia, frigidity and Impotence. Aphrodisiac plants with the highest Fidelity Level (FL = 100%) accounted for 79.71% (110/138) of all species recorded. High degree of consensus was observed among informants on the use of a great number of aphrodisiac plants (96 species, 69.57%) to manage sexual weakness such as *Acridocarpus smeathmannii*, *Citrus aurantifolia*, *Cyperus esculentus*, *Garcina kola*, *Imperata cylindrical* and *Pachycarpus lineolatus* which were cited among commonly used species. But few aphrodisiac plants with highest fidelity level were found for other sexual dysfunction treated. Early ejaculation was more treated with *Solenostemon monostachyus* (FL = 100%), azoospermia more treated with *Dioscorea praehensislis, Heliotropium indicum* and *Tragia senegalensis* (FL = 100% for each), impotence more treated with *Blumea viscosa, Icacina oliviformis, Mallotus oppositifolius* and *Sida garckeana* (FL = 100% for each), the lack of libido more treated with *Saccharum officinarum* (FL = 100%), sperm deficiency more treated with *Acacia polyacantha, Abelmoschus esculentus, Desmodium gangeticum* (FL = 100% for each) and frigidity more treated with *Caesalpinia pulcherrima* and *Hexalobus crispiflorus* (FL = 100% for each).

Causes of sexual dysfunction according to informants

Our ethnobotanical survey revealed ten (10) causes of sexual dysfunction of which excess alcohol drinking and some diseases/infection (hemorrhoids, diabetes, ulcers, hypertension, gonorrhea, chancroid etc.) were the most represented (with a proportion of 17.46% each). Other causes such as abuse of sex (11.11%) especially during youth, excess of table (very fat and very sweet dishes, 9.52%), psychological troubles (fear, nervousness, worries etc., 9.52%), mystical causes (bewitchment, adultery, contact of breast milk with the boy’s penis during breastfeeding etc. 9.52% each), age increased (7.94%), others causes such as excessive consumption of pharmaceuticals and bitter herbal teas, excess plowing, accidents and sexual abstinence (7.94%), heredity (4.76%) and lack of sport (4.76%).

Market data

Most plant organs sold for aphrodisiac purposes in the six (06) markets surveyed, resulted in a total of nineteen (19) plant species. All these species were recorded during ethnobotanical survey; eight (8) of them were among the fifteen aphrodisiac species commonly used. Moreover these eight (8) were threatened according the IUCN Red List of Threatened Species of Benin (Adomou et al. 2011). Table 3 listed these aphrodisiac plants recorded, the main organs sold and their status. Herb sellers interviewed mentioned that their customers were mostly old and adults men but rarely young people.

Table 3
List of aphrodisiac plants and organs sold

Aphrodisiac plants	Organs sold	Plant status
Acridocarpus smeathmannii *	Root	In danger (EN)
Caesalpinia bonduc *	Root	Extinct in the wild (EW)
Pachycarpus lineolatus *	Rhizome	
Monodora myristica *	Seed	In danger (EN)
Mondia whitei	Root	Vulnerable (VU)
Xylopia aethiopica *	Fruit	Vulnerable (VU)
Aframomum melegueta *	Fruit	
Carpolobia lutea	Root	
Garcina kola *	Seed	Extinct in the wild (EW)
Allium cepa	Bulb	
Carissa spinarum	Root	Vulnerable (VU)
Cola acuminata *	Seed	
Cola nitida	Seed	
Cissus populnea	Root	
Curculigo pilosa	Root	
Eugenia aromaticum	Flower	
Voacanga africana	Root	Vulnerable (VU)
Opilia celtidifolia	Root	
Prosopis africana	Root	
* Species with the highest quotation frequencies		

Discussion

Diversity of aphrodisiac plants in Central and Southern Benin

Results from this study show that 138 aphrodisiac plant species are used in center and south Benin. In similar work, Kambalé (2012) identified 37 species in Democratic Republic of Congo, while Talaa (2009) and Singh et al. (2010) identified 118 and 136 aphrodisiac plant species respectively in Morocco and India.

The high diversity of plants reported to have aphrodisiac properties could result from daily uses of plants added with hearsay occurrences. The presence of such a large number of aphrodisiac plant species indicates that the study area harbored a very high diversity of medicinal plants and that it is a site for various indigenous knowledge. However, the high number of species recorded (72) at the center Benin can result from the largest number of respondents in this area (90 *vs.* 44 respondents in the south Benin).

Our results revealed that taxa Fabaceae, Euphorbiaceae and Poaceae displayed the highest proportion of aphrodisiac plants (27.54% of the total plants collected). According to several reports, Fabaceae (Adomou et al. 2012; Ahoyo et al. 2017; Laleye et al. 2015), Euphorbiaceae (Adomou et al. 2012 ; Ambé et al. 2015) and Poaceae (Akouedegni et al. 2012) contain the greatest number of medicinal plants commonly used to treat several diseases in Benin and neighboring countries. It is also possible that these dominant families include species that possess many biologically active compounds which can be effective in the management of diseases. However, if we assumed that medicinal properties are not randomly distributed in plant phylogenies (Saslis-Lagoudakis et al. 2011), these data need to be confirmed through bioscreening potential and bioinformatics approaches for example.

