

Do not fear the supernatural!
**The relevance of ritual plant use for traditional culture, nature
conservation, and human health in western Africa**

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This research was conducted under the auspices of the C.T. de Wit Graduate School for Production Ecology and Resource Conservation (PE&RC)

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Diana Quiroz

Thesis

submitted in fulfilment of the requirements for the degree of doctor
at Wageningen University

by the authority of the Rector Magnificus

Prof. Dr M.J. Kropff,

in the presence of the

Thesis Committee appointed by the Academic Board

to be defended in public

on Friday 20 March 2015

at 11 a.m. in the Aula.

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Do not fear the supernatural! The relevance of ritual plant use for traditional culture,
nature conservation, and human health in western Africa

250 pages

PhD thesis, Wageningen University, Wageningen, NL (2015)

With references, with summaries in Dutch and English

ISBN 978-94-6257-260-7

To my parents,
And their parents,
And their parents...

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Chapter One

General introduction

INTRODUCTION

One of the obstructive features of Western intellectual tradition in the study of human-nature relations is that salient aspects of natural resource use are treated as religious when their causality is attributed to non-human and non-physical agents (e.g. natural resources set apart as symbols, totems, or taboos). The same aspects are considered non-religious when material agency is involved, for instance, the use of natural resources as medicine, weapons, or food (Tuladhar-Douglas, 2010). A conflict arises when considering that the definition of science (i.e. the systematic study of the structure and behaviour of the physical and natural world through observation and experimentation) implies that pursuing perceptions regarding the supernatural world is unscientific (Stepp, 2012).

The problem of mutual exclusivity posed by the dichotomy natural/supernatural in Western science is best illustrated in the context of African ethnobotany. Plants do not only play an overriding role in African traditional medicine (Elujoba et al., 2005), large sectors of the continent's population prefer, or considerably rely on, herbal treatments as their primary source of health care (Antwi-Baffour et al., 2014; Osemene et al., 2011; Towns, 2014; Williams et al., 2013). Traditional medicine, which is defined as the sum of knowledge, skills, and practices used in the prevention, diagnosis, and treatment of diseases (WHO, 2000), involves consultation with spiritual healers and diviners (Antwi-Baffour et al., 2014; Elujoba et al., 2005). At the same time, African religious traditions and the rites that are related to their practice are grouped into the "obscure" (Okon, 2013) and considered unscientific (p'Bitek, 2011). One might ask: Is science missing out by dismissing the supernatural? This thesis explores this question in the context of western African ethnobotany.

Background

The project "Plant use of the Motherland: linking West-African and Afro-Caribbean Ethnobotany" is Tinde van Andel's initiative, which in 2010 was granted funding by the Netherlands Organisation for Scientific Research (NWO). This is a comparative study of ethnobotany supported by fieldwork in both the African and American continents. Its aims and objectives are constructed around a central research question: "How African is Afro-Caribbean plant use?" (Van Andel, 2010). This thesis stemmed from the framework of this larger project. In order to compare ritual plant use between Suriname and Africa, there was a need to gain additional data from West and Central Africa. Ritual plant use has been scantily documented in this region, and herbarium specimens do not support the records that exist.

We worked specifically with members of the ancestral groups of enslaved Africans in present-day Benin and Gabon, the Ewe and Yoruba in Benin, and the Bantu-Kikongo-speaking groups in Gabon (Price, 1996). Apart from their importance during the trans-Atlantic slave trade to Suriname, another consideration for choosing these two countries of study was the long-standing collaboration between Wageningen University and our institutional partners in Benin and Gabon. These institutions and the nature of their involvement in our project, as well as pertinent differences that influenced our choice for the study sites, and the relevance of comparing these differences will be subsequently explained.

MATERIALS AND METHODS

Study sites

We conducted fieldwork in Benin from March to September 2011, and in January 2012. During this period, we worked in different sites across the central and southern parts of the country (Figs 2.1 and 3.1). With a population of almost ten million and a population density of about 88 inhabitants per square kilometre (UN, 2013), Benin is one of the most densely populated countries in West Africa. Situated in the Dahomey Gap, the dry corridor between the Upper and Lower Guinean rain forest blocks, Benin's vegetation comprises, for its greatest part, a forest-savannah mosaic that consists of fallows, fields, and intermittent semi-evergreen, deciduous and swamp forest islands. Its flora includes some 2800 species (Adomou, 2005; Akoègninou et al., 2006). In Benin, traditional religions are officially recognised as state religions and their practice is widely accepted (U.S. Department of the State, 2012). These religions are generally known as Vodoun and Orisha and are based on the Vodoun or Orisha pantheon, the gods that help the creator (Mawu-Lisa) govern the natural world. Examples of such gods are Sakpata, the god of earth and smallpox and Âge, the god of agriculture and forests (Herkovits, 1938).

Fieldwork in Gabon took place from June to December 2012. With an estimated flora of over 4700 species (Sosef et al., 2006), the country is located in the Guineo-Congolian phytogeographical region and is mainly covered with lowland rain and swamp forests (White, 1983). Gabon has a population of over 1.6 million inhabitants and a population density of almost 7 inhabitants per square kilometre (UN, 2013), making it one of the least populated countries in the continent. Bwiti is the collective name for several of traditional religions in Gabon. It can be understood as a 'religious and social institution', comprised of secret societies (e.g. Mwiri and Nyembe, for males and females, respectively), each with its own passage rites and ceremonies (Świdorski, 1965). Although non-traditional religions (e.g. Christianity and Islam) are more widespread than in Benin, traditional religions (or a syncretic version of them) remain important in Gabon (U.S. Department of the State, 2012).

Access to primary education is widespread in both of our countries of study, resulting in the command of French by large sectors of the population. It is not uncommon, however, to find elderly people and women who only speak the local languages, especially in rural areas. In Gabon, monolingualism (French) is common amongst younger inhabitants of its capital city, Libreville.

Our focus was on users of ritual plants. These included traditional healers, adepts of Vodoun and Bwiti, market vendors, and commercial harvesters of ritual plants. For the purpose of comparison, however, we also interviewed non-adepts of these traditional religions. We worked with men and women ranging from 17 to 77 years of age. In total, we interviewed 121 individuals in Benin and 71 in Gabon. These figures corresponded to 22 market vendors, 35 traditional healers, 15 Vodoun adepts, and 49 non-adepts in Benin. In Gabon, the informant pool was composed of eight commercial plant harvesters, 38 traditional healers, 14 Bwiti adepts, and 11 non-adepts (of which ten were market vendors of herbal medicine). In both countries, adepts were considered as persons who self-reported adherence to traditional religions (whereas non-adepts were those who identified themselves as non-devotees). Likewise we considered traditional healers as those healers whose method of diagnosis was done by divination or in consultation with the gods, spirits (including ancestors), or oracles. In Benin, traditional healers are known under the local names of *Bokonon* (Fon) or *Babalawo* (in the Yoruba linguistic groups). In Gabon, these healers are known as *Nganga*. In total, we administered three different types of questionnaires in the two countries. These were a general questionnaire on ritual plant use (including information on the management, trade, and perceived scarcity of ritual plants), one on taboos, and a free-listing exercise. Each of the informants responded to at least one type of questionnaire. Additionally, we conducted ten informal interviews (five in each country) with key informants. These were not included in our quantitative analysis, but served to complement our qualitative discussions. Other methodological considerations are explained in the relevant chapters.

Conceptual framework

This thesis approaches the study of plant use by employing anthropological theories of non-human and non-physical agency. Agency is one of the central concepts in studies that address the relationships between humans and nature (Mora, 2006). It is understood as the capacity of an entity (agent, hereafter) to act in the world. Agents can be human, non-human, physical (or material), or non-physical. While human agents are acknowledged for their primacy in the co-evolutionary process that leads to environmental change (Bandura, 2006), questions have been raised about the actual agency exercised by non-human and non-physical entities (Nash, 2005). This viewpoint is substantiated by that fact that: (1) non-physical agents (e.g. ethereal beings such as spirits and gods) simply cannot directly act in physical ways and; (2) non-human agents (e.g. animals, plants, and objects) lack the essential attributes that characterise agency. These are: intentionality, foresight, and self-reflectiveness of action and its consequences (Bandura, 2006; Nash, 2005). What is known about non-human and non-physical agents, however, is that they possess the ability to act through human agents (Robinson, 2011), as evidenced, for instance, by the wealth of ethnological documentation on the material correlates of animism (Brown and Walker, 2008). In this work, non-human and non-physical entities (supernatural agents henceforth) are acknowledged for their agency as the underlying forces through which humans manage plants in Benin and Gabon.

A key term in this thesis is ‘religion’. While it is beyond the scope of this study to engage in any epistemological discussion of the term, it is important to clarify the manner in which it is used

here. Religion is, by definition, the organised system of beliefs, ceremonies, and rules used to worship a god or a group of gods (Merriam-Webster, 2014). The problem with this frame of reference is that, in the words of Tuladhar-Douglas (2010), religion appears to be objectified as a notion uniformly held across societies. However, from an ethnobiological perspective; western African traditional religions not only include belief and devotion to a superior being, they integrate human, non-human, and non-physical agency in what Toledo (2001) calls the cosmos (symbolism), corpus (knowledge), and praxis (management practices) complex. In the literature, this intersection has commonly referred to as a sacred (Voeks, 1990), magic (Chevalier, 1937; de Albuquerque et al., 2007; De Feo, 1992; van Andel et al., 2013), ritual (Abbink, 1995; Pieroni and Giusti, 2002), medico-magical (Brévar, 2008), magico-religious (Benítez, 2011; Mafimisebi and Oguntade, 2010), fetish (Kerharo and Bouquet, 1949), mythic (Djagoun et al., 2013), and religious (Laydevant, 1932) use of natural resources. Taken into account that: (1) sacred, magic, ritual, and the plethora of notions that can be derived from the combination of these terms fall into the semantic field of 'religion' (Penner, 1995) and; (2) 'religion' lacks any approximation in non-Western languages (Bowie, 2008), the need for finding common cultural proxies becomes apparent.

Panikkar (1980) provided a possibility to reconcile this problem. Diatopical hermeneutics is a method of intercultural interpretation of phenomena. It attempts to answer the question: How can we understand something that does not belong to our circle? It involves bringing together the considerations of one culture (the observant one), and the understandings of another (the observed one) (Panikkar, 1980). Applying this perspective to this study, Bwiti and Vodoun may be considered as the local equivalents of 'religion' in Benin and Gabon. Likewise, it is possible to assume that the term 'religion' is known in those two countries, at least amongst the sectors of the population who speak French. Drawing upon the hermeneutical perspective offered by Panikkar, and the use of anthropological theories on non-human and non-physical agency stated above, two categorical distinctions of 'religion' are used in this work. 'Religion' is understood here as the Abrahamic religions born in the western hemisphere (i.e. Judaism, Christianity, and Islam). Unless otherwise stated, 'traditional religions' is used here to refer to Vodoun (or Orisha) in Benin, and Bwiti in Gabon. Religion and tradition, when used in conjunction, will complement one another either as adjectives or nouns (e.g. religious traditions).

Apart from defining religion in the context of this study, there are other terms that require explanation. We define 'ritual plants' as those plants that are employed in the context of traditional religious practices in Benin and Gabon. These can include, but are not limited to: (1) medicinal plants that are used in the treatment of diseases (mental or physical, recognised in biomedicine or not), manifested in physical agents (either human or non-human), but with roots in the agency of supernatural entities and; (2) plants cultivated, harvested, and commercialised for the former purposes. Likewise, we use the term 'non-ritual plants' to refer to those plants that are not used in a traditional religious context. In the same line of argument, we define 'rituals' as ceremonial activities that take place in the context of these traditional religions.

Ethical considerations

Following the guidelines of African Union's Model Legislation for the Protection of Indigenous Knowledge (OAU, 2001) and the code of ethics of the International Society of Ethnobiology (International Society of Ethnobiology, 2006), informants read and signed a free and prior informed consent form. Whenever informants were not able to read and write, they were informed of our intent and their verbal permission was obtained. Informants were compensated for their time with a sum of money that was agreed with them prior to their participation in the interviews. In Benin, the Faculty of Agricultural Sciences and the Faculty of Science and Technology of the University of Abomey-Calavi issued formal invitations and obtained research permits. In Gabon, we received a letter of invitation and a research permit from the National Centre of Scientific and Technological Research (CENAREST). The National Agency of National Parks (ANPN) provided us with written consent to carry out research in the territories under its jurisdiction. The Plant Protection and Phytosanitary Control Service (Ministry of Agriculture, Livestock, and Fisheries) granted the permits necessary to export all botanical specimens collected during our stay in Benin. In Gabon, the Institute of Pharmacopeia and Traditional Medicine (IPHAMETRA) provided these.

Relevance of this study

The relevance of this study can be summarised in three main points. First, as stated in the introductory part of this chapter, ethnobiological and ethnobotanical research acknowledges the existence of a religious dimension in the human-nature relation. Nonetheless, the theories and methodological approaches that embody this perspective remain underdeveloped. For instance, research on ritual plant use in Benin and Gabon has been predominantly descriptive (De Souza, 2006; Herskovits, 1938; Raponda-Walker and Sillans, 1961; Raponda-Walker and Sillans, 1962; Verger, 1997). This situation is not unique to our countries of study, and neither is it restricted to the field of ethnobotany, or even to the study of ritual practices in resource use. Its commendable achievements notwithstanding, ethnobiology has not lived to its full integrative potential (Stepp, 2012), as its sub-disciplines still strive for a theory-driven study (Alves and Souto, 2011; Reyes-García, 2010). Hence, by integrating traditional religious perspectives, the inherited cultural bias that confine our fields of enquiry could be overcome (Brown and Walker, 2008), thereby contributing to the theoretical advancement of ethnobiology and ethnobotany.

The second point here follows a similar rationale as above. For the better, ethnobotanical research has served the development of biomedicine. For the worse, it has failed to improve the health of the peoples from which the knowledge that made this possible was extracted (Reyes-García, 2010). Vandebroek (2013) points to the potential of prioritising a more interdisciplinary and applied perspective on research, in order to overcome these disparities. As it was highlighted earlier in this chapter, the concept of human health is embedded in African religious traditions. Accordingly, efforts to improve health in the continent justify the study of plant use in the context of Bwiti and Vodoun.

Last, the relevance of this work is emphasised by the mounting evidence on the massive loss of biodiversity and how it is altering key processes important to the productivity and sustainability of

the planet's ecosystems (Hooper et al., 2012). Numerous studies have suggested a relationship between the religious traditions of the world and the conservation of nature (e.g. Dudley et al., 2009; Taylor, 2010; Verschuuren et al., 2010). In the particular case of ritual plant use, however, it remains to be seen if and how this link ensues. The need to understand all of the social mechanisms that, either positively or negatively, influence the present and future availability of plants (and the ecosystems that plants sustain) is critical to conservation planning. In addition to its possible contribution to the improvement of human health, the study of plant use, in the context of traditional religions, may play a role in delaying or alleviating biodiversity loss.

PRESENTATION OF RESULTS

Overall objective and research questions

The overall aim of this thesis is to advance the understanding of the different dimensions of plant use in the context of traditional religions in two western African countries; first, by documenting the use of plants by adepts of Vodoun in Benin and Bwiti in Gabon and; second, by exploring the associated knowledge that sustains these practices. Its purpose is to contribute to an improved plant resource management and, ultimately, the development of culturally appropriate interventions aimed at the conservation of useful plant species and their ecosystems, as well as the improvement of human health in settings similar to those of our countries of study.

The research questions that stem from the overall aim of this research are:

1. What is the role of plants in the religious traditions of Benin and Gabon?
2. What makes plants ritual?
3. What are the implications of ritual plant use for the conservation of nature?
4. What is the ethnopharmacological relevance of ritual plant use?
5. What is the role of religious traditions in the cultural and social environments of Benin and Gabon?

Outline of the thesis

This thesis consists of six chapters. In the current chapter, I have laid out the conceptual framework of this study and introduced the study sites. Based on an assessment of the relevance of this study, I have framed its overall objective and research questions.

Medicinal plants are not only acknowledged for their importance in satisfying the health needs of people in sub-Saharan Africa, but also for the role their commercialisation plays as a source of income for vulnerable groups. However, little is known about the implications of medicinal plant trade for sustainability, especially when data on the volume and diversity of species sold are not available. In Chapter Two, we address this knowledge gap by providing an estimation of the volume and economic value of the domestic market in herbal medicine in Benin. We also highlight local health concerns reflected by the medicinal plant market and the role of ritual plants in this context. Additionally, we suggest some species with possible sustainability issues.

In Chapter Three, we explore the potential link between two different social mechanisms that regulate the use of plant resources (taboos and sacrifices) and the scarcity of ritual plants in Benin and Gabon. The scholarly discussion around the origin and necessity of taboos has found these to exist either as a means to avoid potential diseases (Ogbeide, 1974) or to control the use of natural resources (Colding and Folke, 2001; McDonald, 1977). Moreover, empirical data has shown that taboos reflect resource abundance (Rea, 1981). These studies, however, have primarily focussed on the use of wild animals as food. By performing quantitative analyses based on questionnaires with local informants, we advance new explanations of the existence of these social mechanisms, as well as their role in the management of plants.

In Chapter Four, we revise two of the notions that are central to our study: religion and traditional religion, this time as defined by the people who profess these faiths in Benin and Gabon. Plant use in the context of traditional religions has been typically documented from an outsider's perspective. The same is true for religion and traditional religions. In this chapter, we compare the importance of plants and other elements of the natural world in the cultural domains of religion and traditional religions, from the viewpoint of adepts and non-adepts of Vodoun and Bwiti.

In Western science, the effects of ritual plants on human health have been proposed to be a matter of belief (Burkill, 1995). In Chapter Five, we discuss the potential pharmacological effect of culturally salient and economically important ritual plants on their users. We do this by contrasting their mode of application to proven pharmacological properties gathered from the literature. Additionally, we describe folk categories of illness related to supernatural agents (e.g. evil spirits, ancestors, and sorcerers), as well as diseases recognised by biomedicine but are attributed supernatural causes by people in Benin and Gabon.

Finally, in Chapter Six, I address the research questions formulated above and discuss the work's methodological issues as well as its implications to other scientific disciplines. I also highlight the possible applications of the research results to informing nature conservation and human development interventions, as well as some possibilities for future research.

Authorship

With respect to the contribution of the authors mentioned in the chapters of this thesis, Tinde van Andel has conceptualised the larger research project from which this thesis is derived. The methods used in the collection and analysis of data on the medicinal plant trade are also hers. My contribution, as the first author of all of the chapters in this thesis has consisted in the framing of the present research and in the selection of its methodological approaches, as well as leading the collection of its data, performing its analysis, and drafting the corresponding manuscripts. The contribution of all the other authors in this work includes their participation in the collection of data or in providing input for the interpretation of results, as well as reviewing draft chapters. Thus, I use 'we' to refer to the collective work of the authors in each of the chapters of this thesis, and 'I' to refer to the work I have conducted on my own. Several other people have participated in the collection or analysis of data, particularly, by facilitating community entry, simultaneously translating interviews, assisting the collection or identification of herbarium specimens, or by

commenting on our draft manuscripts. Their contribution, albeit important, we have not considered as substantial in the analysis of our results. Therefore, we have not included them as co-authors, but acknowledged their collaboration in the section of this book reserved for that purpose.



Chapter Two

Quantifying the domestic market in herbal medicine in Benin, West Africa *

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ABSTRACT

Herbal medicine markets are essential in understanding the importance of medicinal plants amongst a country's inhabitants. They are also instrumental in identifying plant species with resource management priorities. Our objective was to document the diversity of the medicinal plant market in Benin (West Africa), to quantify the weight of traded species in order to evaluate their economic value, and to make a first assessment of their vulnerability for commercial extraction. We quantitatively surveyed 22 market stalls of 16 markets in the country's eight largest urban areas. We collected all plant (parts) following standard botanical methods and recorded uses, prices and local names, and weighed and counted the numbers of sales units. We recorded 307 medicinal products corresponding to ca. 283 species. Thirty-five species were encountered in at least 25% of the surveyed stalls, from which ten are locally endangered or red-listed by the IUCN. Examples of vulnerable species included the nicker nut (*Caesalpinia bonduc*), which has been declared extinct in the wild but is largely cultivated in home gardens, and was exploited for its seeds, roots, and leaves, and *Zanthoxylum zanthoxyloides* which was harvested for its bark, roots, and leaves. Other top-selling fruits and seeds included red-listed species: *Monodora myristica*, *Xylopia aethiopica*, and *Schrebera arborea*. Top-selling woody plant parts included the roots of *Sarcocephalus latifolius*, *Mondia whitei*, and the barks of *Khaya senegalensis* and *Pteleopsis suberosa*. All but *S. latifolius* and *P. suberosa* were species with some threat status. Plants sold at the market were mainly used for ritual purposes, women's health, and to treat malaria and its symptoms.

Keywords: Herbal market; Plant conservation; Trade; Traditional medicine; Vodoun

* Published in a slight modified form in the Journal of Ethnopharmacology, 2014, 151: 1100-1108. DOI: 10.1016/j.jep.2013.12.019

INTRODUCTION

Herbal markets are essential to understand the importance of medicinal plants for a country's inhabitants. These markets provide a snapshot of a country's medicinal flora (Van Andel et al., 2007, 2012), reflect distinct cultural preferences (Schippmann and Cunningham, 2006), and are instrumental in identifying plant species with resource management priorities (Martin, 1995). Despite the widespread availability of Western medicine in Africa, medicinal plants remain an important source of health care in the continent. It is estimated that 70–80% of the continent's population depends on herbal medicine (Cunningham, 1993; WHO, 2008), however, these figures lack the support of empirical data. Nonetheless, most authors agree on the preference and considerable reliance on herbal treatments by a wide range of peoples throughout the continent (Magassouba et al., 2007; Mafimisebi and Oguntade, 2010; Williams et al., 2013). In addition, medicinal plants are harvested, transported, and traded in both rural and urban markets, generating economic opportunities for vulnerable groups, especially women and farmers facing decreasing agricultural income (Cunningham, 2001; Mander et al., 2007; Vodouhé et al., 2008). Because of the positive implications for rural livelihoods, it has been suggested that the harvest and trade of non-timber forest products provide an incentive for biodiversity conservation (Padoch, 1992; Neumann and Hirsch, 2000).

In spite of their benefits, medicinal plant harvest and trade are not exempted from controversy. With an increasingly large global demand for herbal medicine (TRAFFIC, 1999, 2013), profit margins still remain remarkably low (Vodouhé et al., 2008). This scenario, coupled with the selective nature of market demand, is changing the traditional subsistence-based use systems into market-oriented production ones (Arnold and Ruiz Pérez, 2001). Exacerbated by the popularity of wild-crafted medicinal plant harvesting and lack of opportunities in the formal job market, this could lead to an overexploitation of wild and rare medicinal plant species (Cunningham, 1997; Bussmann and Sharon, 2009).

Albeit their importance, medicinal plant markets remain understudied in West Africa. Numerous works have explored different aspects of medicinal plant markets in Nigeria (Sofidiya et al., 2007; Olowokudejo, 2008; Osemeobo, 2009), Togo (De Souza et al., 2011), Niger (Ikhiri and Saadou, 1984), Burkina Faso (Fernandez de la Pradilla, 1982; Ky et al., 2009), Mali (Maiga et al., 2005; Diallo et al., 2010), and Ghana (Asase et al., 2005). While these studies have documented marketed species, only one of them has recorded sales frequencies and volumes sold (Van Andel et al., 2012). In Benin, particularly, studies on herbal medicine markets have focused on few species, limited regions, on supply chains only, and most are not published in scientific journals (Allagbé, 1987; CENPREBAF, 1999; Hermans et al., 2004; Fassinou, 2008; Vodouhé et al., 2008; Legba, 2010; Djègo et al., 2011; Adomou et al., 2011, 2012). Moreover, official records about the amount of exported medicinal plant products from Benin only include airborne shipments.

Benin's economy is half the size of neighbouring Ghana (CIA, 2013), while its land surface and floristic diversity are much smaller (Adomou, 2005; Akoegninou et al., 2006). Furthermore, Vodoun or Orisha is recognised as one of the country's official religions, and its practice is widely

accepted amongst its inhabitants (U.S. Department of the State, 2012). Therefore, we expected Benin's herbal markets to be smaller in volume and less floristically diverse than Ghanaian markets, but to specialise more on plants used for rituals. In order to test our hypotheses we addressed the following questions: (1) Which medicinal and ritual plant species are commercialised in Benin, and what percentage is this of the total number of species used for these purposes in the country? (2) What is the volume and annual value of commercialised plant species? (3) Which are the species in highest demand? (4) What are the most salient health issues covered by the market? In light of the wealth of work on Benin's medicinal flora and the sustainability issues for some of its species, the objectives of this study were to document the diversity of the country's medicinal plant market, to quantify the bulk of traded species, and to evaluate their economic value and possible ecological impact.

METHODS

Quantitative market survey

We performed a systematic quantitative market survey from July to September 2011 and in January 2012 in selected herbal markets of Benin. Similarly to Van Andel et al. (2012), we classified market stalls in four categories, according to their size and the type of products sold. Stalls selling more than 1 square metre of plant products (herbs, bark, and wood) were classed as 'large herb stalls', and those with less than 1 square metre as 'small herb stalls'. Stalls selling mostly medicinal fruits and seeds were called 'seed stalls', and those selling a few plants and mostly animal carcasses (which were sold for the elaboration of charms) were called 'Vodoun stalls'. We counted all plant products and total amount of sales units (bags, bundles, bottles, and loose units) per stall, and noted their fresh or dry weight using a portable digital scale. Additionally, we estimated the total weight of stock kept separately (usually at the back of the stall). We noted the vendors' ethnicity and gender and interviewed them about their weekly sales of medicinal plant products, so we could estimate annual sales for surveyed stalls and extrapolate this to the entire market. We also asked them to indicate those species that had become (or were becoming) expensive because they were difficult to obtain, and to explain other reasons for increasing (or decreasing) prices. We then calculated the volume of plant material offered for sale per stall in order to estimate the total amount of herbal medicine available daily on the surveyed markets. The average price per kilogram of each product was calculated from prices and weights of several sales units. This figure was then multiplied by the volumes of the species in question encountered during our survey to obtain the total economic value of herbal medicine at each market. Last, we summed all figures for all species and extrapolated this information to estimate the annual volume and value for the entire Beninese market.

Plant collection and identification

Plant collection was done following standard botanical methods (Forman and Bridson, 1989). Vouchers were deposited at the National Herbarium of Benin (BEN) and the Wageningen branch of the National Herbarium of the Netherlands (WAG), now part of Naturalis Biodiversity Center (L). Collected plant specimens were identified in the herbarium using local flora keys (Akoegninou et

al., 2006) and literature including vernacular plant names (Adjahoun et al., 1989; De Souza, 1988). Market wood samples were identified by a wood anatomist using microscopic methods and the InsideWood database (2004- onwards) and by means of DNA analysis.

DNA analysis involved extracting DNA from the outer layer of samples and performing amplifications of a DNA barcoding marker (i.e. 157 basepair fragment of the *rbcL* gene) by means of a Polymerase Chain Reaction (PCR). The Enriched Ion Spheres were prepared for sequencing on a Personal Genome Machine (PGM) with the Ion PGM 200 Sequencing kit as described in the protocol and deposited on an Ion-314-chip (520 cycles per run) in three consecutive loading cycles for one sequencing run. R Reads obtained from Ion Torrent sequencing were trimmed with CLC Workbench Genomics version 4.5 (<http://www.clcbio.com>). Only reads with a length of at least 100 bp were selected for further analysis. Reads were clustered into Operational Taxonomic Units (OTU's) defined by a sequence similarity of at least 97% using the Octopus pipeline. Representative consensus sequences of each cluster were blasted against NCBI GenBank data (Benson et al., 2005) for taxonomic identification. Finally, we verified the threat status of all encountered plant species using the IUCN red list (<http://www.iucnredlist.org/>), and a red list for Benin (Adomou et al., 2011).

Data analysis

Using EstimateS version 8.2 (Colwell, 2010) we calculated Fisher's alphas, to assess cumulative diversity. We built sample-based rarefaction curves to verify whether our sampling effort had been sufficient to cover the floristic diversity of Benin's herbal market (Williams and Balkwill, 2005). In order to assess whether the markets of Ghana were larger and more diverse than those of Benin, we compared the diversity in products and species of the different stalls sampled by Van Andel et al. (2012) with those sampled by us and performed a Mann-Whitney U test using SPSSs version 20.0.

RESULTS

Benin's medicinal plant markets

During our survey we sampled 22 stalls in 16 different markets in eight of Benin's largest urban areas (Fig. 2.1). Apart from the Avogbamana market in Bohicon, that exclusively sold vodoun products, medicinal plant markets in Benin do not stand on their own. They form part of larger markets selling a plethora of daily- use goods such as household products and foods, amongst others (Table 2.1). Herbal medicine stalls are usually found clustered together within the premises of a market. Large and small herb stalls sell mostly dried and fresh leaves and herbs, woods, barks, roots, and a few seeds and fruits, especially calabashes (*Crescentia cujete* and *Lagenaria siceraria*). The latter ones are cultivated in different shapes and both species' fruits are often used as containers for herbal medicine and ceremonial offerings. Seed stalls, as their name suggests, specialise in medicinal seeds and a few fruits, but also sell products used in traditional ceremonies such as feathers, beads, kaolin, soaps, perfumes, ironware, and special fabrics. The Avogbamana market in

TABLE 2.1 Main characteristics of surveyed markets in Benin in 2011 and 2012

Location (Market)	Products sold	Sales frequency (days per week)	Total number of stalls	Big herb stalls (>1m ³)	Small herb stalls (<1m ³)	Seed stalls	Vodoun stalls	No. of sampled stalls (%)	No. of herbal medicine products (%)	Total daily stock (kg)
Lokossa	Herbs, produce, clothing, kitchenware	1	500	1	2	4	6	4 (30)	62 (27)	635
Calavi	Herbs, produce, meat, fish, fabrics, pulses, kitchenware	7	200	11	0	12	8	2 (6.4)	119 (52)	3990
Godomey	Herbs, produce, meat, fish, fabrics, pulses, kitchenware	7	200	8	0	1	16	2 (8)	92 (40)	2610
Cotonou (Dantokpa)	Herbs, produce, meat, fish, fabrics, pulses, kitchenware, electronics, livestock, clothing	7	3000	38	8	36	52	2 (1.4)	112 (49)	10419
Cotonou (Fifadjì)	Herbs, produce, meat, fish, fabrics, pulses, kitchenware	7	150	3	4	3	1	1 (9)	29 (12)	3876
Cotonou (Gbegamey)	Herbs, produce, meat, fish, fabrics, pulses, kitchenware	7	200	12	8	7	0	1 (3.7)	23 (10)	571
Cotonou (Saint Michel)	Herbs, produce, meat, fish, fabrics, pulses, kitchenware	7	200	1	2	7	2	1 (8.3)	55 (24)	706
Parakou (Arzeke)	Herbs, produce, fabrics, pulses, kitchenware, clothing	7	1000	0	11	28	12	1 (1.9)	15 (6)	2331
Parakou (Kobo Kobo)	Herbs, clothing, animal carcasses	7	1000	0	0	6	8	1 (7)	31 (13)	3440
Parakou (Dépot)	Herbs, produce, meat, fish, fabrics, pulses, kitchenware	7	500	7	8	7	2	1 (4)	14 (6)	4550
Dogbo	Herb, produce, pulses, kitchenware	1	900	1	2	16	20	1 (2.5)	13 (5)	2847
Porto Novo (Grand Marché)	Herbs, produce, meat, fish, fabrics, pulses, kitchenware, clothing	7	1000	12	3	18	8	1 (2.4)	49 (21)	2241
Porto Novo (Agbokou)	Produce, pulses, livestock, wholesale herbal medicine	1	100	27	19	8	5	1 (1.6)	44 (19)	2843
Bohicon	Herbs, produce, meat, fabrics, pulses, kitchenware, clothing	7	1000	11	21	24	0	1 (1.7)	49 (21)	2145
Bohicon (Avogbamana)	Herbs and animal carcasses	7	20	0	0	1	16	1 (5.8)	15 (6)	1802
Ouidah (Zohé)	Herbs, produce, fabrics, pulses, kitchenware, clothing	7	300	6	14	5	9	1 (2.9)	115 (50)	1846
Total				149	168	362	180	22 (3.7)	226 (100)	46852

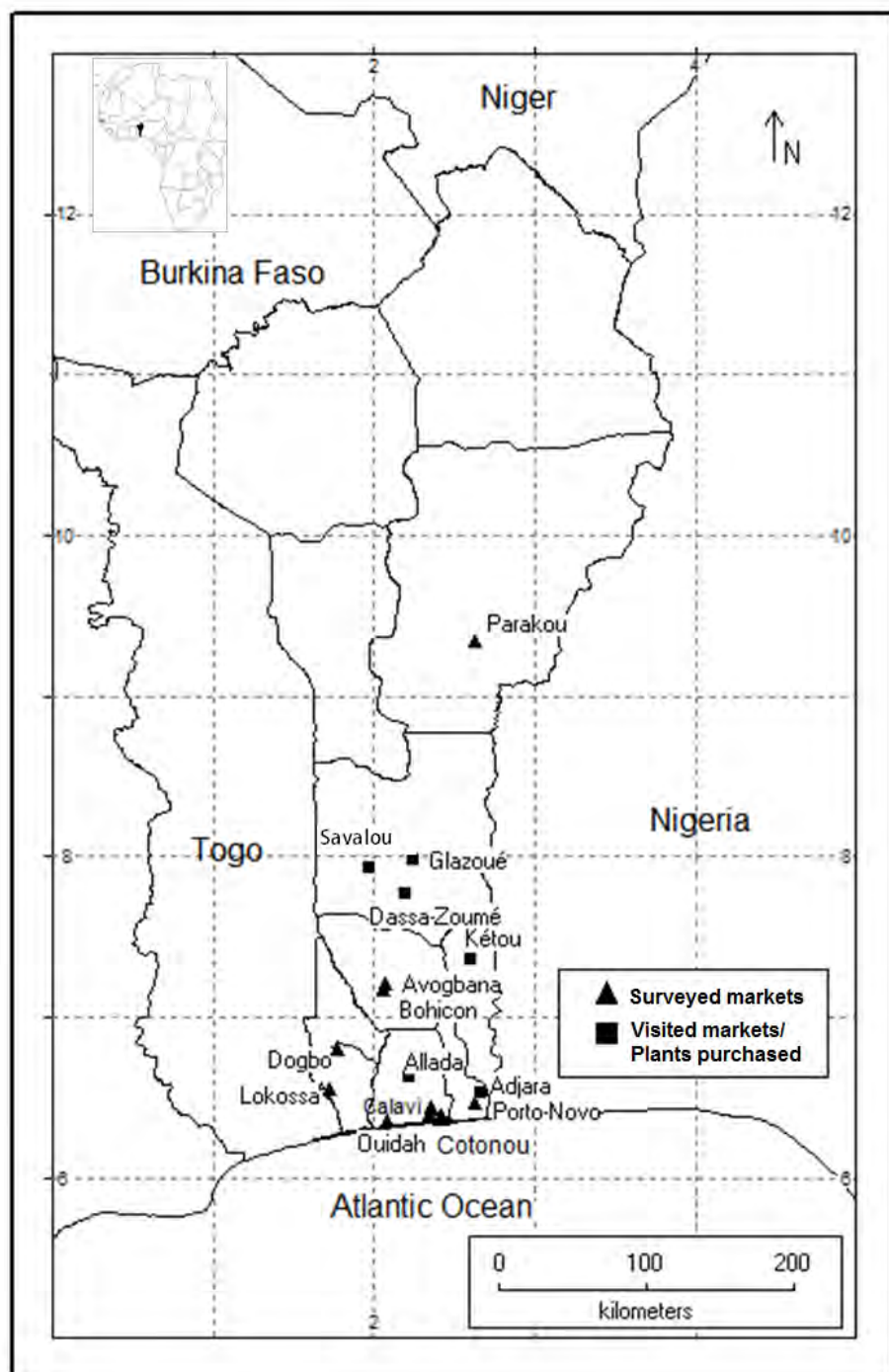


FIGURE 2.1. Map of visited and surveyed markets in Benin in 2011–2012

Bohicon and Kobo Kobo in Parakou are known as fetish markets. Just as other vodoun stalls found in the Beninese markets, they specialise in ingredients for rituals. These ingredients include, for its greatest part, the carcasses of animals such as birds, rodents, reptiles, and mammals.

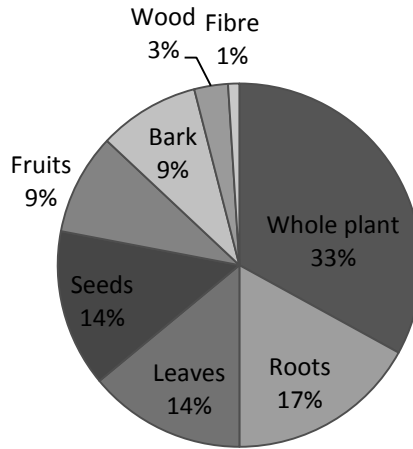
Many markets in Benin, especially those in rural areas, take place only once or twice a week (usually in intervals of three to five days). During these days vendors come from nearby villages to sell their goods. Located near Porto Novo, the Adjara and Agbokou markets are characterised by the predominance of stalls that sell plant products wholesale. In Adjara, seeds, fruits, and fibres (the latter ones derived from species such as *Ficus thonningii* and *Raphia* sp.) are the most common plant products, whereas Agbokou specialises in roots, barks, and woods. Markets in cities, or settlements with a distinct urban character, take place almost daily (but some of them close on Sundays). Although the ethnic back- grounds of the vendors we interviewed were different, Fon and Yoruba were the vernaculars most often used for plant names. In Parakou, some plant products were also marketed with their Dendi or Bariba names. Half the herb sellers we interviewed indicated that they considered themselves of mixed ethnicity. Where vodoun stalls were almost without exception owned by men, female vendors (86%) outweighed male ones in the medicinal plant trade.

Volume and value of Benin's medicinal plant trade

We calculated the total amount of medicinal plants available for sale at all surveyed Beninese markets at 46,815 kg per day. Over a third of the total herbal remedies present as daily stock were concentrated in the markets of Cotonou (15,572 kg). Other urban markets situated at important crossroads in the country stored considerable amounts of daily stock as well (Table 2.1). However, not all plants offered for sale were actually sold that same day. Although 86% of the medicinal plants we encountered during our survey were sold dry (Table 2.5), our informants indicated discarding an average of 4.12 kg per week. They also indicated selling, on average, 25 kg of herbal medicine weekly (with large herb stalls selling 33 kg, small herb stalls 36 kg, seed stalls 18 kg, and vodoun stalls 5 kg). Further, they pointed out that markets take place every week of the year. By multiplying weekly sales by 52 and subtracting discarded volumes, we estimate the annual amount of medicinal plants sold at the surveyed Beninese markets at 655,252 kg.