Of the 138 aphrodisiac plants identified, 61 have been previously cited for aphrodisiacal properties. These include *Caesalpinia bonduc* (Assogbadjo et al. 2011; Gbankoto et al. 2015), *Garcinia kola* (Adomou et al. 2012; Ojo et al. 2019), *Cyperus esculentus* (Adomou et al. 2012; Talaa 2009), *Borassus aethiopum* (Gbesso et al. 2016), *Aframomum melegueta* (Kamtchouing et al. 2002), *Acridocarpus smeathmannii* (Adomou et al. 2012), *Musa sapientum* (Lal et al. 2017), *Cola acuminata* (Kambalé 2012; Okwunodulu et al. 2017), *Xylopia aethiopica* (Talaa 2009; Woode et al. 2011), *Cissus populnea* (Adomou et al. 2012; MacDonald et al. 2016), *Carissa spinarum* (Adomou et al. 2012), *Carpolobia lutea* (Adomou et al. 2012), *Carica papaya* (Kambalé 2012), *Securidaca longepedunculata* (Chika et al. 2017), *Citrus aurantifolia* (Adejoh et al. 2017), *Cola nitida* (Odebunmi et al. 2009), *Mondia whitei* (Adomou et al. 2012; Deguenonvo 2011), *Paullinia pinnata* (Adomou et al. 2012), *Eugenia aromatica* (Adomou et al. 2012; Tajuddin et al. 2003), *Zingiber officinale* (Abudayyak et al. 2015; Talaa 2009 ; Adomou et al. 2012), *Rourea coccinea* (Adomou et al. 2012), *Capsicum frutescens*, *Citrus lemon*, *Cymbopogon citratus*, *Desmodium velutinum*, *Elaeis guineensis*, *Euphorbia hirta*, *Piper guineense* (Kambalé 2012; Echo et al. 2017), *Citrus aurantium, Cocos nucifera* (Abudayyak et al. 2015) *Paullinia pinnata*, *Waltheria indica* (Békro et al. 2007), *Daucus carota*, *Allium cepa*, *Allium sativum*, *Arachis hypogea*, *Phoenix dactylifera* et *Tribulus terrestris* (Talaa 2009), *Ananas comosus*, *Evolvulus alsiniodes*, *Hymenocardia acida*, *Prosopis africana*, *Kigelia africana*, *Moringa oleifera*, *Parkia biglobosa*, *Phoenix*

dactylifera, *Prosopis africana*, *Pseudocedrela kotschyi*, *Scoparia dulcis*, *Senna occidentalis* (MacDonald et al. 2016), *Manihot esculenta* (Tan et Zahazah 2015), *Abelmoschus esculentus* (L.) Moench, *Abrus precatorius* L., *Aloe vera* (L.) Burm. F, *Cissus quadrangularis* L., *Desmodium gangeticum* (L.) DC., *Evolvulus alsinoides* (L.) L., *Flueggea virosa* (Roxb.ex Willd), *Jatropha curcas* L., *Ocimum gratissimum* L., *Tamarindus indica* L (Singh et al. 2012). These results attest that respondents hold a good knowledge on plant species with aphrodisiac properties that can help phytochemists and pharmacologists to test bioactive compounds and to confirm traditional uses.

The species mostly cited were *Caesalpinia bonduc* (49 citations), *Musa sapientum* (37 citations), *Garcina kola* (33 citations), *Cyperus esculentus* (24 citations), *Borassus aethiopum* (21 citations), *Aframomum melegueta* (19 citations), *Acridocarpus smeathmannii* (18 citations), *Cola acuminata* (18 citations), *Citrus aurantifolia* (17 citations), *Imperata cylindrica* (17 citations), *Manihot esculenta* (17 citations), *Monodora myristica* (14 citations), *Pachycarpus lineolatus* (14 citations), *Gardenia erubescens* (13 citations), *Xylopia aethiopica* (13 citations). This indicates their high potential for the management of sexual dysfunction symptoms. These plants could be considered as promising candidates for further scientific validation, especially those not yet screened for any pharmacological property. However, the study must be extended to the whole country to get the list all plants traditionally used as aphrodisiac for phytochemical research.

The study revealed that the ethnic group Idaatcha had a great knowledge of aphrodisiac plants in the study area probably due to the unequal number of respondents in different ethnic groups.

Market surveys exhibited eight (8) aphrodisiac plant species of high quotation frequencies mostly marketed from which five species fall in the Red List of IUCN due to root and/or fruit overexploitation: *Caesalpinia bonduc, Acridocarpus smeathmanni, Monodora myristica, Xylopia aethiopica*, and *Garcina kola*. In-depth studies must be conducted especially implications of commercial extraction in 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.

In addition, the present study showed that aphrodisiac plant buyers were mainly old men. This is not surprising because men's sexual capacities reach their peak in the range of 25 to 35 years of age (Ondele et al. 2015). Sexual intercourse for the elderly aims to maintain health and harmony within the married couple. But it would be wise not to have sexual intercourse too prolonged at the old age (60 to 70 years). .

Ecological parameters of aphrodisiac plants

Aphrodisiac plant species recorded here were mainly phanerophytes. This suggested that woody plants contain more aphrodisiac active ingredients. Similar results have been reported on aphrodisiac plants by Kambalé (2012) and Ipona et al. (2018) and by Adomou et al. (2012) for on medicinal plants sold in the market of Abomey-Calavi (Benin). With regard to phytogeographic distribution, the Sudano-Guinean and Pantropical species were the dominated recorded species. These results matched Kambalé (2012) and Ipona et al. (2018) findings. According to Adomou et al. (2012), species with wide distribution are able of colonizing degraded environments (fields, fallows, roadsides). Moreover, of all aphrodisiac plants identified, seventeen (17) species were threatened in Benin and appeared on the IUCN Red List with different status (Table 4). Of these species, two (02) were declared extinct in the wild (EW), four (04) were endangered (EN) and eleven (11) were vulnerable. Based on the ongoing degradation and conversion of natural habitats in Benin, awareness-raising actions on the risks of residual populations of aphrodisiac plant, reforestation and promotion of medicinal plant gardens should be encouraged.

Table 4
List of threatened aphrodisiac plants in Benin

Aphrodisiac plants	Status (Adomou et al. 2011)
Caesalpinia bonduc (L.) Roxb.	Extinct in the wild (EW)
Garcina kola Heckel	Extinct in the wild (EW)
Acridocarpus smeathmannii (DC.) Guill. & Perr.	In danger
Afraegle paniculata (Schumach & Thonn.) Engl.	In danger
Monodora myristica (Gaertn.) Dunal	In danger
Pterocarpus erinaceus Poir.	In danger
Borassus aethiopum Mart.	Vulnerable (VU)
Carissa spinarum L.	Vulnerable (VU)
Detarium senegalense JF Gmel.	Vulnerable (VU)
Khaya senegalensis (Desr.) A. Juss.	Vulnerable (VU)
Kigelia africana (Lam.) Benth.	Vulnerable (VU)
Mondia whitei (Hook, f.) Skeels	Vulnerable (VU)
Tetrapleura tetraptera (Schumach & Thonn.) Taub.	Vulnerable (VU)
Vitellaria paradoxa CF Gaertn. ssp. paradoxa	Vulnerable (VU)
Voacanga africana Stapf.	Vulnerable (VU)
Xylopia aethiopica (Dunal) A. Rich.	Vulnerable (VU)
Zanthoxylum zanthoxyloides (Lam.) Zepernick & Timler	Vulnerable (VU)