We calculated the average price of herbal medicine at 21 USD/ kg. Vendors indicated that they sold on average 83 USD of herbal medicine per week. Vodoun stalls earned only 6 USD per week, whereas seed stalls made as much as 212 USD in the same time period. The contrast is explained by the fact that vodoun stalls made most of their gains from the sales of animal carcasses (which we did not include in our calculation). Seed stalls, on the other hand, made their earnings from the sale of plant products with the highest prices per kilogram (seeds and fruits, both sold at an average of 27 USD/kg). Small and large herb stalls had a weekly income of 45 and 46 USD, respectively. Based on this information we estimated the annual value of medicinal plant trade in Benin at 2,735,310 USD.

a)



b)

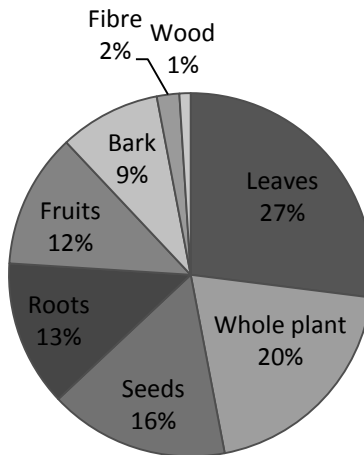


FIGURE 2.2. Plant parts sold in Beninese herbal markets sampled in 2011, (a) as percentage of the total number of products (n = 226), and (b) as percentage of the daily stock (excluding stock packed behind stalls)

Market's floristic diversity

Throughout the entire fieldwork period, we have documented 307 plant products sold at the herbal medicine markets of Benin. From these 307 products, we have been able to identify 283 to the species level, 11 to the genus level, and 11 to the family level. Two products remained unidentified due to insufficient sample material. All plant species and products encountered during our surveys

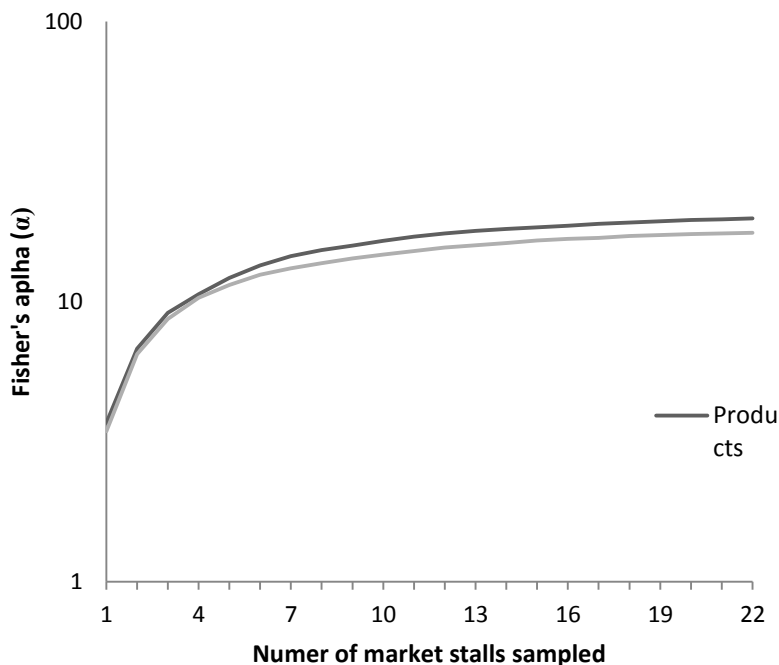


FIGURE 2.3. Cumulative diversity curve for traded plant products and species in the 22 markets stalls sampled in Benin in 2011-2012.

and visits to the Beninese markets are listed in the Table 2.5. Herbs, sold as whole individual plants, made up for the largest percentage of plant diversity sold, while the leaves of shrubs and trees represented the bulk of plant parts available as daily stock (Fig. 2.2).

Sample-based incidence of plant products and species, which was measured with Fisher's alpha, increased with the number of sampled stalls. The curves show a sharp increase in the first four samples, afterward the increase becomes gradual. By the 19th sample, we had already covered 97% of the total plant products and 98.5% of the species we encountered in our quantitative survey. This suggests that our sampling effort of 22 stalls has been sufficient (Fig. 2.3).

After surveying 22 market stalls, we had covered 226 (73%) of the total number of plant products encountered during the fieldwork, and between 198 and 205 (73–75%) of the total number plant species. The number of plant products is higher than that of species because the different organs of several plant species were exploited as separate products (e.g. for *Kigelia africana* we recorded four different products: fruits, leaves, bark, and roots). Seventy plant products (30% of the total) were recorded only once during the entire survey. The families most encountered in the market survey were Leguminosae (33 spp.), Rubiaceae (19 spp.), Compositae (10 spp.), Apocynaceae and Malvaceae (nine spp. each), Euphorbiaceae and Cucurbitaceae (eight spp. each), Poaceae and Anacardiaceae (seven spp. each), Annonaceae and Lamiaceae (six spp. each).

TABLE 2.2. Plant species found at Beninese herbal medicine markets in 2011 and 2012 with the highest sales frequency.

Species	Product	No. of uses	Frequency (%)	Threat status	Growth form	Domestication
<i>Sarcocephalus latifolius</i>	Roots	1	64		Tree	Wild
<i>Xylopi aethiopica</i>	Fruits	2	55	VU ¹	Tree	Wild, cultivated
<i>Pteleopsis suberosa</i>	Bark	3	55		Tree	Wild
<i>Schrebera arborea</i>	Fruits	2	55	EN ¹	Tree	Cultivated
<i>Aframomum melegueta</i>	Fruits	2	55		Herb	Domesticated
<i>Monodora myristica</i>	Seeds	4	50	EN ¹	Tree	Wild, cultivated
<i>Ocimum americanum</i>	Whole plant	3	50		Woody herb	Cultivated
<i>Chamaecrista mimosoides</i>	Whole plant	3	50		Woody herb	Wild
<i>Entada gigas</i>	Seeds	2	50		Woody climber	Wild
<i>Allium</i> sp.	Roots	2	45		Herb	Cultivated
<i>Abrus precatorius</i>	Seeds	1	45		Twinning herb	Wild
<i>Caesalpinia bonduc</i>	Seeds	3	45	EW ¹	Shrub	Cultivated
<i>Cymbopogon citratus</i>	Whole plant	1	45		Herb	Wild, cultivated
<i>Dicoma tomentosa</i>	Whole plant	1	40		Herb	Wild
<i>Lycopodiella cernua</i>	Whole plant	2	40		Herb	Wild
<i>Remirea maritima</i>	Whole plant	2	40		Herb	Wild
<i>Gladiolus dalenii</i>	Roots	2	40		Herb	Wild
<i>Senna siamea</i>	Leaves	1	40		Shrub	Wild, cultivated
<i>Lannea barteri</i>	Bark	2	36		Tree	Wild
<i>Picralima nitida</i>	Seeds	2	36		Tree	Wild
<i>Acridocarpus smeathmannii</i>	Roots	2	36	EN ¹	Tree	Wild
<i>Zanthoxylum zanthoxyloides</i>	Roots	1	32	VU ¹	Tree	Wild
<i>Tetrapleura tetraptera</i>	Fruits	2	32	VU ¹	Tree	Wild
<i>Aerva lanata</i>	Whole plant	1	32		Herb	Wild
<i>Garcinia kola</i>	Seeds	2	32	EW ¹	Tree	Cultivated
<i>Heterotis rotundifolia</i>	Whole plant	2	32		Herb	Wild
<i>Psychotria vogeliana</i>	Leaves	1	32		Shrub	Wild
<i>Khaya senegalensis</i>	Bark	2	32	EN ¹ , VU ²	Tree	Wild, cultivated
<i>Cucumis metuliferus</i>	Fruit	1	32		Scrambling herb	Domesticated
<i>Lagenaria breviflora</i>	Fruit	2	32		Scrambling herb	Domesticated
<i>Lagenaria siceraria</i>	Fruit	1	32		Scrambling herb	Domesticated
<i>Momordica charantia</i>	Fruit	1	32		Climbing herb	Cultivated
<i>Curcuma</i> sp.	Roots	1	32		Herb	Cultivated
<i>Ensete livingstonianum</i>	Seeds	1	27	CR ¹	Herb	Cultivated
<i>Mondia whitei</i>	Roots	3	27	VU ¹	Climbing herb	Wild

¹Adomou et al., 2011

² IUCN Red List (<http://www.iucnredlist.org/>)

Prices, rare plants, and the provenance of some commercial species

With an average weight of 112 g and an average price of 1.38 USD per sales units, barks were the most expensive plant products we encountered during our survey. Roots (113 g) were sold at 0.75 USD per sales unit, fruits (21 g) at 0.58 USD, seeds (9 g) at 0.25 USD, and whole herbs (55 g) at 0.23 USD. The prices per kilogram for individual plant species varied from 0.06 to 866 USD (Table 2.5). We noticed that species used for ritual purposes and plants with a low weight per sales unit were amongst the most expensive products. The bulbs of sedges (*Cyperus* sp.) and the seeds of the cat's claw (*Martynia annua*), and an unidentified species of Anacardiaceae (DQ 246) were the three most expensive plants. All of them had a weight per sales unit of one gram. In contrast to our observations, all informants agreed that plants were expensive because they were scarce. Only two vendors mentioned that increasing prices were also due to retailers controlling the trade who raised prices, as they would see most convenient.

TABLE 2.3. Plant species sold in the greatest bulk at Beninese herbal medicine markets in 2011 and 2012.

Species	Product	No. of uses	Market stock (kg/d)*	Threat status	Growth form	Domestication status
<i>Dioclea reflexa</i>	Seeds	1	2788.84		Twinning herb	Cultivated
<i>Cola acuminata</i>	Fruits, seeds	3	2501.85		Tree	Wild
<i>Pavetta corymbosa</i>	Leaves	2	2194.27		Shrub	Wild
<i>Caesalpinia bonduc</i>	Roots, seeds, leaves	3	2171.15	EW ¹	Shrub	Cultivated
<i>Prosopis africana</i>	Leaves, wood	1	2163.15		Tree	Wild
<i>Cassytha filiformis</i>	Whole plant	2	1758.05		Parasitic herb	Wild
<i>Kedrostis foetidissima</i>	Whole plant	2	1691.46		Herb	Wild
<i>Annona senegalensis</i>	Leaves	1	1472.73		Tree	Wild, cultivated
<i>Anthocleista vogelii</i>	Roots	4	1266.24		Shrub	Wild, cultivated
<i>Ageratum conyzoides</i>	Whole plant	3	1231.75		Herb	Wild
<i>Raphia</i> sp.	Fibre	2	1203.06		Tree	Wild
<i>Leonotis nepetifolia</i>	Whole plant	1	1176.96		Herb	Wild, cultivated
<i>Uraria picta</i>	Whole plant, seed	2	1134.99		Herb	Wild
<i>Anacardium occidentale</i>	Bark	3	1131.50		Tree	Domesticated
<i>Pterocarpus erinaceus</i>	Bark	6	1096.89	EN ¹	Tree	Wild
<i>Sterculia setigera</i>	Leaves	1	1090.62		Tree	Wild

¹Adomou et al., 2011

²IUCN Red List (<http://www.iucnredlist.org/>)

*Sum of stock of all plant products for each species

From the 283 species in our product list (Table 2.5), 28 were listed as threatened (from which 10 species were globally threatened). The average price per kilogram of these species was 16 USD. From the 28 threatened species, 11 were said to be scarce by our informants: *Milicia excelsa*, *Caesalpinia bonduc*, *Pterocarpus erinaceus*, *Azvelia africana*, *Garcinia kola*, *Mondia whitei*, *Khaya senegalensis*, *Bridelia ferruginea*, *Carissa spinarum*, and *Acridocarpus smeathmannii*. Other non-red-listed plant products perceived as rare by our informants include the roots of *Morinda lucida*, *Anthocleista vogelii*, *Chassalia kolly*, and *Sansevieria liberica*; and the barks from species such as

Parkia biglobosa, and *Psychotria vogeliana*. On average, these plants were sold for 6.5 USD per kilogram. The vendors we interviewed in the rural markets of Lokossa and Dassa indicated that themselves collected all of the plants they sold, except for seeds and barks. Interviewees in large urban centres such as Cotonou (Dantokpa, Saint-Michel, Gbgamey, and Fifadji), Abomey-Calavi, and Godomey indicated that they purchased their plants from the market in Pahou (a town near Ouidah, Southern Benin, which hosts the forest of Pahou), or that they were delivered to them by small-scale collectors or middlemen.

We had the opportunity to visit the home garden of one of the market vendors in Godomey, who cultivated plants that she reported as difficult to find in the wild, and had considerable demand at the market (e.g. *C. bonduc*, *M. lucida* and *C. kolly*). We also encountered *Kalanchoe crenata* and *Aloe* sp. growing in flowerpots in four of the stalls we surveyed. Avogbamana market had a piece of land of ca. 0.25 ha where medicinal plants were cultivated (e.g. *Merremia quinquefolia*, *Jatropha multifida*, *J. gossypifolia*, *Musa* sp., *Carica papaya*). Except for *M. quinquefolia*, none of these species were found at the sampled stalls during our quantitative survey. *C. papaya*, however, was one of the products we purchased during one of our visits prior to the survey.

Roughly 17% (n=35) of the medicinal plant species encountered during our survey were found in at least 25% of the sampled stalls. Amongst these plants, 11 (5% of the total) are locally threatened or IUCN red-listed species (Table 2.2). *C. bonduc* (a locally threatened species) was the only species with both high sales frequency and large stock. Plants that were present daily at the market in quantities higher than one (metric) ton included both wild and cultivated species, as well as herbs, trees, and shrubs (Table 2.3).

Sold at ca. 1 USD per piece, the seeds of *Dioclea reflexa* were commercialised as *M. excelsa* seeds. Vendors indicated that the seeds were expensive because “they were never found anywhere near an *M. excelsa* tree” (which seems obvious they did not correspond to the same species), thus they were perceived as very rare. Although not explicitly considered a rare plant, *Ipomoea argenteaurata* was sold in the markets of Parakou as a “Northern version” of *Dicoma tomentosa*, a plant widely commercialised for its ritual uses. Although *I. argenteaurata* was sold for double the price of *D. tomentosa* (0.15 USD), we were able to confirm neither the rarity nor the provenance of these two species.

Salient ailments and their remedies at the Beninese markets

The 226 plant products recorded in the Beninese markets were used in 378 medical and ritual treatments. Most plants were used for ritual purposes (101 species, 27% of the total uses). All other use categories for the plants recorded in this survey are listed in Table 4. Ailments that could not be classified in any of the above categories and that were only mentioned once were classed as ‘other’ uses. These comprise eight species (2%) and include: epilepsy, haemorrhoids, rheumatism, hernia, and utensils used to administer herbal remedies.

Some diseases could be classed in more than one category. Sakpata diseases, for example, were illnesses whose symptoms were characterised by pustules (i.e. rubeola, rubella, and varicella).

TABLE 2.4. Use percentage of medicinal plants sold in Beninese markets per ailment category.

Use	Number of species used	Percentage
Ritual		27
Love	25	
Good luck	20	
Protection against evil spirits	20	
Protection against <i>Tchakatou</i> (bewitchment)	10	
Initiation ceremonies (purification baths)	10	
Divination	7	
Protection against accidents	4	
Protection against enemies/ thieves	4	
Protection against STDs	1	
Women's health		21
Infertility	20	
Pregnancy	16	
Painful menstruation	17	
Breast milk production	11	
Vaginal cleanse	3	
Contraception	4	
Womb cleanse	3	
Cysts	4	
Malaria	22	16
Anaemia	29	
Fever	9	
Fatigue	1	
Jaundice	1	
Child care		15
Early walk	14	
<i>Atita</i> (redness and pimples in joints and stomach in infants)	14	
Teething	13	
Failure to thrive syndrome	5	
Closing fontanel	3	
Drying of navel cord	1	
Circumcision	2	
Other ¹	5	
Digestive disorders		5
Diarrhoea	16	
Constipation	4	
Respiratory diseases		4
Asthma	6	
Cough	8	
Skin diseases		5
<i>Sakpata</i> (rubeola, rubella, varicella)	10	
Rashes	3	
Wounds	2	
Hypertension	11	2
Sexually transmitted diseases (STDs)	5	1
Diabetes	4	1
Madness	3	1
Other	8	2
Total	378	100

¹Cited by informants as "for children's health"

This ailment category owed its name to the god of smallpox and earth, Sakpata. Although smallpox has long been eradicated, Sakpata diseases were considered as skin conditions with, what was often explained by our informants, a “mystical” or “bizarre” origin. Albeit sexually transmitted diseases (STDs) were also treated with herbal remedies, plants sold at the market were used in amulets that were believed to prevent them.

DISCUSSION

We hypothesised that Ghana’s medicinal markets would be larger and more diverse than the Beninese ones. Beninese herbal medicine stalls were significantly more diverse than the Ghanaian ones in terms of species ($U=149.50$, $Z=-2.96$, $p = 0.003$) and products ($U=151.00$, $Z=-2.93$, $p = 0.003$). However, with an estimated annual volume of 951 tons of plant material and a value of 7.8 million USD (Van Andel, et al., 2012), Ghana’s herbal market was larger than Benin’s.

The fact that Benin’s vegetation type was not determinant to the diversity of its medicinal herb market vis-à-vis Ghana could find its explanation in the country’s location in the Abidjan-Lagos Corridor. Cotonou, is the best performing port to reach land-locked neighbouring country Niger (Hall, 2011), and because of the absence of significant civil conflict, the country is an important access point to the sea to Burkina Faso as well. These factors place Benin in privileged position at a crossroads of commerce amongst various phytosociological regions in West Africa. As we had expected, the majority of herbal medicine products in Benin was meant for use within a spiritual context (in Ghana this ailment category was only second in importance). However, the importance of traditional spiritual values (i.e. Vodoun) is even larger than the herbal market alone, as reflected by the large amounts of animals traded for this purpose (Djagoun and Gaubert, 2009; Djagoun et al., 2013).

Our quantitative market survey indicated that the annual value of Benin’s medicinal plant market was at least 2.7 million USD in 2011. This figure is small when compared to the economic value of cotton production, Benin’s most important agricultural export, which in 2008 was about 620 million USD (CIA, 2013). Nonetheless, the importance of the plant trade in Benin cannot only be assessed with respects to its contribution to the GDP, as it is an important component of the livelihood strategies of vulnerable groups (Vodohué et al., 2008). Moreover, our calculations should be seen as an underestimation as available medicinal plant export figures mostly lack volumes and values and we did not include several of the smaller markets in our survey. There were various plant species that, apart from being sold as remedies at medicinal plant markets, also served as food, condiments or colorants (the seeds of *Triticum* sp., *Amaranthus* sp, *Pennisetum* cf. *glaucum*, *Xylopia aethiopica*, *Monodora myristica*, *Aframomum melegueta*, *Piper guineense* and *Sesamum indicum*; the leaves of *Ocimum gratissimum* and *Sorghum bicolor*; the fruits of *Capsicum annuum* and *Syzygium aromaticum*; and the bulbs of *Allium* spp). These products were sold in large quantities on general food stalls, and thus excluded from our survey.

In addition, plants that are officially exported from the country are shipped in small quantities to Italy and Guadeloupe. The largest exports comprise endangered species such as *K. senegalensis* (bark), *K. africana* (fruits, of which 10 metric tons were exported between 2007 and 2010),

Rauvolfia vomitoria (leaves), *C. bonduc* (roots), and *Z. zanthoxyloides* (roots). These data are only available because medicinal plants that leave the country as air shipments must go through a phytosanitary control, which is performed by the Phytosanitary Control Post at Cotonou's airport. However, there is no record as to whether these plants are cultivated by the exporting agents, bought directly from harvesters, self-collected, or purchased at the markets (C. Zinse, personal communication of May, 2013). Moreover, there is no record of the amount of plant material that leaves the country through other ports, although there is evidence that Beninese medicinal plants are sold in Ghana (Van Andel et al., 2012) and Gabon (A. M. Towns, personal communication of July, 2012).

Prices could be a misleading indicator of scarcity in the wild. As Botha et al. (2007) explained, it is difficult to estimate the scarcity of a species when collection is not done directly by one's self. Most of our informants did not collect the plants they sold themselves, and those who did only collected herbs and leaves. Thus, the rarity of bark, wood, and root products perceived by the vendors did not necessarily reflect scarcity in the wild, with the exception of the plant species with threat status in Benin. Many species were just occasionally commercialised (i.e. *Hydrocotyle bonarensis*) so they could be considered "hard to find" just because they were not frequently encountered at the market. Likewise, abundance at the market did not necessarily mean that a species was common in the wild. Some locally endangered species such as *Schrebera arborea* and *M. myristica*, had a high sales frequency and were sold at small quantities, but were not perceived as scarce by our informants. Moreover, far from reflecting scarcity, high prices were influenced by the size of their sales units. Some plants were sold in small quantities but are not endangered or perceived as rare (i.e. the seeds of *Cleistopholis patens*). This lack of consistency in the relationship between prices per sales units and per kilogram of medicinal plants has also been noted by other authors (Botha et al., 2007; Williams et al., 2007).

In Benin there is a legal restriction for the collection and commercialisation of endangered species. Article 84 of the law of forests of Benin stipulates punishments up to ca. 1000 USD and two months of jail for the exploitation of protected plant species. However, we lack the evidence to state that these measures effectively discourage harvesters from collecting the endangered species we encountered during our market visits. Finally, there is a substantial number of species whose perceived rarity has been reported by Djègo et al. (2011) and were encountered only once during our survey (e.g. *Acmella uliginosa*, *Bryophyllum pinnatum*, *Cissampelos mucronata*, *Commiphora africana*, *Ficus thonningii*, *Millettia thonningii*, *Parkia biglobosa*, *Pseudocedrela kotschyi*, and *Pterocarpus santalinoides*). Although none of these plants were perceived as rare by the market vendors interviewed in our survey, the fact that their scarcity was reported elsewhere merits consideration when revising local lists of threatened species.

The fact that during our market survey we encountered only 75% of the total plant products and species recorded during our entire field stay raises the question: has our sampling effort been sufficient to cover the entire floristic diversity of the Beninese markets? In 1989, 530 plant species with medicinal uses were recorded in Benin (Adjanohoun et al., 1989). In 2013, only 20 species had been added to this figure in the PROTA database (<http://www.prota4u.org/>). During our market

survey we covered around 50% of this total medicinal plant diversity. Over a period of three months, Legba (2010) recorded a total of 205 species (and 217 products) sold at the Calavi market, while the CENPREBAF (1999) market survey registered 338 species found in 81 markets, but neither referred to making botanical collections nor specified the duration of fieldwork.

Vodouhé et al. (2008) sustained that during the rainy season medicinal plants became scarce in the Beninese markets because farmers, who they identified as the most numerous of commercial collectors, were not active during this period because of agricultural activities. We started our survey at the end of the long rainy season (April-July) and finished during the short dry season (August-September). Although we surveyed one more market in January, we did not find new species. A fieldwork stay of an entire year would have been desirable, however, our budget and time schedule limited the period of our stay in Benin. Further market research should focus on plant availability during the long dry season (December to March).

The importance of collecting comprehensive herbarium vouchers and the potential of DNA barcoding for ethnobotanical research has been stressed by Veldman et al. (2013). Our results from the DNA analysis and wood anatomical identification for those specimens that lacked other diagnostic features were not completely satisfactory. In spite of its relatively large size, descriptions in the InsideWood database do not represent all woody plants and are supported by a few samples only, thus they not always reflect the full variability of a species (InsideWood, 2004-onwards). Nine of the samples that were sent to the laboratory for DNA barcoding yielded unlikely results, as their sequencing 'matched' that of species that did not occur in Benin or even West Africa (e.g. *Schima superba*, *Pongamia pinnata*, and *Digitalis lutea*). The task of rigorously actualizing these databases remains a challenge that can be bridged by completing botanical collections, as much as possible, not only with vernacular names, uses, woods, barks, and roots, but also with DNA samples.

CONCLUSIONS

In our study we found that 50% of the total medicinal flora in Benin was commercialized in its markets. A volume of approximately 655 metric tons worth 2.7 million USD is offered for sale annually. These figures are below the estimated volume and value recorded for the herbal market in Benin's much larger neighbour Ghana, but the floristic diversity of both markets is comparable. Nonetheless, our results suggest that the domestic medicinal plant market in Benin is of substantial economic importance. Traditional spiritual beliefs seem to be a major driving force behind the trade in herbal medicine. As it has been previously stated, medicinal plants are a resource of societal, economic, and cultural importance for the Beninese people.

TABLE 2.5. List of plant products recorded in selected markets of Benin in 2011 and 2012

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Amavivi, vivima (F)	leaves	DQ 309	Leguminosae	<i>Abrus precatorius</i> L.	ritual	dry	Herb	0.021	10.04	
Azekwin (F)	seeds	DQ 37	Leguminosae	<i>Abrus precatorius</i> L.	ritual	dry	Herb	0.607	0.36	
Booni (Y)	fruits	DQ 889	Leguminosae	<i>Acacia nilotica</i> (L.) Delile	women's health	dry	Tree	0.002	292.94	
Awadama (F)	leaves	AMT 201	Leguminosae	<i>Acacia</i> sp.	skin diseases/ritual	dry	Tree	0.032	3.47	
Vivi (F)	whole plant	DQ 58	Euphorbiaceae	<i>Acalypha ciliata</i> Forssk.	ritual	dry	Herb	0.054	3.90	
Ahowonglon, awanglo, gbemachu (F)	whole plant	DQ 72	Compositae	<i>Acanthospermum hispidum</i> DC.	malaria, ritual, hypertension	fresh	Herb	0.054	2.05	
	whole plant	DQ 901	Acanthaceae	<i>Acanthus montanus</i> (Nees) T. Anderson	ritual	fresh	Herb	0.054	3.90	CR, EW? 4
Parakuma, retiti (F)	whole plant	DQ 186	Compositae	<i>Acmella caulirrhiza</i> Delile	ritual, STDS/ritual, women's health	dry	Herb	0.003	68.55	
Awelekppe (F)	whole plant	DQ 307	Compositae	<i>Acmella uliginosa</i> (Sw.) Cass.	ritual	dry	Herb	0.003	70.26	
Gbangina, gbangido (F)	roots	DQ 409	Malpighiaceae	<i>Acridocarpus smeathmannii</i> (DC.) Guill. & Perr.	aphrodisiac, malaria,	dry	Shrub	0.285	3.89	EN ⁴
Blotchon (F)	leaves	DQ 369	Pteridaceae	<i>Acrostichum aureum</i> L.	ritual, childcare/ritual	fresh	Shrub	0.005	42.16	
Akwema (F), Eweadje, Enadjema (Y)	whole plant	DQ 131	Amaranthaceae	<i>Aerva lanata</i> (L.) Juss.	ritual	dry	Herb	0.005	42.16	
Atá (F)	fruits	DQ 136	Zingiberaceae	<i>Aframomum melegueta</i> K. Schum.	ritual	dry	Herb	0.018	33.28	
Atakwin (F)	seeds	AMT 309	Zingiberaceae	<i>Aframomum melegueta</i> K. Schum.	ritual	dry	Herb	sold per kg	0.22	
Kpa Kpa bga (F)	fruits	DQ 169	Leguminosae	<i>Azelia africana</i> Pers.	ritual	dry	Tree	0.042	14.26	EN ⁴ , VU ⁵
Agbakpogoto (F)	bark	AMT 362	Leguminosae	<i>Azelia africana</i> Pers.	ritual, STDS	dry	Tree	0.111	4.32	EN ⁴ , VU ⁵
Akatu (F)	whole plant	DQ 78	Compositae	<i>Ageratum conyzoides</i> (L.) L.	ritual, gastric disorders, childcare	dry	Herb	0.054	3.90	
Ayolé (F)	roots	DQ 404 ⁱⁱ	Leguminosae	<i>Albizia adianthifolia</i> (Schum.) W. Wight	ritual, women's health	dry	Tree	0.113	7.66	
Ayolou (F)	wood	AMT 179	Leguminosae	<i>Albizia adianthifolia</i> (Schum.) W. Wight		dry	Tree	1.64	0.19	
Ayoma (F), petit ognon, échalotes rouges (Fr)	roots	DQ 678	Amaryllidaceae	<i>Allium</i> sp.	women's health, ritual	dry	Herb	0.28	4.75	
Aloe (Fr, F)	whole plant		Asphodelaceae	<i>Aloe cf. tenuifolia</i> Lam.	skin diseases	fresh	Herb	0.6	0.35	
Appareilman (G)	leaves	AMT 367	Apocynaceae	<i>Alstonia boonei</i> De Wild.	women's health	fresh	Tree	0.054	3.90	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Ajinje (Y)	whole plant	DQ 219	Amaranthaceae	<i>Alternanthera pungens</i> Kunth	childcare/ritual	dry	Herb	0.008	26.35	
Wonexku (F)	seeds	DQ 866	Amaranthaceae	<i>Amaranthus</i> sp.	ritual	dry	Herb	sold per kg	0.31	
Tekple (Ai)	whole plant	AMT 320	Vitaceae	<i>Ampelocissus leonensis</i> (Hook.f.) Planch.	women's health, childcare	fresh	Herb	0.06	0.92	
Akarjigoto Cadjou gato (F)	bark	AMT 183	Anacardiaceae	<i>Anacardium occidentale</i> L.	STDs, childcare	dry	Tree	0.117	1.90	
Aiai goto (F)	bark	DQ 420	Annonaceae	<i>Amnictia cf. polycarpa</i> (DC.) Setten & Maas	malaria, CBD	dry	Tree	0.08	5.99	
Atahe (F)	wood	AMT 661	Annonaceae	<i>Amnictia polycarpa</i> (DC.) Setten & Maas	gastric disorders	dry	Tree	0.073	4.26	
Nyoki kloma (F)	leaves	DQ 205	Annonaceae	<i>Annona senegalensis</i> Pers.	gastric disorders	fresh	Shrub	0.054	3.90	
Gotundun, kuotundo, gotudo (F)	roots	DQ 491	Gentianaceae	<i>Antholeista vogelii</i> Planch.	ritual, women's health	dry	Shrub	0.026	33.30	
Asainko (F)	seeds	DQ 674	Anacardiaceae	<i>Antrocaryon micraster</i> A.Chev. & Guillaumin	ritual	dry	Tree	0.014	31.70	CR ⁴ , VU ⁵
Arachide (Fr), azi (F)	whole plant	DQ 347	Leguminosae	<i>Arachis hypogaea</i> L.	ritual	fresh	Shrub	0.054	0.14	
Huweychenyo (F)	leaves	AMT 72	Papaveraceae	<i>Argemone mexicana</i> L.	childcare	dry	Herb	0.054	3.90	
Azema (F)	whole plant	DQ 41	Acanthaceae	<i>Asystasia gangetlica</i> (L.) T. Anderson	ritual	dry	Herb	0.054	3.90	
Sokpekpe (Ai)	roots	AMT 319	Leguminosae	<i>Baphia nitida</i> Lodd.	malaria, women's health, ritual	dry	Shrub	0.113	7.66	
Klongboma (F)	leaves	DQ 151	Leguminosae	<i>Bauhinia reticulata</i> DC.	ritual	dry	Tree	0.046	4.58	
Akluernia (Ad)	leaves	AMT 466	Leguminosae	<i>Bauhinia thomningii</i> Schumacher.	childcare	dry	Tree	0.046	1.21	
Kiké (F)	whole plant	DQ 374	Oxalidaceae	<i>Biophytum umbraculum</i> Welw.	ritual	dry	Herb	0.054	3.90	
Lizekwin (F)	seeds	DQ 171	Sapindaceae	<i>Blighia sapida</i> K.D.Koenig	ritual	dry	Tree	0.002	108.23	
Kachouwey, kachu ayi , kachu awi (F)	whole plant	AMT 202	Nyctaginaceae	<i>Boerhavia erecta</i> L.	women's health, ritual	dry	Herb	0.009	23.42	
Kapok (Fr)	fruits	DQ 852	Malvaceae	<i>Bombax buonopozense</i> P.Beauv.	ritual	dry	Tree	0.041	14.61	
Hongera do, honsukokoydo (F)	roots	DQ 431	Euphorbiaceae	<i>Bridelia ferruginea</i> Benth.	women's health	dry	Shrub	0.164	5.28	
Honsukokoydo (F), ira (Y)	bark	DQ 223	Euphorbiaceae	<i>Bridelia ferruginea</i> Benth.	childcare/ritual, childcare/CBD, malaria, women's health, gastric disorders	dry	Shrub	0.09	2.47	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Afama djomakou (F)	whole plant	DQ 368	Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	ritual	fresh	Herb	0.054	3.90	
Adjikwin do (F)	roots	DQ 705	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	aphrodisiac	dry	Shrub	0.05	17.32	EW ⁴
Adjikwin (F)	seeds	DQ 413	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	ritual	dry	Shrub	0.019	11.68	EW ⁴
Adjima (F)	leaves	DQ 311	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	ritual	dry	Shrub	0.028	7.53	EW ⁴
Orgueil de Chine (Fr)	leaves	DQ 343	Leguminosae	<i>Caesalpinia pulcherrima</i> (L.) Sw.	ritual	fresh	Shrub	0.028	1.98	
Kélékouman (F)	whole plant	DQ 399	Leguminosae	<i>Cajanus cajan</i> (L.) Millsp.	skin diseases/ritual	fresh	Shrub	0.05	2.22	
Oke (Y)	whole plant	DQ 90	Orchidaceae	<i>Calypochilum christyanum</i> (Rehb.f.) Summerh.	ritual, women's health	fresh	Herb	0.03	7.40	
Akpakpu wiwi (F)	seeds	DQ 172	Leguminosae	<i>Canavalia ensiformis</i> (L.) DC.	ritual	dry	Herb	0.002	108.23	
Tanglan kw'in (F)	seeds	DQ 250	Cannaceae	<i>Canna indica</i> L.	ritual	dry	Herb	0.135	1.64	
Vavofli, fliman (F)	fruits	DQ 477	Solanaceae	<i>Capsicum annuum</i> L.	childcare	dry	Herb	0.184	3.26	
Ayolé (F)	roots		Caricaceae	<i>Carica papaya</i> L.	ritual	dry	Tree	0.113	6.99	
Ahanzo (F)	roots	DQ 485	Apocynaceae	<i>Carissa spinarum</i> L.	gastric disorders, malaria, aphrodisiac, women's health, STDs	dry	Shrub	0.125	5.77	VU ⁴
Aviádo, avia (F)	roots	DQ 486	Polygalaceae	<i>Carpolobia lutea</i> G.Don	aphrodisiac	dry	Shrub	0.176	4.92	
Agbégékan (F)	whole plant	AMT 326	Lauraceae	<i>Cassytha filiformis</i> L.	childcare/ritual, women's health	fresh	Herb	0.032	6.59	
Agonte (G)	seeds	DQ 897	Arecaceae	<i>cf. Borassus aethiopicum</i> Mart	women's health	dry	Tree	0.345	0.64	
	roots		Arecaceae	<i>cf. Borassus aethiopicum</i> Mart	aphrodisiac	dry	Tree	0.113	7.66	VU ⁴
Ayeku (F)	seeds	DQ 251	Apocynaceae	<i>cf. Cascabela thevetia</i> (L.) Lippold	ritual	dry	Shrub	0.006	36.98	
Atitama (F)	bark	DQ 480	Rubiaceae	<i>cf. Cremaspora triflora</i> (Thom.) K.Schum.	childcare	dry	Shrub	0.111	4.32	
Atabuna, azima (F), faux arachide (Fr)	whole plant	DQ 119 ¹	Leguminosae	<i>Clanacrista mimosoides</i> (L.) Greene	ritual, malaria, STDs	dry	Herb	0.02	11.09	
Djétindo (F)	roots	AMT 328	Rubiaceae	<i>Chassalia kolly</i> (Schumach.) Hepper	women's health	dry	Shrub	0.194	2.29	
Azongweywey (F)	leaves	AMT 590	Sapotaceae	<i>Chrysophyllum albidum</i> G.Don	skin diseases/ritual	dry	Tree	0.054	3.90	VU ⁴
Gando (F)	roots	DQ 121	Poaceae	<i>Chrysopogon zizanioides</i> (L.) Roberty	ritual, women's health	dry	Herb	0.007	120.69	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Djekodjé (F)	whole plant	DQ 177	Menispermaceae	<i>Cissampelos mucronata</i> A.Rich.	ritual, women's health	dry	Liana	0.016	13.17	
Tchegba (Ai)	fruits	AMT 303	Cucurbitaceae	<i>Citrullus colocynthis</i> (L.) Schrad.	gastric disorders	dry	Herb	0.534	1.12	
Kledo (F)	roots	AMT 345	Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	women's health	dry	Tree	0.113	7.66	
Vertiga (G)	leaves	AMT 426 ⁱⁱ	Rutaceae	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.	childcare, childcare/CBD	dry	Shrub	0.048	2.31	
Hounzoko (F)	seeds	DQ 244	Annonaceae	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels	ritual	dry	Tree	0.001	216.46	
Ale (Y)	wood	DQ 89	Annonaceae	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels	aphrodisiac	dry	Tree	0.026	11.95	
Hunsugun goto (F)	bark	DQ 479	Annonaceae	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels	aphrodisiac, women's health	dry	Tree	0.28	1.71	
Wawa (Y)	whole plant	DQ 59	Cleomeaceae	<i>Cleome viscosa</i> L.	ritual	fresh	Herb	0.054	3.90	
Agongédo (F)	roots	DQ 457	Araceae	<i>Cocos nucifera</i> L.	hypertension, malaria, childcare	dry	Tree	0.113	7.66	
Cola (F)	fruits	DQ 578	Malvaceae	<i>Cola acuminata</i> (P.Beauv.) Schott & Endl.		dry	Tree	0.026	42.67	
Atita (F)	seeds	DQ 158	Malvaceae	<i>Cola acuminata</i> (P.Beauv.) Schott & Endl.	ritual, childcare/CBD	dry	Tree	0.01	22.19	
Atita (F)	fruits	DQ 380	Malvaceae	<i>Cola gigantea</i> A.Chev.		dry	Tree	0.021	2.85	
Aloviaton (F)	leaves	DQ 156	Malvaceae	<i>Cola millettii</i> K.Schum.	childcare	dry	Tree	0.062	3.40	
Tchankoko (F)	roots	AMT 334	Commelinaceae	<i>Commelina erecta</i> L.	women's health	dry	Herb	0.02	43.30	
Felijimi (G)	leaves	AMT 434	Burseraceae	<i>Commiphora africana</i> (A.Rich.) Endl.	ritual/childcare	dry	Tree	0.054	3.90	
Akpafo (F)	fruits	DQ 882	Leguminosae	<i>Capaifera salikounda</i> Heckel	ritual	dry	Tree	0.003	7.40	VU ⁵
Tétregougou (F)	whole plant	DQ 196	Costaceae	<i>Costus afer</i> Ker Gawl.	women's health	fresh	Herb	0.054	3.90	
Hotonzuzwe (F)	leaves	AMT 226	Capparaceae	<i>Cratava adansonii</i> DC.	gastric disorders	fresh	Tree	0.103	2.41	
Calebasse (Fr), igba degi (Y)	fruits	DQ 236	Bignoniaceae	<i>Crescentia cujete</i> L.	ritual, utensil	dry	Shrub	0.05	11.98	
Tonyan (F)	roots		Amaryllidaceae	<i>Crinum jagus</i> (J.Thomps.) Dandy	infections	dry	Herb	sold per kg	0.86	
Djelele, adjedje, adjele man (F)	leaves	DQ 333	Euphorbiaceae	<i>Croton gratissimus</i> Burch.	ritual, malaria, women's health, hypertension	dry	Shrub	0.02	2.77	
Awgba (F)	seeds	DQ 804	Euphorbiaceae	<i>Croton tiglium</i> L.	gastric disorders	dry	Shrub	0.025	8.88	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Donkpegan (F)	whole plant	DQ 32	Cucurbitaceae	<i>Cucumis melo</i> L.	ritual	fresh	Herb	0.054	3.90	
Gbohounon (F)	fruits	DQ 382	Cucurbitaceae	<i>Cucumis metuliferus</i> E.Mey. ex Naudin	ritual	dry	Herb	0.108	10.27	
Igba go (Y)	fruits	DQ 242	Cucurbitaceae	<i>Cucurbita</i> sp.	ritual	dry	Herb	0.067	8.94	
Ayoké (F)	roots	DQ 883	Hypoxidaceae	<i>Curculigo pilosa</i> (Schumach. & Thonn.) Engl.	women's health	dry	Herb	0.065	13.32	
Tchyaomkoko (F) gengembre rouge (Fr)	roots	AMT 196	Zingiberaceae	<i>Curcuma</i> sp.	ritual	dry	Herb	0.008	27.74	
Vivima te, honsicusa (F)	whole plant	DQ 320	Compositae	<i>Quantillium cinereum</i> (L.) H. Rob.	ritual, childcare/CBD	dry	Herb	0.007	30.11	
Tchama (F)	leaves	DQ 318	Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	ritual	dry	Herb	0.058	3.63	
Bagagoto (F)	bark	DQ 414 ^{4†}	Leguminosae	<i>Cynometra megalophylla</i> Harms	women's health, childcare/CBD, malaria	dry	Tree	0.367	1.31	
Aflyo (F)	roots	DQ 460	Cyperaceae	<i>Cyperus esculentus</i> L.	aphrodisiac	dry	Herb	0.008	108.24	
Diore (Id)	roots	DQ 454 ⁴	Cyperaceae	<i>Cyperus</i> sp.	ritual	dry	Herb	0.001	865.91	
Ozagoto (F)	bark	DQ 703	Leguminosae	<i>Daniellia oliveri</i> (Rolfe) Hutch. & Dalziel	childcare/ritual, gastric disorders	dry	Tree	0.345	1.39	
Asonsoingoto (F)	bark	DQ 417	Leguminosae	<i>Dialium guineense</i> Willd.	malaria	dry	Tree	0.111	4.32	
Badawi (F)	roots	AMT 587	Leguminosae	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	infections	dry	Tree	0.113	7.66	
Hounzogotosikwin (F), chikichiki (Nigeria)	fruits	DQ 495	Leguminosae	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	childcare	dry	Tree	0.007	1.55	
Axexe (F)	whole plant	DQ 23	Compositae	<i>Dicoma tomentosa</i> Cass.	ritual	dry	Herb	0.028	1.98	
Lokokwin (F)	seeds	DQ 245	Leguminosae	<i>Dioclea reflexa</i> Hook f.	ritual	dry	Herb	0.003	72.15	
Sehouman (F)	whole plant		Rubiaceae	<i>Diodelia sarmentosa</i> (Sw.) Bacigalupo & Cabral ex Borhidi	women's health	dry	Herb	0.054	3.90	
Tevi hunton (F)	roots	DQ 499	Dioscoreaceae	<i>Dioscorea dumetorum</i> (Kunth) Pax	ritual	dry	Herb	0.113	7.66	
Anya (F)	leaves	DQ 157	Asparagaceae	<i>Dracaena arborea</i> (Willd.) Link		dry	Shrub	0.054	3.90	
	whole plant	AMT 712	Compositae	<i>Echinops longifolius</i> A.Rich.	childcare	dry	Herb	0.054	3.90	
Kanbala (F)	leaves	AMT 460	Boraginaceae	<i>Elhretia cymosa</i> Thonn.	malaria, women's health	dry	Tree	0.051	2.00	
Ekou (Y)	bark	DQ 222	Meliaceae	<i>Ekebergia</i> sp.	malaria	dry	Tree	0.075	6.39	
Ahlon lon kwın (F)	seeds	DQ 857	Musaceae	<i>Ensete livingstonianum</i> (J.Kirk)	ritual	dry	Herb	0.036	6.16	CR ⁴ , LC ⁵