Plant parts and manner of use

People use various parts of medicinal herbs to prepare aphrodisiac remedies. When analyzing the use of plant parts, we found a frequent utilization of root (33.12%) followed by leaf (20.13%). Several ethnobotanical studies were quoted root and leaf among the most preferred part of plant for the preparation of remedies (Adomou et al. 2012; Ipona et al. 2018; Kambalé, 2012; Lagnika et al. 2016; Laleye et al. 2015). Therefore, root appears as the organ that contains more aphrodisiac active ingredients. This has been confirmed clinically on species such as *Caesalpinia bonduc* (Gbankoto et al. 2015; Shelar et al. 2014), *Acridocarpus smeathmannii* (Kale et al. 2019), *Mondia whitei* (Watcho et al. 2012; Oloro et al. 2016). However, root harvesting is very dangerous and even fatal for the survival of a plant. There is a need for phytochemical data on underutilized parts of species such as *Pachycarpus lineolatus*, *Acridocarpus smeathmannii*, *Curculigo pilosa* and *Caesalpinia bonduc* which were cited by herbs sellers as rare species to find while its demand is growing. Contrary to the devastating effect that the use of roots can cause to plant biodiversity, the high frequency of use of leaf in recipes is a great advantage for the preservation of plant biodiversity because they are less dangerous apart from flowering delay due to allocations.

Moreover, maceration (44.76%) was the most frequent mode of aphrodisiac remedies preparation. These result contrasted those on leaf decoction obtained by Kambalé (2012). For the present study, alcoholic maceration was the most suitable for extracting aphrodisiac active ingredients from the roots. According to Lévy and Garnier (2006), the consumption of alcohol in moderate quantities would constitute a substance lifting inhibitions, which would amplify sensations and contribute to increase sexual arousal. Chikere et al. (2011) reported also that alcohol drinking enhances pleasure during period of sex. But studies are needed in order to find more suitable solvent for the human body other than alcohol that can be one cause of sexual weakness. Indeed, with the unrestrained quest for income following the world economic crisis, the traditional alcohol resulting from the distillation of palm wine and the other solvents are often adulterated alcohols of all kinds that are unsuitable for human health. Other solvents should be sought, except water.

Moreover, we notice that some traditional healers associated ingredients such as ivory and elephant penis, buffalo horn, horse penis and squirrel penis when prepared their aphrodisiac remedy. This is very dangerous and can lead in disappearance of these wild animals. Sensitization actions are needed in order to discourage this practice reducing animal biodiversity.

Sexual weakness appeared as the common sexual dysfunction treat and for which nine (9) aphrodisiac plants were mostly used: *Acridocarpus smeathmannii*, *Citrus aurantifolia*, *Cyperus esculentus*, *Garcina kola*, *Imperata cylindrica*, *Pachycarpus lineolatus, Borassus aethiopum*, *Cola acuminata* and *Caesalpinia bonduc* (FL ≥ 91% for each species). Some previous studies revealed that *Acridocarpus smeathmannii* (Kale et al. 2018), *Borassus aethiopum* (Gbesso et al. 2016), *Garcinia kola* (Ojo et al. 2019), *Caesalpinia bonduc* (Gbankoto et al. 2015), *Cyperus esculentus* (koud et al, 2016), *Imperata cylindrica* (Gaikwad et al. 2019) and *Cola acuminata* (Eromosele et al. 2018), contained pharmacological agents for the treatment of erectile dysfunction. But According to Idris et al. (2018), *Citrus aurantifolia* juice should be consumed with caution due to its potential to cause infertility in males.

Causes of sexual dysfunction treated

In this study, it was found that the main causes of sexual dysfunction were excess alcohol drinking and some chronic diseases (17.46% of each) followed by sex abuse (11.11%), excess of table, psychological disorders, mystical causes (9.52% of each), aging (7.94%), heredity and lack of exercise (4.76% of each). Similar results were found by Jain (2019) and Seisen et al. (2012). Chronic diseases cited here suggested that their prevention can help prevent sexual dysfunctions. Here again, regarding of excess alcohol drinking, there is an urgent need for sensitization people in order to limit human healthy damage.

Conclusion

This ethnobotanical study allowed the registration of aphrodisiac plants species and documented their traditional uses in Central and South Benin. A total of 138 aphrodisiac plants species were recorded, including 72 from Center Benin and 20 from South Benin while 46 species were common to both areas. Fifteen (15) of them were commonly used. Aphrodisiac plant species were mainly phanerophytes. Aphrodisiac plants were used for 220 recipes to treat eight affections from which the common was sexual weakness (88.80%). Roots (33.12%) and leaves (20.13%) were the most used parts. The maceration (44.76%) and oral route (88.11%) were the main galenic form and the main mode of administration, respectively. Study has provided basic information to pharmacological researches. It is therefore desirable that thorough phytochemical and pharmacological studies be carried out on these plants for their scientific validation. A problematic use of aphrodisiac plant relies on roots overexploitation and their maceration using adulterated alcohols unsuitable for human health. This requires sensitization campaigns.

Declarations

Ethics approval and consent to participate

Ethical considerations were addressed prior to starting the interviewing process with each participant. The purpose of the interview and study was explained verbally to each one of the informants. Their consent was requested for recording the process and using the provided information for the purposes of scientific research. Respondents were explicitly notified that their participation is voluntary, confidential, and non-identifiable. All participants in this study, including plant sellers and traditional healers agreed to give consent before moving on to the data collection processes.

Consent for publication

Not applicable.

Availability of data and materials

We have already included all data in this manuscript.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

IAB and E-EBKE designed the study. IAB conducted data collection and drafted the manuscript. E-EBKE assisted greatly in all stages of the study and supplemented the draft. HY and ACA revised the manuscript. IAB, E-EBKE and HY identified the plants. All authors read and approved the final manuscript.

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Appendix

Table 1
List of aphrodisiac plants recorded and their traditional uses

No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
1	*Abelmoschus esculentus* (L.) Moench	Févi (Fon), Ila (Idaatcha)	Malvaceae	Annual herb	Th	Pt	Fruitsuits	Sperm deficiency	C
2	*Abrus precatorius* L.	Viviman (Fon), Odjou êga (Idaatcha)	Fabaceae	Liana	Lnph	SG	Leaves, Seed	Sexual weakness, Azoospermia	M D
3	*Acacia polyacantha*	Egui èdè (Tchabè)	Fabaceae	Tree	mPh	SZ	Sap	Sperm deficiency	P
4	*Acridocarpus smeathmannii* (DC.) Guill. & Perr.	Gbanguinan (Fon)	Malpighiaceae	Tree	Lmph	GC	Roots	Sexual weakness	M
5	*Afraegle paniculata* (Schumach. & Thonn.) Engl.	Egui agogo (Idaatcha)	Rutaceae	Tree	mph	At	Roots	Sexual weakness	M
6	*Aframomum melegueta* (Roscoe) K. Schum.	Atakoun (fon) Ata (Idaatcha)	Zingiberaceae	Perennial herb	Gr	GC	Seed	Impotence, sperm deficiency, Sexual weakness	M P M
7	*Allium cepa* L.	Manssa (Idaatcha)	Liliaceae	Perennial herb	Gb	Pt	Bulb	Sexual weakness, non-development of penis	D M
8	*Allium sativum* L.	Ayo (Idaatcha)	Liliaceae	Perennial herb	Gb	Pt	Bulb	Sexual weakness	M
9	*Aloe vera* (L.) Burm. f.	Aloès	Asphodelaceae	Perennial herb	Ch	SZ	Laeves	Sexual weakness, Frigidity	M
10	*Amaranthus spinosus*	Tètè ounon (Fon)	Amaranthaceae	Annual herb	Th	Pt	Roots	Sexual weakness	D
11	*Ananas comosus* (L.) Merr.	Ananas	Bromeliaceae	Annual herb	Hc	Pt	Fruits	Sexual weakness	C
12	*Annona senegalens*is Pers.	Gniglo (Fon)	Annonaceae	Shrub	nph	SZ	Laeves, Roots	Sperm Deficiency, Sexual Weakness	T M
13	*Anogeissus leiocarpa* (DC.) Guill. & Perr.	Hlihon (Fon)	Combretaceae	Tree	mPh	S	Roots	Sexual weakness	M
14	*Arachis hypogea* L.	Aziin (Fon)	Fabaceae	Annual herb	Th	SG	Seed	Sexual weakness	C
15	*Bambusa vulgaris* Schrad. ex J.C. Wendl.	Idaatchawé (Idaatcha)	Poaceae	Perennial herb	Gr	SG	Roots	Sexual weakness	M
16	*Biophytum petersianum* Klotzsch	Kpatèman (Idaatcha)	Oxalidaceae	Annual herb	Th	SG	Laeves	Sexual weakness	M
17	*Blumea viscosa* (Mill.) V.M.Badillo	Azuman (Fon)	Asteraceae	Perennial herb	Th	S	Laeves	incapacity	T
18	*Boerhavia diffusa* L.	Gbadjèwin/Gbagbada (Fon)	Nyctaginaceae	Annual herb	Th	Pt	Whole plant	Sexual weakness	M

Biological types : Th = Thérophytes, Hc = Hemicryptophytes, Ge = Geophytes, Ch = Chaméphytes, Ph = Phanérophytes, MPh = megaphanérophytes, mPh = mes nanophanérophytes; **Chorology** : GC = Guineo-Congolese, S = Sudanese, SG = Sudano-Guinean transition, SZ = Sudano-Zambezian, At = Tropical Africa, Pt = P.

No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
19	*Borassus aethiopum* Mart.	Agonté (Fon), Egui Agban (Idaatcha)	Arecaceae	Tree	mPh	SZ	Fruits, Roots	Sexual weakness, Impotence	C D
20	*Bridelia ferruginea* Benth.	Ira (Idaatcha)	Euphorbiaceae	Shrub	mph	SG	Roots, Laeves	Sexual weakness	D
21	*Caesalpinia bonduc* (L.) Roxb.	Adjikoun /Adji (Fon)	Fabaceae	Shrub	mph	GC	Roots	Premature ejaculation, Sexual weakness	M
22	*Caesalpinia pulcherrima* (L.) Sw.	Orgeuil de chine	Fabaceae	Shrub	mph	SG	Roots	Frigidity	M
23	*Calotropis procera* (Aiton) W.T. Aiton	Amon man (Fon)	Asclepiadaceae	Shrub	mph	SG	Roots	Sexual weakness	M
24	*Capsicum frutescens* L.	Tahounbo olobéré (Idaatcha)	Solanaceae	Annual herb	Th	Pt	Fruits	Sexual weakness,	P C
25	*Carica papaya* L.	Aguidi (Idaatcha)	Cariaceae	Shrub	mph	Pt	Roots, Fruits	Sexual weakness	M D
26	*Carissa spinarum* L.	Ahanzo (fon)	Apocynaceae	Shrub	nph	PAL	Roots	Sexual weakness	M
27	*Carpolobia lutea* G. Don	Aviatin (Fon)	Polygalaceae	Shrub	mph	GC	Roots	Sexual weakness, Premature ejaculation	M
28	*Catharanthus roseus* (L.) G. Don	Pervenche de Madagascar	Apocynaceae	Annual herb	Th	SG	Whole plant	Sexual weakness	M
29	*Ceiba pentandra* (L.) Gaertn.	Fromager	Bombacaceae	Tree	MPh	Pt	Barks	Sexual weakness	D
30	*Cerathoteca sesamoides* Endl.	Agbor (Idaatcha), caloulou (Tchabè)	Pedaliaceae	Annual herb	Ch	SZ	Laeves	Sexual weakness	P
31	*Cissus populnea* Guill. & Perr.	Djawawa, Orbè ordè (Idaatcha), Assankan (fon)	Vitaceae	Liana	LHc	S	Stem, Roots	Azoospermia, Sexual Weakness	P
32	*Cissus quadrangularis* L.	Assan (Fon)	Vitaceae	Liana	Lmph	SZ	Stem	Sexual weakness	P
33	*Citrus arantium* L.	Mandarinier	Rutaceae	Tree	mph	SG	Fruits	Sexual weakness	C
34	*Citrus aurantifolia* (Christm. & Panzer) Swingle	Klétin (Fon)	Rutaceae	Shrub	mph	SG	Fruits	Sexual weakness	C
35	*Citrus lemon* L.	Oranger	Rutaceae	Shrub	mph	GC	Fruits	Sexual weakness	C
36	*Cocos nucifera* L.	Cocotier	Arecaceae	Shrub	mph	Pt	Fruits	Sexual weakness, Premature ejaculation	P C
37	*Cola acuminata* (P. Beauv.) Schott & Endl.	Obi (Idaatcha)	Sterculiaceae	Shrub	mPh	GC	Seed	Sexual weakness, Impotence	M
38	*Cola nitida* (Vent.) Schott. & Endl.	Goro (Idaatcha), Golo (Fon)	Sterculiaceae	Shrub	mPh	GC	Seed	Sexual weakness	C
39	*Commelina diffusa* Burm. f.	Handoukpo (Fon)	Commelinaceae	Annual herb	Hc	Pt	Laeves	Sexual weakness	D
40	*Commelina erecta* L. ssp. Erecta	Olirékou (Idaatcha)	Commelinaceae	Annual herb	Hc	Pt	Roots	Sexual weakness	C