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Cheesman										
Kpakpassoumehamam (G)	whole plant	AMT 394	Leguminosae	<i>Entada africana</i> Guill. & Perr.	women's health	dry	Tree	0.054	3.90	
Gbagbarakun, gbagbadia (F)	seeds	DQ 412	Leguminosae	<i>Entada gigas</i> (L.) Fawc. & Rendle	ritual, childcare	dry	Liana	0.024	9.24	
Iginla (Y)	bark	DQ 498	Meliaceae	<i>Entandrophragma cf. candollei</i> Harms	ritual	dry	Tree	0.111	4.32	
Lemma (F)	whole plant		Leguminosae	<i>Eriosema laurentii</i> De Wild.	ritual	dry	Shrub	0.1	2.11	
Ekpoyobo (Y)	bark	DQ 483 ⁴	Leguminosae	<i>Erythrophloeum cf. africanum</i> (Benth.) Harms	ritual	dry	Tree	0.111	4.32	
	bark		Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh.	cold	dry	Tree	0.111	2.00	
Lekuleku, anosika (F)	whole plant	DQ 69	Euphorbiaceae	<i>Euphorbia hirta</i> L.	women's health, ritual	dry	Herb	0.054	1.02	
Oro olombo (Y)	whole plant		Euphorbiaceae	<i>Euphorbia unispina</i> N.E.Br.	ritual	fresh	Shrub	3	7.40	
Kusu kusu (F)	whole plant	DQ 174	Convolvulaceae	<i>Evolvulus alsinoides</i> (L.) L.	ritual, childcare/ritual	dry	Herb	0.054	3.90	
Akpagema, akbadjema (F)	leaves		Rubiaceae	<i>Feretia apodanthera</i> Delile	gastric disorders	dry	Shrub	0.131	2.54	
Igbueku (Y)	roots	DQ 234 ⁴	Moraceae	<i>Ficus</i> sp.	skin diseases	dry	Tree	0.113	7.66	
Tchiviman (G)	leaves	AMT 388	Moraceae	<i>Ficus sur</i> Forssk.	women's health	dry	Tree	0.054	3.90	
Gumangbo (F)	fibre	DQ 254	Moraceae	<i>Ficus thommingii</i> Blume	childcare/ritual, ritual	dry	Tree	0.007	15.85	
Gbolhunkadje do (F)	roots	AMT 214	Flacourtiaceae	<i>Flacourtia indica</i> (Burm.f.) Merr.	malaria	dry	Shrub	0.113	7.66	
Gbonkadje, bonkatche (F)	leaves	AMT 127	Flacourtiaceae	<i>Flacourtia indica</i> (Burm.f.) Merr.	malaria, aphrodisiac	dry	Shrub	0.214	2.07	
Alotrobadiiki (F)	whole plant	DQ 476	Phyllanthaceae	<i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	skin diseases/ritual, malaria, women's health	dry	Shrub	0.021	10.57	
Ahowedo, ahowe (F)	roots	DQ 484	Clusiaceae	<i>Garcinia kola</i> Heckel	diabetes	dry	Tree	0.012	72.16	EW ⁴ , VU ⁵
Ahoé (F)	seeds	DQ 138	Clusiaceae	<i>Garcinia kola</i> Heckel	ritual, childcare	dry	Tree	0.004	13.87	EW ⁴ , VU ⁵
Avia, ahowo (F)	wood	DQ 87	Clusiaceae	<i>Garcinia kola</i> Heckel	aphrodisiac, women's health	dry	Tree	0.0655	4.74	EW ⁴ , VU ⁵
Tatakplanman, dakpla (F)	leaves	DQ 106 ⁴	Rubiaceae	<i>Gardenia ternifolia</i> Schumacher & Thonn.	hypertension, gastric disorders, malaria	dry	Tree	0.054	3.90	
Tatakplando (F)	wood	AMT 520	Rubiaceae	<i>Gardenia ternifolia</i> Schumacher & Thonn.	aphrodisiac, ritual, hypertension	dry	Tree	0.086	2.58	
Baka (F)	roots	AMT 174	Iridaceae	<i>Gladiolus dalenii</i> Van Geel	gastric disorders,	dry	Herb	0.007	31.70	

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women's health										
Sankafouma (F)	whole plant	AMT 592	Malvaceae	<i>Gossypium hirsutum</i> L.	ritual/madness	dry	Shrub	0.054	3.90	
Azongbo (F)	whole plant	DQ 31	Poaceae	<i>Hackelochloa granularis</i> (L.) Kuntze	ritual	dry	Herb	0.054	3.90	
Coclossoudin Kpacha (F)	whole plant	DQ 306	Boraginaceae	<i>Heliotropium indicum</i> L.	skin diseases/ritual, hypertension	dry	Herb	0.054	3.90	
Wiwé (Y)	whole plant	DQ 76	Pontederiaceae	<i>Heisteranthera callifolia</i> Rchb. ex Kunth	ritual	fresh	Herb	0.1	0.22	
Xexema, hehema (F)	whole plant	DQ 176	Melastomataceae	<i>Heterotis rotundifolia</i> (Sm.) Jacq.-Fél.	ritual, women's health	fresh	Herb	0.01	21.08	
Hungbe (Ad)	whole plant	AMT 465	Malvaceae	<i>Hibiscus acetosella</i> Welw. ex Hiern	childcare, malaria	fresh	Shrub	0.054	1.02	
Kpakloman (F)	whole plant	DQ 342	Malvaceae	<i>Hibiscus surattensis</i> L.	women's health, malaria	fresh	Shrub	0.054	3.90	
Abiwelé (F)	whole plant	DQ 330	Violaceae	<i>Hybanthus emneaspermus</i> (L.) F.Muell.		dry	Herb	0.011	18.50	
Ilu femi (Y)	whole plant	DQ 71	Araliaceae	<i>Hydrocotyle bonariensis</i> Lam.	ritual	dry	Herb	0.054	3.90	
Kadiji beriberi (De)	whole plant	AMT 711	Acanthaceae	<i>Hygrophila auriculata</i> (Schumacher) Heine	childcare	fresh	Herb	0.054	3.90	
Awalinguin (F)	roots		Rubiaceae	<i>Hymenodictyon floribundum</i> (Steud. & Hochst.) B.L.Rob.		dry	Shrub	0.113	7.66	
Kweflu, koueflou (F)	whole plant	AMT 215	Lamiaceae	<i>Hypis suaveolens</i> (L.) Poit.	childcare	dry	Herb	0.092	1.88	
Sedo (F)	roots		Poaceae	<i>Imperata contracta</i> (Humb., Bonpl. & Kunth) Hitchc.		dry	Herb	0.079	10.96	
Axugbe (Ad)	leaves	AMT 366	Leguminosae	<i>Indigofera</i> sp.	childcare	dry	Herb	0.054	1.02	
Djéninigo (F), Axexe du Nord (Fr, F)	whole plant	DQ 895	Convolvulaceae	<i>Ipomoea argenteaurata</i> Hallier f.	ritual	dry	Herb	0.054	3.90	
Axinadjé, ainadjé (F)	whole plant	DQ 183	Convolvulaceae	<i>Ipomoea quamoclit</i> L.	ritual, women's health	dry	Herb	0.054	3.90	
Afama, afama avo (F)	whole plant	DQ 141	Crassulaceae	<i>Kalanchoe crenata</i> (Andrews) Haw.	ritual	fresh	Herb	0.054	3.90	
Zozokan, Tchioma (F)	whole plant	AMT 228	Cucurbitaceae	<i>Kedrostis foetidissima</i> (Jacq.) Cogn.	childcare, malaria	fresh	Herb	0.054	32.87	
Casédril, zousagoto (F)	bark	DQ 228	Meliaceae	<i>Klaya senegalensis</i> (Desv.) A.Juss.	ritual/malaria, women's health	dry	Tree	0.042	9.25	EN ⁴ , VU ⁵
Flagbo (F)	leaves	DQ 83	Meliaceae	<i>Klaya senegalensis</i> (Desv.) A.Juss.	ritual/madness	dry	Tree	0.054	3.90	EN
Gnamlikpogoto, ajangoto (F)	bark	DQ 425	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	women's health, childcare	dry	Tree	0.037	12.95	VU ⁴

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Gnablikpogoto (F)	roots	DQ 489	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.		dry	Tree	0.113	7.33	VU ⁴
Koudouman (F)	leaves	AMT 396	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	women's health	fresh	Tree	0.054	3.90	VU ⁴
Gnablikpo (F)	fruits	AMT 342	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	ritual/aphrodisiac	dry	Tree	2	0.29	VU ⁴
Kadjidji (F)	roots	DQ 806	Cyperaceae	<i>Kyllinga erecta</i> Schumacher.	ritual	dry	Herb	0.005	168.95	
Kablougoudui (F)	whole plant	DQ 360	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	ritual, childreare/CBD	dry	Herb	0.054	3.90	
Igba dekofo (Y)	fruits	DQ 237	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	ritual	dry	Herb	0.206	1.62	
Goussi (F)	fruits	DQ 312	Cucurbitaceae	<i>Lagenaria siceraria</i> (Molina) Standl.	ritual, utensil	dry	Herb	0.051	11.75	
Minameygot, zuzugoto (F)	bark	AMT 47	Anacardiaceae	<i>Lannea acida</i> A.Rich.	malaria, childreare/ritual	dry	Tree	0.111	4.32	
Humansin tekan non, humansin kekan (F)	bark	DQ 408	Anacardiaceae	<i>Lannea barkeri</i> (Oliv.) Engl.	gastric disorders, malaria	dry	Tree	0.166	1.33	
Tchio, ratchayo (F)	whole plant	DQ 795	Verbenaceae	<i>Lantana camara</i> L.	ritual/childreare	fresh	Herb	0.06	3.51	
	whole plant	DQ 35	Compositae	<i>Lantana taraxacifolia</i> (Willd.) Amin ex C. Jeffrey	ritual	dry	Herb	0.054	3.90	
Dawili (De)	whole plant	DQ 838	Lamiaceae	<i>Leonotis nepetifolia</i> (L.) R.Br.	childreare	dry	Herb	0.054	3.90	
Yeya (Ai)	leaves	AMT 311	Verbenaceae	<i>Lippia multiflora</i> Moldenke	gastric disorder, childreare/CBD	dry	Herb	0.006	35.13	
Banhô (Y)	bark	DQ 220	Ochnaceae	<i>Lophira lanceolata</i> Tiegh. ex Keay	malaria, gastric disorders	dry	Tree	0.055	8.71	
Zentiti, retiti (F)	whole plant	DQ 30	Lycopodiaceae	<i>Lycopodiella cernua</i> (L.) Pic. Sern.	childreare, ritual	dry	Herb	0.054	1.02	
Mangue goto, manga goto (F)	bark	DQ 704	Anacardiaceae	<i>Mangifera indica</i> L.	aphrodisiac, malaria	dry	Tree	0.282	1.57	
Azetofin (F)	seeds	DQ 168	Martyniaceae	<i>Martynia annua</i> L.	ritual	dry	Herb	0.001	599.09	
Bpema, kpimansinemeton (F)	leaves		Myrtaceae	<i>Melaleuca leucadendron</i> (L.) L.	respiratory diseases, childreare	dry	Tree	0.054	3.90	
Alovi aton, alofiantoma (F)	whole plant	DQ 188	Convolvulaceae	<i>Merremia quinquefolia</i> (L.) Hallier f.	ritual	dry	Herb	0.054	3.90	
Degoma, degoman (F)	whole plant	DQ 779	Polypodiaceae	<i>Phymatosorus scolopendria</i> (Burm. f) Pic. Sern.	women's health, ritual	fresh	Herb	0.042	5.02	
Egné (Y)	whole plant	DQ 644	Euphorbiaceae	<i>Microstachys chamaelea</i> (L.) Müll.Arg.	gastric disorders, childreare	dry	Herb	0.054	3.90	
Lokotin (F)	Bark	DQ 865	Moraceae	<i>Milicia excelsa</i> (Welw.) C.C.Berg	ritual	dry	Tree	0.024	90.20	EN ⁴ , VU ⁵

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Otiétié (Na)	whole plant	AMT 501	Leguminosae	<i>Milletia thomingii</i> (Schum. & Thonn.) Baker	women's health	dry	Tree	0.054	3.90	
Ioroma (F)	whole plant	DQ 48	Molluginaceae	<i>Mollugo nudicaulis</i> Lam.	ritual	dry	Herb	0.054	3.90	
Nyesike (F)	whole plant	DQ 876	Cucurbitaceae	<i>Momordica balsamina</i> L.	skin diseases/ritual	fresh	Herb	0.009	6.16	
Nyesike kwín (F)	seeds	DQ 249	Cucurbitaceae	<i>Momordica charantia</i> L.	women's health	dry	Herb	0.005	44.38	
Yinsikwin (F)	whole plant	DQ 219	Cucurbitaceae	<i>Momordica charantia</i> L.	hypertension, skin diseases/ritual	fresh	Herb	0.009	23.42	
Tchigoun (F)	roots	DQ 107	Apocynaceae	<i>Mondia whiteii</i> (Hook.f.) Skeels	aphrodisiac, ritual	dry	Liana	0.065	13.32	VU ⁴
Hungogoto (F)	bark		Annonaceae	<i>Monodora myrsistica</i> (Gaertn.) Dunal	malaria	dry	Tree	0.156	2.84	EN ⁴
Sasalikwin (F)	seeds	DQ 890	Annonaceae	<i>Monodora myrsistica</i> (Gaertn.) Dunal	women's health, ritual, gastric disorders	dry	Tree	0.01	22.19	EN ⁴
Kweinsido, weswe (F)	roots	DQ 428	Rubiaceae	<i>Morinda lucida</i> Benth.	aphrodisiac, ritual, women's health	dry	Tree	0.1	8.66	
Hundi hundi goto (F)	bark	AMT 35	Rubiaceae	<i>Morinda lucida</i> Benth.	women's health	dry	Tree	0.07	6.84	
Kwensina (F)	leaves	AMT 603	Rubiaceae	<i>Morinda lucida</i> Benth.	childcare	dry	Tree	0.054	1.02	
Vesú (F)	seeds	DQ 248	Leguminosae	<i>Mucuna sloanei</i> Fawc. & Rendle	ritual	dry	Liana	0.005	11.09	
Atahe (Ghana)	wood	AMT 189	Rubiaceae	<i>Nauclea diderrichii</i> (De Wild.) Merr.	aphrodisiac	dry	Shrub	0.1622	1.92	EN ⁴ , VU ⁵
adjamangoto (F)	bark	DQ 482	Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	women's health	dry	Shrub	0.034	14.09	
Kpatiman (F)	whole plant	DQ 104	Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	ritual	dry	Shrub	0.054	3.90	
Tabac (Fr), Yéron, Azezewe (F)	leaves	DQ 379	Solanaceae	<i>Nicotiana tabacum</i> L.	ritual	dry	Shrub	0.016	3.47	
Kesu kese, xesinsin (F)	whole plant	DQ 51	Lamiaceae	<i>Ocimum americanum</i> L.	ritual, childcare	fresh	Herb	0.043	5.78	
Tchayo, dan tchayo (F)	leaves	DQ 181	Lamiaceae	<i>Ocimum gratissimum</i> L.	women's health, respiratory diseases, ritual	dry	Herb	0.043	4.90	
Kesu kesu heviosu (F)	whole plant		Lamiaceae	<i>Ocimum sp.</i>	ritual	dry	Herb	0.043	1.29	
Méindo (F)	roots	DQ 493	Olacaceae	<i>Olax subscorpioides</i> Oliv.	ritual, aphrodisiac	dry	Shrub	0.037	23.40	
Ahonthouman, Azanglo (F)	whole plant	DQ 44	Rubiaceae	<i>Oldenlandia affinis</i> (Roem. & Schult.) DC.	ritual, women's health	dry	Herb	0.017	13.05	

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Kudjé kudjé (F)	whole plant	DQ 66	Oxalidaceae	<i>Oxalis corniculata</i> L.	ritual	dry	Herb	0.054	3.90	
Mekukuyama, kooyoma (F)	roots	AMT 173	Amaryllidaceae	<i>Pancratium tenuifolium</i> Hochst. ex A.Rich.	ritual, childcare	dry	Herb	0.015	7.40	
Tchakaman (G)	leaves	AMT 384	Leguminosae	<i>Parkia biglobosa</i> (Jacq.) G.Don	women's health	dry	Tree	0.054	3.90	
Avunjemetri, avuneme (F)	whole plant	AMT 204	Passifloraceae	<i>Passiflora foetida</i> L.	childcare	fresh	Herb	0.033	3.36	
Heviohuma (F)	whole plant	AMT 61	Sapindaceae	<i>Paullinia pinnata</i> L.	diarrhea, malaria, childcare	dry	Herb	0.028	7.53	
Loxwi (F)	leaves	DQ 153	Rubiaceae	<i>Pavetta corymbosa</i> (DC.) F.N.Williams	malaria, women's health	dry	Shrub	0.054	3.90	
Lohou, Tchakatou ma (F)	leaves	DQ 73	Rubiaceae	<i>Pavetta crassipes</i> K.Schum.	malaria, ritual	dry	Shrub	0.156	0.71	
Likou (F)	seeds		Poaceae	<i>Pennisetum glaucum</i> cf. <i>glaucum</i>	ritual	dry	Herb	0.181	1.22	
Dengwikwin (F)	seeds	DQ 676	Leguminosae	<i>Penaclehra macrophylla</i> Benth.	ritual	dry	Tree	0.012	18.49	VU ⁴
Dengwi (F)	fruits	DQ 164	Leguminosae	<i>Penaclehra macrophylla</i> Benth.	ritual	dry	Tree	0.057	10.51	VU ⁴
Fifaman (Ai)	whole plant	AMT 323	Piperaceae	<i>Peperomia pellucida</i> (L.) Kunth	ritual	fresh	Herb	0.3	3.70	
Gbangina wewe (F)	bark		Asclepiadaceae	<i>Periploca cataphylla</i> (Baill.) Roberty	aphrodisiac	dry	Liana	0.111	4.32	
Avocat (F)	leaves		Lauraceae	<i>Persea americana</i> Mill.		dry	Tree	0.054	3.90	
Zoroman (F)	whole plant	DQ 366	Phytolaccaceae	<i>Peitveria alliacea</i> L.	ritual	fresh	Herb	0.054	3.90	
Homefado (F)	whole plant	DQ 93	Acanthaceae	<i>Phaulopsis ciliata</i> (Willd.) Hepper	ritual	dry	Herb	0.015	14.05	
Helwe (F)	whole plant	DQ 202	Phyllanthaceae	<i>Phyllanthus amarus</i> Schumacher & Thonn.	malaria, ritual, women's health	dry	Herb	0.01	21.08	
Ayokpe (F)	seeds	DQ 679	Apocynaceae	<i>Pieralima nitida</i> (Stapf) T.Durand & H.Durand	ritual	dry	Tree	0.012	54.12	
Kplekple (F)	seeds	DQ 807	Apiaceae	<i>Pimpinella anisum</i> L.		dry	Herb	sold per kg	4.53	
Lenlenkwini (F)	roots	AMT 658	Piperaceae	<i>Piper guineense</i> Schumacher. & Thonn.		dry	Herb	0.083	10.43	
Lenlenkwini (F)	seeds	DQ 677	Piperaceae	<i>Piper guineense</i> Schumacher. & Thonn.	ritual	dry	Herb	sold per kg	4.53	
Gnamalogu (Ad)	whole plant	DQ 722	Plumbaginaceae	<i>Plumbago zeylanica</i> L.	ritual	dry	Shrub	0.054	3.90	
Kpeseto (F)	whole plant	DQ 128	Caryophyllaceae	<i>Polycarpon prostratum</i> (Forssk.)	ritual	fresh	Herb	0.054	3.90	

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Asch. & Schweinf.										
Afero (Y)	whole plant	DQ 53	Polygalaceae	<i>Polygala arenaria</i> Willd.	ritual, women's health, childcare	dry	Herb	0.006	36.98	
Agouébé (F)	leaves	AMT 401	Leguminosae	<i>Prosopis africana</i> (Guill. & Perr.) Taub.	ritual, childcare	dry	Tree	0.067	3.15	
Kake, kakein (F)	wood	DQ 403	Leguminosae	<i>Prosopis africana</i> (Guill. & Perr.) Taub.	childcare/ritual	dry	Tree	0.132	1.68	
Kpaklesido (F)	roots	AMT 131 th	Rosaceae	<i>Prunus africana</i> (Hook. f.) Kalkman	women's health	dry	Tree	0.113	7.66	
Atindorokpo (F)	roots	DQ 487	Meliaceae	<i>Pseudocedrela kotschyi</i> (Schweinf.) Harms	gastric disorders	dry	Tree	0.174	4.98	
Magbey vidéy (F)	leaves	DQ 422	Rubiaceae	<i>Psychotria vogeliana</i> Benth.	childcare	dry	Shrub	0.45	2.47	
kulikuligoto (F)	bark	DQ 415	Combretaceae	<i>Pteleopsis suberosa</i> Engl. & Diels	childcare/ritual, childcare/CBD	dry	Tree	0.272	1.76	
Hongera goto (F)	bark	DQ 226	Leguminosae	<i>Pterocarpus erinaceus</i> Poir.	malaria, childcare/ritual, respiratory diseases, women's health	dry	Tree	0.03	15.97	EN ⁴
Bembema (F)	leaves	AMT 64	Leguminosae	<i>Pterocarpus santalinoides</i> DC.	childcare	dry	Tree	0.054	3.90	
Tledgbokokwin (F)	fruits	DQ 435	Amaranthaceae	<i>Pupalia lappacea</i> (L.) Juss.	ritual, headache, childcare	dry	Herb	0.017	35.24	
Tledgboko (F)	whole plant	DQ 91	Amaranthaceae	<i>Pupalia lappacea</i> (L.) Juss.	women's health, childcare	dry	Herb	0.054	3.90	
Dekuwin, de (F)	seeds	DQ 247	Arecaceae	<i>Raphia hookeri</i> G.Mann & H.Wendl.	ritual, childcare	dry	Tree	0.015	14.79	
Letin, lewedo (F)	roots	DQ 165 th	Apocynaceae	<i>Rauwolfia vomitoria</i> Afzel.	ritual/madness, aphrodisiac	dry	Shrub	0.113	7.66	NT ⁴
Houyin (F)	whole plant	AMT 417	Cyperaceae	<i>Remirea maritima</i> Aubl.	gastric disorders, childcare	fresh	Herb	0.054	1.02	
Kpakplakan (F)	wood	AMT 500	Icacinaceae	<i>Rhaphiostylis beninensis</i> (Hook.f. ex Planch.) Planch. ex Benth.	gastric disorders, childcare, women's health	dry	Shrub	0.165	1.88	
Gbadema, badema (F)	leaves	AMT 199	Rubiaceae	<i>Rytigynia nigerica</i> (S.Moore) Robyns	childcare	dry	Shrub	0.031	6.80	
Avihaman (G)	whole plant	AMT 391	Rubiaceae	<i>Sabicea calycina</i> Benth.	STDs	dry	Liana	0.054	3.90	
Hutchabu (F)	seeds	DQ 675	Humiriaceae	<i>Sacoglottis gabonensis</i> (Baill.) Urb.	gastric disorders, ritual	dry	Tree	0.029	7.65	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Ezo onoubé (F)	seeds	DQ 577	Celastraceae	<i>Salacia erecta</i> (G.Don) Walp.	malaria	dry	Shrub	0.008	27.74	
Kpayando, kpoingado (F)	roots	DQ 488	Asparagaceae	<i>Sansevieria liberica</i> Cérôme & Labroy	malaria	dry	Herb	0.187	1.18	
Kudo, kodo (F)	roots	DQ 427	Rubiaceae	<i>Sarcocephalus latifolius</i> (Sm.) E.A.Bruce	women's health	dry	Shrub	0.143	1.55	
Axonxu (F)	fruits	DQ 881	Oleaceae	<i>Schrebera arborea</i> A.Chev.	ritual, childcare	dry	Tree	0.01	58.45	EN ⁴
Anakuku, aman kwikwi (F)	whole plant		Solanaceae	<i>Schwenkia americana</i> Kunth	women's health	dry	Herb	0.013	16.21	
Vivima te, vivimantéon (F)	whole plant	DQ 372	Plantaginaceae	<i>Scoparia dulcis</i> L.	ritual, childcare/ritual	dry	Herb	0.054	3.90	
Kunkundirma, wuguduma (F)	whole plant	AMT 71	Apocynaceae	<i>Secamone afzelii</i> (Schult.) K.Schum.	childcare, women's health	fresh	Liana	0.054	3.90	
Kpetado, Kpékado (F)	roots	DQ 241	Polygalaceae	<i>Securidaca longipedunculata</i> Fre sen.	aphrodisiac, ritual	dry	Shrub	0.006	140.80	
Biwelé (F)	whole plant	AMT 225	Polygalaceae	<i>Securidaca longipedunculata</i> Fre sen.	ritual, women's health	fresh	Shrub	0.196	2.26	
Agbegbe (F)	whole plant	AMT 589	Leguminosae	<i>Senna italica</i> Mill.	gastric disorders, women's health	dry	Shrub	0.054	3.90	
Agonlika (F)	wood	AMT 195	Leguminosae	<i>Senna occidentalis</i> (L.) Link	childcare	dry	Shrub	0.01	22.19	
Kenkiliba (F)	whole plant	DQ 319	Leguminosae	<i>Senna occidentalis</i> (L.) Link	ritual/women's health, malaria	fresh	Shrub	0.054	1.02	
Cassia, zangla (F)	leaves	DQ 406	Leguminosae	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	malaria	dry	Shrub	0.054	3.90	
Xassia, sangara (F)	roots	DQ 406	Leguminosae	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	malaria	dry	Shrub	0.113	1.96	
Agbomankwin (F)	seeds	DQ 324	Pedaliaceae	<i>Sesamum indicum</i> L.	ritual	dry	Herb	sold per kg	4.53	
Leku leku (F)	whole plant	DQ 68	Smilacaceae	<i>Smilax anceps</i> Willd.	ritual	dry	Shrub	0.054	3.90	
Agbali biakan (F)	roots	AMT 186	Smilacaceae	<i>Smilax anceps</i> Willd.	women's health	dry	Shrub	0.37	1.19	
Aboku (F)	seeds		Poaceae	<i>Sorghum bicolor</i> L.	ritual	dry	Herb	0.16	1.39	
Kpokpo (Na), Lokoman (F)	leaves	DQ 218	Poaceae	<i>Sorghum bicolor</i> L.	ritual, malaria,	dry	Herb	0.083	0.06	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Oignon (Fr)	roots		Amaryllidaceae	sp.		dry	herb	0.113	39.27	
Itwonti, awontin (F)	seeds	DQ 246	Anacardiaceae	sp.	ritual	dry	Unknown	0.001	315.87	
Éponge traditionnelle (Fr)	fibre	DQ 854, DQ 853	Areaceae	sp.	ritual	dry	Tree	0.1622	1.37	
Igzo kpa gbo (F)	fruits	DQ 576	Chrysobalanaceae	sp.		dry	Tree	0.021	10.57	
Agbwagé (F)	roots	DQ 456 ^l	Myrtaceae	sp.	aphrodisiac	dry	Unknown	0.017	63.67	
Ombogoto (F)	bark	DQ 424 ^{ll}	Plantaginaceae	sp.		dry	Herb	0.164	152.44	
Shigó (Y)	wood	DQ 85 ^l	Rubiaceae	sp.	aphrodisiac	dry	Unknown	0.002	8.75	
Igbo korom (Y)	roots	DQ 569 ^l	Rubiaceae	sp.	aphrodisiac	dry	Unknown	0.103	8.41	
Awalinguin (F)	roots	DQ 407 ^{ll}	Rubiaceae	sp.	aphrodisiac	dry	Unknown	0.113	7.66	
Empiaji (Y)	bark	DQ 229 ^{ll}	Rubiaceae	sp.	malaria	dry	Unknown	0.113	7.66	
Koromi (F)	roots	DQ 708 ^l	Rubiaceae	sp.	aphrodisiac	dry	Unknown	0.113	7.66	
Adadegoto (F)	bark	DQ 425	Bignoniaceae	<i>Spathodea campanulata</i> P.Beauv.	STDs	dry	Tree	0.003	152.44	
Adademan, adada (F)	leaves	DQ 192	Bignoniaceae	<i>Spathodea campanulata</i> P.Beauv.	women's health, hypertension, haemorrhoids	dry	Tree	0.054	3.90	
	whole plant	DQ 28	Menispermaceae	<i>Sphenocentrum jollyanum</i> Pierre	ritual	fresh	Shrub	0.054	3.90	
Kpedo (F), Akerigibo (Y)	roots	AMT 717	Menispermaceae	<i>Sphenocentrum jollyanum</i> Pierre	ritual, women's health	dry	Shrub	0.185	1.19	
Akikongoto (F)	bark	DQ 152	Anacardiaceae	<i>Spondias mombin</i> L.	women's health	dry	Tree	0.012	39.92	
Akiklonkwín (F)	seeds	DQ 805	Anacardiaceae	<i>Spondias mombin</i> L.		dry	Tree	0.008	27.74	
Akonkonman (F)	leaves	AMT 412	Anacardiaceae	<i>Spondias mombin</i> L.	women's health, childcare	dry	Tree	0.054	3.90	
Alotrohe (F)	whole plant	DQ 142	Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	women's health	dry	Herb	0.054	3.90	
Housouma (F)	leaves	AMT 203	Malvaceae	<i>Sterculia setigera</i> Delile	childcare	fresh	Tree	0.054	4.11	
Adikoun, Tchakpa (F)	roots	DQ 215	Apocynaceae	<i>Strophanthus hispidus</i> DC.	women's health	dry	Shrub	0.004	216.48	
Acodigoue (G)	whole plant	AMT 385	Compositae	<i>Struthium sparganophorum</i> (L.) Kuntze	malaria	dry	Herb	0.054	3.90	
Aduma, aminglon (F)	whole plant	DQ 373	Leguminosae	<i>Stylosanthes erecta</i> P.Beauv.	childcare, ritual	dry	Herb	0.054	4.11	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
Kpatado (F)	leaves	DQ 133	Sapotaceae	<i>Synsepalum dulcificum</i> (Schumacher, & Thonn.) Daniell		dry	Tree	0.012	17.57	EN ⁴
Atinken, atikenbodota (F)	fruits	AMT 116	Myrtaceae	<i>Syzygium aromaticum</i> (L.) Merr. & L.M. Perry	ritual, women's health	dry	Tree	sold per kg	0.59	
Mlanmi (G)	whole plant	AMT 431	Myrtaceae	<i>Syzygium guineense</i> (Willd.) DC.	childeare/CBD	dry	Tree	0.054	3.90	
Ndimno (Na)	roots	DQ 813	Combretaceae	<i>Terminalia avicennioides</i> Guill. & Perr.		dry	Tree	0.113	7.47	
Lenja, kpata do (F)	fruits	DQ 116	Leguminosae	<i>Tetrapleura tetraptera</i> Taub	insomnia	dry	Tree	0.026	23.04	VU ⁴
Azoma (F)	whole plant	DQ 175	Euphorbiaceae	<i>Tragia senegalensis</i> Mull. Arg.	ritual	dry	Herb	0.054	3.90	
Akokpla (F)	leaves	DQ 96	Aizoaceae	<i>Trianthema portulacastrum</i> L.	ritual	dry	Herb	0.054	3.90	
Gando (F)	whole plant	DQ 121	Zygophyllaceae	<i>Tribulus terrestris</i> L.	STDs/ritual, childeare	dry	Herb	0.054	3.90	
Blé (Fr)	seeds		Poaceae	<i>Triticum</i> sp.	ritual	dry	Herb	sold per kg	4.53	
Adorokpo (F)	roots	DQ 542	Meliaceae	<i>Turraea heterophylla</i> Sm.	aphrodisiac	dry	Shrub	0.108	35.95	EN ⁴
Tegbeusu (F)	leaves	DQ 147	Apocynaceae	<i>Tylophora cameroonica</i> N.E.Br.	ritual	fresh	Liana	0.021	10.04	NT ⁵
Asima, asinsinman (F)	whole plant	DQ 126	Leguminosae	<i>Uraria picta</i> (Jacq.) DC.	ritual, childeare	dry	Herb	0.015	14.05	
Kenkemiba (F)	seeds	DQ 803	Leguminosae	<i>Uraria picta</i> (Jacq.) DC.	skin diseases	dry	Herb	0.016	12.83	
Erunjuit (Y)	roots	DQ 277	Annonaceae	<i>Uvaria chamae</i> P.Beauv.	ritual/childeare malaria, aphrodisiac	dry	Shrub	0.018	12.33	
Agbodé (F)	whole plant		Rutaceae	<i>Vepris verdoorniana</i> (Exell & Mendonça) Mziray	malaria	dry	Shrub	0.054	3.90	
Dannaliguedyo (F)	roots	AMT 232	Compositae	<i>Lernmontia adoensis</i> Sch.Bip. ex Walp.	diabetes	dry	Herb	0.113	7.66	
Wugo (F)	whole plant		Sapotaceae	<i>Viellaria paradoxa</i> C.F. Gaertn.	ritual	dry	Tree	0.054	3.90	VU ^{4, 5}
Fagoto, wugo (F)	bark	DQ466	Sapotaceae	<i>Viellaria paradoxa</i> C.F. Gaertn.	malaria, respiratory diseases, childeare/ritual, gastric disorders	dry	Tree	0.241	1.84	VU ^{4, 5}
Fonkpa (F)	bark	AMT 160	Lamiaceae	<i>Vitex doniana</i> Sweet	respiratory	dry	Tree	0.021	22.81	
Avidido (G)	whole plant	AMT 423	Malvaceae	<i>Waltheria indica</i> L.	diseases, women's health, childeare	fresh	Herb	0.112	1.88	
Abibey (Ad)	whole plant	AMT 364	Convolvulaceae	<i>Xenostegia tridentata</i> (L.)	childeare,	fresh	Herb	0.054	1.41	

Vernacular name (language) ¹	Plant part sold	Voucher number	Family ²	Genus and species	Use ³	Stage	Habit	Average weight per sales unit (kg)	Price per kg (US\$)	Threat status
D.F.Austin & Staples										
Kpecherekuru (F), Eru (Y)	fruits	DQ 233	Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	women's health	dry	Tree	0.009	64.24	VU ⁴
Kpecherekugoto (F)	bark	DQ 497	Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	haemorrhoids	dry	Tree	0.037	12.95	VU ⁴
Xetin (F)	wood		Rutaceae	<i>Zanthoxylum zanthoxiloides</i> (Lam.) Zepern. & Timler	ritual	dry	Tree	0.1622	1.92	EN ⁴
Xe, Xema (F)	leaves		Rutaceae	<i>Zanthoxylum zanthoxiloides</i> (Lam.) Zepern. & Timler	ritual	dry	Tree	0.31	0.17	VU ⁴
Xedo, axedo (F)	roots	DQ 492	Rutaceae	<i>Zanthoxylum zanthoxiloides</i> (Lam.) Zepern. & Timler	aphrodisiac	dry	Tree	0.037	6.00	VU ⁴
Tétrégougou (F)	roots	DQ 332	Zingiberaceae	<i>Zingiber officinale</i> Roscoe	aphrodisiac	dry	Herb	0.113	7.66	
Gbedjeku, akunini (F)	seeds	DQ 252			ritual, childcare	dry	Unknown	0.009	10.00	
Ahansou, hamsodo (F)	roots	AMT 524			women's health	dry	Unknown	0.113	5.26	

¹ Fon (F), G (Goun), Y (Yoruba), Ai (Aizo), Fr (French), Ad (Adja), Id (Idatchá), De (Dendi), Na (Nago) ² Botanical binomials follow The Plant List (www.theplantlist.org).

³ The dash symbol indicates diseases that can be placed in two categories. CBD indicates Culturally-bound diseases ⁴ Adomou et al. 2011 5 IUCN Red list (<http://www.iucnredlist.org/>) Identification on the basis of wood anatomical analysis ⁱⁱ Identification on the basis of DNA analysis



Chapter Three

Evidence of a link between taboos and sacrifices and resource scarcity of ritual plants^{*}

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ABSTRACT

One of the main obstacles for the mainstreaming of religious traditions as tools for the conservation of nature is the limited applicability of research results in this field. We documented two different restrictions implemented by local people (taboos and sacrifices) related to the use of ritual plants in Benin (West Africa) and Gabon (Central Africa). To see whether these restrictions reflected plant scarcity from an etic perspective (official threat status) and an emic viewpoint (perceived scarcity by local people), we conducted 102 interviews with traditional healers and adepts of traditional faiths. We documented a total of 618 ritual plants, from which 52 species were used in both countries. In Benin, the use of 63 of the 414 ritual plant species was restricted; while in Gabon 23 of the 256 ritual plants were associated with taboos and sacrifices. In Benin, restricted plants were significantly more often officially threatened, perceived as scarce, and actively protected than non-restricted plants. In the more forested and less densely populated Gabon, plants that were perceived as scarce were more often associated to local restrictions than officially threatened species. These results prove the presence of a form of adaptive management where restrictions are related to resource scarcity and protection of ritual plant species. By providing baseline data on possibly endangered species, we demonstrate how plant use in the context of religious traditions can yield important information for conservation planning.

Keywords: Africa; Benin; Bwiti; Ethnobotany; Gabon; IUCN Red List; plant conservation; threatened species; Vodoun

^{*} Published in a slight modified form in the Journal of Ethnobiology and Ethnomedicine, 2015, 11: 5, DOI: 0.1186/1746-4269-11-5

INTRODUCTION

One of the main obstacles in the mainstreaming of practices associated with religious traditions as tools for the conservation of biodiversity is the insufficient applicability of research results in this field. Over the last two decades, a considerable body of evidence linking religious traditions to nature conservation has been produced in academia (Berkes, 2001; Dudley et al., 2008; Kideghesho, 2009; Sasaki et al., 2010; Verschuuren et al., 2010; Ormsby, 2013). However, at the policy level, the integration of these data into conservation planning and implementation remains rather limited, like for example, the almost exclusive attention that sacred natural sites have received as de-facto protected areas. Although this is a laudable achievement, cultural values (which include religious traditions) encompass a wider range of social mechanisms that pose an untapped potential in conservation (Cocks et al., 2012), as they are a form of adaptive management of natural resources based on traditional ecological knowledge (Berkes et al., 2000). Our work is concerned with practices related to religious traditions that regulate the use of ritual plants, namely, taboos and sacrifices.

Following Evans-Pritchard (1954), we consider sacrifices as a symbolic payment prior to the use of a certain plant. These have received relatively little attention in circles other than archaeology and social anthropology. Taboos, which we define according to Meyer-Rochow (2009) as the prohibition to interact with a plant, are, on the other hand, a topic of interest in several disciplines. In fact, there is a long-standing dissension about their necessity and origin in human societies. Taboos have been found to exist as a means of avoidance of potential health hazards (Begossi et al., 2004; Henrich and Henrich, 2010; Meyer-Rochow, 2009; Ogbeide, 1974), or associated with signs of spiritual purity (Douglas, 1968). They have also been viewed as mechanisms for the partitioning of resources, either with the purpose of monopolizing (Whitehead, 2000) or conserving them (Barre et al., 2009; Begossi, 1992; Colding and Folke, 1997; Meyer-Rochow, 2009). While these views might support or refute one another, the discussion has predominantly revolved around food taboos and, particularly, the consumption of wild-caught fish and birds or bush meat (Colding, 1998; Ogbeide, 1974; Whitaker, 2005). Moreover, only a few of these studies are supported by quantitative analysis based on interviews with local informants (Begossi et al., 2004).

We focused on adepts of different traditional faiths and traditional health practitioners (henceforth healers) in Benin (West Africa) and Gabon (Central Africa) in order to identify ritual plant species. Our work consisted in documenting taboos and sacrifices associated with the use of plant species in the context of the traditional religious practices of the two countries. Hereinafter, we use the term restrictions to refer to taboos and sacrifices. Our objective was to see whether these restrictions reflected plant scarcity from an etic perspective (official threat status, e.g. IUCN Red List) and an emic viewpoint (perceived scarcity by local people). We expected that the number of officially threatened species would be higher among species associated with taboos or sacrifices (restricted plant species, hereafter) than among those species that were not associated with taboos or sacrifices (non-restricted species, henceforth). Likewise, we expected the proportion of plants perceived as scarce by our informants to be higher among the restricted plants.

Another theoretical assumption relevant for our study stemmed from previous work on ecological niche theory and (food) taboos by Rea (1981) and Begossi (2004). These authors departed from an application of the Hutchinsonian niche theory proposed by Hardesty (1975). In human ecology, the niche is elucidated by the amount of variety present and the number of resources used for subsistence by human populations. Rea and Begossi posited that “taboos are a luxury” and that people whose niche comprises a high availability of resources implement them. Following this assumption, we would expect to find a larger number of restricted plant species in Gabon, a country with extensive forest cover and low population density, than in the densely populated Benin which has lost the majority of its forest cover in the last two decades (FAO, 2010).

METHODS

Fieldwork was carried out in central and southern Benin (Figure 3.1) and in different sites throughout Gabon (Figure 3.2). A detailed description of the vegetation zones indicated in these figures is provided, for Benin by Adomou (2005), and for Gabon by Caballe (1978). We focused on healers and adepts of traditional faiths who collected plants themselves. Both healers and adepts engage in plant use either by administering or receiving herbal treatments and participating in ceremonies that involve the use of plants. Sampling was done by chain referral (Penrod et al., 2003), a method we chose for two reasons: (1) the lack of an accessible frame (e.g. a directory of healers and adepts), which did not allow us to draw a random sample, and (2) the expected difficulty in obtaining information from two target groups who are known to cautiously guard their trade secrets (Obama-Ondo, 2002). In Benin, our sample consisted of 50 informants (39 males and 11 females, 35 healers and 15 adepts) representing 9 linguistic groups and 19 traditional faiths. In Gabon, we interviewed 52 informants (30 males and 22 females, 38 healers and 14 adepts), covering 16 linguistic groups and 14 traditional faiths. Power analysis of sample size was estimated with a 90% interval using nQuery Advisor version 7.0. A value of $p < 0.05$ was considered statistically significant.

We conducted face-to-face, semi-structured questionnaires and asked our informants to indicate ritual plant species. For each species, we documented whether its harvest or use was associated with a taboo or merited a sacrifice or payment in kind. We only considered plant species which prohibition was related to ritual mandates and excluded plants with restrictions related to kinship, gender, or illnesses. We also asked our informants to list plants that they perceived as scarce. We then accompanied them to the places where they collected the plants mentioned during the interview in order to make herbarium specimens. Likewise, we documented plants that were actively protected by local people, that is, plants that had been removed from the wild and were cultivated by our informants in home gardens or sacred forests, as well as plants which growth was promoted in the wild. Domesticated species (e.g. maize and cassava) with a restriction status were not considered as actively protected. Plants were collected following standard botanical methods (Forman and Bridson, 1989). Vouchers were deposited and identified at the national herbaria of the countries where they were collected (BEN and LBV) and the Wageningen branch of the National Herbarium of the Netherlands (WAG), now part of Naturalis Biodiversity Center (L). Scientific plant names

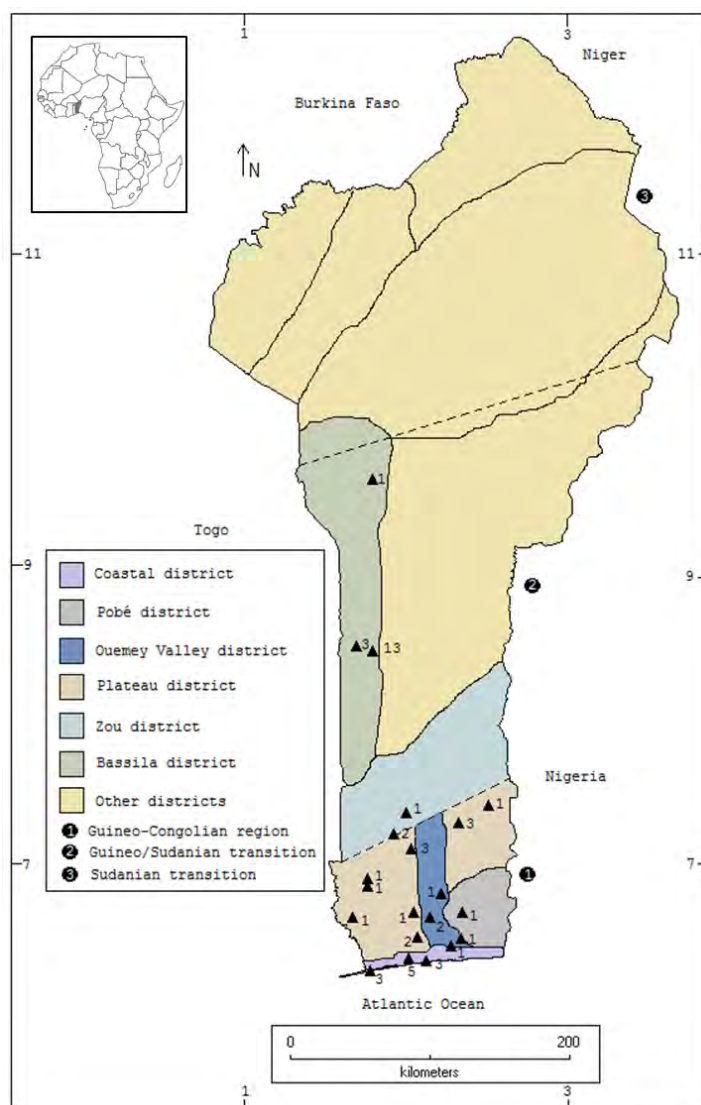


FIGURE 3.1. Map of Benin displaying the different phytogeographical districts and vegetation zones based on plant species composition. Adapted from Adomou (2005). Triangles indicate surveyed locations. Numbers indicate informants per location.

were checked against their latest nomenclature status following The Plant List (<http://www.theplantlist.org>).

Data on habitat and distribution ranges for wild species were obtained from the PROTA database (<http://www.prota4u.org>) and the Flore du Gabon (Sosef et al, 2009--; Various Editors, 1968-2008) and the Flore analytique du Bénin (Akoegninou et al., 2006). Using IBM SPSS 20, we

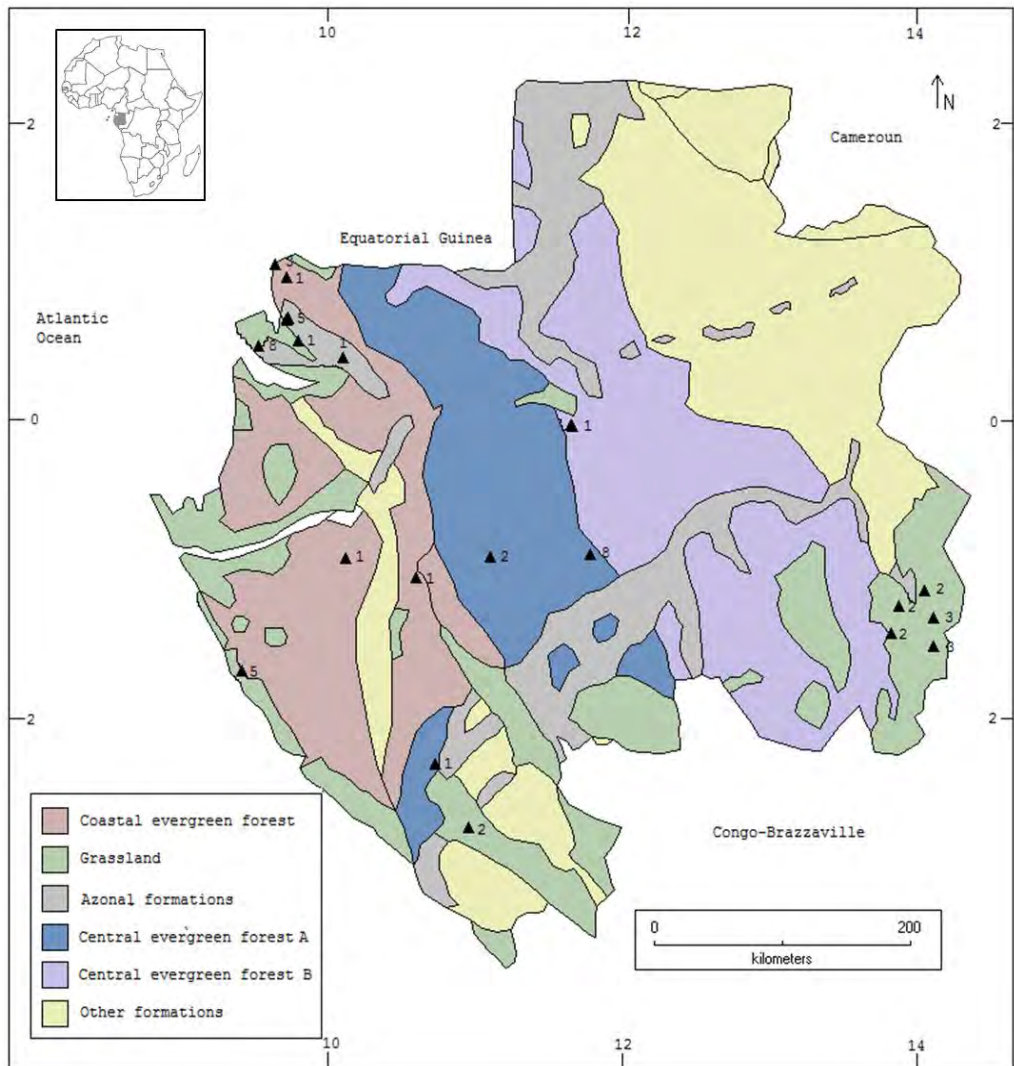


FIGURE 3.2. Map of Gabon displaying the different vegetation zones. Adapted from Caballe (1974). Triangles indicate surveyed locations. Numbers indicate informants per location.

RESULTS

Types of taboos and sacrifices

We documented 414 plant species used for ritual purposes in Benin and 256 in Gabon. Fifty-two species were used in both countries, thus in total 618 different plant species were used. In Table 3.5, all species are listed with their scientific and vernacular names, part used, and a brief description of their uses. The two countries differed in the way in which restrictions were transmitted. In Benin, the spiritual father or mother, that is, the person who guides the ceremony in which an adept is initiated, gives these to adepts. In the case of Fâ oracle priests, it is the interpretation of the oracle signs that are drawn during the initiation that determine what plants (and animals) are to be avoided by initiates (including the type of restriction and the plant part to be avoided). In Gabon, on the other hand, restrictions may come in manner of a vision experienced by adepts under the hallucinogenic effects of the iboga plant (*Tabernanthe iboga*) during initiation ceremonies.

TABLE 3.1. Different types of restrictions for ritual plant use in the two African countries, ranked according to frequency of citations and number of species involved.

Type of restriction	Benin		Gabon	
	Frequency	Nr of species	Frequency	Nr of species
Felling/ cutting	19	12	13	3
Burning wood	13	8	0	0
Not to be used as medicine	13	8	0	0
Unspecified	13	8	0	0
Offer money/wine	9	6	22	5
Food taboo	8	5	30	7
Sacrifice livestock	8	5	0	0
Forbidden in herbal bath	6	4	0	0
Sacrifice wildlife	5	3	0	0
Touching	0	0	22	5
Collect fruits forbidden	0	0	9	2
Other	6	4	4	1

We found contrasting differences in the degree of severity of restrictions related to ritual plant use in the two countries (Table 3.1). In Benin, the harvest of certain plant species involved intricate procedures. For example, the harvest of the cat's-tail grass (*Sporobolus pyramidalis*) was limited to plants found at a crossroad and required the sacrifice of a ram. In Gabon, restrictions were notably milder and mostly limited the physical contact with plant species. Remarkably, in Gabon, collecting the fruits of the pink magic (*Massularia acuminata*) and the ofumu (*Maranthes chrysophylla*) was a taboo for any adept whose parents were still alive. We did not encounter this type of restriction related to living parents in Benin. Individual food taboos were present in both countries, especially with regard to cultivated crops. In Gabon, the leaves of taro (*Colocasia esculenta*) and manioc (*Manihot esculenta*), and pineapple fruits (*Ananas comosus*) were forbidden food items for Bwiti adepts. In Benin, cowpea (*Vigna unguiculata*), sorghum (*Sorghum bicolor*), the fruits of the African custard-apple (*Annona senegalensis*), the horned melon (*Cucumis metuliferus*), and the African oil palm (*Elaeis guineensis*) were food taboos for Fâ oracle initiates whose initiation signs were

governed by these species. Furthermore, in Benin some adepts mentioned not being allowed to specify the type of restriction, although they did provide the name of the plant species in question. These restrictions are included in Table 3.1 under unspecified. Moreover, restrictions that were only mentioned once were classified as other and include: cultivation (of maize, *Zea mays*), harvest, urination (on species such as *Mallotus oppositifolius*) and whipping (with the twigs of *Grewia carpinifolia*).

Benin

We documented 414 plant species used in the context of religious traditions in Benin, of which 63 (15%) were restricted and 351 (85%) were not. Restricted plants were two and a half times as often officially threatened (19%) than non-restricted plants (7%) ($\chi^2 = 10.03$, $df = 1$, $P < 0.002$). Remarkably, variations between restricted plant species did not reflect affiliation to a specific traditional faith but seemed to be related more to the geographical location of our informants. For instance, adepts of Heviosso or Shango (the god of thunder) living in the Central part of the country had prohibitions on species such as the heart-fruit (*Hymenocardia acida*) and the groundnut tree (*Ricinodenron heudelottii*). In contrast, their counterparts of the same traditional faith in the South of Benin mentioned restrictions on species such as the African border tree (*Newbouldia laevis*), the Senegal prickly-ash (*Zanthoxylum zanthoxyloides*), and the yellow mombin (*Spondias mombin*). Incidentally, these restrictions also applied to adepts of other faiths in south Benin. The kapok (*Ceiba pentandra*) and the iroko tree (*Milicia excelsa*), however, were restricted species shared by all groups and in all regions. Table 3.2 shows the most salient restricted species in Benin.

Perceived scarcity, on the other hand, showed little variation between informants in southern and central Benin. Restricted plants were twice as often perceived as scarce (29%) than non-restricted ones (12%) ($\chi^2 = 11.88$, $df = 1$, $P < 0.001$) (Table 3.2 and Table 3.5). Plants such as the yellow plum (*Ximenia americana*), the wild banana (*Ensete livingstonianum*), and the poison arrow wood (*Strophanthus hispidus*), however, showed a perceived scarcity limited to a single location in central Benin. People most often attributed the disappearance of plant species to urban and agricultural development (92% of informants), but also to the export-oriented exploitation of timber species (8%).

Gabon

We recorded 256 plant species used for religious traditions, of which 23 (9%) were restricted species and 233 (91%) were not. Compared to our results in Benin, restrictions in Gabon appeared to follow neither a geographical nor a faith-related pattern. Rather, they included large forest trees and a few cultivated crops. Restricted plant species were more often perceived as scarce (12%) than non-restricted ones (7%) ($\chi^2 = 19.47$, $df = 1$, $P < 0.001$). The majority of informants (87%) identified timber exploitation as the main cause for the scarcity of plants. Accordingly, the most frequently mentioned plants in this category corresponded to important species in the international timber trade (Table 3.3 and Table 3.5). Fewer informants (13%) attributed rareness to the seasonal

TABLE 3.2. Restricted and threatened plants in Benin ranked according to their citation frequency.

Restricted species	Citation frequency (% of informants)	Official threat status	Perceived scarcity (% of informants)	Habitat	Habit	Distribution
Kapok tree (<i>Ceiba pentandra</i>)	20		23	Primary forest to settlements	Large tree	Pantropical
African border tree (<i>Newbouldia laevis</i>)	18		0	Secondary forest to settlements	Small tree	Pantropical
Senegal prickly-ash (<i>Zanthoxylum zanthoxyloides</i>)	16	VU ^b	46	Savannah and dry forest	Small tree	West Africa
Iroko tree ^a (<i>Milicia excelsa</i>)	14	EN ^b / VU ^c	15	Primary to secondary deciduous forest	Large tree	West, Central, and East Africa
Heart-fruit (<i>Hymenocardia acida</i>)	12		0	Savannah to deciduous woodland	Shrub	Tropical Africa
Cowpea (<i>Vigna unguiculata</i>)	12		0	Cultivated fields, settlements	Vine	Pantropical
Yellow mombin (<i>Spondias mombin</i>)	10		0	Secondary deciduous forest	Medium-sized tree	Pantropical
Groundnut tree (<i>Ricinodendron heudelotii</i>)	10		0	Secondary humid forest to fallows	Medium-sized tree	West, Central and East Africa
Nicker tree (<i>Caesalpinia bonduc</i>)	0	EW ^b	53	Disturbed sites	Shrub	Pantropical
African locust tree (<i>Parkia biglobosa</i>)	0		46	Savannah to cultivated fields	Small tree	West and Central Africa
Wild banana (<i>Ensete livingstonianum</i>)	0	CR ^b	30	Savannah	Large herb	West Africa
Yellow plum (<i>Ximenia americana</i>)	0		30	Savannah to dry forests	Small tree	Pantropical

^aImportant timber species (Blackett and Gardette, 2008). ^bLocally threatened (Adomou et al., 2011). ^cGlobally threatened (<http://www.iucnredlist.org>). EN = Engangered, VU = Vulnerable, CR = Critically endangered, EW = Extinct in the wild.

availability of plants such as herbs that were difficult to find during the dry season. Finally, restricted plant species were slightly more often officially threatened (9%) than non-restricted plants (6%), but this difference was not significant.

Emic explanations for taboos and sacrifices

When asked, our informants' most common explanation to the existence of taboos and sacrifices in Benin (34% of interviewees) was that these were created in order to keep the union, peace, or happiness of the individual, the family, and the community. In Gabon, respondents most often indicated (60%) that restrictions were practices that had permitted ancestors to exist in equilibrium with their entourage, and as such, they should be kept in order to assure the survival of present generations. In Benin, that response was only second in importance (27%). Another common interpretation was that restrictions were a means to avoid disease (23% of informants in Benin and 32% in Gabon), followed by the belief that restrictions existed because "it is the spirits' will [that

TABLE 3.3. Restricted and threatened plants in Gabon ranked according to their citation frequency.

Restricted species	Citation frequency (% of informants)	Official threat status	Perceived scarcity (% of informants)	Habitat	Habit	Distribution
Kevazingo ^a (<i>Guibourtia tessmannii</i>)	33		42	Primary evergreen forest	Large tree	Cameroon, Equatorial Guinea, Gabon
Moabi ^a (<i>Baillonella toxisperma</i>)	26	VU ^b	28	Primary rain forest	Large tree	Nigeria to Gabon (and DR Congo)
Red anzem (<i>Copaifera religiosa</i>)	26		23	Primary lowland rain forest	Large tree	Cameroon to DR Congo
Kapok tree (<i>Ceiba pentandra</i>)	20		15	Primary forest to settlements	Large tree	Pantropical
Pink magic (<i>Massularia acuminata</i>)	20		15	Primary forest to settlements	Shrub	West and Central Africa
Ofumu (<i>Maranthes chrysophylla</i>)	13		0	Primary to secondary forest	Large tree	West and Central Africa
Spider tresses (<i>Strophanthus gratus</i>)	13		7	Primary moist forest	Liana	West and Central Africa
Horseradish tree (<i>Drypetes gossweileri</i>)	6		7	Primary to secondary semi-deciduous forest	Medium-sized tree	Central Africa
Bitter kola (<i>Garcinia kola</i>)	0	VU ^b	15	Primary to secondary evergreen forest	Medium-sized tree	West and Central Africa
Ordeal tree (<i>Erythrophleum ivorense</i>)	0		15	Primary to secondary evergreen forest	Large tree	West and Central Africa
African padauk ^a (<i>Pterocarpus soyauxii</i>)	0		15	Primary to secondary evergreen forest	Large tree	Nigeria to Angola

^aImportant timber species (Eba'a-Atyi, 2009; Precious Woods, 2013). ^bGlobally threatened (<http://www.iucnredlist.org>). VU = Vulnerable

there are taboos]" (11% in Benin). Only a few informants (6% in Benin and 8% in Gabon) indicated not knowing why restrictions existed.

We also asked our respondents to explain what the consequences of not respecting such restrictions would be. The most prevalent response was "illness and eventual death" (42% in Benin, and 69% in Gabon). In Benin, another common response was that breaking taboos would bring misfortune to the entire family (25%). In both countries, informants indicated madness to be a punishment for sinners (7% in Benin and 21% in Gabon). The loss of spiritual power, the detriment of the tradition, and the dissolution of the family were also regarded as possible consequences of disobeying restrictions. Last, in response to our question "what can one do in order to be forgiven for breaking a taboo?" all respondents agreed that ritual ceremonies were necessary in order to be forgiven by the spirits or ancestors (including the sacrifice of livestock, usually a chicken or a goat).

Active protection of restricted vs. non-restricted plant species

We encountered different ways in which people actively protected wild plant species used for ritual purposes. In Benin, it was common to find full grown trees of species such as the baobab (*Adansonia digitata*), the iroko (*M. excelsa*), and the kapok (*C. pentandra*) in forests patches (or even roadsides) wrapped with a white cloth tied at breast height. The cloth, usually covered with a stain of oil palm mixed with maize flour (which are common ingredients in rituals), was an indication that the tree was a sacred one (i.e. a dwelling place for spirits) and therefore should be spared from felling. Often, adepts and healers would carefully uproot plants from their wild surroundings to tend them at home gardens or sacred forests. Also plants' growth would be promoted in the wild by weeding around them or by pruning neighbouring trees to secure that these plants would have better access to water and light. When asked, informants indicated that growing plants that were perceived as scarce, such as the wild banana (*E. livingstonianum*) and the poison arrow wood (*S. hispidus*) at home was the only way to secure their survival. In Benin, roughly, 50% of all restricted species were actively protected, and we found a significant relation between these two (Table 3.4). In contrast, far fewer restricted plants were protected in Gabon, where only 13% of the total were taken from the wild to be planted in home gardens (notably, iboga *T. iboga*) or spared from felling (particularly *Baillonella toxisperma* and *Copaifera religiosa*). Nonetheless, this percentage was not significantly different from that of non-restricted plants.

TABLE 3.4. Restricted, non-restricted, and actively protected plants compared.

	Restriction	Actively protected Nr. of species (% of total)		Total	χ^2	P
		Yes	No			
Benin	Yes	22 (5)	41 (10)	63	7.255	0.007
	No	69 (17)	282 (68)	351		
Gabon	Yes	3 (1)	20 (8)	23	0.400	0.527
	No	21 (10)	212 (91)	233		

DISCUSSION

Our results showed that restricted plant species are significantly more often officially threatened, perceived as scarce, and actively protected by adepts and healers in Benin than non-restricted plants. These findings support earlier studies that suggested taboos as social institutions for resource conservation (Colding and Folke, 2001; Colding et al., 2003; McDonald, 1977; Monson and Cox, 2007). At the same time, however, our findings contend with previous evidence that taboos occur only amongst populations with high availability and choice of resources (Begossi et al., 2004; Rea, 1981). We encountered three times as many restricted plants in Benin, the least species-rich, and least forested, and most densely populated of the two countries of study. On the other hand, food taboos were far more common in Gabon than in Benin. These results are consistent with the taboo-as-a-luxury premise in the case of food taboos. Therefore, this combination of findings calls for

further scrutiny of Hardesty's niche concept in human ecology, especially with respect to the insufficiency of its theoretical framework (Howard-Kirkby, 1978).

While there is no indication of a link between restricted species and officially threatened ones, and actively protected plants in Gabon, restricted and perceivedly scarce plants did show a significant relation. This finding becomes particularly relevant when looking at species such as kevazingo (*Guibourtia tessmannii*) and the red anzem (*C. religiosa*). Both were perceived as scarce by our informants, have a narrow distribution (<http://www.prota4u.org>), and are exploited for timber, but their threat status has not yet been officially evaluated (<http://www.iucnredlist.org>). Lykke (1998) considered that consensus in response to structured questions among people with different backgrounds is a good indication that a true process is described. In our study, her claim is exemplified by the types of restrictions found in Benin that reflected a geographical pattern (and not a faith-based one), and in both countries by the congruency between the restrictions associated with plants and their perceived scarcity. Considering these two trends in our results, we can state that local people could be a potentially reliable source of information on endangered species. Moreover, these results encourage us to support the emphasis other authors have made on the little attention plants receive when it comes to the Red List (Schatz, 2009).

Finally, one might ask: to what extent do restrictions such as taboos and ritual sacrifices contribute to the conservation of plant species. While we found that there is a relation between restricted and actively protected species in Benin, we lack the evidence to ascertain that restrictions will ultimately result in the sustainable use of ritual plants. Taboos or sacrifices do not seem to apply to commercial loggers. In spite of being one of the most sacred trees in Benin, the iroko (*M. excelsa*) is still largely exploited as timber product (Daïnou et al., 2012). The same applies to the ritually important okume (*Aucoumea klaineana*) in Gabon. The belief in the ritual power of plants, apart from posing a potential, can also be an obstacle to their conservation. Because of the supernatural powers that are often attributed to them, the harvesting of such plants for commercial purposes is a profitable activity. Hundreds of ritual plants are traded on medicinal plant markets in West Africa (Jusu and Cuni-Sanchez, 2013; Quiroz et al., 2014; van Andel et al., 2012) and Gabon (Towns et al, 2014). Although restricted plants are often protected, their products are still sold and purchased by adepts. As we have no evidence of the intent of all actors (Alvard, 1998; Begossi et al., 2014), we do not know the ultimate effect of protection and commercial harvesting for ritual purposes on these plants' survival. Therefore, studies on ritual plant use should focus not only on potentials but also on constraints for conservation.

CONCLUSION

This study set out with the aim of providing evidence-based data about the role of religious traditions in nature conservation. We are certain that it will be especially valuable in informing conservation planning by proposing a simple methodological approach to obtain baseline data on endangered plant species. In this study, we were able to confirm the relationship between restrictions on plant use and the intent to conserve these plant species. It also substantiated the premise that ritual restrictions reflect plant scarcity. The large number of restricted plants and the

intentions of local people to cultivate or to protect ritual species in Benin suggests a form of adaptive management where restrictions related to ritual plant use are more prevalent in degraded landscapes. In species-rich and heavily forested Gabon, lower numbers of restricted species and fewer signs of the active protection of plants by informants reflected a greater availability of plants. Still, restricted species were also more often perceived as scarce, especially primary rainforest trees subject to commercial timber exploitation. Finally, our results contribute to the discussion on the purpose of taboos by demonstrating that in the case of non-food taboos, restrictions on plant use do not necessarily occur among people with high availability of resources.

TABLE 3.5. Complete list of ritual plants in Benin and Gabon including restriction, threat, active protection, and domestication status, as well as perceived scarcity.