Biological types : Th = Thérophytes, Hc = Hemicryptophytes, Ge = Geophytes, Ch = Chaméphytes, Ph = Phanérophytes, MPh = megaphanérophytes, mPh = mes nanophanérophytes; **Chorology** : GC = Guineo-Congolese, S = Sudanese, SG = Sudano-Guinean transition, SZ = Sudano-Zambezian, At = Tropical Africa, Pt = P.

No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
41	*Commiphora africana* (A.Rich.) Engl. var. africana	Oridji (Idaatcha)	Burseraceae	Shrub	mph	SZ	Laeves	Sexual weakness	D
42	*Connarus africanus* Lam.	Ganganlissè (Fon)	Connaraceae	Shrub	mph	GC	Roots	Sexual weakness	C
43	*Croton gratissimus* Burch.	Djélélé (fon), Adjêkofolé (Idaatcha)	Euphorbiaceae	Shrub	mph	SG	Laeves	Sexual weakness	P
44	*Croton lobatus* L.	Alovi aton (Fon)	Euphorbiaceae	Annual herb	Th	SG	Laeves	Sexual weakness	T
45	*Curculigo pilosa* (Schum. &Thonn.) Engl.	Kôrômi (Nago)	Hypoxidaceae	Tree	Gr	PAL	Roots	Sexual weakness	M
46	*Cymbopogon citratus* (DC.) Stapf	Tcha â man (Fon)	Poaceae	Annual herb	Hc	SG	Laeves, Stem	Sexual weakness	M
47	*Cyperus esculentus* L.	Ofio (Idaatcha), Fio (fon)	Cyperaceae	Annual herb	Gt	Pt	Roots	Sexual weakness, Impotence, Azoospermia	M P
48	*Daniellia oliveri* (RolLaeves) Hutch. & Dalzie	Egui iya (Idaatcha)	Fabaceae	Tree	mPh	SZ	Sap	Sexual weakness	C
49	*Daucus carota* L. ssp. sativus (Hoffm.) Arcang.	Carotte	Apiaceae	Liana	Gt	Pt	Roots	Sexual weakness	P
50	*Desmodium gangeticum* (L.) DC.	Ayikpéilè (Tchabè)	Fabaceae	Under-shrub	nph	PAL	Roots	Sexual weakness	M
51	*Desmodium velutinum* (Willd.) DC.	Trèdavor (Fon)	Fabaceae	Tree	Ch	PAL	Roots	oligospermia	P
52	*Detarium senegalense* J.F. Gmel.	Adjêkofolé Koriko (Idaatcha)	Fabaceae	Tree	mPh	SG	Roots	Sexual weakness	D
53	*Dioscorea alata* L.	Aga (Idaatcha)	Dioscoreaceae	Liana	Gt	SG	Tubersbers	Sexual weakness	P
54	*Dioscorea dumetorum* (Kunth) Pax	Léfé (Fon)	Dioscoreaceae	Liana	Gt	SZ	Tubersbers	Sexual weakness	P
55	*Dioscorea praehensislis*	Igname sauvage	*Dioscoreaceae*	Liana	Gt	SG	Tubersbers	Sexual weakness	D
56	*Dioscorea rotundata* Poir.	Kokoro (Idaatcha)	Dioscoreaceae	Liana	Gt	SG	Tubersbers	Azoospermia	P
57	*Drypetes floribunda* (Müll.Arg.) Hutch.	Assokara (Nago)	*Euphorbiaceae*	Tree	mph	GC	Roots	Sexual weakness	D
58	*Elaeis guineensis* Jacq.	Egui êkpê (Idaatcha)	Arecaceae	Tree	mPh	GC	Roots, Sap, Seed	Sexual weakness	C
59	*Entada africana* Guill. & Perr.	Igba arisso (Idaatcha)	Fabaceae	Tree	mPh	SZ	Roots	Sexual weakness	M
60	*Erythrina senegalensis* DC.	Oshishè (Idaatcha)	Fabaceae	Tree	mph	SG	Stem	Sexual weakness	C