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Gabon	Munyaenyogi (Ma)	Leaves, seeds	Leguminosae	<i>Abus precatorius</i> L.	Protection against evil spirits.	0	0	0	0	0
Benin	Vivina (F), Buchenche (T)	Leaves, seeds	Leguminosae	<i>Abus precatorius</i> L.	Protection against evil spirits, purification baths.	0	0	0	0	0
Benin	Gnokpekpe (T)	Roots	Malvaceae	<i>Abutilon mauritanum</i> (Jacq.) Medik.	Used in the treatment of rashes in the feet caused by a Sakpata spell.	0	0	0	0	0
Benin	Booni (Y)	Fruits	Leguminosae	<i>Acacia nilotica</i> (L.) Delile	Several medico-spiritual uses.	0	0	0	0	0
Benin	Danmalia (F)	Whole plant	Leguminosae	<i>Acacia erythracalyx</i> Brenan	Unspecified ritual use.	1	0	0	0	0
Benin	Denwi (F)	Whole plant	Leguminosae	<i>Acacia polyacantha</i> Willd.	Unspecified ritual use.	1	0	0	0	0
Benin	Vivi (F)	Whole plant	Euphorbiaceae	<i>Acalypha ciliata</i> Forssk.	Purification baths.	0	0	0	0	0
Gabon	Igondjo (E)	Whole plant	Euphorbiaceae	<i>Acalypha hispida</i> Burm.f.	Protection against evil spirits.	0	0	0	0	1
Benin	Poisong-arrow wood (En)	Whole plant	Compositae	<i>Acanthospermum hispidum</i> DC.	Love-bringing baths.	0	0	0	0	0
Gabon	Odjamngan ovoel (Fa)	Whole plant	Acanthaceae	<i>Acanthus latiseptalus</i> C.B.Clarke	Charm to make people disappear.	0	1	0	0	0
Gabon	Mabangnebeli (Ma)	Whole plant	Acanthaceae	<i>Acanthus montanus</i> (Nees) T.Anderson	Several medico-spiritual uses.	0	0	0	0	0
Benin	Mountain Thistle (En)	Whole plant	Acanthaceae	<i>Acanthus montanus</i> (Nees) T.Anderson	As amulet to attract wealth.	0	1	0	1	0
Gabon	Ngalisi (Fa)	Whole plant	Compositae	<i>Acemella caulhriza</i> Delile	Plant rubbed on the bodies of people believed to be vampires.	0	0	0	0	0
Benin	Welekekpe (F)	Whole plant	Compositae	<i>Acemella caulhriza</i> Delile	Protection against STDs believed to be caused by bewitchment.	0	0	0	0	0
Benin	Awlekekpe (F)	Whole plant	Compositae	<i>Acemella uliginosa</i> (Sw.) Cass.	Used in baths to attract love	1	0	0	0	0
Benin	Gbanguna (F)	Roots	Malpighiaceae	<i>Acridocarpus smeathmanii</i> (DC.) Guill. & Perr.	Restricted species	1	1	1	0	0
Benin	Blotchon (F)	Whole plant	Pteridaceae	<i>Acrostichum aureum</i> L.	Plant goes in the preparation of luck soaps and perfumes	0	0	0	0	0
Benin	Baobab (En)	Whole plant	Malvaceae	<i>Adansonia digitata</i> L.	Sacred tree	1	0	1	0	0
Gabon	Mobulo (Ma)	Stems	Passifloraceae	<i>Adenia gracilis</i> Harms	Luck soaps and perfumes.	0	0	0	0	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Gabon	Mobulu (Bp)	Stems	Passifloraceae	<i>Adenia lobata</i> (Jacq.) Engl.	Protection against evil spirits and to exorcism.	0	0	0	0	0
Gabon	Tzama tzama (Fa), Potu (Nz)	Whole plant	Compositae	<i>Adenostemma viscosum</i> J.R.Forst. & G.Forst.	Charm to destroy marriages or unions. Luck-bringing baths.	0	0	0	0	0
Benin	Akwema (F)	Whole plant	Amaranthaceae	<i>Aerva lanata</i> (L.) Juss.	Baths to attract money.	0	0	0	0	0
Gabon	Nzoane (Fa)	Wood	Leguminosae	<i>Aeschynomene elaphroxylon</i> (Guill. & Perr.) Taub.	Ceremonial objects.	1	0	0	0	0
Gabon	Mungunu (Fa)	Leaves, seeds	Zingiberaceae	<i>Aframomum alboviolaceum</i> (Ridl.) K.Schum.	Seeds eaten in protection against evil spirits. Luck-bringing baths.	0	0	0	0	0
Gabon	Nzombe (Nz)	Leaves	Zingiberaceae	<i>Aframomum giganteum</i> (Oliv. & D.Harb.) K.Schum.	Luck-bringing baths.	0	0	0	0	0
Gabon	Ditundudimukue (Ma)	Seeds	Zingiberaceae	<i>Aframomum longipetiolatum</i> Koechlin	Eaten by people who want to seduce others with their words.	0	0	0	0	0
Benin	Atakwin (F)	Seeds	Zingiberaceae	<i>Aframomum melegueta</i> (Roscoe) K.Schum.	Eaten ceremonially or to enhance the effectiveness of medical treatments.	0	0	0	1	0
Gabon	Bdong bingon (Fa)	Seeds	Zingiberaceae	<i>Aframomum subsericeum</i> (Oliv. & D.Harb.) K.Schum.	Ceremonial stimulant	0	0	0	0	0
Gabon	Muyenbi (Ma)	Wood, seeds	Huaceae	<i>Afrotyrax kamerunensis</i> G.Perkins & Gilg	Cooked in a sauce eaten to exorcise evil spirits from possessed persons.	0	0	0	0	0
Gabon	L'ai indigène (Fr)	Wood, seeds	Huaceae	<i>Afrotyrax lepidophyllus</i> Mildbr.	Cooked in a sauce eaten to exorcise evil spirits from possessed persons.	0	1	0	0	0
Gabon	Ogeda (Mi)	Seeds	Leguminosae	<i>Azelia africana</i> Pers.	Ordeal poison.	0	1	1	0	0
Benin	Akpakpa (T)	Bark	Leguminosae	<i>Azelia africana</i> Pers.*	Used in baths to protect oneself from weapons.	1	1	1	0	0
Benin	Aniya (T)	Roots	Leguminosae	<i>Aganope stuhlmannii</i> (Taub.) Adema	Used in purification baths.	0	0	1	1	0
Benin	Zungan (F)	Leaves	Comaraceae	<i>Agelaea pentagyna</i> (Lam.) Bail.	Used in charms that protect people against sorcerers.	0	0	0	0	0
Benin	Wedegbema (Ad)	Whole plant	Compositae	<i>Ageratum conyzoides</i> L.	Used in baths in protection from Sakpata-related diseases.	0	0	0	0	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Gabon	Potou (Nz)	Whole plant	Compositae	<i>Ageratum conyzoides</i> L.	Baths to attain love and in protection against evil spirits	0	0	0	0	0
Benin	Koxwe (F)	Roots	Apocynaceae	<i>Alafia barkeri</i> Oliv.	Purification baths.	0	0	0	0	0
Benin	Ayole (F)	Roots	Leguminosae	<i>Albizia adianthifolia</i> (Schum.) W. Wight	Unspecified ritual use.	0	0	0	0	0
Benin	Aunre (Y)	Roots	Leguminosae	<i>Albizia ferruginea</i> (Guill. & Perr.) Benth.	Purification baths.	0	1	1	0	0
Gabon	Oignon de la brousse (F)	Whole plant	Asparagaceae	<i>Albuca sudanica</i> A.Chev.	Seen as a sign that the earth where the plant grows is adequate for cultivation.	0	0	0	0	0
Gabon	Alan (Fa)	Roots	Euphorbiaceae	<i>Alchornea floribunda</i> Müll.Arg.	Ceremonial stimulant.	0	0	0	0	0
Gabon	Nkabi (Fa)	Leaves	Euphorbiaceae	<i>Alchornea cordifolia</i> (Schumach. & Thonn.) Müll.Arg.	Several medico-spiritual uses.	0	0	0	0	0
Benin	Ayoma (F)	Whole plant	Amaryllidaceae	<i>Allium</i> sp.	Protection against evil spirits.	0	0	0	0	0
Benin	Gbadjedje (F)	Whole plant	Sapindaceae	<i>Allophylus spicatus</i> (Poir.) Radlk.	Spiritual purification.	0	0	0	0	0
Benin	Etira (T)	Whole plant	Asparagaceae	<i>Aloe tenuifolia</i> Lam.	Used in the treatment of wounds of mystical origin.	0	0	1	1	0
Gabon	Ofuga (Te)	Bark	Apocynaceae	<i>Alstonia boonei</i> De Wild.	Good luck.	0	0	0	0	0
Gabon	Ofuga (Te)	Wood	Apocynaceae	<i>Alstonia congensis</i> Engl.	Ceremonial objects.	0	0	0	0	0
Benin	Ajinje (Y)	Twigs	Amaranthaceae	<i>Alternanthera pungens</i> Kunth	Unspecified ritual use.	0	0	0	0	0
Gabon	Mutchiembengu (Lu)	Whole plant	Amaranthaceae	<i>Amaranthus blitum</i> subsp. <i>oleraceus</i> (L.)	Protection against bewitchment.	0	0	0	0	0
Benin	Tetekpukpa (T)	Whole plant	Amaranthaceae	<i>Amaranthus spinosus</i> L.	Said to be used by sorcerers in the preparation of spells. Problem-solving rituals.	0	0	1	0	0
Benin	Olonigo (Ad)	Flower	Araceae	<i>Amorphophallus baumannii</i> (Engl.) N.E.Br.	Protection against witchcraft.	0	0	0	0	0
Benin	Droma (F)	Roots	Vitaceae	<i>Ampelocissus africana</i> (Lour.) Merr.	Treatment of diseases said to be caused by bewitchment.	0	0	0	0	0
Benin	Tchokor ache (T)	Roots	Vitaceae	<i>Ampelocissus bombycina</i> (Baker) Planch.	Treatment of wounds of supernatural origin.	0	0	0	0	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Gabon	Ananas (Fr), Pineapple (En)	Fruit	Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Food taboo.	1	0	0	0	1
Gabon	Igname de brousse (Fr)	Roots	Araceae	<i>Anchomanes difformis</i> (Blume) Engl.	Treatment of bewitchment in children.	0	0	0	0	0
Benin	Inbore (T)	Seeds	Araceae	<i>Anchomanes dalzielii</i> N.E.Br.	Used in a ritual to increase the yield of food crops.	0	0	1	0	0
Benin	Fan (F)	Whole plant	Poaceae	<i>Andropogon gayanus</i> Kunth	Unspecified ritual use.	0	0	0	0	0
Benin	Mkumo agude (T)	Fruits	Commelinaceae	<i>Anellema lanceolatum</i> Benth.	Made into a pulitice to treat Sakpata-related diseases.	0	0	0	0	0
Gabon	Nkonkosi (Lu)	Stems	Commelinaceae	<i>Anellema beniniense</i> (P.Beauv.) Kunth	Treatment of headaches of supernatural origin.	0	0	0	0	0
Gabon	Kobdin (Fa)	Bark	Anisophylleaceae	<i>Anisophyllea purpurascens</i> Hutch. & Dalziel	Pigment used ritually.	0	0	0	0	0
Gabon	Moghey (Mi)	Wood	Amonaceae	<i>Amickia affinis</i> (Exell) Versteegh & Sosef	Ceremonial objects.	0	0	0	0	0
Gabon	La Mbamba bengue (Fr)	Bark	Amonaceae	<i>Amickia clorantha</i> (Oliv.) Setten & Maas	Good luck baths.	0	0	0	0	0
Benin	Ataigoto (F)	Bark	Amonaceae	<i>Amickia polycarpa</i> (DC.) Setten & Maas ex I.M.Turner	Purification baths.	0	0	0	0	0
Benin	Yovo niglo (F)	Leaves	Amonaceae	<i>Ammona muricata</i> L.	Medico-spiritual treatment against infections in children.	0	0	0	0	1
Benin	African apple tree (En)	Leaves, fruit	Amonaceae	<i>Ammona senegalensis</i> Pers.	Purification baths. Food taboo for some Fa oracle initiates.	1	0	0	0	0
Benin	Ani (T)	Whole plant	Combretaceae	<i>Anogeissus leiocarpa</i> (DC.) Guill. & Perr.	Restricted species	1	0	0	1	0
Benin	Nkouma agudo (T)	Whole plant	Melastomataceae	<i>Antherotoma irvingiana</i> (Hook.) Jacq.-Fél.	Unspecified ritual use.	0	0	0	0	0
Gabon	Adjimibi (Fa)	Bark	Gentianaceae	<i>Anthocleista nobilis</i> G.Don	Several medico-spiritual uses.	0	0	0	0	0
Benin	Cotoum (F)	Roots	Gentianaceae	<i>Anthocleista vogelii</i> Planch.	Purification baths.	0	0	0	0	0
Benin	Irakpo (T)	Roots	Gentianaceae	<i>Anthocleista liebrechtiana</i> De Wild. & T.Durand	Purification baths.	0	0	1	1	0
Benin	Oroto (Y)	Whole plant	Moraceae	<i>Antiaris toxicaria</i> Lesch.*	Planted in protection against evil spirits.	1	0	0	1	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Gabon	Onzakong (Fa)	Wood	Anacardiaceae	<i>Antrocaryon klaineana</i> Pierre*	Ceremonial objects.	0	0	0	0	0
Benin	Asankò (F)	Fruits	Anacardiaceae	<i>Antrocaryon micraster</i> A.Chev. & Guill.	Ceremonial object	0	1	0	0	0
Benin	Peanut (En), Azi (F)	Seeds	Leguminosae	<i>Arachis hypogaea</i> L.	Oil used for ceremonial offerings.	0	0	0	0	1
Benin	Debio (F)	Whole plant	Papaveraceae	<i>Argemone mexicana</i> L.	Protection against STDs believed to be caused by bewitchment.	0	0	0	0	0
Benin	Liane d'argent (Fr)	Whole plant	Convolvulaceae	<i>Argyria nervosa</i> (Burm. f.) Bojer	Baths to attract wealth and good luck.	0	0	0	0	0
Benin	Iwawogu (T)	Whole plant	Aristolochiaceae	<i>Aristolochia albidula</i> Duch.	Unspecified ritual use.	0	0	1	0	0
Benin	Blefutu (P)	Bark	Moraceae	<i>Artocarpus altilis</i> (Parkinson ex F.A.Zorn) Fosberg	Protective baths against witchcraft.	0	0	0	0	1
Gabon	Rougo (Ma)	Leaves	Asparagaceae	<i>Asparagus warneckei</i> (Engl.) Hutch.	Charm to make husbands return to their wives.	0	0	0	0	0
Gabon	Inkanba (Pu)	Whole plant	Asparagaceae	<i>Asparagus flagellaris</i> (Kunth) Baker	Plant used in protection against evil spirits.	0	0	0	0	0
Benin	Gnogno (T)	Leaves	Compositae	<i>Aspilia</i> sp.	Eaten by pregnant women in protection against miscarriage	0	0	0	0	0
Gabon	Tjame-tjame (Mk)	Whole plant	Aspleniaceae	<i>Asplenium africanum</i> Desv.	Protection against witchcraft and possession.	0	0	0	0	0
Gabon	Avoy (Fa)	Whole plant	Acanthaceae	<i>Aystasia gongelica</i> (L.) T.Anderson	Protection against spells.	0	0	0	0	0
Benin	Azema (F)	Whole plant	Acanthaceae	<i>Aystasia gongelica</i> (L.) T.Anderson	Drink and herbal bath in protection against sorcery.	0	0	0	0	0
Gabon	Okoumé	Bark, resine	Burseraceae	<i>Aucoumea klaineana</i> Pierre*	Protection against evil spirits, purification baths.	0	1	0	0	0
Benin	Neem (En)	Leaves	Meliaceae	<i>Azadirachta indica</i> A.Juss.	Restricted species	1	0	0	0	1
Gabon	Moabi (En), Adjab (Fa)	Bark	Sapotaceae	<i>Baillonella toxisperma</i> Pierre*	Initiation, purification, and protective baths.	1	1	1	1	0
Gabon	Avomatok (Fa)	Latex	Apocynaceae	<i>Baiassa axillaris</i> (Benth.) Hua	Unspecified ritual use.	0	0	0	0	0
Benin	Dokpakpe (F)	Roots	Leguminosae	<i>Baphia nitida</i> Lodd.	Purification baths and luck-bringing soaps.	0	0	1	0	0
Gabon	Ngokoum (F)	Whole plant	Passifloraceae	<i>Barteria fistulosa</i> Mast.	Initiation ceremonies.	0	0	0	0	0

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Gabon	Musuga (Nv)	Bark	Passifloraceae	<i>Barteria nigritana</i> Hook.f.	Ceremonial treatment for infertility in women.	0	0	0	0	0
Benin	Klo (F)	Leaves	Leguminosae	<i>Bauhinia purpurea</i> L.	Protection against witchcraft.	0	0	0	0	1
Benin	Klongboma (F)	Leaves	Leguminosae	<i>Bauhinia reticulata</i> DC.	Protection for hunters.	0	0	0	1	0
Benin	Kpanoumon (T)	Leaves	Leguminosae	<i>Bauhinia thonningii</i> Schum.	Protection against snake bites.	0	0	1	1	0
Gabon	Bocuapingui (Bb)	Leaves	Begoniaceae	<i>Begonia auriculata</i> Hook.f.	Eaten in protection against evil spirits.	0	0	0	0	0
Benin	Ekpado (T)	Bark	Leguminosae	<i>Berlinia grandiflora</i> (Vahl) Hutch. & Dalziel	Protection against sorcerers.	0	0	0	0	0
Gabon	Nameniele (Mk)	Wood	Leguminosae	<i>Berlinia viridicans</i> Baker f.	Ceremonial objects.	0	0	0	0	0
Gabon	Namenan (Ba)	Leaves	Compositae	<i>Bidens pilosa</i> L.	Eaten by pregnant women in protection against miscarriage	0	0	0	0	0
Benin	Kike (F), Kpidimo kpidimo (T)	Whole plant	Oxalidaceae	<i>Biophytum umbraculum</i> Welw.	Luck-bringing soaps and perfumes.	0	0	0	0	0
Benin	Assorogodaru (T)	Seeds	Bixaceae	<i>Bixa orellana</i> L.	Made into a sauce eaten in protection against enemies.	0	0	1	0	1
Gabon	Minondu (Og)	Seeds	Bixaceae	<i>Bixa orellana</i> L.	Supplement for red caolin	0	0	0	0	1
Benin	Lizekwin (F)	Seeds	Sapindaceae	<i>Blighia sapida</i> K.D.Koenig	Divination.	1	0	0	1	0
Benin	Katchu awi (F)	Whole plant	Nyctaginaceae	<i>Boerhavia diffusa</i> L.	Treatment of stomachache caused by bewitchment.	0	0	0	0	0
Benin	Gbadagbada (F)	Leaves	Nyctaginaceae	<i>Boerhavia erecta</i> L.	Kept under the bed in protection against sorcerers.	0	0	0	0	0
Benin	Red silk cotton tree (En)	Fruits	Malvaceae	<i>Bombax buonopozense</i> P.Beauv.	Used in protective charms and Hevioso ceremonies.	0	0	0	1	0
Benin	Faux-kapok (Fr), Kponkpol (Y), Biobio (T)	Fruits, bark, flowers	Malvaceae	<i>Bombax costatum</i> Pellegr. & Vuillet	Used in a medico-spiritual treatment for anaemia in children.	0	0	0	1	0
Benin	Agbon (T)	Leaves	Areaceae	<i>Borassus aethiopum</i> Mart.	Purification baths.	1	1	1	0	0
Gabon	Oyem (Fa)	Fruit	Rubiaceae	<i>Brenania brevii</i> (De Wild.) E.M.A.Petit	Chase evil spirits away.	1	0	0	0	0
Benin		Whole plant	Rubiaceae	<i>Breonaia salicina</i> (Vahl) Hepper & J.R.I.Wood	Unspecified ritual use.	0	0	0	0	0

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Gabon	Eso (Fa)	Bark	Phyllanthaceae	<i>Bridelia micrantha</i> (Hochst.) Baill.	Treatment of stomachache caused by bewitchment.	0	0	0	0	0
Benin	Kinshanshala (T)	Bark	Phyllanthaceae	<i>Bridelia ferruginea</i> Benth.	Protection against enemies.	0	0	0	0	0
Gabon	Kri Tangumina (Nz)	Whole plant	Acanthaceae	<i>Brilliantaisia lancifolia</i> Lindau	Purification baths.	0	1	0	0	0
Gabon	Dibughele dalembutoro (Bp)	Whole plant	Acanthaceae	<i>Brilliantaisia owarensis</i> P.Beauv.	Protection against bewitchment.	0	0	0	0	0
Benin	Tesuma (F)	Whole plant	Crasulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Purification baths	0	0	0	1	0
Benin	Atakpa (T)	Leaves	Leguminosae	<i>Burkea africana</i> Hook.	Treatment of snakebites believed to be caused by spells.	0	0	0	0	0
Benin	Adjikwin (F)	Seeds	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	Protection against skin diseases in children, divination	0	1	1	1	0
Gabon	Digudimumbu (Ma)	Seeds	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	Amulets worn by pregnant women to prevent miscarriage.	0	0	0	0	0
Benin	Sukuluma (G)	Seeds	Leguminosae	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Used in the treatment of pharyngitis caused by bewitchment.	0	0	0	0	1
Benin	Kelekouman (F)	Seeds	Leguminosae	<i>Cajanus cajan</i> (L.) Millsp.	Food taboo.	1	0	0	0	1
Benin	Akelema (Pe)	Whole plant	Araceae	<i>Caladium bicolor</i> (Aiton) Vent.	Planted in protection against Sakpata diseases.	0	0	0	1	0
Benin	Hengba (F)	Whole plant	Orchidaceae	<i>Calyptrochilum christyanum</i> (Rehb.f.) Summerh.	Purification baths, love charms	0	0	0	1	0
Benin	Afa (T)	Whole plant	Orchidaceae	<i>Calyptrochilum emarginatum</i> (Afzel. ex Sw.) Schltr.	Restricted species. Purification baths.	1	1	0	0	0
Benin	Sukusu (F)	Leaves	Celastraceae	<i>Campylostemon warneckeanum</i> Loes. ex Fritsch	Worn as an amulet by pregnant women to prevent miscarriage.	0	0	0	0	0
Gabon	Musimina (Ma)	Seeds	Leguminosae	<i>Canavalia ensiformis</i> (L.) DC.	Planted around homesteads in protection against evil.	0	0	0	0	1
Benin	Akpakpu wiwi (F)	Seeds	Leguminosae	<i>Canavalia ensiformis</i> (L.) DC.	Planted as a protection against snakes	0	0	0	0	0
Benin	Legba kpakpun (F)	Seeds	Leguminosae	<i>Canavalia gladiata</i> (Jacq.) DC.	Divination	0	0	0	0	0
Benin	Tanglankwin (G)	Seeds	Cannaceae	<i>Canna indica</i> L.	Used ceremonially	0	0	0	0	0
Benin	Ewondudu (T)	Leaves	Capparaceae	<i>Capparis brassii</i> DC.	Protective infusion against enemies.	1	0	1	0	0

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Gabon	Tzoli (Ma)	Fruits	Solanaceae	<i>Capsicum annuum</i> L.	Burnt as incense in protection against evil spirits.	0	0	0	0	1
Benin	Piment (Fr)	Fruits	Solanaceae	<i>Capsicum annuum</i> L.	Burnt as incense in protection against evil spirits.	0	0	0	0	1
Benin	Togba (F)	Whole plant	Sapindaceae	<i>Cardiospermum grandiflorum</i> Sw.	Unspecified ritual use.	0	0	0	0	0
Benin	Pawpaw (En), Aguidi (T)	Leaves	Caricaceae	<i>Carica papaya</i> L.	Used in Legba ceremonies.	1	0	0	0	1
Benin	Ahanzo (F)	Roots	Apocynaceae	<i>Carissa spinarum</i> L.	Used in the treatment of headaches of mystical origin.	0	1	0	0	0
Gabon	Kota (Nz), Kara (Fa)	Leaves	Polygalaceae	<i>Carpolobia alba</i> G. Don	Medico-spiritual treatment to close fontanelles in infants.	0	0	0	0	0
Benin	Aviado (F)	Roots	Polygalaceae	<i>Carpolobia lutea</i> G. Don	Exorcism.	0	0	0	0	0
Gabon	Kuta (Bb)	Whole plant	Polygalaceae	<i>Carpolobia lutea</i> G. Don	Planted outside homesteads where twins have been born.	0	0	0	0	0
Benin	Ayeku (F)	Fruits	Apocynaceae	<i>Cascabela thevetia</i> (L.) Lippold	Ceremonial object.	0	0	0	0	1
Gabon	Kolagba kolese (T)	Whole plant	Lauraceae	<i>Cassytha filiformis</i> L.	Scrub in ceremonial baths.	0	0	0	0	0
Benin	Munziji mangueb (Bp)	Whole plant	Lauraceae	<i>Cassytha filiformis</i> L.	Used as a scrub in ceremonial baths.	0	0	0	0	0
Benin	Flawe (F)	Whole plant	Apocynaceae	<i>Catharanthus roseus</i> (L.) G. Don	Used in protection against evil spirits.	0	0	0	0	0
Gabon	Assong (Fa)	Leaves	Urticaceae	<i>Cecropia peltata</i> L.	Bwiti initiation ceremonies	0	0	0	0	0
Benin	Kapok (Fr), Agougou (T)	Whole plant	Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn.	Sacred tree.	1	0	1	1	0
Gabon	Kapok (Fr), Oguma (Mi)	Whole plant	Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn.*	Sacred tree.	1	0	1	0	0
Benin	Agboni (T)	Roots	Cannabaceae	<i>Celtis zenkeri</i> Engl.	Used in a protective bath for men.	0	0	1	0	0
Gabon	Engo (Fa)	Leaves	Cannabaceae	<i>Celtis mildbraedii</i> Engl.	Protection against evil spirits.	0	0	1	0	0
Gabon	Membenbe (Bb)	Whole plant	Apiaceae	<i>Centella asiatica</i> (L.) Urb.	Ceremonial plant for twin burials.	0	0	0	0	0
Benin	Tchirigun (F)	Whole plant	Apocynaceae	<i>Ceropegia fusiformis</i> N.E.Br.	Unspecified ritual use.	0	0	0	0	0
Benin	Kilofemusishi (Y)	Whole plant	Leguminosae	<i>Chamaecrista mimosoides</i> (L.) Greene	Purification baths.	0	0	0	0	0

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Benin	Tekan (F)	Whole plant	Menispermaceae	<i>Chasmanthera dependens</i> Hochst.	Restricted species	1	0	0	0	0
Benin	Baka (Y)	Whole plant	Asparagaceae	<i>Chlorophytum cameronii</i> (Baker) Katiu	Unspecified ritual use.	0	0	0	0	0
Benin	Zevonukun (F)	Whole plant	Compositae	<i>Chrysanthellum indicum</i> DC.	Soaps and perfumes to attract good luck.	0	0	0	0	0
Benin	Azongogbe (F)	Leaves	Sapotaceae	<i>Chrysophyllum albidum</i> G. Don	Treatment of Sakpata-related diseases.	0	1	1	0	0
Gabon	Soke	Fruits	Sapotaceae	<i>Chrysophyllum subnudum</i> Baker	Ceremonial object	0	0	0	0	0
Benin	Gando (F)	Roots	Poaceae	<i>Chrysopogon zizanioides</i> (L.) Roberty	Burnt as an incense in protection against evil spirits.	0	0	0	0	0
Benin	Djokodje (Y)	Roots	Menispermaceae	<i>Cissampelos mucronata</i> A.Rich.	Purification baths. Talismans.	0	0	0	0	0
Benin	Djokodje (Y)	Roots	Menispermaceae	<i>Cissampelos owariensis</i> P.Beauv. ex DC.	Purification baths.	0	0	0	0	0
Gabon	Abokoei (Fa)	Whole plant	Vitaceae	<i>Cissus aralioides</i> (Welw. ex Baker) Planch.	Protective baths against evil spirits.	0	0	0	0	0
Benin	Alun (F)	Whole plant	Vitaceae	<i>Cissus aralioides</i> (Welw. ex Baker) Planch.	Unspecified ritual use.	0	0	0	0	0
Benin	Asankan (F)	Whole plant	Vitaceae	<i>Cissus palmatifida</i> (Baker) Planch.	Unspecified ritual use.	0	0	0	0	0
Benin	Tchokubalo (T)	Stem	Vitaceae	<i>Cissus populnea</i> Guill. & Perr.	Male aphrodisiac with restricted use to adepts of the god of thunder.	1	0	0	1	0
Benin	Asan (F)	Whole plant	Vitaceae	<i>Cissus quadrangularis</i> L.	Treatment of broken bones caused by bewitchment.	0	0	0	1	0
Benin	Kakoothe (T)	Fruits, leaves	Cucurbitaceae	<i>Citrullus colocynthis</i> (L.) Schrad.	Made into a cream to cure swelling in feet caused by bewitchment.	0	0	0	0	1
Benin	Kaka (T)	Fruits	Cucurbitaceae	<i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai	Eaten, it is said to improve the memory of children.	0	0	0	0	1
Benin	Gbo (F)	Fruits	Rutaceae	<i>Citrus limon</i> (L.) Osbeck	Several medico-spiritual uses.	0	0	0	0	1
Benin	Ogwritaiweve (T)	Leaves	Rutaceae	<i>Citrus aurantiifolia</i> (Christm.) Swingle	Treatment of malaria caused by bewitchment.	0	0	0	0	1

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Gabon	Mouloushi (Nz)	Leaves	Rutaceae	<i>Citrus aurantifolia</i> (Christm.) Swingle	Treatment of malaria caused by bewitchment.	0	0	0	0	1
Benin	Gbossou azoue (F)	Leaves	Rutaceae	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.	Treatment of infections caused by bewitchment.	0	0	0	0	0
Benin	Hounzoko (F)	Seeds	Annonaceae	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels	Divination.	0	0	0	1	0
Benin	Adjangula (T)	Leaves	Cleomaceae	<i>Cleome gynandra</i> L.	Purification baths.	0	0	0	0	0
Benin	Akaya (F)	Leaves	Cleomaceae	<i>Cleome rutidosperma</i> DC.	Protection against evil spirits.	0	0	0	0	0
Benin	Wawa (Y)	Whole plant	Cleomaceae	<i>Cleome viscosa</i> L.	Baths to attract love.	0	0	0	0	0
Gabon	Ebele beyem (Fa)	Whole plant	Lamiaceae	<i>Clerodendrum melanocrater</i> Gürke	Protection against evil spirits.	0	0	0	0	0
Gabon	Belbayem (Fa), Elelem (Ma)	Leaves	Lamiaceae	<i>Clerodendrum splendens</i> G.Don	Treatment of diseases said to be caused by bewitchment.	0	0	0	0	0
Benin	Zoflotin (P)	Whole plant	Lamiaceae	<i>Clerodendrum capitatum</i> (Willd.) Schumacher. & Thonn.	Used in a bath by pregnant women to prevent miscarriage.	0	0	1	0	0
Benin	Azelokoma (F)	Whole plant	Leguminosae	<i>Clitoria falcata</i> Lam.	Protective baths against sorcery.	0	0	0	0	0
Benin	Azankposso (F)	Whole plant	Leguminosae	<i>Clitoria ternatea</i> L.	Drink and herbal bath in protection against sorcery.	0	0	0	0	1
Gabon	Eyendzie (Fa)	Leaves	Conmaraceae	<i>Cnestis ferruginea</i> Vahl ex DC.	Protective drink against bewitchment.	0	0	0	0	0
Benin	Chori (Id), Gbetu (T)	Seeds	Bixaceae	<i>Cochlospermum planchonii</i> Hook.f. ex Planch.	Used as ceremonial necklaces.	0	0	0	0	0
Benin	Agongedo (F)	Roots	Arecaceae	<i>Cocos nucifera</i> L.	Purification baths.	1	0	0	0	1
Gabon	Elombo (Bb)	Bark	Myristicaceae	<i>Coelocaryon preussii</i> Warb.	Treatment of respiratory diseases caused by evil spirits.	0	0	0	0	0
Gabon	Mbama (Tk)	Stem	Cucurbitaceae	<i>Cogniauxia podolaena</i> Baill.	Made into a necklace to attach dogs believed to be possessed.	0	0	0	0	0
Gabon	Yiel (Ma)	Seeds	Malvaceae	<i>Cola acuminata</i> (P.Beauv.) Schott & Endl.	Stimulant	0	0	0	0	0
Benin	Cola nuts (En)	Seeds	Malvaceae	<i>Cola acuminata</i> (P.Beauv.) Schott & Endl.	Stimulant, divination	0	0	1	1	0
Benin	Wutin (F)	Whole plant	Malvaceae	<i>Cola gigantea</i> A.Chev.	Sacred tree	1	0	0	1	0

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Benin	Alolvi aton (F)	Leaves	Malvaceae	<i>Cola millenii</i> K.Schum.	Medico-spiritual treatment against cardiac conditions in children.	0	0	0	1	0
Benin	Golo (F)	Seeds	Malvaceae	<i>Cola nitida</i> (Vent.) Schott & Endl.	Ceremonial stimulant.	0	0	1	1	0
Gabon	Taro (En), Kak'li (Tk)	Leaves	Araceae	<i>Colocasia esculenta</i> (L.) Schott	Food taboo.	1	0	0	0	1
Benin	Bodomi (T)	Whole plant	Combretaceae	<i>Combretum collinum</i> Fresen.	Unspecified ritual use.	0	0	1	0	0
Benin	Akpuro (T)	Whole plant	Combretaceae	<i>Combretum nigricans</i> Lepr. ex Guill. & Perr.	Ritual to make babies strong.	0	0	0	0	0
Benin	Ogonbo (T)	Whole plant	Combretaceae	<i>Combretum racemosum</i> P.Beauv.	Unspecified ritual use.	0	0	0	0	0
Benin	Xanxwe (F)	Roots	Commelinaceae	<i>Commelina</i> sp.	Burnt as incense to chase evil spirits away	0	0	0	0	0
Benin	Eridji (T)	Whole plant	Burseraceae	<i>Commiphora africana</i> (A.Rich.) Endl.	Protection against evil spirits.	0	0	0	1	0
Gabon	Tabacon (A)	Whole plant	Compositae	<i>Conyza sumatrensis</i> (S.F.Blake) Pruski & G.Sancho	Luck-bringing baths.	0	0	0	0	0
Gabon	Red Anzem (En)	Bark, resine	Leguminosae	<i>Copaifera religiosa</i> J.Leonard	Burnt as incense or in purification baths.	1	0	1	1	1
Benin	Vinkpa (F)	Fruits	Leguminosae	<i>Copaifera salikounda</i> Heckel	Divination	0	0	0	0	0
Benin	Ninnuyi (F)	Whole plant	Malvaceae	<i>Corchorus olitorius</i> L.	Purification baths.	0	0	0	0	1
Benin	Kutin (F)	Whole plant	Boraginaceae	<i>Cordia senegalensis</i> Juss. ex Poir.	Unspecified ritual use.	0	0	1	0	0
Benin	Tetegungun (F)	Whole plant	Costaceae	<i>Costus afer</i> Ker Gawl.	Planted in protection against sorcerers.	0	0	0	1	0
Gabon	Mokusarera (Mi)	Roots	Costaceae	<i>Costus phyllocephalus</i> K.Schum.	Medico-spiritual treatment against illnesses in twins.	0	0	0	0	0
Gabon	Nkakoum (Fa)	Whole plant	Costaceae	<i>Costus tappenbeckianus</i> J.Braun & K.Schum.	Purification and initiation baths.	0	0	0	0	0
Gabon	Mokosa gega (Mi)	Stem	Costaceae	<i>Costus ligularis</i> Baker	Ceremonial object during initiation ceremonies.	0	0	0	0	0
Gabon	Myan (Fa)	Sap	Costaceae	<i>Costus lucanusianus</i> J.Braun & K.Schum.	Spitted on the head of initiates as a blessing.	0	0	0	0	0
Gabon	Oghoua (Mt)	Fruits	Oleaceae	<i>Coula edulis</i> Baill.	Protection against sorcery.	0	0	0	0	0

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Benin	Ebolo (T)	Whole plant	Compositae	<i>Crassocephalum rubens</i> (Juss. ex Jacq.) S.Moore	Used in an incantation to treat short breath.	0	0	0	0	0
Gabon	Kadjabali (Tk)	Bark	Rubiaceae	<i>Craterispermum cerinthanthum</i> Hiern	Treatment of wounds of mystical origin.	0	0	0	0	0
Benin	Igha degi (Y)	Fruits	Bignoniaceae	<i>Crescentia cujete</i> L.	Ceremonial object	0	0	0	0	1
Benin	Oignon de la mort (F)	Whole plant	Amaryllidaceae	<i>Crinum glaucum</i> A.Chev.	Kept in homesteads to bring good luck.	0	0	0	0	0
Benin	Tonyan (F)	Whole plant	Amaryllidaceae	<i>Crinum jagus</i> (J.Thomps.) Dandy	Purification baths.	0	0	0	0	0
Gabon	Shambo (Sa)	Whole plant	Amaryllidaceae	<i>Crinum</i> sp.	Luck-bringing perfumes.	0	0	0	0	0
Benin	Gbo akuatu (T)	Leaves	Leguminosae	<i>Crotalaria retusa</i> L.	Purification baths to treat Sakpata diseases	0	0	0	0	0
Benin	Djelelele (F)	Whole plant	Euphorbiaceae	<i>Croton gratissimus</i> Burch.	Planted in protection against evil spirits.	0	0	1	1	0
Benin	Cocolossoudin Kpatacha (F)	Leaves	Euphorbiaceae	<i>Croton hirtus</i> L'Hér.	Unspecified ritual use.	0	0	0	0	0
Gabon	Omamba (Ak)	Bark	Euphorbiaceae	<i>Croton mayumbensis</i> J.Léonard	Purification baths to get rid of bad luck.	0	0	0	0	0
Gabon	Obamba (Mi)	Bark	Euphorbiaceae	<i>Croton oligandrus</i> Pierre ex Hutch.	Ceremonial offerings.	0	0	1	0	0
Benin	Agba (F)	Seeds	Euphorbiaceae	<i>Croton tiglium</i> L.	Said to be used by sorcerers in the preparation of spells.	0	0	0	0	1
Gabon	Motaba (Mi)	Wood	Euphorbiaceae	<i>Crotonogyne manniana</i> Müll.Arg.	Ceremonial objects.	0	1	0	0	0
Benin	Goussi (F)	Fruits	Cucurbitaceae	<i>Cucumeropsis mannii</i> Naudin	Ceremonial offerings	0	0	0	0	1
Benin	Donkepegan (F)	Leaves	Cucurbitaceae	<i>Cucumis melo</i> L.	Purification baths.	0	0	0	0	1
Benin	Gbohounon (F)	Fruits	Cucurbitaceae	<i>Cucumis metuliferus</i> E.Mey. ex Naudin	Treatment of Sakpata-related diseases.	1	0	0	0	1
Benin	Goussi de terre (F, Fr)	Fruits	Cucurbitaceae	<i>Cucurbita moschata</i> (Duch. ex Lam.) Duch. ex Poir.	Ceremonial offerings	0	0	0	0	1
Gabon	Ayangdzic (Fa)	Stems	Anaceae	<i>Culcasia scandens</i> P.Beauv.	Stem is made into a cord used for amulets.	0	0	0	0	0
Benin	Ayote (F)	Roots	Hypoxidaceae	<i>Curculigo pilosa</i> (Schumach. & Thonn.) Engl.	Used as an amulet to attract wealth.	0	0	0	0	0

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Benin	Gengembre rouge (Fr)	Roots	Zingiberaceae	Curcuma sp.	Purification baths.	0	0	0	0	0
Benin	Edigo (T)	Bark	Araliaceae	<i>Cussonia arborea</i> Hochst. ex A.Rich.	Used in a ceremonial bath for newborns.	0	0	0	0	0
Gabon	Nzoeng (Fa)	Stems	Rubiaceae	<i>Caviera pierrei</i> N.Hallé	Kept in dwelling compounds in protection against evil spirits	0	0	0	0	0
Benin	Koufla (F)	Whole plant	Commelinaceae	<i>Cyanotis lanata</i> Benth.	Purification baths.	0	0	0	0	0
Benin	Honsicuse (F)	Leaves	Compositae	<i>Cyanthillium cinereum</i> (L.) H.Rob.	Eaten in protection against enemies	0	0	0	0	0
Gabon	Mudum (Nz)	Bark	Leguminosae	<i>Cylindrodiscus gabunensis</i> Harms	Luck-bringing baths.	1	0	0	0	0
Benin	Tchama (F)	Whole plant	Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	Restricted species	1	0	0	0	1
Gabon	Disasango (Bp)	Flower	Poaceae	<i>Cymbopogon densiflorus</i> (Steud.) Stapf	Burnt as incense to chase evil spirits away	0	0	0	0	1
Gabon	Gepungulele (E)	Fruit	Apocynaceae	<i>Cynanchum acuminatum</i> Humb. & Bonpl. ex Schult.	Food taboo.	1	0	0	0	0
Benin	Bagagoto (F)	Bark	Leguminosae	<i>Cynometra megalophylla</i> Harms	Used in protection against evil spirits.	0	0	0	0	0
Gabon	Tsassagou (Bp)	Stems	Cyperaceae	<i>Cyperus articulatus</i> L.	Lace used in twin ceremonies.	0	0	0	1	0
Benin	Afio (G)	Roots	Cyperaceae	<i>Cyperus esculentus</i> L.	Burnt as incense to chase evil spirits away	0	0	0	1	0
Benin	Bongbo (T)	Leaves	Vitaceae	<i>Cyphostemma adenocaula</i> (Steud. ex A.Rich.) Desc. ex Wild & R.B.Drumm.	Treatment of Sakpata-related diseases.	0	0	0	0	0
Benin	Bongbo (T)	Leaves	Vitaceae	<i>Cyphostemma sokodense</i> (Gilg & M.Brandt) Desc.	Treatment of Sakpata-related diseases.	0	0	0	0	0
Gabon	Osigo (Mi)	Bark	Burseraceae	<i>Dacryodes buettneri</i> (Engl.) H.J. Lam*	Treatment of skin diseases of supernatural origin.	0	0	0	1	0
Gabon	Nngengen (Fa)	Whole plant	Euphorbiaceae	<i>Dalechampia ipomoeifolia</i> Benth.	Protection against evil spirits.	0	0	0	0	0
Benin	Azeglo (F)	Leaves	Leguminosae	<i>Daniellia olivieri</i> (Rolé) Hutch. & Dalziel	Protective baths against sorcery.	0	0	1	0	0
Gabon	Oteva (Mi)	Bark	Irvingiaceae	<i>Desbordesia insignis</i> Pierre	Amulet for fertility.	1	0	0	0	0

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Gabon	Pinde batabe (Nz)	Whole plant	Leguminosae	<i>Desmodium adscendens</i> (Sw.) DC.	Made into a cream believed to attract good luck.	0	0	0	0	0
Benin	Omini (Y)	Whole plant	Leguminosae	<i>Desmodium gangeticum</i> (L.) DC.	Herbal bath to attract love.	0	0	0	0	0
Gabon	Onduonentchina (Tk)	Leaves	Leguminosae	<i>Desmodium triflorum</i> (L.) DC.	Rubbed against torso to treat pain with a mystical origin.	0	0	0	0	0
Benin	Emon (T)	Leaves	Leguminosae	<i>Desmodium velutinum</i> (Willd.) DC.	Purification baths.	0	0	1	0	0
Benin	Irede (T)	Whole plant	Leguminosae	<i>Detarium senegalense</i> J.F.Gmel.	Unspecified ritual use.	1	1	0	1	0
Gabon	Ogboule (Tk)	Bark	Leguminosae	<i>Dialium englerianum</i> Henriq.	Treatment of anaemia of mystical origin.	0	0	0	1	0
Benin	Asonoungoto (F)	Bark	Leguminosae	<i>Dialium guineense</i> Willd.	Unspecified ritual use.	0	0	0	1	0
Benin	Gmiondo (T)	Leaves	Dichapetalaceae	<i>Dichapetalum oblongum</i> (Hook.f. ex Benth.) Engl.	Medico-spiritual treatment against malaria.	0	0	0	0	0
Benin	Hounzogotosikwin (G)	Whole plant	Leguminosae	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Purification baths.	0	0	0	0	0
Benin	Axexe (F)	Whole plant	Compositae	<i>Dicoma tomentosa</i> Cass.	Amulets, protective baths	0	0	1	0	0
Benin	Eran (T)	Whole plant	Poaceae	<i>Digitaria leptorhachis</i> (Pilg.) Stapf	Purification baths and initiation ceremonies.	0	0	0	0	0
Gabon	Disesi (Bp)	Leaves	Melastomataceae	<i>Dinophora spenneroides</i> Benth.	Ceremonial offerings.	0	0	0	0	0
Gabon	Butsangi (Bp)	Seeds	Leguminosae	<i>Dioclea hexandra</i> (Ralph) Mabb.	Worn in protection against accidents in the forest.	0	0	0	0	0
Gabon	Mussimene (Ma)	Seeds	Leguminosae	<i>Dioclea reflexa</i> Hook.f.	Eaten to obtain the favour of someone in a better position.	0	0	0	1	0
Benin	Lokokwin (F)	Seeds	Leguminosae	<i>Dioclea reflexa</i> Hook.f.	Divination	0	0	0	0	0
Gabon	Evusa (Fa)	Leaves	Rubiaceae	<i>Diodellea scandens</i> (Sw.) Bacigalupo & E.L.Cabral	Protection against evil spirits.	0	0	0	0	0
Benin	Intchookinko (T)	Roots	Dioscoreaceae	<i>Dioscorea alata</i> L.	Offerings	0	0	0	0	1
Gabon	Lindi (Nz)	Roots	Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Unspecified ritual use.	0	0	0	0	0
Benin	Ewueu esi (T)	Roots	Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Offerings	0	0	0	1	0
Benin	Ewe eshwe ghene (Y)	Roots	Dioscoreaceae	<i>Dioscorea burkiliana</i> J.Miège	Offerings	0	0	0	1	0

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Benin	Tevihounton (F)	Roots	Dioscoreaceae	<i>Dioscorea dumetorum</i> (Kunth) Pax	Unspecified ritual use.	0	0	0	1	0
Benin	Aboko (F), Latchiri (T)	Roots	Dioscoreaceae	<i>Dioscorea minutiflora</i> Engl.	Offerings	0	0	0	0	1
Benin	Ogbukingko (T)	Roots	Dioscoreaceae	<i>Dioscorea preussii</i> Pax	Offerings	0	0	0	1	0
Benin	Kokoro (T)	Roots	Dioscoreaceae	<i>Dioscorea sagittifolia</i> Pax	Offerings.	0	0	0	1	0
Gabon	Mbongo amome (Mi)	Bark, wood	Ebenaceae	<i>Diospyros mami</i> Hiern	Protection against evil spirits.	0	0	0	0	0
Gabon	Mukemu (E)	Leaves	Melastomataceae	<i>Dissotis multiflora</i> (Sm.) Triana	Treatment of wounds of supernatural origin.	0	0	0	0	0
Gabon	Ovonge (Mi)	Bark	Leguminosae	<i>Distemonanthus benthamianus</i> Baill. *	Protection against weapons and accidents.	0	0	0	0	0
Gabon	Ghecondondo (Bb)	Leaves	Asparagaceae	<i>Dracaena camerooniana</i> Baker	Protective bath for newborns.	0	0	0	0	0
Gabon	Bango (Tk)	Bark	Asparagaceae	<i>Dracaena mami</i> Baker	Treatment for pregnant women on whom a spell has been casted.	1	0	0	0	0
Gabon	Endo (Bb)	Whole plant	Asparagaceae	<i>Dracaena phrynoides</i> Hook.	Sacred plant of Ndjembé secret society	0	0	0	0	0
Benin	Olauru (T)	Leaves	Asparagaceae	<i>Dracaena arborea</i> (Willd.) Link	Several medico-spiritual uses.	0	0	0	1	0
Benin	Muyunguo (Ma)	Whole plant	Droseraceae	<i>Drosera indica</i> L.	Unspecified ritual use.	0	0	0	0	0
Gabon		Bark	Putranjivaceae	<i>Drypetes gossweilerii</i> S.Moore	Protection against snakes.	1	0	1	0	0
Gabon	Aka (Fa)	Fruits	Malvaceae	<i>Duboscia macrocarpa</i> Bocq.	Charm to keep threatening words from becoming actions.	0	0	0	1	0
Benin	Yerma (Pe)	Whole plant	Acanthaceae	<i>Dyschoriste nagchana</i> (Nees) Bennet	Treatment of madness caused by possession by spirits.	0	0	0	0	0
Benin	Godó (F)	Whole plant	Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Chase evil spirits away.	0	0	0	1	0
Gabon	Mubindisa (Ms)	Whole plant	Compositae	<i>Eclipta prostrata</i> (L.) L.	Ritual scarification.	0	0	0	0	0
Benin	Ndidudu (T)	Roots	Boraginaceae	<i>Ehretia cymosa</i> Thonn.	Used in the treatment of toothache believed to be caused by envy.	0	0	0	0	0
Benin	Togble (F)	Whole plant	Pontederiaceae	<i>Eichhornia crassipes</i> (Mart.) Solms	Luck-bringing soaps.	0	0	0	0	0
Benin	Okgo (T)	Seeds	Areaceae	<i>Elaeis guineensis</i> Jacq.	Divination, offerings. Food taboo.	1	0	1	0	1

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Gabon	Ngare (Tk)	Whole plant	Iridaceae	<i>Eleutherine bulbosa</i> (Mill.) Urb.	Planted in protection against lightning	0	0	0	1	0
Gabon	Moukoura (Bp)	Whole plant	Acanthaceae	<i>Elytraria marginata</i> Vahl	Good luck baths and perfumes.	0	0	0	0	0
Gabon	Alomyu (Fa)	Whole plant	Compositae	<i>Emilia coccinea</i> (Sims) G. Don	Good luck baths.	0	0	0	0	0
Gabon	Nkarne (F)	Whole plant	Loranthaceae	<i>Englerina gabonensis</i> (Engl.) Balle	Protection against bewitchment.	0	0	0	0	0
Benin	Fomfom (T)	Seeds	Musaceae	<i>Ensete livingstonianum</i> (J.Kirk) Cheesman	Used as necklace by priests. Restricted species.	1	1	1	1	0
Benin	Akpogbowewe (T)	Bark	Leguminosae	<i>Enada africana</i> Guill. & Perr.	Purification baths.	0	0	1	0	0
Benin	Gbagbada (F)	Seeds	Leguminosae	<i>Enada gigas</i> (L.) Fawc. & Rendle	Divination	1	0	0	0	0
Benin	Igila (T)	Bark	Meliaceae	<i>Enandrophragma candollei</i> Harms.*	Protection against enemies.	0	0	1	0	0
Gabon	Odjuko (Mi)	Wood	Meliaceae	<i>Enandrophragma utile</i> (Dawe & Sprague) Sprague*	Ceremonial objects.	0	1	0	0	0
Gabon	Gheeta (Bb)	Wood	Arecaceae	<i>Eremospatha macrocarpa</i> H.Wendl.	Various ceremonial objects.	0	0	0	0	0
Benin		Whole plant	Eriocaulaceae	<i>Eriocaulon togoense</i> Moldenke	Unspecified ritual use.	0	0	0	0	0
Benin	Lema (F)	Whole plant	Leguminosae	<i>Eriosema laurentii</i> De Wild.	Purification baths.	0	0	0	0	0
Benin	Kpakesigoto (F)	Whole plant	Leguminosae	<i>Erythrina senegalensis</i> DC.	Planted in protection against evil spirits	0	0	0	0	0
Benin	Ekpoyobo (Y)	Whole plant	Leguminosae	<i>Erythrophileum africanum</i> (Benth.) Harms	Protection against evil spirits.	1	0	1	0	0
Gabon	Mkas (Nz)	Bark	Leguminosae	<i>Erythrophileum ivorense</i> A.Chev.*	Ordeal poison.	0	0	0	0	0
Gabon	Elon (Fa)	Bark	Leguminosae	<i>Erythrophileum suaeolens</i> (Guill. & Perr.) Brenan	Ordeal poison.	0	0	1	0	0
Benin	Oro (Y)	Roots	Leguminosae	<i>Erythrophileum suaeolens</i> (Guill. & Perr.) Brenan	Used in a Gun incantation to find things that have been lost or stolen.	0	0	0	0	0
Benin	Eucalyptus (Fr)	Bark	Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnh.	Protection against evil spirits.	0	0	0	0	1
Benin	Hundi hundi (F)	Whole plant	Euphorbiaceae	<i>Euphorbia convolvuloides</i> Hochst. ex Benth.	Luck-bringing baths.	0	0	0	0	0

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Benin	Lekuleku (F)	Whole plant	Euphorbiaceae	<i>Euphorbia hirta</i> L.	Herbal baths to attract love.	0	0	0	0	0
Benin	Assani (G)	Whole plant	Euphorbiaceae	<i>Euphorbia hyssopifolia</i> L.	Purification baths.	0	0	0	0	0
Benin	Oro onigbo (T)	Whole plant	Euphorbiaceae	<i>Euphorbia kamerunica</i> Pax	Planted to protect fields and homes from sorcerers.	1	0	0	1	0
Benin	Oro olombo (T)	Whole plant	Euphorbiaceae	<i>Euphorbia tirucalli</i> L.	Planted in protection of Sakpata shrines	0	0	0	1	0
Benin	Oro (Y)	Whole plant	Euphorbiaceae	<i>Euphorbia unispina</i> N.E.Br.	Said to be used by sorcerers in the preparation of spells.	0	0	0	0	0
Benin	Droman (F)	Whole plant	Convolvulaceae	<i>Evolvulus alsinoides</i> (L.) L.	Used in a charm meant to silence people claiming justice after a crime.	0	0	0	0	0
Benin	Agbedokota (T)	Roots	Moraceae	<i>Ficus abutilifolia</i> (Miq.) Miq.	Purification baths.	0	0	0	0	0
Benin	Obou (F)	Whole plant	Moraceae	<i>Ficus dicanostyla</i> Mildbr.	Unspecified ritual use.	0	0	0	0	0
Benin	Adago (T)	Whole plant	Moraceae	<i>Ficus lutea</i> Vahl	Plant that governs one of the Fa oracle signs.	0	0	1	1	0
Benin	Okpoto (T)	Bark	Moraceae	<i>Ficus sur</i> Forssk.	Protection against enemies.	0	0	0	0	0
Gabon	Mobende (Mi)	Bark	Moraceae	<i>Ficus thonningii</i> Blume	Ceremonial objects.	0	0	1	0	0
Benin	Gbokoka (F)	Bark	Moraceae	<i>Ficus thonningii</i> Blume	Made into a cord used in charms and amulets.	0	0	0	0	0
Benin	Bafle (Ad)	Leaves	Moraceae	<i>Ficus umbellata</i> Vahl	Ritual bath to protect pregnant women.	0	0	0	0	0
Benin	Oguro (Y)	Bark	Moraceae	<i>Ficus vallis-choudae</i> Delile	Purification baths.	0	0	0	0	0
Gabon	Mbudi (Nz)	Bark	Rubiaceae	<i>Fleroya ledermannii</i> (K. Krause) Y.F.Deng	Luck-bringing baths.	0	0	0	0	0
Benin	Kakakaka (T)	Leaves	Phyllanthaceae	<i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	Purification baths.	0	0	0	0	0
Gabon	Owade (Mi)	Seeds	Clusiaceae	<i>Garcinia epunctata</i> Stapf	Ceremonial stimulant.	0	0	0	0	0
Gabon	Bois amer (Fr)	Bark, seeds	Clusiaceae	<i>Garcinia kola</i> Heckel	Ceremonial stimulant.	0	1	1	0	0
Benin	Ahowe (F)	Seeds	Clusiaceae	<i>Garcinia kola</i> Heckel	Stimulant, divination.	0	1	1	1	0

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Gabon	Bondjo (Mi)	Seeds	Clusiaceae	<i>Garcinia manii</i> Oliv.	Ceremonial stimulant.	0	0	0	0	0
Gabon	Siegit (Bp)	Bark	Clusiaceae	<i>Garcinia preussii</i> Engl.	Several medico-spiritual uses.	0	0	0	0	0
Benin	Hédmaǰe (F)	Leaves	Rubiaceae	<i>Gardenia nitida</i> Hook.	Purification baths.	0	1	0	0	0
Gabon	Ndjego (Mi)	Bark	Rubiaceae	<i>Gardenia ternifolia</i> Schumach. & Thonn.	Treatment of wounds of supernatural origin.	1	0	0	0	0
Benin	Dakpla (F), Kikigba (T)	Leaves	Rubiaceae	<i>Gardenia ternifolia</i> Schumach. & Thonn.	Protection against sorcerers.	0	0	0	1	0
Gabon	Dourai da mourim (Bp)	Leaves	Rubiaceae	<i>Geophila afzelii</i> Hiern	Eaten with honey to attract love.	0	0	0	0	0
Benin	Aixa (F)	Leaves	Rubiaceae	<i>Geophila afzelii</i> Hiern	Protection baths against bewitchment.	0	0	0	0	0
Gabon	Duba (Bb)	Leaves	Rubiaceae	<i>Geophila lancistipula</i> Hiern	Good luck baths.	0	0	0	0	0
Benin	Abov botor (Y)	Whole plant	Rubiaceae	<i>Geophila repens</i> (L.) I.M.Johnst.	Purification baths.	0	0	0	0	0
Benin	Hankun (F)	Whole plant	Colchicaceae	<i>Gloriosa superba</i> L.	Planted as a luck-bringing plant.	0	0	0	1	0
Gabon	Gapasa mogodo (Mi)	Wood	Ochnaceae	<i>Gomphia elongata</i> Oliv.	Ceremonial objects.	0	0	0	0	0
Benin	Ore-we (T)	Fruits	Malvaceae	<i>Gossypium arboreum</i> L.	Ceremonies to get rid of spells or to make pacts with sorcerers.	0	0	0	0	1
Gabon	Mukundu (Bp)	Fruits	Malvaceae	<i>Gossypium barbadense</i> L.	Ceremonial objects.	0	0	0	0	1
Gabon	Otunga (Fa)	Leaves	Annonaceae	<i>Greenwayodendron suaveolens</i> (En gl. & Diels) Verdc.	Purification baths.	0	0	0	0	0
Benin	Ore (T)	Stems	Malvaceae	<i>Grewia carpinifolia</i> Juss.	Restricted species	1	0	0	1	0
Gabon	Kewozengo (Lu)	Bark	Leguminosae	<i>Guibourtia ehie</i> (A.Chev.) J.Leonard	Initiation ceremonies.	0	0	0	0	0
Gabon	Kebanzingo (Bb)	Whole plant	Leguminosae	<i>Guibourtia tessmannii</i> (Harms) J.Leonard*	Good luck.	1	0	1	0	0
Benin	Ariko wewe (T)	Leaves	Compositae	<i>Gynnanthemum coloratum</i> (Willd.) H.Rob. & B.Kahn	Unspecified ritual use.	1	0	0	0	0
Benin	Fefeya (T)	Whole plant	Celastraceae	<i>Gymnosporia senegalensis</i> (Lam.) Loos.	Unspecified ritual use.	1	0	0	0	0
Benin	Azongbe (F)	Whole plant	Poaceae	<i>Hackelochloa granularis</i> (L.) Kuntze	Purification baths.	0	0	0	1	0

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Gabon	Musasa (E)	Wood	Hypericaceae	<i>Harungana madagascariensis</i> Lam. ex Poir.	Construction of Bviti altars.	0	0	0	0	0
Benin	Ebo (T)	Bark	Hypericaceae	<i>Harungana madagascariensis</i> Lam. ex Poir.	Protection against stomach ailments believed to be caused by sorcery.	0	0	1	0	0
Gabon	Rumueni (Pu)	Whole plant	Rubiaceae	<i>Heinsia crinita</i> (Aubl.) G. Taylor	Baths to attain success.	0	0	0	0	0
Gabon	Djele vende (My)	Whole plant	Rubiaceae	<i>Heinsia</i> sp.	Good luck baths.	0	0	0	0	0
Gabon	Ntsabi (Mk)	Bark	Olivaceae	<i>Heisteria parvifolia</i> Sm.	Purification baths.	0	0	0	0	0
Gabon	Mugamba (Bp)	Fruits	Olivaceae	<i>Heisteria zimmereri</i> Engl.	Amulets for women to keep their husbands with them.	0	0	0	0	0
Benin	Klonlonson (F)	Whole plant	Boraginaceae	<i>Heliotropium indicum</i> L.	Treatment of Sakpata-related diseases.	0	0	0	0	0
Benin	Dlo (F)	Whole plant	Pontederiaceae	<i>Heteranthera callifolia</i> Richb. ex Kunth	Luck-bringing soaps.	0	0	0	0	0
Benin	Xexema (F)	Whole plant	Melastomataceae	<i>Heterotis rotundifolia</i> (Sm.) Jacq.-Fél.	Purification baths.	0	0	0	0	0
Benin	Houmassivovo (F)	Whole plant	Malvaceae	<i>Hibiscus acetosella</i> Welw. ex Hiern	Planted in protection against sorcerers.	0	0	0	1	0
Gabon	Esang (Fa)	Leaves	Malvaceae	<i>Hibiscus sabdariffa</i> L.	Treatment of wounds of supernatural origin.	1	0	0	0	1
Benin	Oseille sauvage (Fr)	Whole plant	Malvaceae	<i>Hibiscus surattensis</i> L.	Planted in protection against sorcerers.	0	0	0	1	0
Benin	Ano (T)	Leaves	Phytolaccaceae	<i>Hilliera latifolia</i> (Lam.) H. Walter	Eaten in protection against bewitchment	0	0	0	0	0
Gabon	Oignon de la brousse (F)	Whole plant	Amariyllidaceae	<i>Hippeastrum puniceum</i> (Lam.) Voss	Luck-bringing perfumes.	0	0	0	0	0
Benin	Akogbo (F)	Whole plant	Salicaceae	<i>Homalium le-testui</i> Pellegr.	Restricted species	1	1	0	0	0
Benin	Ilu femi (Y)	Whole plant	Araliaceae	<i>Hydrocotyle bonariensis</i> Comm. ex Lam.	Purification baths.	0	0	0	0	0
Gabon	Ontcholu (Tk)	Wood	Phyllanthaceae	<i>Hymenocardia ulmoides</i> Oliv.	Construction of Bviti altars.	0	0	0	0	0
Benin	Tchoukoko (T)	Whole plant	Phyllanthaceae	<i>Hymenocardia acida</i> Tul.	Restricted species	1	0	0	0	0
Gabon	Esekule (Fa)	Leaves	Rubiaceae	<i>Hymenocoleus hirsutus</i> (Benth.) Robbr.	Ritual scarifications.	0	0	0	0	0

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Gabon	Alozonge (Fa)	Stems	Marantaceae	<i>Hypselodelphys violacea</i> (Ridl.) Milne-Redh.	Construction of Bviti altars.	0	0	0	0	0
Gabon	Bedieme (Fa)	Whole plant	Icacinaceae	<i>Icacina mamii</i> Oliv.	Several medico-spiritual uses.	0	0	0	0	0
Benin	Egon (T)	Stems	Poaceae	<i>Imperata cylindrica</i> (L.) Raeusch.	Protection against sorcerers.	0	0	0	0	0
Benin	Keafumitiche (T)	Roots	Leguminosae	<i>Indigofera dendroides</i> Jacq.	Eaten in protection against enemies	0	0	0	0	0
Benin	Agondje (F)	Leaves	Leguminosae	<i>Indigofera hirsuta</i> L.	Purification baths and drinks.	0	0	0	0	0
Benin	Waraougu (F)	Whole plant	Leguminosae	<i>Indigofera spicata</i> Forsk.	Used in love charms.	0	0	0	0	0
Benin	Axe de du Nord (F, Fr)	Whole plant	Convolvulaceae	<i>Ipomoea argenteaurata</i> Hallier f.	Amulets, protective baths.	0	0	0	0	0
Benin	Atoyoe (F)	Whole plant	Convolvulaceae	<i>Ipomoea fistulosa</i> Mart. ex Choisy	Purification baths.	0	0	0	0	1
Gabon	Nichobi (Ak)	Whole plant	Convolvulaceae	<i>Ipomoea mauritiana</i> Jacq.	Luck-bringing baths.	0	0	0	0	0
Gabon	Otunden (Fa)	Stems	Convolvulaceae	<i>Ipomoea pileata</i> Roxb.	Amulet for fertility.	0	0	0	0	0
Benin	Funchele (F)	Whole plant	Convolvulaceae	<i>Ipomoea pileata</i> Roxb.	Charms to break spells left behind by dead people.	0	0	0	0	0
Benin	Axinadje (F), Senewanmi (G)	Whole plant	Convolvulaceae	<i>Ipomoea quamoclit</i> L.	Purification baths	0	0	0	0	0
Gabon	Uba (Mi)	Bark	Irvingiaceae	<i>Irvingia gabonensis</i> (Aubry-Lecomte ex O'Rorke) Baill.	Amulet for fertility.	1	1	0	1	0
Gabon	Mulenda (Bp)	Leaves	Irvingiaceae	<i>Irvingia grandifolia</i> (Engl.) Engl.	Unspecified ritual use.	0	0	1	0	0
Benin	Kitikpokpo (T)	Whole plant	Euphorbiaceae	<i>Jatropha carcas</i> L.	Planted in protection against evil spirits.	0	0	0	1	0
Benin	Ketigbokugb (T)	Whole plant	Euphorbiaceae	<i>Jatropha gossypifolia</i> L.	Planted in protection against evil spirits, purification baths	0	0	0	1	0
Benin	Akpawi (F)	Whole plant	Euphorbiaceae	<i>Jatropha multifida</i> L.	Planted in protection against evil spirits.	0	0	0	1	0
Benin	Houmanssiteton (F)	Whole plant	Acanthaceae	<i>Justicia secunda</i> Vahl	Treatment of malaria caused by bewitchment.	0	0	0	0	0
Benin	Afama (F)	Whole plant	Crassulaceae	<i>Kalanchoe crenata</i> (Andrews) Haw.	Restricted species. Purification baths.	1	0	0	1	0
Gabon	Everem (Fa)	Whole plant	Crassulaceae	<i>Kalanchoe crenata</i> (Andrews) Haw.	Purification baths.	0	0	0	1	0
Benin	Kasedral (F)	Bark	Meliaceae	<i>Khaya senegalensis</i> A.Juss.	Protective baths	0	1	1	1	0

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Benin	Faux baobab (Fr), Kpando (T)	Leaves	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	Used in a treatment to increase the size of genitals.	0	1	0	1	0
Benin	Dogbo dogbo (Y)	Roots	Cyperaceae	<i>Kyllinga erecta</i> Schumach.	Burnt as incense in protection against evil spirits.	0	0	0	0	0
Gabon	Pivam (Tk)	Fruits	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	Protection against snake bites.	0	0	0	1	0
Benin	Weblikpin (F)	Fruits	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	Ceremonial object.	0	0	0	1	0
Benin	Ado (Y)	Fruits	Cucurbitaceae	<i>Lagenaria siceraria</i> (Molina) Standl.	Ceremonial object	0	0	0	0	1
Benin	Aku (T)	Bark	Anacardiaceae	<i>Lannea acida</i> A.Rich.	Protective baths for infants.	0	0	0	0	0
Benin	Hounmansi (F)	Bark	Anacardiaceae	<i>Lannea barteri</i> (Oliv.) Engl.	Protective baths for infants.	0	0	0	0	0
Gabon	Bikona (Fa)	Bark	Anacardiaceae	<i>Lannea welwitschii</i> (Hiem) Engl.	Good luck baths.	0	0	0	0	0
Gabon	Munju (Nz)	Whole plant	Stemonuraceae	<i>Lasianthera africana</i> P.Beauv.	Luck-bringing baths.	0	0	1	0	0
Gabon		Whole plant	Rubiaceae	<i>Lasianthus batangensis</i> K.Schum.	Unspecified ritual use.	0	0	0	0	0
Benin	Hemé (Fr), Lali (T)	Leaves	Lythraceae	<i>Lawsonia inermis</i> L.	Ceremonial pigmentation.	0	0	0	0	1
Benin	Wawa (T)	Leaves	Sapindaceae	<i>Lecaniodiscus cupanioides</i> Planch. ex Benth.	Soap used by merchants to increase their profits.	0	0	0	0	0
Gabon	Igaleneroghout (E)	Whole plant	Vitaceae	<i>Leea guineensis</i> G. Don	Purifications baths to get rid of bad luck.	0	0	0	0	0
Gabon	Malamanzoengui (Br)	Flower	Lamiaceae	<i>Leonotis nepetifolia</i> (L.) R.Br.	Medico-spiritual treatment against female infertility.	0	0	0	1	0
Benin	Dawili (De)	Whole plant	Lamiaceae	<i>Leonotis nepetifolia</i> (L.) R.Br.	Used in protective baths for infants.	0	0	0	0	0
Benin	Aklala (F)	Leaves	Verbenaceae	<i>Lippia rugosa</i> A.Chev.	Purification baths.	0	0	0	0	0
Gabon	Afi (Fa)	Flower	Verbenaceae	<i>Lippia multiflora</i> Moldenke	Burnt as incense to chase evil spirits away	0	0	0	0	0
Gabon	Njemale (Mk)	Whole plant	Campanulaceae	<i>Lobelia gillettii</i> De Wild.	Charm for husbands to return to their wives.	0	0	0	0	0
Gabon	Azobe (Fa), Okoka (Bb)	Bark	Ochnaceae	<i>Lophira alata</i> Banks ex C.F. Gaertn.*	Protective baths against bewitchment.	0	1	0	0	0

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Benin	Kpapasa (T)	Bark	Ochnaceae	<i>Lophira lanceolata</i> Tiegh. ex Keay	Medico-spiritual treatment for malaria in infants.	0	0	0	0	0
Benin	Éponge traditionell (Fr)	Fruits	Cucurbitaceae	<i>Luffa cylindrica</i> M.Roem.	Purification baths	0	0	0	0	1
Benin	Zetinti (F)	Whole plant	Lycopodiaceae	<i>Lycopodiella cernua</i> (L.) Pic. Serm.	Protective baths	0	0	1	0	0
Gabon	Gbanga (Bb)	Stems	Lygodiaceae	<i>Lygodium smithianum</i> C. Presl	Ceremonial objects.	0	0	0	0	0
Gabon	Assas (Fa)	Leaves	Euphorbiaceae	<i>Macaranga monandra</i> Müll.Arg.	Ceremonially, to sweep evil away.	0	0	0	0	0
Gabon	Insaha la muelle (Bb)	Leaves	Euphorbiaceae	<i>Macaranga spinosa</i> Müll.Arg.	Herbal baths for people who desire to become more attractive.	0	0	0	0	0
Benin	Tchutchugrutchu (F)	Leaves	Capparaceae	<i>Maeria duchesnei</i> (De Wild.) F.White	Said to be used by sorcerers in the preparation of spells.	0	1	0	0	0
Gabon	Otol (Fa)	Fruits	Phyllanthaceae	<i>Maesobotrya barkeri</i> (Baill.) Hutch.	Unspecified ritual use.	0	0	0	0	0
Gabon	Mususu (Lu)	Bark	Rhamnaceae	<i>Maesopsis eminii</i> Engl.	Initiation baths.	0	0	0	0	0
Benin	Kise kise ma (F), Ahindja (Id)	Whole plant	Euphorbiaceae	<i>Mallotus oppositifolius</i> (Geiseler) Müll.Arg.	Used for several charms.	1	0	0	0	0
Benin	Mango (En), Mangagoto (F)	Bark	Anacardiaceae	<i>Mangifera indica</i> L.	Protective baths for men.	0	0	0	0	1
Gabon	Cassave, manioc (Fr)	Leaves	Euphorbiaceae	<i>Manihot esculenta</i> Crantz	Food taboo.	1	0	0	0	1
Benin	Kutuma asu (Ad)	Leaves, root	Euphorbiaceae	<i>Manihot esculenta</i> Crantz	Ceremonial offerings	0	0	0	0	1
Benin	Emedo (T)	Bark	Sapotaceae	<i>Manilkara sapota</i> (L.) P.Royen	Burnt as incense in protection against diseases.	0	0	0	0	1
Gabon	Bilambesu (My)	Bark	Euphorbiaceae	<i>Maprounea membranacea</i> Pax & K.Hofm.	Protective baths for newborns.	0	0	0	0	0
Gabon	Kaisieli (Tk)	Leaves	Euphorbiaceae	<i>Maprounea africana</i> Müll.Arg.	Baths in protection against diseases of mystical origin.	0	0	0	0	0
Gabon	Oisa (Mi)	Fruits	Chrysobalanaceae	<i>Maranthes chrysophylla</i> (Oliv.) Prance ex F.White	Food taboo.	1	0	0	0	0
Benin	Tchonkoko (T)	Whole plant	Chrysobalanaceae	<i>Maranthes polyandra</i> (Benth.) Prance	Protection against evil-doers.	1	0	1	1	0

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Benin	Tehiningo (T)	Bark	Bignoniaceae	<i>Markhamia tomentosa</i> (Benth.) K.Schum. ex Engl.	Used in a spiritual context as a vermifuge.	0	0	0	1	0
Benin	Azizaŋ (F)	Seeds	Martyniaceae	<i>Martynia annua</i> L.	Vaccinations against evil spirits	0	0	0	0	0
Gabon	Pink magic (En), Eleoan (Lu)	Fruits	Rubiaceae	<i>Massularia acuminata</i> (G.Don) Bullock ex Hoyle	Good luck baths.	1	0	1	0	1
Gabon	Okeku (Fa)	Leaves	Marantaceae	<i>Megaphrynium macrostachyum</i> (K. Schum.) Milne-Redh	Ceremonial offerings	0	0	0	0	0
Gabon	Girendenyala (E)	Whole plant	Poaceae	<i>Megastachya mucronata</i> (Poir.) P.Beauv.	Unspecified ritual use.	0	0	0	0	0
Benin	Irewa (T)	Leaves	Malvaceae	<i>Melochia melissifolia</i> Benth.	Purification of body and ceremonial objects.	0	0	0	0	0
Benin	Aloviaton (F)	Whole plant	Convolvulaceae	<i>Merremia quinquefolia</i> (L.) Hallier f.	Used in charms that grant people any wish.	0	0	0	0	0
Gabon	Ogandaga (My)	Leaves	Pandaceae	<i>Microdesmis camerunensis</i> J.Léonard	Charms to resolve disputes.	0	0	0	0	0
Gabon	Duganda (Lu)	Leaves	Pandaceae	<i>Microdesmis afrodecandra</i> Floret, A.M.Louis & J.M.Reitsma	Purification baths.	0	0	0	0	0
Benin	Egn (T)	Whole plant	Euphorbiaceae	<i>Microstachys chamaelea</i> (L.) Müll.Arg.	Healing soaps.	0	0	0	0	0
Benin	Iroko (En)	Whole plant	Moraceae	<i>Millettia excelsa</i> (Welw.) C.C.Berg*	Sacred tree.	1	1	1	1	0
Gabon	Iroko (En)	Whole plant	Moraceae	<i>Millettia excelsa</i> (Welw.) C.C.Berg*	Sacred tree.	0	1	0	0	0
Gabon	Mbota (E)	Wood	Leguminosae	<i>Milletia laurentii</i> De Wild *	Construction of Bviti altars.	0	1	0	0	0
Benin	La honte (Fr)	Whole plant	Leguminosae	<i>Mimosa pudica</i> L.	Used as an amulet for women who are afraid to lose their husbands.	0	0	0	0	0
Benin	Velun (F)	Whole plant	Leguminosae	<i>Mimosa quadrivalvis</i> var. <i>leptocarpa</i> (DC.) Barneby	Purification baths.	1	0	0	0	0
Benin	Godoko (F)	Whole plant	Rubiaceae	<i>Mitracarpus hirsus</i> (L.) DC.	Unspecified ritual use.	0	0	0	0	0
Benin	Tugbase (F)	Whole plant	Molluginaceae	<i>Mollugo nudicaulis</i> Lam.	Protective baths.	0	0	0	0	0
Gabon	Babumbolo (Lu)	Whole plant	Cucurbitaceae	<i>Momordica balsamina</i> L.	Scrub in ceremonial baths.	0	0	0	0	0

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Benin	Aslosikan (G)	Whole plant	Cucurbitaceae	<i>Momordica balsamina</i> L.	Protective baths.	0	0	0	0	0
Benin	Tchati (T)	Fruits	Cucurbitaceae	<i>Momordica charantia</i> L.	Treatment of Sakpata-related diseases.	0	0	0	1	0
Benin	Tchigou (F)	Roots	Apocynaceae	<i>Mondia whitei</i> (Hook.f.) Skeels	Protective baths against sorcery.	0	1	0	0	0
Benin	Sasalikwin (F)	Seeds	Annonaceae	<i>Monodora myristica</i> (Gaertn.) Dunal	Substitute for Aframomum melegueta in ceremonies.	0	1	0	0	0
Gabon	Nzingu (Ma)	Seeds	Annonaceae	<i>Monodora myristica</i> (Gaertn.) Dunal	Purification baths	0	0	0	0	0
Benin	Xwenswema (F)	Leaves	Rubiaceae	<i>Morinda lucida</i> Benth.	Baths to attract love and in protection against theft	0	0	0	1	0
Benin	Ewe ile (Y)	Leaves	Moringaceae	<i>Moringa oleifera</i> Lam.	Ceremonial offerings.	0	0	0	0	1
Benin	Akpakpu wewe (F)	Seeds	Leguminosae	<i>Mucuna pruriens</i> (L.) DC.	Cultivated as a protection against snakes	0	0	0	0	0
Benin	Vese (F)	Seeds	Leguminosae	<i>Mucuna sloanei</i> Fawc. & Rendle	Divination	0	0	0	0	0
Benin	Ori oka (Y)	Leaves	Cucurbitaceae	<i>Mukia maderaspatana</i> (L.) M Roem.	Eaten in protection against diseases believed to be caused by witchcraft.	0	0	0	0	0
Benin	Tchigou (F)	Leaves	Rutaceae	<i>Murraya paniculata</i> (L.) Jack	Treatment of malaria caused by bewitchment.	0	0	0	0	0
Gabon	Bapung (Ak)	Leaves	Rubiaceae	<i>Mussaenda soyauxii</i> Büttner	Baths in protection against theft	0	0	0	0	0
Gabon	Fol (Fa)	Whole plant	Rubiaceae	Mussaenda sp.	Ordeals for adulterous women.	0	0	0	0	0
Benin	Atinken (F)	Fruits	Myrtaceae	<i>Myrcianthes fragrans</i> (Sw.) McVaugh	Ceremonies for new-borns.	0	0	0	0	0
Benin	Zedon (F)	Whole plant	Lecythidaceae	<i>Napoleonaea vogelii</i> Hook. & Planch.	Unspecified ritual use.	0	0	1	0	0
Benin	Opepe (Y)	Wood	Rubiaceae	<i>Naucllea diderrichii</i> (De Wild.) Merr.*	Ceremonial objects.	0	1	1	0	0
Benin	Atiti (Pe)	Whole plant	Acanthaceae	<i>Nelsonia canescens</i> (Lam.) Spreng.	Rituals to revert spells.	0	0	0	0	0
Benin	Eaw (T)	See	Leguminosae	<i>Neonotonia wightii</i> (Wight & Arn.) J.A.Lackey	Ceremonial offerings	0	0	0	0	0
Benin	Djelema (F)	Whole plant	Nephrolepidaceae	<i>Nephrolepis biserrata</i> (Sw.) Schott	Protective baths against Sakpata diseases.	0	0	0	0	0

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Gabon	Ayangyo (F)	Whole plant	Nephrolepidaceae	<i>Nephrolepis biserrata</i> (Sw.) Schott	Purification baths	0	0	0	0	0
Gabon	Tsengingi (Nz)	Whole plant	Nephrolepidaceae	<i>Nephrolepis undulata</i> (Afzel. ex Sw.) J. Sm.	Luck-bringing baths.	0	0	0	0	0
Gabon	Onana (Bb)	Stems	Araceae	<i>Nephtytis afzelii</i> Schott	Cords used in amulets.	0	0	0	0	0
Benin	Xetitin (F)	Whole plant	Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	Planted in protection against evil spirits	1	0	0	1	0
Gabon	Douvindegisa (Bp)	Leaves	Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	Purification baths.	0	0	0	0	0
Benin	Tobaco (En), Azewewe (F)	Leaves	Solanaceae	<i>Nicotiana tabacum</i> L.	Good luck soaps and perfumes.	0	0	0	0	1
Benin	Kesu kesu (F)	Leaves	Lamiaceae	<i>Ocimum americanum</i> L.	Baths to attract love.	1	0	0	1	0
Gabon	Ossim (Fa)	Leaves	Lamiaceae	<i>Ocimum americanum</i> L.	Baths to attain good luck.	0	0	0	1	0
Benin	Cohou (G)	Whole plant	Lamiaceae	<i>Ocimum basilicum</i> L.	Eaten in protection against diseases believed to be caused by witchcraft.	0	0	0	1	0
Benin	Tchayo (F)	Leaves	Lamiaceae	<i>Ocimum gratissimum</i> L.	Charms to attain success, purification baths	1	0	0	1	0
Gabon	Malundumb (Ms)	Leaves	Lamiaceae	<i>Ocimum gratissimum</i> L.	Baths to attain good luck.	0	0	0	1	0
Gabon	Ekobe (Fa)	Bark	Olacaceae	<i>Olax staudtii</i> Engl.	Ceremonial objects.	0	0	0	0	0
Benin	Mitin (F)	Bark	Olacaceae	<i>Olax subscorpioides</i> Oliv.	Protective baths against weapons.	0	0	1	0	0
Benin	Azanglo (F)	Leaves	Rubiaceae	<i>Oldenlandia affinis</i> (Roem. & Schult.) DC.	Protective baths against sorcery.	0	0	0	0	0
Gabon	Nambibot (Fa)	Leaves	Rubiaceae	<i>Oldenlandia lancifolia</i> (Schumach.) DC.	Ceremonially, to strengthen the effectivity of other medicinal plants.	0	0	0	0	0
Gabon	Poutcho (Sa)	Bark, fruits	Sapotaceae	<i>Omphalocarpum procerum</i> P.Beauv.	Ceremonial treatment for infertility in women.	0	0	0	0	0
Benin	Koloro (T)	Fruits	Salicaceae	<i>Oncoba spinosa</i> Forssk.	Ceremonial object.	0	0	0	0	0
Benin		Whole plant	Ophioglossaceae	<i>Ophioglossum costatum</i> R. Br.	Unspecified ritual use.	0	0	0	0	0
Benin	Nyondo (T)	Whole plant	Opiliaceae	<i>Opilia amentacea</i> Roxb.	Protective bath against sorcery	0	0	0	0	0
Gabon	Mburwe (Bb)	Fruits	Lecythidaceae	<i>Oubanguiia africana</i> Baill.	Food taboo.	1	0	0	0	0
Benin	Kudje kudje (F)	Whole plant	Oxalidaceae	<i>Oxalis corniculata</i> L.	Love-bringing baths.	0	0	0	0	0

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Gabon	Didjodjoru (Nv)	Leaves	Commelinaceae	<i>Palisota ambigua</i> (P.Beauv.) C.B.Clarke	Protective baths against evil spirits.	0	0	0	0	0
Benin	Agbato abo (T)	Whole plant	Commelinaceae	<i>Palisota hirsuta</i> (Thunb.) K.Schum.	Burnt and eaten in protection against evil spirits.	0	0	1	0	0
Benin	Zoxume sabla (Ad)	Whole plant	Amaryllidaceae	<i>Pancratium tenuifolium</i> Hochst. ex A.Rich.	Protection against evil spirits.	0	0	0	0	0
Benin	Gbeke gbeke (T)	Whole plant	Amaryllidaceae	<i>Pancratium trianthum</i> Herb.	Protection against evil spirits.	0	0	0	0	0
Gabon	Ando (Fa)	Seeds	Pandaceae	<i>Panda oleosa</i> Pierre	Eaten in protection against the return of diseases of mystical origin.	0	0	0	0	0
Benin	Ogbokneko (T)	Flower	Aristolochiaceae	<i>Parasitochia goldieana</i> (Hook.f.) Hutch. & Dalziel	Used in the treatment of rashes in the feet caused by a Sakpata spell	0	1	0	0	0
Benin	Agao (T)	Leaves	Leguminosae	<i>Parkia biglobosa</i> (Jacq.) R.Br. ex G.Don	Eaten in protection against sorcerers.	0	0	1	1	0
Gabon	Ndjendja (Bp)	Fruits	Passifloraceae	<i>Paropsia grewioides</i> Welw. ex Mast.	Tied to the legs of infants in order to make them walk.	0	0	0	0	0
Benin	Avu nien (F)	Whole plant	Passifloraceae	<i>Passiflora foetida</i> L.	Scrub in ceremonial baths.	0	0	0	0	0
Gabon	Miran (Bp)	Whole plant	Sapindaceae	<i>Paullinia pinnata</i> L.	Bath to attract love.	0	0	0	0	0
Benin	Lowxi (F)	Leaves	Rubiaceae	<i>Pavetta corymbosa</i> (DC.) F.N.Williams	Drank by pregnant women in protection against physical dangers.	0	0	0	0	0
Benin	Gongoako (T)	Leaves	Rubiaceae	<i>Pavetta crassipes</i> K.Schum.	Purification baths.	0	0	0	0	0
Benin	Likun (F)	Seeds	Poaceae	<i>Pennisetum glaucum</i> (L.) R.Br.	Fertility rituals.	0	0	0	0	0
Gabon	Gesenge (Mi)	Bark	Leguminosae	<i>Pentaclethra eerveldeana</i> De Wild. & T.Durand	Several medico-spiritual uses.	0	0	0	0	0
Benin	Dengwi (F)	Fruits	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Used in protection against thieves.	0	1	0	0	0
Gabon	Oba (Mi)	Fruits	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Protection against weapons and accidents.	1	0	0	0	0
Benin	Sinfifama (F)	Whole plant	Piperaceae	<i>Peperomia pellucida</i> (L.) Kunth	Worn in protection against enemies.	0	0	0	0	0
Benin	Okuoghbon (T)	Bark	Apocynaceae	<i>Periploca calophylla</i> (Wight) Falc.	Used in protection against enemies.	0	0	0	0	0