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
61	*Eugenia aromaticum* (L.) Merr. & L. M. Perry	Atikingbadota (Fon)	Myrtaceae	Tree	mph	At	Flowers	Sexual weakness	P M
62	*Euphorbia hirta* L.	Iyankou ayira (Idaatcha)	Euphorbiaceae	Annual herb	Th	SG	Laeves	Sexual weakness	D
63	*Evolvulus alsinoides* (L.) L.	Tibitiré (Idaatcha), Zounkorman (Fon)	Convolvulaceae	Annual herb	Th	Pt	Laeves	Sexual weakness	P
64	*Flacourtia indica* (Burm. f.) Merr.	Gbohounkadjê (Fon)	Flacourtiaceae	Shrub	mph	GC	Laeves	Sexual weakness	D
65	*Flueggea virosa* (Roxb.ex Willd) Voigt.	Wadjédjé (Idaatcha), Tchaké-chaké (Fon)	Euphorbiaceae	Under-shrub	nph	Pt	Roots, Laeves	Frigidity, Sexual weakness	D
66	*Garcina kola* Heckel	Ahowé (Fon), Iwo (Idaatcha)	Clusiaceae	Tree	mPh	GC	Seed	Sexual weakness	C
67	*Gardenia erubescens* Stapf & Hutch.	Kankranbor (Idaatcha), Dakpla (Fon)	Rubiaceae	Shrub	nph	S	Roots, Seed	Sexual weakness, Impotence	P M
68	*Glycine max* (L.) Merr.	soja	Fabaceae	Annual herb	Th	SG	Seed	Azoospermia	P
69	*Gomphrena celosoides* Mart.	Dawawé (Fon)	Amaranthaceae	Annual herb	Th	Pt	Laeves	Sexual weakness	M
70	*Heliotropium indicum* L.	Crête de coq	Boraginaceae	Annual herb	Th	SG	Laeves, Flowers	Sexual weakness	T
71	*Hexalobus crispiflorus* A.Rich.	Igui Akpado (Nago)	Annonaceae	Tree	mPh	SG	Sap	azoospermia	P
72	*Holarrhena floribunda* (G. Don) T. Durand & Schinz	Lètin wiwi (Fon)	Apocynaceae	Tree	mph	SG	Barks	Frigidity	D
73	*Hymenocardia acida* Tul.	Orokpa (Idaatcha)	Euphorbiaceae	Tree	mph	SZ	Roots	Sexual weakness	M
74	*Hyphaene thebaica* (L.) Mart.	Palmier fourchu	Arecaceae	Tree	mPh	SZ	Fruits	Sexual weakness	C
75	*Icacina oliviformis* (Poiret) Raynal,	Azonkwin (Fon)	Icacinaceae	Under-shrub	nph	SG	Roots	Impotence	P
76	*Imperata cylindrica* (L.) P. Beauv.	Sè (Fon), Igan (Idaatcha)	Poaceae	Annual herb	Hc	Pt	Rhizomes	Sexual weakness	M
77	*Irvingia gabonensis* (Aubry-LeComte ex O'Rorke)	Egui Oro (Nago)	Irvingiaceae	Tree	MPh	GC	Seed	Sexual weakness	P M
78	*Jatropha curcas* L.	Yonkpontin (Fon)	Euphorbiaceae	Shrub	mph	GC	Laeves	Sexual weakness	D
79	*Khaya senegalensis* (Desr.) A. Juss.	Caïlcedrat	Meliaceae	Tree	mPh	S	Barks	Sexual weakness, Premature ejaculation	M
80	*Kigelia africana* (Lam.) Benth.	Gnanblikpo (Idaatcha)	Bignoniaceae	Tree	mph	SG	Laeves, Fruits	Non-development of the penis, Sexual weakness	D
81	*Launea taraxacifolia*	Gnantoto (Fon)	Asteraceae	Annual herb	Th	SZ	Whole plant	Sexual weakness, Frigidity	C M
82	*Luffa cylindrica* M. Roem.	éponge végétale	Cucurbitaceae	Liana	Lnph	Pt	Laeves	Sexual weakness	T

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
83	*Mallotus oppositifolius* (Geiseler) Müll. Arg.	Ayindja (Idaatcha)	Euphorbiaceae	Shrub	mph	PAL	Stem	Impotence	M
84	*Manihot esculenta* Crantz	Manioc	Euphorbiaceae	Under-shrub	nph	Pt	Roots	Sperm Deficiency, Sexual Weakness, Impotence	C
85	*Mondia whitei* (Hook. f.) Skeels	Tchirigoun (Fon)	Asclepiadaceae	Liana	Lmph	SG	Roots	Sexual weakness	M
86	*Monodora myristica* (Gaertn.) Dunal	Sassalikoun (Fon)	Annonaceae	Tree	mPh	GC	Seed	Sexual weakness, Premature ejaculation	M
87	*Moringa oleifera* Lam.	Lagalaga (Idaatcha), Yovokpatin (Fon)	Moringaceae	Shrub	mph	SZ	Seed, Laeves, Barks	Sexual weakness	M
88	*Musa sapientum* auct. div.	Kokoé aloga (Fon)	Musaceae	Perennial herb	Gt	GC	Fruits	Sexual weakness, Azoospermia, Impotence	P
89	*Newbouldia laevis* (P.Beauv.) Seemann ex Bureau	Kpatin (Fon), Hysope	Bignoniaceae	Shrub	mph	GC	Laeves	Sexual weakness	M
90	*Ocimum canum* L.	Héhétchou (Adja), Hissihissi (Idaatcha)	Lamiaceae	Annual herb	Th	Pt	Laeves	Sexual weakness	M
91	*Ocimum gratissimum* L.	Tchiayo (Fon), Gnandodoui (Adja)	Lamiaceae	Under-shrub	nph	Pt	Laeves	Sexual weakness	M
92	*Olax subscorpiodea* Oliv.	Mitin (Fon)	Olacaceae	Shrub	mph	GC	Roots	Sexual weakness	M
93	*Opilia celtidifolia*	Atchuntchun (Holli)	*opiliaceae*	Liana	Lmph	SZ	Roots	Sexual weakness,	M
94	*Pachycarpus lineolatus* (Decne.) Bullock	Agboaguin (fon) Tchéffé (Idaatcha)	Asclepiadaceae	Perennial herb	Gr	SG	Roots	Sexual weakness	M
95	*Parkia biglobosa* (Jacq.) R. Br. ex G. Don	Egui Igba (Idaatcha)	Fabaceae	Tree	mPh	S	Seed	Sexual weakness	C
96	*Paullinia pinnata* L.	Adaklordor (Fon)	*Sapindaceae*	Liana	Lmph	At	Roots	Sexual weakness	M
97	*Pavetta crassipes* K.Schum.	Dakplassou (Fon)	*Rubiaceae*	Shrub	mph	SZ	Roots	Sexual weakness	M
98	*Periploca nigrescens* Afzel.	Orgbor founfoun (Tchabè)	Asclepiadaceae	Liana	Lmph	GC	Laeves	azoospermia	T
99	*Persea americana* Mill.	Avocatier	Lauraceae	Shrub	mPh	GC	Seed	Sexual weakness	M
100	*Phoenix dactylifera* L.	Dattier	Arecaceae	Shrub	mph	SG	Fruits	Sexual Weakness,, Sperm Deficiency	C
101	*Phyllantus amarus* Schumach. & Thonn.	Tèyinsso (Nago)	Euphorbiaceae	Annual herb	Th	Pt	Whole plant	Azoospermia, Sexual Weakness	D M
102	*Piliostisgma reticulatum* (DC.) Hochst.	Kparounman (Idaatcha)	Fabaceae	Shrub	mph	S	Laeves	Sexual weakness	D