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Gabon	Ntchovi (My)	Leaves	Apocynaceae	<i>Periploca nigrescens</i> Afzel.	Protective amulet for fishermen.	0	0	0	0	0
Gabon	Ebindjo (Mi)	Fruits	Lecythidaceae	<i>Petersianthus macrocarpus</i> (P.Beau v.) Liben	Food taboo.	1	0	0	0	0
Benin	Zoroman (F)	Whole plant	Phytolaccaceae	<i>Peitiveria alliacea</i> L.	Chase evil spirits away.	0	0	0	0	0
Benin	Homefado (F)	Stem	Acanthaceae	<i>Phaulopsis ciliata</i> (Willd.) Hepper	Ceremonial bath to treat infertility in women.	0	0	0	0	0
Benin	Ahoma (F)	Leaves	Leguminosae	<i>Philenoptera cyanescens</i> (Schum. & Thonn.) Roberty	Unspecified medico-spiritual treatments.	0	0	0	0	0
Benin	Kunse kunse (F)	Whole plant	Phyllanthaceae	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Worn in pockets in protection against sorcerers	0	0	0	0	0
Benin	Agemon kogu (T)	Whole plant	Phyllanthaceae	<i>Phyllanthus muellerianus</i> (Kunze) Exell	Restricted species	1	0	0	1	0
Gabon	Sala (F)	Whole plant	Phyllanthaceae	<i>Phyllanthus odontadenius</i> Müll.Arg.	Unspecified ritual use.	0	0	0	0	0
Benin	Degoma (F)	Whole plant	Polypodiaceae	<i>Phymatosorus scolopendria</i> (Burm. f.) Pic. Serm.	Protective baths against Sakpata diseases.	0	0	0	0	0
Gabon	Binyumelök (Fa)	Leaves	Solanaceae	<i>Physalis angulata</i> L.	Unspecified ritual use.	0	0	0	0	0
Benin	Ayokpe (F)	Seeds	Apocynaceae	<i>Picralima nitida</i> (Stapf) T.Durand & H.Durand	Occasionally chewed as a stimulant during vodoun ceremonies	0	0	1	0	0
Gabon	Dighoundou (Ma)	Bark	Apocynaceae	<i>Picralima nitida</i> (Stapf) T.Durand & H.Durand	Several medico-spiritual uses.	0	0	0	0	0
Benin	Lenkun (F)	Seeds	Piperaceae	<i>Piper guineense</i> Schumach. & Thonn.	Eaten to increase the power of words.	0	0	0	0	0
Gabon	Abonsan (Fa)	Leaves	Piperaceae	<i>Piper umbellatum</i> L.	Wrapping of ceremonial offerings	0	0	0	0	0
Gabon	Tom (Fa)	Wood	Leguminosae	<i>Piptadeniastrum africanum</i> (Hook.f.) Brenan	Ceremonial objects.	0	0	0	0	0
Benin	Foutou (Ad)	Whole plant	Araceae	<i>Pistia stratiotes</i> L.	Used in a spell that is supposed to bring misfortune to businessmen.	1	0	0	0	0
Benin	Gomido (G)	Whole plant	Leguminosae	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Unspecified ritual use.	0	0	0	0	0
Gabon	Ghetodho (Mi)	Bark	Euphorbiaceae	<i>Platostyles africana</i> (Müll.Arg.) Prain	Purification baths.	0	0	0	0	0

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Benin	Banvillekou (F)	Whole plant	Lamiaceae	<i>Plectranthus monostachyus</i> (P.Beauv.) B.J. Pollard	Good luck soaps and perfumes.	0	0	0	0	0
Gabon	Ava (Fa)	Leaves	Lamiaceae	<i>Plectranthus monostachyus</i> (P.Beauv.) B.J. Pollard	Treatment of stomachache caused by bewitchment.	0	0	0	0	0
Gabon	Intabi (Bb)	Whole plant	Lamiaceae	<i>Plectranthus occidentalis</i> B.J. Pollard	Herbal baths by women to prevent their men from abandoning them.	0	0	0	0	0
Gabon	Muvogi (Ma)	Fruits	Anisophyllaceae	<i>Poga oleosa</i> Pierre	Eaten in protection against diseases believed to be caused by witchcraft.	0	0	0	0	0
Benin	Muye muye (F)	Whole plant	Caryophyllaceae	<i>Polycarpon prostratum</i> (Forsk.) Asch. & Schweinf.	Protective baths.	0	0	0	0	0
Benin	N'Kpatale (T)	Whole plant	Polygalaceae	<i>Polygala arenaria</i> Willd.	Protective baths against snake bites.	0	0	0	0	0
Benin	Dri (F)	Whole plant	Portulacaceae	<i>Portulaca grandiflora</i> Hook.	Baths to attract love.	0	0	0	0	1
Benin	Afla (F)	Leaves	Portulacaceae	<i>Portulaca oleracea</i> L.	Eaten in protection against evil spirits.	0	0	0	0	0
Benin	Enhuma (Ad)	Whole plant	Portulacaceae	<i>Portulaca quadrifida</i> L.	Unspecified sorcery spells.	0	0	0	0	0
Gabon	Tsamba (Mi)	Whole plant	Portulacaceae	<i>Portulaca quadrifida</i> L.	Treatment of headaches of supernatural origin.	0	0	0	0	0
Benin	Kake (F)	Whole plant	Leguminosae	<i>Prosopis africana</i> (Guill. & Perr.) Taub.	Sacred tree	1	0	1	0	0
Benin	Aroubologbo (De)	Whole plant	Proteaceae	<i>Protea madiensis</i> Oliv.	Unspecified ritual use.	0	0	1	0	0
Gabon	Ke (Fa)	Whole plant	Acanthaceae	<i>Pseuderanthemum tunicatum</i> (Afzel.) Mihe-Redh. (Roxb. ex Rottl.) Roxb.	Several medico-spiritual uses.	0	0	0	0	0
Benin	Tchangui (T)	Roots	Meliaceae	<i>Pseudocedrela kotschy</i> (Schweinf.) Harms	Treatment of stomachache caused by bewitchment.	0	0	1	1	0
Gabon	Nlgabge (Fa)	Wood	Myrtaceae	<i>Psidium guajava</i> L.	Ceremonial objects.	0	0	0	0	1
Gabon	Nzjvale (Mk)	Leaves	Rubiaceae	<i>Psychotria latistipula</i> Benth.	Good luck baths.	0	0	0	0	0
Benin	Magbevide (F)	Leaves	Rubiaceae	<i>Psychotria vogeliana</i> Benth.	Protective baths against bewitchment.	0	0	0	0	0

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Gabon	Guisofo (E)	Flower	Rubiaceae	<i>Psychotria ledermannii</i> (K.Krause) Figueiredo	Luck-bringing perfumes.	0	0	0	0	0
Benin	Kulikiligoto (F)	Whole plant	Combretaceae	<i>Pteleopsis suberosa</i> Engl. & Diels	Unspecified ritual use.	1	0	1	1	0
Gabon	Eichengoungue (Mi)	Leaves	Demstaediaceae	<i>Peridium aquilinum</i> (L.) Kuhn	Worn by men during Bwiti ceremonies	0	0	0	0	0
Benin	Gbagbe (F)	Whole plant	Leguminosae	<i>Pterocarpus erinaceus</i> Poir.*	Restricted species	1	1	1	0	0
Benin	Gbenhgi (T)	Whole plant	Leguminosae	<i>Pterocarpus santalinoides</i> DC.	Restricted species	1	0	0	0	0
Gabon	Padauk (En, Fr)	Wood	Leguminosae	<i>Pterocarpus soyauzii</i> Taub.*	Ceremonial pigment (red caolin).	0	0	1	0	0
Benin	Goduwe (F)	Whole plant	Amaranthaceae	<i>Pupalia lappacea</i> (L.) Juss.	Baths to attract love.	0	0	0	0	0
Gabon	Geomba (Mi)	Seeds	Myristicaceae	<i>Pycnanthus angolensis</i> (Welw.) Warb.	Several medico-spiritual uses.	0	0	0	0	0
Gabon	Musieguieri (Lu)	Bark	Simaroubaceae	<i>Quassia gabonensis</i> Pierre	Baths in protection against evil spirits.	0	0	0	0	0
Benin	Deka (F)	Seeds, fibre from young leaves	Arecaceae	<i>Raphia hookeri</i> G.Mann & H.Wendl.	Divination	0	0	0	1	0
Benin	Asofeyeye (Y)	Leaves	Apocynaceae	<i>Rauvolfia vomitoria</i> Aitzel.	Used in the treatment of madness caused by possession by spirits.	0	1	1	1	0
Gabon	Tchodosodo (Mi)	Stem	Zingiberaceae	<i>Renanthera polypus</i> Gagnep.	Ceremonial object.	0	0	0	0	0
Benin	Kplankplankan (F)	Wood	Icacinaceae	<i>Rhaphiostylis beninensis</i> (Hook.f. ex Planch.) Planch. ex Benth.	Used in protective baths for infants.	0	0	0	0	0
Benin	Kpatidehi (F)	Whole plant	Malvaceae	<i>Rhodogaphalon brevicuspe</i> (Sprague) Roberty	Restricted species	1	1	0	1	0
Benin	Edigo (T)	Leaves	Euphorbiaceae	<i>Ricinodendron heudelotii</i> (Baill.) Heckel	Ritual baths to make babies strong.	1	0	1	1	0
Benin	Fefufufu (T)	Whole plant	Euphorbiaceae	<i>Ricinus communis</i> L.	Planted in protection of ceremonial places.	0	0	0	1	0
Benin	Egido eta (T)	Bark	Capparaceae	<i>Ritchiea capparoides</i> (Andrews) Britten	Used in a head wash to treat headaches caused by evil spirits.	1	0	0	0	0
Benin	Amedje (T)	Leaves	Connaraceae	<i>Rourea coccinea</i> (Schumacher & Thonn.) Benth.	Protective baths against spells.	0	0	0	0	0

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Benin	Plante corail (Fr)	Whole plant	Plantaginaceae	<i>Russelia equisetiformis</i> Schltdl. & Cham.	Protection against evil spirits.	0	0	0	1	0
Gabon	Mupuga (Pu)	Whole plant	Rubiaceae	<i>Sabicea mildbraedii</i> Wernham	Charm to solve disputes.	0	0	0	0	0
Benin	Hutchabu (F)	Seeds	Humiriaceae	<i>Sacoglottis gabonensis</i> (Baill.) Urb.	Used in amulets in protection against evil spirits.	0	0	0	0	0
Benin	Zunkusi (F)	Seeds	Celastraceae	<i>Salacia erecta</i> (G.Don) Walp.	Used in the treatment of malaria caused by bewitchment.	0	0	0	0	0
Gabon	Nkai (Tk)	Whole plant	Asparagaceae	<i>Sansevieria liberica</i> Gérôme & Labroy	Planted in protection against evil spirits.	0	0	0	1	0
Benin	Kponja (F)	Whole plant	Asparagaceae	<i>Sansevieria liberica</i> Gérôme & Labroy	Planted in protection against evil spirits, purification baths	0	0	0	1	0
Gabon	Eba (Fa)	Wood	Burseraceae	<i>Saniria trimera</i> (Oliv.) Aubrév.	Ceremonial objects.	0	0	0	0	0
Benin	Kudo (F)	Roots	Rubiaceae	<i>Sarcocephalus latifolius</i> (Sm.) E.A.Bruce	Treatment of malaria caused by bewitchment.	0	0	0	0	0
Benin		Whole plant	Amaryllidaceae	<i>Scadoxus multiflorus</i> (Martyn) Raf.	Unspecified ritual use.	0	0	0	0	0
Gabon	Dikobekobe (Bb)	Wood	Malvaceae	<i>Scaphopetalum thonneri</i> De Wild. & T.Durand	Ceremonial objects.	0	0	0	0	0
Benin	Gumagan (F)	Fruits	Oleaceae	<i>Schrebera arborea</i> A.Chev.	Divination	0	1	1	1	0
Gabon	Fafolo (Fa)	Whole plant	Cyperaceae	<i>Scleria boivinii</i> Steud.	Against bed-wetting in children.	0	0	0	0	0
Benin	Vivi teton (F)	Whole plant	Plantaginaceae	<i>Scoparia dulcis</i> L.	Luck baths	0	0	0	0	0
Gabon	Osimiale (Fa)	Whole plant	Plantaginaceae	<i>Scoparia dulcis</i> L.	Amulet to obtain the favor of important persons.	0	0	0	1	0
Gabon	Tsoro (Fa)	Bark	Myristicaceae	<i>Scyphocephalum manni</i> (Benth. & Hook. f.) Warb.	Medico-spiritual treatments for unspecified diseases.	0	0	0	0	0
Gabon	Otsoko (Mi)	Seeds	Myristicaceae	<i>Scyphocephalum ochocoa</i> Warb.*	Several medico-spiritual uses.	0	0	0	0	0
Gabon	Pekintchori (Bp)	Whole plant	Apocynaceae	<i>Secamone afzelii</i> (Schult) K. Schum	Protective bath.	0	0	0	0	0
Benin	Ngat (T), Kpatale (Id)	Leaves	Polygalaceae	<i>Securidaca longipedunculata</i> Fresen.	Eaten to attain the favor of influential persons.	0	0	0	0	0

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Gabon	Magoyiu (Ma)	Whole plant	Selaginellaceae	<i>Selaginella myosurus</i> Alston	Worn by women during Bwiti ceremonies	0	0	0	0	0
Gabon	Itsamuna (Bp)	Leaves	Leguminosae	<i>Senna alata</i> (L.) Roxb.	Several medico-spiritual uses.	0	0	0	1	0
Benin	Botiowo (T)	Whole plant	Leguminosae	<i>Senna alata</i> (L.) Roxb.	Planted in protection against sorcerers.	0	0	0	1	0
Gabon	Ebesi (Fa)	Whole plant	Leguminosae	<i>Senna occidentalis</i> (L.) Link	Several medico-spiritual uses.	0	0	0	1	0
Benin	Ayaxenu (F)	Leaves	Leguminosae	<i>Senna occidentalis</i> (L.) Link	Used in a charm to make smokers give up smoking.	0	0	0	1	0
Benin	Kenu (F)	Whole plant	Leguminosae	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Restricted species	1	0	0	0	1
Benin	Adovo (F)	Leaves	Leguminosae	<i>Senna sophora</i> (L.) Roxb.	Used in a charm to make smokers give up smoking.	0	0	0	0	0
Benin	Agboma (F)	Seeds	Pedaliaceae	<i>Sesamum indicum</i> L.	Ceremonial offerings	0	0	0	0	1
Gabon	Isinga (Bp)	Whole plant	Poaceae	<i>Setaria homonyma</i> (Steud.) Chiov.	Unspecified ritual use.	0	0	0	0	0
Gabon	Nom Nzizim (Fa)	Leaves	Malvaceae	<i>Sida acuta</i> Burm.f.	Several medico-spiritual uses.	0	0	0	0	0
Benin	Adoma (F)	Whole plant	Malvaceae	<i>Sida acuta</i> Burm.f.	Carrying this plant will protect someone who is trying to scape justice.	0	0	0	0	0
Benin	Lelikomi (F)	Whole plant	Malvaceae	<i>Sida javensis</i> Cav.	Baths to attract love.	0	0	0	0	0
Benin	Afefe (T)	Stems	Malvaceae	<i>Sida spinosa</i> L.	Worn as a protective necklace against fever.	0	0	0	0	0
Benin	Enkana magbo (Y)	Whole plant	Smilacaceae	<i>Smilax anceps</i> Willd.	Purification baths.	0	0	0	0	0
Gabon	Boudiambou (Bp)	Whole plant	Compositae	<i>Solanecio angulatus</i> (Vahl) C.Jeffrey	Exorcism.	0	0	0	0	0
Gabon	Nzangou (Nz)	Leaves	Solanaceae	<i>Solanum americanum</i> Mill.	Exorcism.	0	0	0	1	0
Benin	Imoro (T)	Fruit	Solanaceae	<i>Solanum americanum</i> Mill.	Medico-spiritual treatment to increase appetite in infants.	0	0	0	0	0
Gabon	Pivi (Mi)	Fruits	Solanaceae	<i>Solanum incanum</i> L.	Ceremonial offerings	0	0	0	0	1
Benin	Ogborno (T)	Fruits	Solanaceae	<i>Solanum macrocarpon</i> L.	Unspecified ritual use.	0	0	0	0	1

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Gabon	Mukjer (Ma)	Fruits	Solanaceae	<i>Solanum macrocarpon</i> L.	Unspecified ritual use.	0	0	0	0	1
Gabon	Dongio (Fa)	Fruits	Solanaceae	<i>Solanum rudepannum</i> Dunal	Purification baths.	0	0	0	0	0
Benin	Bamomi (Y)	Whole plant	Solanaceae	<i>Solanum rudepannum</i> Dunal	Planted in protection against sorcerers.	0	0	0	1	0
Benin	Nkcoaudi (T)	Leaves	Solanaceae	<i>Solanum dasyphyllum</i> Schumach. & Thonn.	Protection against bullets and weapons.	0	0	0	0	0
Benin	Kpokpo (Na)	Seeds, stems	Poaceae	<i>Sorghum bicolor</i> L.	Food taboo.	1	0	0	0	1
Benin	Adada (Y)	Roots	Bignoniaceae	<i>Spathodea campalunata</i> P.Beauv.	Medico-spiritual treatment against female infertility.	0	0	0	1	0
Benin		Leaves	Menispermaceae	<i>Sphenocentrum jolyanum</i> Pierre	Purification baths.	0	0	0	0	0
Benin	Dan nye (F)	Whole plant	Loganiaceae	<i>Spigelia antheimia</i> L.	Unspecified ritual use.	0	0	1	0	0
Benin	Yeyatche (T)	Bark	Anacardiaceae	<i>Spondias mombin</i> L.	Eaten in protection against weapons.	1	0	0	1	0
Benin	Ekwigbe (Ad)	Whole plant	Poaceae	<i>Sporobolus pyramidalis</i> P.Beauv.	Restricted species	1	0	0	0	0
Benin	Alotrohe (F)	Whole plant	Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	Charms to gain the favor of persons in positions of power.	0	0	0	0	0
Benin	Alotrohe (F)	Whole plant	Verbenaceae	<i>Stachytarpheta indica</i> (L.) Vahl	Charms to gain the favor of persons in positions of power.	0	0	0	0	0
Gabon	Ogobe (Mi)	Bark	Myristicaceae	<i>Suaudia kamerunensis</i> var. gabonensis (Warb.) Fouilloy*	Protection of hunters against dangers.	0	0	0	0	0
Gabon	Nzombo (Nz)	Leaves	Acanthaceae	<i>Senandrium guineense</i> (Nees) Vollesen	Purification baths.	0	0	0	0	0
Benin	Ola-okto (T)	Leaves	Malvaceae	<i>Sterculia setigera</i> Delile	Protective baths.	1	0	0	0	0
Benin	Adjadin (T)	Leaves	Bignoniaceae	<i>Stereospermum kunthianum</i> Cham.	Protective drink against bewitchment.	0	0	0	0	0
Gabon	Monai (Bb)	Latex	Apocynaceae	<i>Srophanthus gratus</i> (Wall. & Hook.) Baill.	Arrow poison. Restricted species.	1	0	1	0	0
Benin	Logbo (Ad)	Roots	Apocynaceae	<i>Srophanthus hispidus</i> DC.	Eaten in protection against enemies and sorcerers.	1	0	1	1	0

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Benin	Tchae (T)	Leaves	Apocynaceae	<i>Strophanthus sarmentosus</i> DC.	Purification baths for Fa oracle priests.	0	0	0	0	0
Gabon	Mweya (Mf)	Bark	Loganiaceae	<i>Strychnos icaja</i> Baill.	Ordeal poison.	0	0	0	0	0
Benin	Djatibololi (P)	Bark	Loganiaceae	<i>Strychnos innocua</i> Delile	Purification baths.	0	0	0	0	0
Benin	Agogo (Id)	Bark	Loganiaceae	<i>Strychnos spinosa</i> Lam.	Purification baths.	0	0	0	0	0
Benin	Aduma (F)	Whole plant	Leguminosae	<i>Sylosanthus erecta</i> P. Beauv.	Purification baths.	0	0	0	0	0
Benin		Whole plant	Clusiaceae	<i>Symphonia globulifera</i> L.f.	Unspecified ritual use.	1	0	0	0	0
Benin	Kpatado (F)	Leaves	Sapotaceae	<i>Synsepalum dulcificum</i> (Schumacher & Thonn.) Daniell	Bath to attract wealth.	0	0	0	0	0
Benin	Mlammi (G)	Whole plant	Myrtaceae	<i>Syzygium guineense</i> (Willd.) DC.	Purification baths.	0	0	0	0	0
Gabon	Irugu (Bp)	Leaves	Apocynaceae	<i>Tabernaemontana brachyantha</i> Stapf	Protection against insects said to be sent by sorcerers.	0	0	0	0	0
Gabon	Iboga	Roots	Apocynaceae	<i>Tabernanthe iboga</i> Baill.	Ceremonial stimulant	0	0	1	1	0
Benin	Tchare (T)	Leaves	Dioscoreaceae	<i>Tacca leontopetaloides</i> (L.) Kuntze	Treatment of Sakpata-related diseases.	0	0	0	0	0
Benin	Adodoako (T)	Whole plant	Talinaceae	<i>Talinum fruticosum</i> (L.) Iuss.	Planted around houses in order to prevent mishaps. Purification baths.	0	0	0	1	0
Benin	Iroko (G)	Fruits, leaves, roots	Cucurbitaceae	<i>Telfairia occidentalis</i> Hook.f.	Used ceremonially	0	0	0	0	1
Benin	Agoma (F)	Leaves	Leguminosae	<i>Tephrosia elegans</i> Schum.	Purification baths.	0	0	0	0	0
Gabon	Ofe (Fa)	Whole plant	Leguminosae	<i>Tephrosia vogelii</i> Hook.f.	Ceremonial stimulant.	0	0	0	1	0
Benin	Ndimio (Na)	Roots	Combretaceae	<i>Terminalia avicennioides</i> Guill. & Perr.	Used in protection against evil spirits.	0	0	0	0	0
Benin	Alotoun (F)	Whole plant	Combretaceae	<i>Terminalia glaucescens</i> Planch. ex Benth.	Unspecified ritual use.	1	0	0	0	0
Benin	N'di (T)	Roots	Combretaceae	<i>Terminalia macroptera</i> Guill. & Perr.	Treatment of Sakpata-related diseases.	0	0	0	0	0
Benin	Azin (F)	Whole plant	Combretaceae	<i>Terminalia neotaliala</i> Capuron	Spiritual purification.	0	0	0	0	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Benin	Bero (De)	Bark	Combretaceae	<i>Terminalia superba</i> Engl. & Diels*	Medico-spiritual treatment against female infertility.	0	1	0	0	0
Gabon	Muru (Ak)	Sap	Dilleniaceae	<i>Tetracera alnifolia</i> Willd.	Against poisoning caused by witchcraft in children.	0	0	1	0	0
Gabon	Osaga (Mi)	Fruits	Leguminosae	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	Protection against plagues and other animals in cultivated fields.	0	0	0	1	0
Benin	Lendja (F)	Fruits	Leguminosae	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	Used to treat insomnia caused by evil spirits.	0	1	0	1	0
Benin	Cacotier (Fr)	Leaves	Malvaceae	<i>Theobroma cacao</i> L.	Treatment for the enlargement of male genitals	0	0	0	0	1
Benin	Otchokumonku (T)	Roots	Balanophoraceae	<i>Thonningia sanguinea</i> Vahl	Used in the treatment of insomnia caused by evil spirits.	0	0	0	0	0
Gabon	Aza (Fa)	Whole plant	Sapotaceae	<i>Tieghemella heckelii</i> (A.Chev.) Pierre ex Dubard*	Several medico-spiritual uses.	0	1	1	0	0
Benin	Guidofo (T)	Whole plant	Compositae	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Used in a ceremonial treatment against malaria	1	0	0	0	0
Benin	Azoma (F)	Whole plant	Euphorbiaceae	<i>Tragia senegalensis</i> Müll.Arg.	Used in charms to come out of difficult situations.	0	0	0	0	0
Gabon	Munyedi (Bp)	Wood	Malvaceae	<i>Treculia africana</i> Decne. ex Trécul	Ceremonial objects.	0	0	0	0	0
Gabon	Edzip (Fa)	Bark	Malvaceae	<i>Treculia erinacea</i> A. Chev.	Medico-spiritual treatment against female infertility.	0	0	0	0	0
Benin	Akokpla (F)	Whole plant	Aizoaceae	<i>Trianthema portulacastrum</i> L.	Ritual cleanse of objects used in divination.	0	0	0	0	0
Benin	Itchiku (T)	Roots	Meliaceae	<i>Trichilia emetica</i> Vahl	Protection against snake bites.	0	0	1	0	0
Gabon	Revuto (Sa)	Bark	Anacardiaceae	<i>Trichoscypha acuminata</i> Engl.	Exorcism.	0	0	0	0	0
Benin	Olombingo	Roots	Menispermaceae	<i>Triclisia subcordata</i> Oliv.	Treatment of stomachache caused by bewitchment.	0	0	0	0	0
Gabon	Masses (Ma)	Whole plant	Melastomataceae	<i>Tristemma hirtum</i> P. Beauv.	Medico-spiritual treatment against female infertility.	0	0	0	0	0
Benin	Wheat (En), Blé (Fr)	Seeds	Poaceae	<i>Triticum</i> sp.	Fertility rituals.	0	0	0	0	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Benin	Adorokpo (F)	Roots	Meliaceae	<i>Touraea heterophylla</i> Sm.	Treatment believed to enlarge the penis of small boys.	0	1	0	1	0
Benin	Tegbesu (F)	Leaves	Apocynaceae	<i>Tylophora cameroonica</i> N.E.Br.	Protective plant for hunters.	0	1	0	1	0
Gabon	Aborganbi (Fa)	Whole plant	Apocynaceae	<i>Tylophora sylvatica</i> Decne.	Protection against evil spirits.	0	0	0	0	0
Gabon	Assang (Fa)	Bark	Phyllanthaceae	<i>Uapaca acuminata</i> (Hutch.) Pax & K.Hoffm.	Several medico-spiritual uses.	0	0	0	0	0
Gabon	Osombi (Mi)	Bark	Phyllanthaceae	<i>Uapaca guineensis</i> Müll.Arg.	Several medico-spiritual uses.	0	0	0	0	0
Benin	Gbinda (T)	Seeds, leaves	Leguminosae	<i>Uraria picta</i> (Jacq.) DC.	Purification baths.	0	0	0	1	0
Gabon	Poonga (Bb)	Fruit	Malvaceae	<i>Urena lobata</i> L.	Protective baths against evil spirits.	0	0	0	0	0
Benin	Ahavu (F)	Whole plant	Lentibulariaceae	<i>Utricularia arenaria</i> A.DC.	Unspecified ritual use.	0	0	0	0	0
Benin	Arimdjo (T)	Bark	Annonaceae	<i>Uvaria chamae</i> P.Beauv.	Medico-spiritual treatment against anaemia in children.	0	0	0	0	0
Gabon	Onduma (Mi)	Roots	Orchidaceae	<i>Vanilla africana</i> Lindl.	Fabrication of ceremonial harps.	0	1	0	0	0
Benin	Orungo (Y)	Whole plant	Compositae	<i>Vernonia ambigua</i> Kotschy & Peyr.	Purification baths.	0	0	0	0	0
Gabon	Noandjo (Fa)	Whole plant	Compositae	<i>Vernonia amygdalina</i> Delile	Purification baths.	0	0	0	1	0
Benin	Aloma (Ad)	Leaves	Compositae	<i>Vernonia amygdalina</i> Delile	Treatment of Sakpata-related diseases.	0	0	0	1	0
Benin	Ekpa (T)	Leaves	Leguminosae	<i>Vigna subterranea</i> (L.) Verdc.	Baths to strengthen and protect men.	0	0	0	0	0
Benin	Cowpea (En)	Seeds	Leguminosae	<i>Vigna unguiculata</i> (L.) Walp.	Food taboo	1	0	0	0	1
Benin	Hounsukokwedo (F)	Seeds	Sapotaceae	<i>Vitellaria paradoxa</i> C.F.Gaertn.	Offerings, protective creams	0	1	0	1	0
Benin	Ori gogwe (Id)	Leaves	Lamiaceae	<i>Vitex chrysocarpa</i> Planch.	Used in initiation ceremonies.	0	0	0	0	0
Gabon	Dibongu (Bp)	Wood	Lamiaceae	<i>Vitex doniana</i> Sweet	Ceremonial objects.	0	0	0	0	0
Benin	Koto(F)	Bark	Lamiaceae	<i>Vitex doniana</i> Sweet	Purification baths.	0	0	0	0	0
Gabon	Gepogbe (Mi)	Wood	Lamiaceae	<i>Vitex madiensis</i> Oliv. subsp. <i>maiensis</i>	Ceremonial objects.	0	0	0	0	0
Benin	Le (F)	Whole plant	Apocynaceae	<i>Voacanga africana</i> Stapf ex Scott-Elliot	Restricted species	1	1	1	0	0
Gabon	Ntchou (Mk)	Leaves	Apocynaceae	<i>Voacanga bracteata</i> Stapf	Bath to find a European spouse.	0	0	0	0	0

Country	Vernacular name	Plant part used	Family	Genus and species	Use	Restriction status	Threat status	Perceived scarcity	Actively protected	Domestication status
Benin	Eru (T)	Fruits	Oliaceae	<i>Ximenia americana</i> L.	Ceremonial instruments.	0	0	1	1	0
Gabon	Okala (Fa), Ogba (Bb)	Bark	Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	Construction of Bwiti temples.	0	0	0	0	0
Benin	Eru (Na)	Fruits	Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	Treatment of wounds of supernatural origin.	0	1	0	1	0
Benin	Ekun mademe (F)	Leaves	Annonaceae	<i>Xylopia longipetala</i> De Wild. & T.Durand	Unspecified ritual use.	0	0	0	0	0
Gabon	Muranga (Lu)	Fruits	Annonaceae	<i>Xylopia staudtii</i> Engl. & Diels	Exorcism.	0	0	0	0	0
Gabon	Olom (Fa)	Wood	Rutaceae	<i>Zanthoxylum heitzii</i> (Aubrév. & Pellegr.) P.G. Waterman	Protection against sorcerers.	0	0	0	0	0
Gabon	Ndoung (Nz)	Bark	Rutaceae	<i>Zanthoxylum</i> sp.	Protection against STDs believed to be caused by bewitchment.	0	0	0	0	0
Benin	Xedo (F)	Wood	Rutaceae	<i>Zanthoxylum zanthoxylodes</i> (Lam.) Zepem. & Timler	Ceremonial objects.	1	1	1	1	0
Benin	Akanna (F)	Leaves	Leguminosae	<i>Zapoteca portoricensis</i> (Jacq.) H.M. Hern.	Purification baths.	0	0	0	0	0
Benin	Maize (En), Mais (Fr)	Seeds	Poaceae	<i>Zea mays</i> L.	Ceremonial offering.	1	0	0	0	1
Benin	Dote (F)	Roots	Zingiberaceae	<i>Zingiber</i> sp.	Purification baths.	0	0	0	0	0
Benin	Enkanase (Y)	Whole plant	Rhamnaceae	<i>Ziziphus mucronata</i> Willd.	Unspecified medico-spiritual incantation.	0	0	0	0	0
Benin	Lekun lekun (F)	Whole plant	Leguminosae	<i>Zornia glochidiata</i> DC.	Purification baths.	0	0	0	0	0

En (English), Fr (French)

T (Tchà), F (Fon), G (Gun), Y (Yoruba), Ad (Adja), Na (Nagot), Id (Idatcha), De (Dendi), Pe (Pedah)

Mk (Makina), Fa (Fang), Ak (Akele), Lu (Lumbo), Bb (Babongo), Mi (Mitsogo), Nz (Nzebi), Ma (Masango), Bp (Bapumu), Te (Také), My (Myene), Sa (Sake), Nv (Nvungu), E (Eshira), Og (Ogande), Pu (Puvri)

Species marked with an asteric (*) are important timber species

E ZINKOMEY



Chapter Four

Plants of the gods and their importance among the mortals: an analysis of cultural domain^{*}

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ABSTRACT

Plants play an overriding role in African traditional religions, which in turn are closely associated with health practices and nature conservation. In spite of the extensive literature documenting plant use in this context, an emic definition of traditional religions is still lacking. Our objective was to see whether the importance of plants was reflected in people's conceptions of 'religion' and 'traditional religions' (i.e. Vodoun and Bwiti) in Benin and Gabon. By carrying out a cultural domain analysis (CDA) with 96 individuals, we found that, regardless of the religious affiliation of informants, plants and other elements of the natural world were more present in people's notions of traditional religions than in religion, which was mostly understood as Christianity or Islam. Our results suggest that CDA is an effective method to assess people's perception of religion and to inventorize cultural keystone species, like *Milicia excelsa* in Benin and *Tabernanthe iboga* in Gabon.

Keywords: Benin; Ethnobotany; Gabon; Traditional religions; Religion

^{*} Submitted in a slightly modified form

INTRODUCTION

Commonly, researchers have tended to label the unknown or the incomprehensible in other cultures as religious or mystical (Bowie, 2008). In the early history of anthropology, these epithets had, more often than not, a pejorative connotation. The paradigm shift brought by functionalism in anthropology had pivotal repercussions for different fields of research (Gould, 1966). In the case of ethnobotany, for instance, plants that were once considered “primitive” (Chevalier, 1937) and with “plain mumbo-jumbo uses” (Burkill, 1995) are now recognised for their importance in local healthcare practices (Cocks and Moller, 2002; Janzen and Green, 2003; Mafimisebi and Oguntade, 2010; van Andel and Ruyschaert, 2011), as well as for the crucial role they play in nature conservation (Msuya and Kindeghesho, 2009; Quiroz and van Andel, 2015).

While the term has been a recurrent topic in ethnobotanical documentation in the past century, ‘religion’ appears to lack a unified definition in the field. Probably due to the elusiveness of the term, which lacks an approximate translation in non-Western languages (Bowie, 2008), terms such as medico-magic, magico-religious, sacred, ritual, supernatural, mystical, magic, and spiritual all appear to form part of the domain ‘religion’ in the considerable number publications that address plant use in the context of traditional religious practices (Albuquerque et al., 2007; Cavender and Albán, 2009; de Souza, 2006; Mafimisebi and Oguntade, 2010; Robson et al., 1982; Sharma et al., 2012; van Andel et al., 2012; Voeks, 1993; Voeks, 1997).

We performed an analysis of cultural domain (or Cultural Domain Analysis, henceforth), a method commonly used in cognitive anthropology and marketing research for the purpose of highlighting the underlying properties of a given cultural domain from the viewpoint of informants (Borgatti, 1994). Ritual plants have been found to play a central role in the traditional religious practices of Benin and Gabon (Herskovits, 1938; Raponda-Walker and Sillans, 1962). They also are commercialised in substantial quantities in the medicinal plant markets there (Quiroz et al., 2014; Towns et al., 2014). Our objectives were: (1) to understand the cultural domains ‘religion’ and ‘traditional religions’ from an emic perspective and; (2) to explore the importance of plants within these two domains in those western African countries.

We wanted to assess whether plants and other elements of the natural world were more often present within our informant’s concept of traditional religions than in their notion of religion. We also wanted to know whether these differences showed when comparing people according to their own cultural background or religious affiliation. We acknowledged the possibility that the term ‘religion’, and the notions that its use elicits, would carry an ethnocentric bias based in Western thought and values (Dubuisson, 2003). Therefore, we hypothesized that informants would hardly mention plants, or other elements of the natural world, when asked to list the names of categories that belong to the domain ‘religion’. We also expected that for people who considered themselves as adepts of Bwiti or Vodoun, plants would more obviously form part of their conception of traditional religions than for non-adepts.

METHODS

Data collection

We conducted fieldwork in Benin in 2011 and in Gabon in 2012. We used a multiple purposive technique (Teddlie and Yu, 2007) in order to obtain a sample of 99 informants in the two countries. This method involved a combination of convenience and chain-referral sampling (Penrod et al., 2003). In cooperation with local universities, we recruited the majority of our participants among students, market vendors, and traditional healers. We obtained data on our informants' socio-demographic background and paid special attention to recording their religious affiliation (i.e. whether they considered themselves adepts of traditional religions or not). Due to the conflictive nature of admitted affiliation to traditional religions (Bonhomme, 2007; Chenry, 2008) and in order to avoid possible under-reporting, we did not ask informants for their names.

We conducted free-listing exercises for the purpose of recording the items that, from the viewpoint of our informants, formed the cultural domains religion ('la religion', in French) and traditional religions, for which we used the term 'Vodoun' in Benin and 'Bwiti' in Gabon. Following Puri (2011), informants were given two minutes to execute the exercise and completed the free-lists themselves in written form. The instructions to the exercise are provided in Appendix 1. In case participants were not able to read and write, the exercise was performed orally and recorded on audiotape. All exercises were conducted individually.

Data analysis

Following Puri (2011), we elaborated a matrix for each domain with the items mentioned by our informants ordered as rows. We used codes for the individual informants and included them to the matrix as columns. We entered the rank numbers of items as they occurred on each of the informants' lists, adding new items as successive rows. Individual plant names and organs derived from a single species were documented, but for the purpose of analysis merged with general plant organs (e.g. bark and leaves) or populations (expressed as trees or forests) under the broader category 'plants'. We did, however, consider individual plant species in our qualitative discussions. We verified the identity of all plant species mentioned in the free-listings by checking their vernacular names against our database of botanical collections (Quiroz and van Andel, 2015). Other terms inherent to the cultures of our countries of study that were also unknown to us were checked with key informants (i.e. elder traditional healers) during informal interviews or by consulting anthropological literature on Benin and Gabon (Herskovits, 1938; Raponda-Walker and Sillans, 1962). All terms mentioned during the interviews are listed, when necessary with a brief explanation of their meanings, in Table 4.2.

Next, we created separate presence-absence matrices by substituting the ranks given to each term in the free-list with the number one. We conducted a Detrended Correspondence Analysis (DCA) to define informant groups and to identify the two main axes that cause the distribution of terms in the cultural domain space. In order to reduce axis length, we down weighed rare informants. We plotted the first and second axes in a two-dimensional graph to examine the potential overlap among informants, and to visualize the variation within and between the two countries of study. To see

whether plants appeared more often in the cultural domain traditional religions than in religion and to see whether this differed among people of various cultural backgrounds or religious affiliations, we checked the frequency and average ranks of all terms mentioned by each group that had resulted from the DCA, and plotted them to visualize their saliency as described by Puri (2011). Because of the large number of words in the free-lists, we only considered terms with frequency higher than 0.10 for the plots.