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
103	*Piper guineense* Schumach. & Thonn.	Linlinkoun (Fon), Idjayé (Idaatcha)	Piperaceae	Liana	LmPh	GC	Fruits	Sexual weakness,	P M
104	*Plumbago zeylanica* L.	Dangblan (Fon)	Plumbaginaceae	Shrub	mph	SG	Roots	Sexual weakness	M
105	*Prosopis africana* (Guill. & Perr.) Taub.	Kakê (Fon), Acacayin (Idaatcha)	Fabaceae	Tree	mPh	S	Barks, Stem, Roots	Sexual weakness, Impotence	M
106	*Pseudocedrela kotschyi* (Schweinf.) Harms	Tchaklikli (fon)	Meliaceae	Tree	mph	S	Roots	Sexual weakness	M
107	*Psorospermum febrifugum* Spach	Amnlanmi (Fon)	Clusiaceae	Shrub	mph	SG	Laeves	Sexual weakness	D
108	*Pteleopsis suberosa* Engl. & Diels	Okroukrou (Idaatcha)	combretaceae	Shrub	mph	SZ	Laeves	Sexual weakness	T
109	*Pterocarpus erinaceus* Poir.	Akpékpé (Idaatcha)	Fabaceae	Tree	mPh	S	Barks	Sexual weakness	P
110	*Rourea coccinea* (Thonn.ex Schumach.) Benth.	Hounssitogbé (Fon), Schihountoboui (Adja)	Connaraceae	Under-shrub	nph	GC	Laeves	Sexual weakness	T
111	*Saccharum officinarum* L.	Léké (fon)	Poaceae	Annual herb	Hc	Pt	Stem	Lack of libido	C
112	*Sarcocephalus latifolius* (Sm.) E. A. Bruce	Kodor (Fon), Igbêssin (Idaatcha)	Rubiaceae	Shrub	mph	At	Roots	Sexual weakness	M
113	*Scoparia dulcis* L.	Viviman tèton (Fon)	Scrophulariaceae	Annual herb	Ch	Pt	Roots/Leaves	Sexual weakness	M P
114	*Securidaca longepedunculata* Fres.	Ikpata (Tchabè)	Polygalaceae	Shrub	mph	SZ	Roots	Sexual weakness	M
115	*Senna occidentalis* (L.) Link	Faux kinkéliba	Fabaceae	Under-shrub	Ch	Pt	Roots	Sexual weakness	M
116	*Sida garckeana* Pol. Syn Sida corymbosa R. E. Fr.	Eshôkoutou abo (Tchabè)	Malvaceae	Annual herb	Ch	GC	Whole plant	Impotence	T
117	*Solenostemon monostachyus*	Igbawo (Nagot)	Lamiaceae	Perennial herb	Th	GC	Laeves	Premature ejaculation	D
118	*Sorghum bicolor* (L.) Moench	Sorgho	Poaceae	Annual herb	nph	Pt	Barks	Sexual weakness	M
119	*Strychnos spinosa* Lam.	Amilimontin (Fon)	Loganiaceae	Shrub	mph	PAL	Stem	Sexual weakness	M
120	*Tamarindus indica* L.	Egui ayinran (Idaatcha), Djêvivi (Fon)	Fabaceae	Tree	mPh	Pt	Roots, Fruits	Sexual weakness	P
121	*Tetrapleura tetraptera* (Schumach. & Thonn.) Taub.	Aïdan ôtôror (Nagot)	Fabaceae	Tree	mPh	GC	Fruits	Sexual weakness	M
122	*Theobroma cacao* L.	Cacaoyer	Sterculiaceae	Tree	mph	GC	Fruits	Sexual weakness	M
123	*Tragia senegalensis* Müll.Arg.	Azor (Fon), Wérékpékpé (Idaatcha)	Euphorbiaceae	Liana	Lnph	S	Laeves	Azoospermia	M

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No.	Scientific names	Vernacular names	Families	Morphological types	Biological types	Chorology	Organs used	Diseases treated	M p
124	*Trema orientalis* (L.) Blume syn Trema guineensis (Schumach. & Thonn.) Ficalho	Afèfè (Idaatcha) Jivi jivi (Fon)	Celtidiaceae	Tree	mph	Pt	Barks	Sexual weakness	D
125	*Tribulus terrestris* L.	Ishakoro (Idaatcha)	Zygophyllaceae	Annual herb	Ch	Pt	Fruits	Sexual weakness	D
126	*Trichilia emetica* Vahl	Tchivi (Fon)	Meliaceae	Tree	mph	SZ	Roots	Sexual weakness	D
127	*Triclisia subcordata* Oliv.	Viaka (Adja), Oshougban (Nago)	Menispermaceae	Liana	Lnph	SG	Roots	Sexual weakness	M
128	*Uvaria chamae* P. Beauv	Egui Yaha (Idaatcha)	Annonaceae	Shrub	mph	GC	Roots	Sexual weakness	M
129	*Vernonia cinerea* Sch. Bip	Houssikoussin (Fon)	Asteraceae	Annual herb	Th	Pt	Laeves	Sexual weakness	D
130	*Vigna subterranea* (L.) Verdc.	êkpê (Idaatchaatcha)	Fabaceae	Annual herb	Th	SG	Seed	Sexual weakness	P
131	*Vitellaria paradoxa* C.F. Gaertn. ssp. paradoxa	Egui êmi (Idaatchaatcha)	Sapotaceae	Tree	mPh	S	Barks	Sexual weakness	P
132	*Voacanga africana* Stapf.	Agbossou ningla (Fon)	Apocynaceae	Shrub	mph	SG	Roots	Sexual weakness	M
133	*Waltheria indica* L.	ôkôrôman (Idaatcha)	Sterculiaceae	Under-shrub	nph	Pt	Roots	Sexual weakness	D
134	*Ximenia americana* L.	Iwéwé oko (Idaatcha)	Olacaceae	Shrub	mph	Pt	Roots	Sexual weakness	D
135	*Xylopia aethiopica* (Dunal) A. Rich.	Kpédjélékoun (Fon), Orhoun (Idaatcha)	Annonaceae	Tree	mPh	SG	Fruits	Sexual Weakness, Frigidity	M P
136	*Zanthoxylum zanthoxyloides* (Lam.) Zepernick & Timler	Egui ata (Idaatcha), Hêtin (Fon)	Rutaceae	Shrub	mph	SG	Barks, Laeves	Frigidity, sexual weakness	T M
137	*Zea mays* L.	Gbado (Idaatchaactha)	Poaceae	Annual herb	Th	Pt	Seed	Sexual weakness, Sperm deficiency,	P
138	*Zingiber officinale* Roscoe	Dotè (Fon), Atalè (Idaatcha)	Zingiberaceae	Perennial herb	Gr	SG	Rhizomes	Sexual weakness, Premature ejaculation	P

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Figures

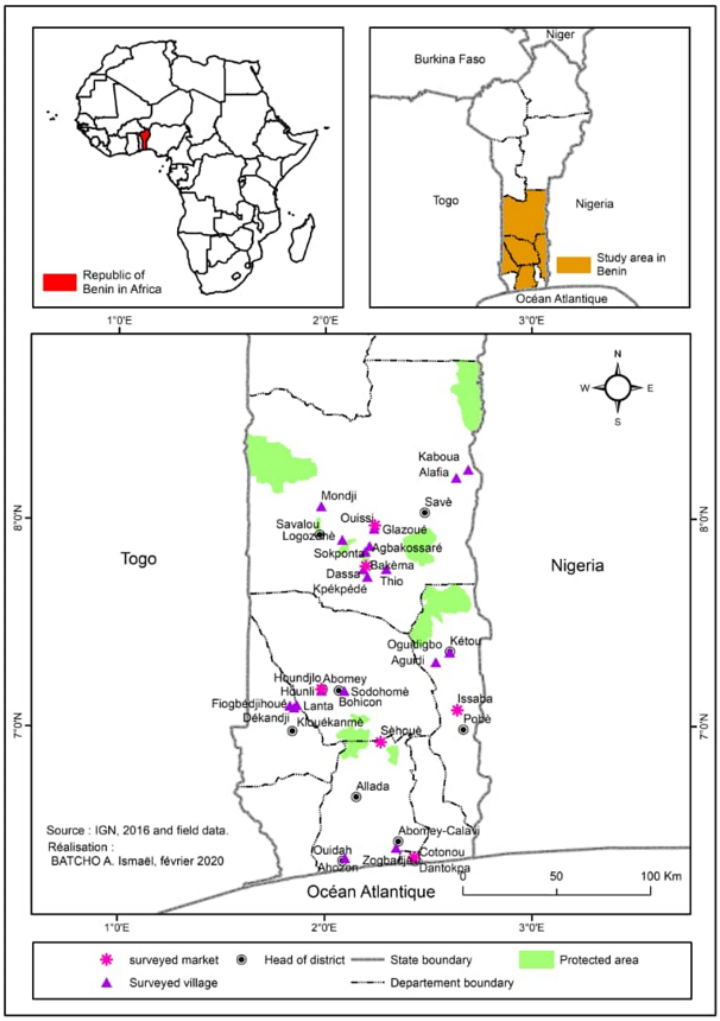

Figure 1

Geographical location of the study area

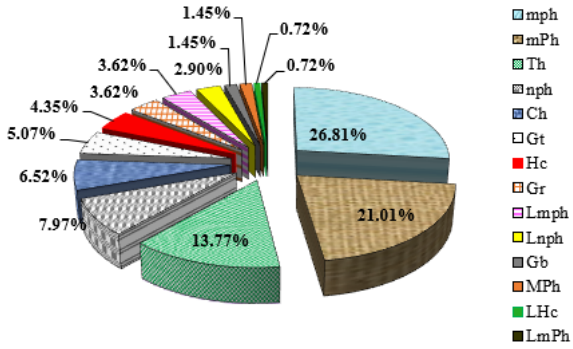

Figure 2

Biological spectrum of aphrodisiac species

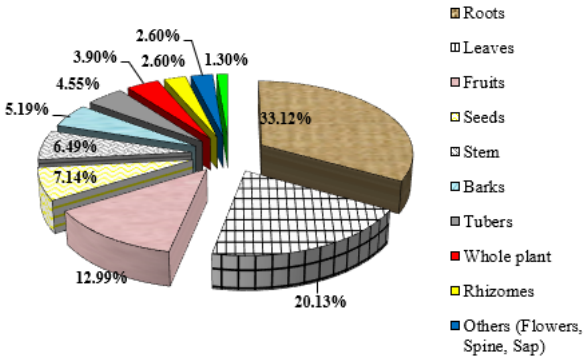

Figure 3

Percentages of aphrodisiac plants parts used

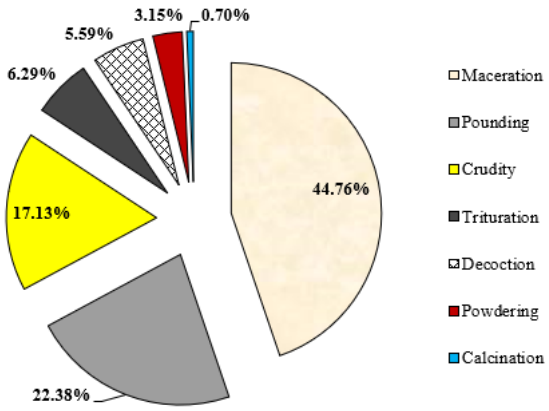

Figure 4

Modes of remedy preparation

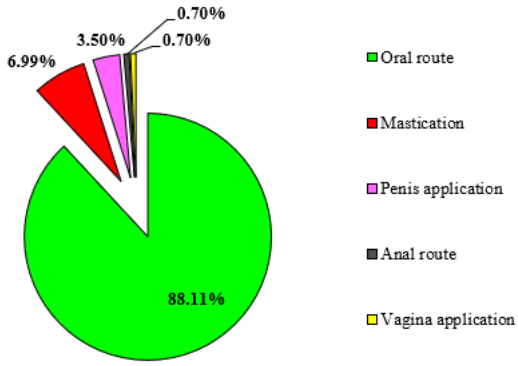

Figure 5

Mode of recipes administration