RESULTS AND DISCUSSION

‘Religion’ vs. ‘traditional religions’

From our initial sample of 99 informants, three were excluded because the lack of sufficient socio-demographic data provided (Table 4.1). Due to of time constraints, the number of informants in Gabon was much smaller than in Benin. Over half of our informants (59%) self-reported adherence to non-traditional religions, most of them as Christians (56 %), while 41% said to follow traditional beliefs in both countries. With the combined responses of both adepts and non-adepts in Benin and Gabon for the cultural domains religion and traditional religions, a list of terms including 425 items was compiled (Supplementary file 2). From those 425 terms, 86 (about 20% of the total) formed part of both cultural domains religion and traditional religion.

TABLE 4.1. Socio-demographic characteristics of 96 participants

Characteristic	N	%
Country		
Benin	66	69
Gabon	30	31
Age (year)		
20<	6	6
20-29	41	42
30-39	22	23
40-49	12	13
50-59	8	9
60>	7	7
Gender		
Male	52	54
Female	44	46
Religion		
Catholic	11	12
Protestant	4	4
Other Christian	39	40
Muslim	3	3
Vodoun	20	21
Bwiti	19	20
Occupation		
Student	38	39
Traditional healer	14	15
Market vendor	32	33
Other	12	13

The results of the DCA (Fig. 4.1a) show that our informants’ notions of religion did not differ much across religious affiliation or country of origin. The free list for this category was composed of 206 terms with 184 terms provided by all Beninese informants and 39 by the Gabonese ones.

Sixteen items (circa 8 % of the total) were provided in both countries, including words such as ‘God’, ‘Bible’, ‘church’, and ‘faith’. In average, each informant mentioned 9.3 terms in Benin and 3.03 in Gabon. Adepts from both countries provided an average of 5.6 words, whereas non-adepts mentioned 6.8.

The low number of terms provided by the Gabonese informants for ‘religion’ is remarkable. The online dictionary of Bantu languages (CBOLD, 2014) has no record of a term for “religion” in the Nzebi, Fang, Punu, and Mpongwe languages. This could explain the short lists provided by informants in the Gabonese free lists. Although the majority of the exercises were executed in French, there were a few informants (all of them from Babongo ethnicity, otherwise known as Pygmies) with whom we could only perform our work with the aid of an interpreter (due to our non-existent knowledge of their language and their insufficient knowledge of French). Probably, the term ‘la religion’ did not have an equivalent in the Babongo language either, as those informants provided no items for the term religion and none of them reported adherence to either Christian, Islamic or other non-traditional religions.

From the scatter plot of terms (Fig. 4.2), it is visible that within the cultural domain religion, all informant groups mentioned items of non-traditional religions (e.g. ‘God’, ‘Islam’, ‘Catholicism’, ‘church’, and ‘Bible’). However, with the exception of non-adepts in Gabon, all informant groups also mentioned aspects of traditional religious practices when asked to define religion. For instance, informants considered the terms ‘Vodoun’ in Benin, and ‘kaolin’ (white and red pigment) and traditional musical instruments played during ceremonies (‘harp’, ‘sitar’, ‘drums’) in Gabon as part of religion. The terms ‘medicinal plants’ and ‘leaves’ (‘les feuilles’ in French, which locally also means herbal medicine) also formed part of religion for some Beninese adepts, but their rank was very low (Table 4.2). We therefore prove our hypothesis that plants are not generally associated with the term ‘religion’.

In the case of the cultural domains ‘Vodoun’ and ‘Bwiti’, the results from the DCA showed a trend influenced by the religious affiliation (i.e. adepts and non-adepts) and country of origin of our informants. Beninese and Gabonese informants formed two clearly defined groups with adepts generally separated from non-adepts (Fig. 4.1b). In total 300 terms were named by all informants for this category (238 in Benin and 100 in Gabon). Thirty-eight items (roughly 13% of the total) were mentioned in both countries. In average, each informant mentioned 11.1 items in Benin and 11.7 in Gabon. Adepts from both countries provided an average of 12.3 words, whereas non-adepts mentioned 9.5.

The cultural domain ‘Vodoun’

Although ‘plants’ was a term highly cited by all Beninese informants, on the sole basis of its saliency (i.e. citation frequency and average rank), it was more closely associated to Vodoun by non-adepts than by adepts (Fig. 4.3). We obtained similar results in the number of responses by the different groups that included elements of the natural world. Non-adepts mentioned three times as many words of this type than adepts. Terms such as ‘earth’, ‘water’, ‘air’, and ‘lightning’ formed

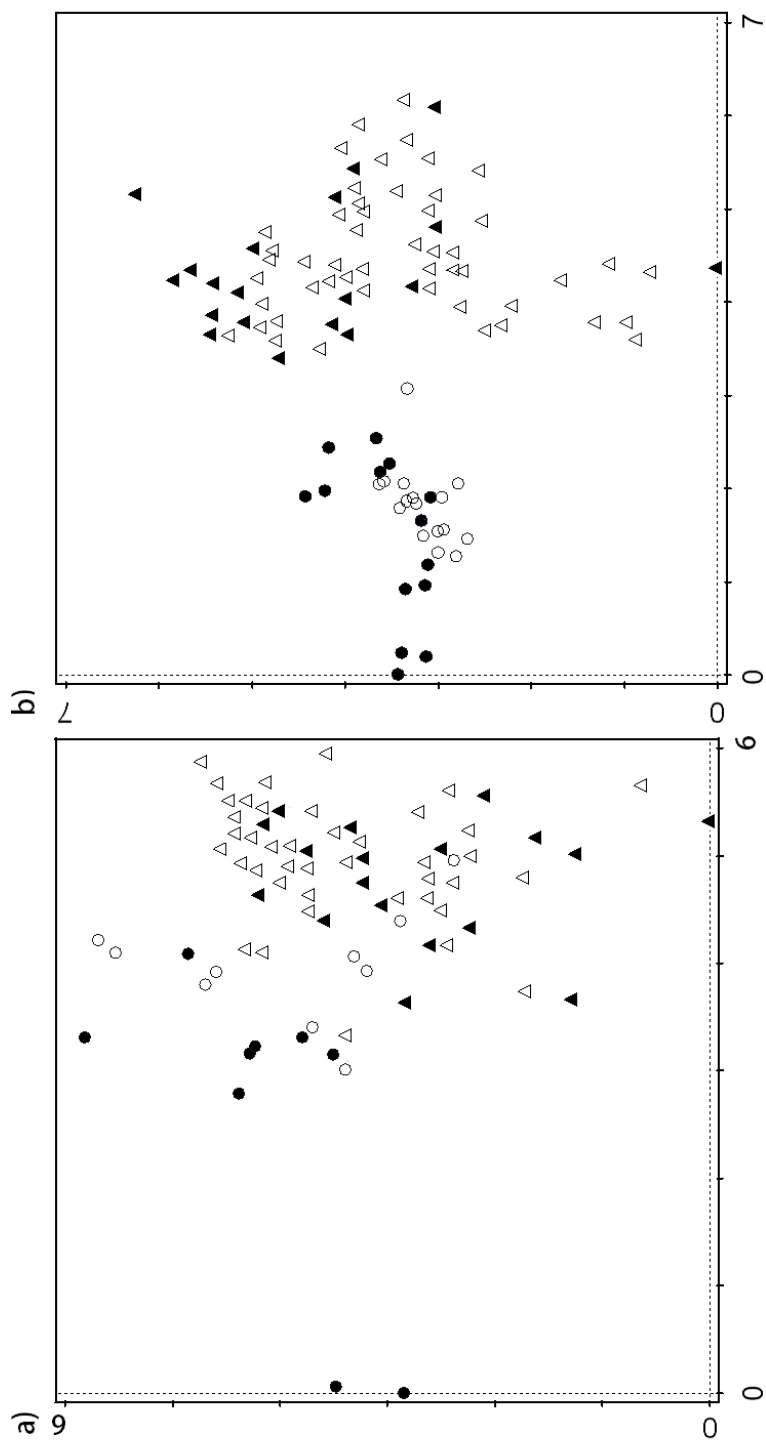


FIGURE 4.1. DCA scatterplots comparing adepts (black) and non-adepts (white) of traditional religions in Gabon (circles) and Benin (triangles) for the domains a) “religion” and b) “traditional religions”.

part of the non-adepts' conception of traditional religions. Thus, for Benin, we reject our second hypothesis that for adepts of traditional religions, plants and other elements of the natural world more evidently conform their idea of the cultural domain traditional religion than for non-adepts.

Beninese adepts' ideas of their own traditional belief were also marked by the high saliency of abstract items, such as 'advantage', 'truth', 'trust', and 'peace'. While non-adepts provided remarkably detailed lists of Vodoun spirit names and ceremonial objects, they also ventured several terms that suggested negative values such as 'sacrilege', 'sadness', 'violence', 'negativity' and 'immorality'. It is interesting that the non-adepts' detailed knowledge of elements of Vodoun (including plant and animal species) reflects the proximity of this cultural expression, if not lifestyle, to wider sectors of the population other than self-reported adepts. These findings corroborate those of Medin and Altran (2004), who, comparing ecological knowledge between novices and experts, found that "standard populations" do not necessarily reflect the cognitive consequences of diminished contact with nature.

The cultural domain 'Bwiti'

In contrast to the results we obtained in Benin, Gabonese adepts mentioned elements of the natural world twice as often as non-adepts, with plants ranking higher in the Gabonese adepts' ideas of the cultural domain 'Bwiti' (Fig. 4.3). For Gabon, we thus prove our hypothesis that within the conception of their own traditional religions, plants are more important to adepts than to non-adepts. Although adepts provided almost four times as many terms as non-adepts in this category, saliency was comparable in both lists. Similarly to our results in Benin, the total non-adepts' list for the cultural domain traditional religion was characterized by the presence of terms with a negative connotation, such as 'ignorance', 'bewitchment', and 'sorcerer'. Whereas the adepts' list also contained such items, these were attributed a lower rank and were cited less frequently. Terms such 'tradition', 'God', and 'knowledge' were amongst the most salient in the lists of adepts.

As it has been mentioned above, although traditional religions are tolerated by a large sector of the Gabonese non-practicing community (US Department of the State, 2012), there is still a rather prevalent secrecy around Bwiti – due either to its demonization by non-adepts or its required confidentiality amongst adepts (Bonhomme, 2007). In spite of taking precautions to prevent underreporting, most of the free-listing exercises in Gabon (n=22) were completed by informants unable to read or write (thus, they involved the presence of a second or even a third party to take notes). This could explain the short lists both amongst adepts and non-adepts. Our sample in Benin, albeit composed by urban and rural adepts and non-adepts, was characterized by its higher education level than that of Gabon. With this bias, it is important to state that caution must be applied, as these results might not be transferrable to more diverse populations.

Plant species and products

In total, our informants mentioned 8 individual plant species and another 21 plant products or other elements in the plant world, such as 'forest' or 'sacred grove' (Table 4.2). Gabonese

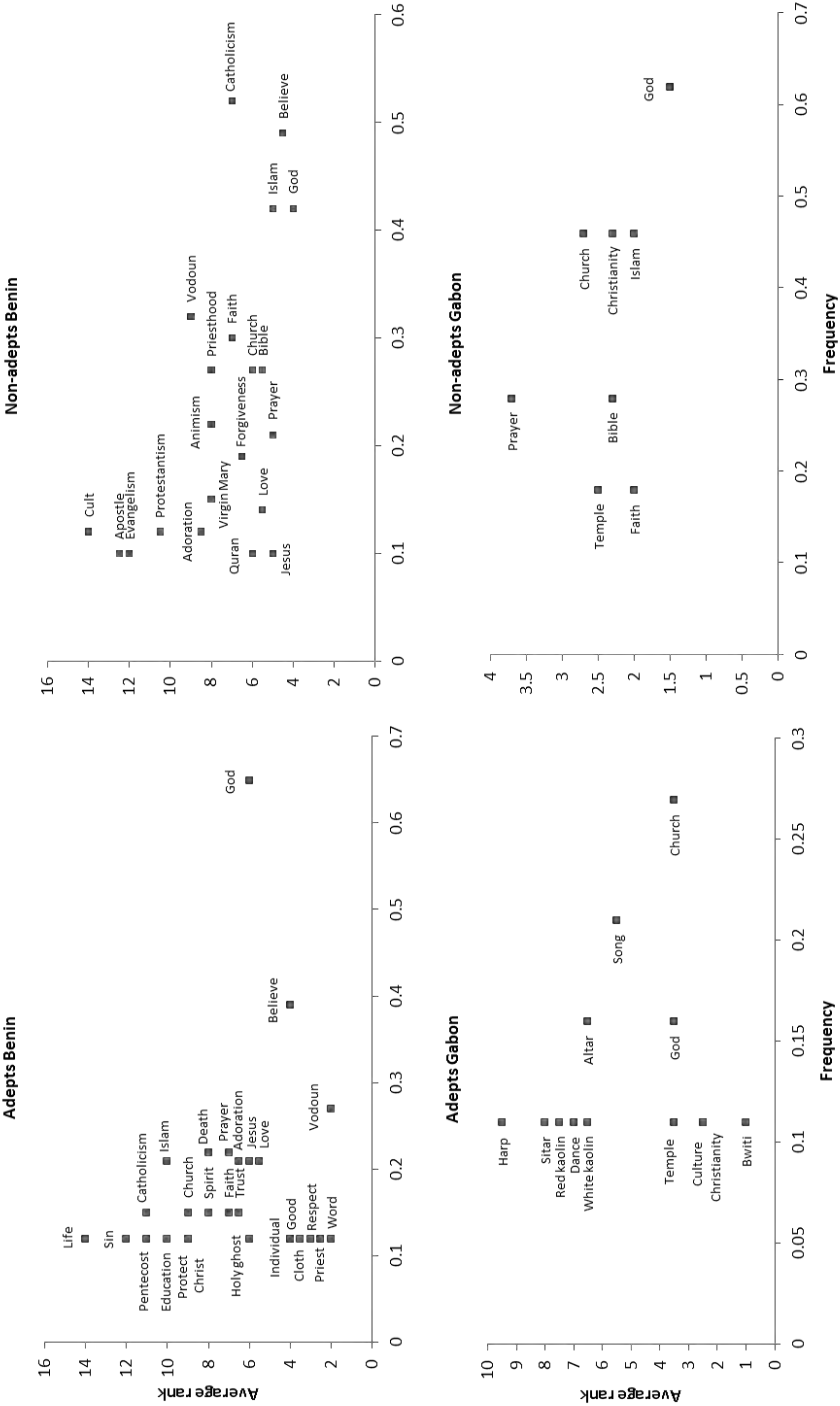


FIGURE 4.2. Scatterplot of terms with frequency > 0.10 for responses provided by all four different groups for the domain “religion”. The higher the frequency and the lower average rank of a term, the higher its saliency.

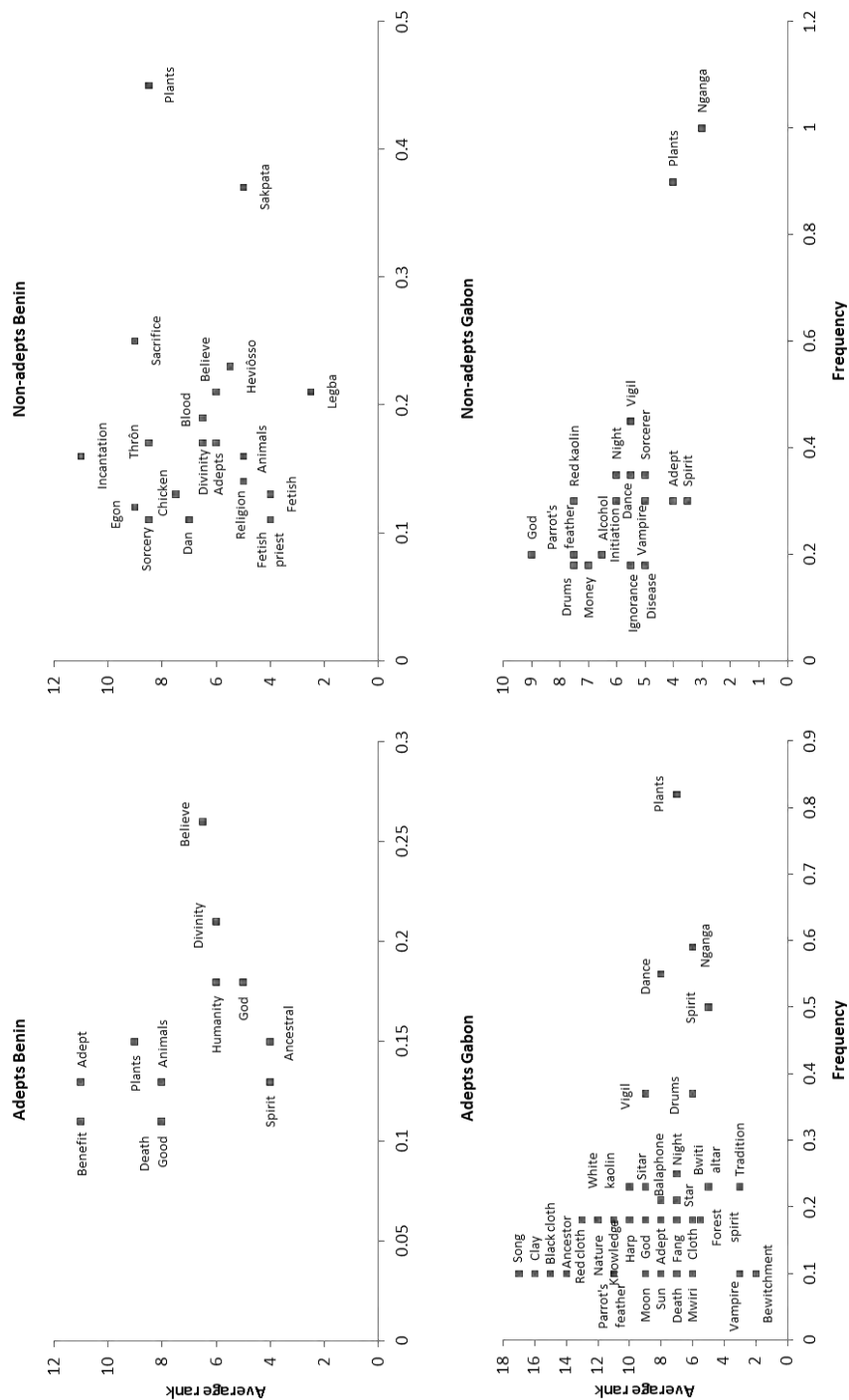


FIGURE 4.3. Scatterplot of terms with frequency > 0.10 for responses provided by all four different groups for the domain “traditional religions”, defined as “Vodoun” in Benin and “Bwiti” in Gabon. The higher the frequency and the lower average rank of a term, the higher its saliency.

informants provided a larger number of plant species ($n = 5$) than their Beninese counterparts (who only provided 3). Beninese informants, on the other hand, advanced more plant products ($n = 7$) than the Gabonese ones (who provided only 6). Six products, or elements of the plant world, figured in the lists of both countries.

In Benin, plant products included ceremonial stimulants such as cola nuts (*Cola acuminata*) and Guinea pepper (*Aframomum melegueta*), products used in offerings such as African palm oil (*Elaeis guineensis*), maize flour (*Zea mays*), cowpeas (*Vigna unguiculata*), and calabashes (*Lagenaria siceraria*, *L. breviflora* and *Crescentia cujete*). Although many ceremonial products can be extracted from the iroko tree (*Milicia excelsa*), the plant was only named by its vernacular, and not by its separate parts, probably because the living tree is an important sacred tree throughout West Africa (Ouinsavi et al., 2005). The raffia palm (*Raphia* sp.) was the species with the largest variety of products mentioned (i.e. palm wine, leaves, fiber, and seeds, Table 4.2). This species appeared as a ceremonial plant in the free-lists of both countries, stressing its important ritual role throughout West Africa (Gruca et al. 2014).

Gabonese plant products included the red kaolin, which is made from the powdered wood of the African padauk (*Pterocarpus soyauxii*) and used ceremonially as a body pigment; the wood of the climbing palm *Eremospatha cabrae* for the elaboration of ceremonial flywhisks; and the bark of the bitter cola (*Garcinia kola*), a fermentation agent for the traditional palm wine. Only adepts in Gabon considered the ‘flambeau’ (a type of torch made from the twigs of *Aframomum giganteum*) and the larger ‘torche indigène’ (the resin of *Aucoumea klaineana* wrapped in the bark of *Xylopia aethiopica*), as elements of Bwiti. Iboga (*Tabernanthe iboga*) was mentioned both as a plant product (‘bois sacré’, sacred wood) and as a plant species (‘eboga’). Other salient plant species linked to Bwiti were the ant tree (*Barteria fistulosa*), and the alan root (*Alchornea floribunda*).

The fact that informants, regardless of their religious affiliation, named the above-mentioned plant products reflects the importance of these species in their social environment. Species such as *A. melegueta*, *C. acuminata*, and *Lagenaria* spp. are sold in large quantities in medicinal plant markets and almost without exception on the ubiquitous roadside stalls of Benin (Quiroz et al., 2014). Likewise, *A. klaineana*, *T. iboga*, *G. kola*, and *P. soyauxii* are amongst the most frequently sold products in the herbal medicine markets of Gabon (Townsend et al., 2014). Considering the definition proposed by Platten and Henfrey (2009) in which cultural keystone species form a complex incorporating several tangible and non-tangible system elements (for example the knowledge, practices and tools involved in their management and use), our results confirm that *A. klaineana* and *T. iboga* in Gabon and *M. excelsa* in Benin can be considered such.

Why emic perspectives matter

Apart from highlighting important aspects of the cultural practices of our countries of study, our results indicate the implications of using the right terminology when conducting research with local informants and asking questions about religion. Far from attempting to engage in an epistemological debate about the definitions of religion, or traditional religions, or the adequacy of these terms, our results invite for a reflection about the notions questions that include these elicit in informants and

the possible curtailing of research results. By failing to provide the boundaries to a study domain, we might be falling on the “I-know-it-when-I-see it” line of argument (Bowie, 2008). Interviewing local people on plants used during ‘religious ceremonies’, for example, might yield very few results as participants can interpret these as activities organized by the church or mosque. The same can be said about asking informants to provide information about the use of natural resources associated to their ‘magico-religious’, or ‘medico-magical’ practices. As explained by Martin (1995), “you would discover you were asking the wrong question for a particular culture”. The results from our study suggest that, as long as the specific local term for traditional religions is used, Cultural Domain Analysis can be an effective method to inventorise spiritual practices, related products and cultural keystone species.

CONCLUSIONS

In our study, we gained understanding of the cultural domains religion and traditional religion in Benin and Gabon from an emic perspective. We were able to confirm that to our informants, notions of the term ‘religion’ reflected a domain more akin to Western than to African cultures. Our findings vindicate the limited role plants play in this domain, both for adepts and non-adepts of Vodoun and Bwiti. Conversely, plants occupied an important place in people’s conceptions of the traditional religions of these two countries, although for the Beninese adepts of these faiths, plants did not prove to be more important than for non-adepts. This confirms the place of plants as cultural keystones, not only in the context of traditional religions, but also in the wider, social environments of Benin and Gabon. Finally, Cultural Domain Analysis proved to be an effective method to retrieve information on the major ritual plant species and products, as long as the specific local terminology is used with regard to traditional beliefs.

TABLE 4.2. Complete list of terms provided by 96 informants for the domains religion and traditional religion

Term	Plant species	Elements of plant world or plant products	Domain				Meaning		
			Religion		Traditional religion				
Accident					Citation frequency	Average rank	0.01	3.00	
Advantage								0.01	10.00
Adept				0.03	7.00	0.22	7.38		
Adoration				0.06	9.50	0.08	8.63		
<i>Aframomum melegueta</i>	1					0.02	3.50		Large herb of the Zingiberaceae family. The seeds of this plant are used both medicinally and ritually in large regions of West and Central Africa.
Africa						0.01	1.00		
Air						0.01	18.00		
Allah				0.15	7.20				
Albino						0.02	3.50		
<i>Alchornea floribunda</i>	1					0.02	4.50		Shrub of the Euphorbiaceae family whose root is used ceremonially to enhance communication with the ancestors.
Alcoholic beverage						0.07	10.43		
America						0.01	2.00		
Ancestor				0.05	4.67	0.06	12.00		
Ancestral						0.08	3.38		
Angel				0.02	3.00				
Animals				0.02	25.00	0.16	6.60		
Animist				0.02	16.00	0.02	14.00		
Apocalipsis				0.15	7.50				
Apostle				0.02	29.00				
Archbishop				0.02	16.00				
Asia						0.01	3.00		
Assemblies of God				0.30	5.10				Groups of autonomous churches part of the Pentecostal church.
Atheist				0.03	13.50				

Term	Plant species	Elements of plant world or plant products	Domain				
			Religion		Traditional religion		Meaning
			Citation frequency	Average rank	Citation frequency	Average rank	
Avoid					0.02	2.00	
Awaken					0.01	6.00	
Balaphone			0.10	6.67	0.04	8.00	Large wooden xylophone (male type).
Baptism			0.05	6.00			
<i>Barteria fistulosa</i>	1				0.01	1.00	Treelet of the Passifloraceae family inhabited by fierce ants (<i>Tetraponera aethiops</i>). The tree is used in Bviti initiation ceremonies to test the courage of men. Known in French as l'arbre de l'adultère (tree of adultery).
Basket					0.02	9.50	
Bead					0.04	12.75	
Beans		1			0.02	12.50	Ayikun in the Fon language, or les haricots in French, usually refer to cowpeas (<i>Vigna unguiculata</i>), a common ceremonial offering and food taboo.
Behaviour			0.02	3.00	0.02	3.50	
Believe			0.02	20.00	0.23	6.09	
Bell					0.02	9.00	
Benefit			0.02	7.00	0.04	11.50	
Benediction					0.01	24.00	
Benefactor					0.01	5.00	
Benin					0.03	18.00	
Bewitchment					0.03	4.00	
Bible			0.06	2.33			
Birds					0.02	4.00	
Birth					0.03	4.67	
Black cloth					0.02	14.00	
Blood					0.13	6.58	
Boss					0.01	18.00	
Buddhism			0.02	21.00			
Burial			0.03	12.50			

Term	Plant species	Elements of plant or world or plant products	Domain				Meaning
			Religion		Traditional religion		
			Citation frequency	Average rank	Citation frequency	Average rank	
Burning torch		1	0.10	5.50	0.10	5.50	The Flambeau (French) or Mododi (Mitsogo) is a ceremonial torch used in Bwiti ceremonies made from the twigs of <i>Aframomum giganteum</i> .
Bwiti			0.03	10.00			
Bwiti altar					0.04	3.67	
Calabasse		1	0.02	9.00	0.02	9.00	The term can refer to the fruit of any of <i>Crescentia cujele</i> , <i>Lagenaria breviflora</i> , or <i>L. siceraria</i> . It is often used as a container for herbal medicine and ceremonial offerings.
Candle			0.02	1.00	0.04	4.50	
Caricature					0.01	10.00	
Cassock			0.02	7.00			Ankle-length garment traditionally worn by nuns, monks, and friars.
Cat			0.02		0.02	11.00	
Catholicism			0.02	10.00			
Celestial			0.02	2.00			
Ceremonial food					0.01	23.00	
Ceremony					0.04	10.25	
Chant			0.02	22.00			
Chapel			0.06	6.75			
Charity			0.03	8.00	0.01	9.00	
Charlatan			0.03	3.00	0.02	2.50	Although the term carries a negative connotation (meaning, a person who cheats others), in Benin and Gabon is the French term with which people refer to traditional healers (Bokonon or Babalawo in Benin, and Nganga in Gabon).
Chicken					0.08	7.50	
Child					0.03	5.33	
Choir			0.02	15.00			
Christ			0.02	10.00			
Christianity			0.07	1.00	0.01	7.00	
Church			0.12	5.42			
Cicatrice					0.01	13.00	Scar.
City					0.01	16.00	

Term	Plant species	Elements of plant world or plant products	Domain				
			Religion		Traditional religion		Meaning
			Citation frequency	Average rank	Citation frequency	Average rank	
Clay					0.03	19.00	
Clay pot					0.01	9.00	
Cleanliness			0.20	6.23			
Cloth			0.16	6.89	0.08	10.13	
<i>Cola acuminata</i>	1				0.06	8.83	Tree of West and Central African rain forests. Its nuts are eaten as ceremonial stimulants.
Colonisation			0.03	4.00	0.01	22.00	
Commandment			0.03	13.50	0.01	16.00	
Community			0.05	12.00	0.01	8.00	
Complication					0.01	2.00	
Comunion			0.02	2.00			
Confession			0.06	6.25			
Confirmation			0.03	18.00			
Consecration			0.03	12.00			
Consultation					0.01	6.00	
Conversion			0.02	10.00			
Coran			0.02	16.00			
Cow					0.03	13.00	
Cowry					0.04	7.25	Ritually used shells, often belonging to the species <i>Monetaria moneta</i> .
Creation					0.01	9.00	
Cross			0.02	11.00	0.01	13.00	
Crucifixion			0.03	14.00			
Cult			0.02	13.00	0.08	5.75	
Culture			0.04	11.00	0.05	7.00	
Cure					0.03	9.33	
Custom			0.09	7.50			
Dah					0.03	7.67	Ancient king of Benin from which the word Dahomey (Benin's former official name,) is

Term	Plant species	Elements of plant world or plant products	Domain				
			Religion		Traditional religion		
			Citation frequency	Average rank	Citation frequency	Average rank	Meaning
said to be derived, meaning 'the abdomen of Dah'.							
Dan			0.06	10.00	0.07	7.00	God of the Pedah tribes in southern Benin which is represented by a (Python) serpent.
Dance			0.05	7.25	0.20	8.00	
Danger					0.01	3.00	
Deacon			0.03	13.00			An ordained minister of an order ranking below that of priest.
Death			0.02	10.00	0.13	9.33	
Demonisation					0.01	17.00	
Destiny					0.01	10.00	
Development					0.02	15.00	
Devil			0.08	9.00	0.05	9.60	
Dignitary			0.03	24.50			A person considered to be important because of high rank or office
Disciple					0.01	5.00	
Disease					0.05	10.40	
Disown					0.01	2.00	
Divinity			0.02	1.00	0.19	6.39	
Doubt					0.01	21.00	
Dress code					0.01	14.00	
Drums			0.10	5.67	0.09	5.89	
Earth			0.05	14.00	0.02	9.00	
Eckankar			0.02	7.00			Religious movement founded by Paul Twitchell in 1965.
Ecumenical			0.02	17.00			
Education			0.02	2.00	0.01	3.00	
Effect					0.02	6.00	
Egg					0.01	2.00	
Egougou					0.01	2.00	The word refers to the Yoruba masquerades connected with ancestor worship.
Egon					0.06	10.00	Yoruba term for the living dead, represented by special costumes in southern Benin.

Term	Plant species	Elements of plant world or plant products	Domain						
			Religion		Traditional religion		Meaning		
			Citation frequency	Average rank	Citation frequency	Average rank			
Egu						0.01	10.00	God of iron and war in the Vodoun pantheon in Benin.	
Elaborate						0.01	1.00		
Elders			0.06	12.00					
Elements						0.01	10.00		
End			0.02	6.00					
Equity			0.02	7.00					
Escape						0.01	2.00		
Essence						0.01	1.00	The intrinsic nature of things.	
Eternal life			0.02	5.00					
Europe						0.01	4.00		
Evangelism			0.03	13.50					
Evil			0.08	12.00		0.08	7.00		
Evil spirit			0.03	3.00					
Evolution			0.03	13.00					
Existence						0.02	4.00		
Fà			0.02	12.00		0.06	13.50	Divinatory science of Benin and Nigeria.	
Faith			0.03	6.75		0.04	7.50		
Faithfulness			0.27	6.22					
Falsehood						0.01	8.00		
Family			0.02	22.00		0.04	7.50		
Fang						0.03	7.33	Ethnic group of Gabon, Cameroun, and Equatorial Guinea.	
Father						0.01	10.00		
Fatigue			0.03	4.50					
Fear						0.02	12.50		
Feast						0.02	9.00		
Feather						0.01	22.00		

Term	Plant species	Elements of plant or world or plant products	Domain				Meaning	
			Religion		Traditional religion			
			Citation frequency	Average rank	Citation frequency	Average rank		
Feed					0.03	4.33	Offering food to the spirits.	
Female drum					0.01	9.00		
Fetish					0.08	5.50		
Fetish priest			0.02	9.00	0.07	5.43		
Fire					0.02	14.50		
Fly-whisk	1				0.02	8.00	Ceremonial object carried by Fâ oracle priests in Benin and male Bwiti initiates in Gabon. In Gabon, it is made from the rattan <i>Eremospatha cabrae</i> . In Benin it is usually made from the tails of horses.	
Force					0.01	4.00		
Forest	1		0.07	2.00	0.02	13.00		
Forest spirit					0.02	5.50		
Forgiveness			0.05	9.38				
France			0.03	3.00				
Free Mason			0.15	6.60				
Freedom			0.03	7.00				
Fruit	1				0.01	19.00		
Gambura					0.02	5.50	Type of Vodoun ceremony from Allada, Benin.	
<i>Garcinia kola</i> bark	1				0.01	12.00	Tree of the Clusiaceae family whose bark is used in the elaboration of palm wine in Gabon. Its seeds are used ceremonially as stimulants.	
Girl					0.01	9.00		
Glory			0.05	11.33				
Goat					0.01	17.00		
God			0.08	7.75	0.17	5.44		
gods					0.04	2.50		
Good			0.03	11.00	0.08	6.25		
Grace			0.18	2.67	0.01	12.00		
Gris-gris					0.03	13.00	Magical object or charm.	

Term	Plant species	Elements of plant world or plant products	Domain				Meaning	
			Religion		Traditional religion			
			Citation frequency	Average rank	Citation frequency	Average rank		
Guelelé					0.01	9.00	Type of masquerades of southern Benin connected with ancestor worship.	
Hand					0.01	2.00		
Happiness					0.04	4.00		
Harp			0.03	2.00	0.03	10.33	Called Mongongo (male) or Ngombi (female), ceremonial string instrument played by the mouth during Bwiti ceremonies.	
Healer			0.02	11.00	0.03	12.33		
Health					0.01	4.00		
Heart			0.02	6.00				
Hell			0.02	4.00	0.01	6.00		
Herbal bath		1			0.01	5.00		
Hévirosso					0.16	5.27	God of thunder in Benin.	
Hideout					0.01	3.00		
History			0.02	10.00				
Holy ghost			0.02	10.00				
Horn					0.03	9.67	Ceremonial instrument made from the horn of a cow used in Bwiti vigils.	
Human			0.09	7.50				
Human skull					0.02	12.50		
Humanity					0.14	6.46		
Ideology			0.06	8.75				
Ignorance					0.02	5.00		
Incantation					0.09	11.67		
Individual			0.02	10.00				
Initiation					0.08	8.75		

Term	Plant species	Elements of plant world or plant products	Domain				Meaning
			Religion		Traditional religion		
			Citation frequency	Average rank	Citation frequency	Average rank	
Initiates					0.02	11.50	
Injure			0.05	3.00			
Imam			0.02	8.00			
Immorality					0.01	6.00	
Impossibility			0.08	11.60			
Insence			0.02	3.00			
Instruments			0.05	5.33	0.01	10.00	
Intelligence					0.01	12.00	
Invisible					0.01	7.00	
Invisible being			0.02	9.00			
Iroko	1				0.01	21.00	Large forest tree (<i>Milicia excelsa</i>) of West and Central Africa. Considered as sacred in Benin
Iron					0.03	4.00	
Islam			0.04	8.00			
Iya-Agan					0.01	8.00	In the Yoruba Egugun mythology, the foster mother of Agan (a half-human, half-monkey child).
Jahova			0.32	7.57			
Jerusalem			0.05	8.33			
Jesus			0.02	17.00			
Joy					0.01	12.00	
Judaism			0.14	5.33			
Judgement day			0.03	12.50			
Kaolin					0.01	9.00	
Kétou					0.01	10.00	City in the Plateau department of Benin.
King					0.02	8.50	
Knowledge					0.06	7.83	

Term	Plant species	Elements of plant world or plant products	Domain						
			Religion		Traditional religion				
			Citation frequency	Average rank	Citation frequency	Average rank	Meaning		
Kòkou					0.02	5.50	A feared warrior undergod of the Yoruba. Also, a town in Benin.		
Konfo					0.01	10.00	Village in Benin.		
Lamb					0.02	13.00			
Language			0.02	10.00					
Law of nature			0.02	8.00	0.01	8.00			
Lesser god					0.02	3.50			
Legba					0.16	3.00	God of chaos, crossroads and protector of homes in Benin.		
Life			0.03	8.00	0.03	5.67			
Lie			0.02	18.00					
Light					0.01	1.00			
Lightning					0.01	4.00			
Lisa					0.01	5.00	The masculine aspect of the androgynous creator god Mawu-Lisa in the Vodoun pantheon.		
Listen			0.06	12.25	0.01	18.00			
Lodge			0.02	1.00					
Longevity			0.02	7.00					
Love			0.02	3.00	0.02	5.50			
Lucifer			0.17	5.00	0.01	10.00	Another name for Satan.		
Maintenance			0.02	19.00					
Maize flour	1				0.10	7.40	Flour of <i>Zea mays</i> is largely used ceremonially in Benin.		
M'alan					0.01	5.00	Initiatic society of the Fang in Gabon. Adepts of this traditional faith consume the roots of <i>Alchornea floribunda</i> ceremonially. The plant is known as Alan (Fang), therefore also the name of the traditional faith.		
Male drum					0.01	7.00	Called Nomnkoul.		
Malefactor					0.01	4.00			
Mami Wata					0.09	5.44	Goddess of water in West and Central Africa.		
Man					0.02	9.00			
Mao-Tse-Tung			0.02	10.00					

Term	Plant species	Elements of plant world or plant products	Domain				
			Religion		Traditional religion		Meaning
			Citation frequency	Average rank	Citation frequency	Average rank	
Marriage			0.02	13.00	0.01	15.00	
Mat	1				0.01	3.00	Woven mats of <i>Raphia</i> fiber.
Matthew			0.03	5.00			
Mecca			0.02	16.00			
Medicinal plants	1		0.02	2.00	0.01	2.00	In French, referred to as 'les feuilles'.
Medicine					0.01	24.00	
Meditation					0.01	2.00	
Mercury			0.02	12.00			
Messenger					0.01	13.00	
Methodist			0.02	4.00			
Missoko					0.01	3.00	A branch of Bwiti exclusive for traditional healers.
Mitsogo					0.01	1.00	Ethnic group of Gabon.
Mohammed			0.02	23.00			
Monastery			0.05	9.67			
Money			0.02	15.00	0.03	6.67	
Moon					0.02	8.00	
Mosque			0.03	7.50			
Mother					0.01	11.00	
Music					0.01	9.00	
Mutton			0.08	11.40			Flesh of mature sheep.
Mwiri					0.02	4.50	Male secret society of Gabon, a branch of Bwiti.
Nature					0.06	9.33	
Needle					0.01	13.00	
Negativity					0.01	7.00	
Neighbour			0.02	9.00			
Nganga					0.22	4.43	In Gabon, the name of Bwiti spiritual guide.

Term	Plant species	Elements of plant world or plant products	Domain					
			Religion		Traditional religion			
			Citation frequency	Average rank	Citation frequency	Average rank	Meaning	
Night					0.11	7.45		
Nun			0.03	7.00				
Nyembe					0.01	3.00		Female secret society of Gabon.
Offering			0.02	9.00	0.06	9.67		
Ogboni			0.02	6.00				Fraternal institution indigenous to the Yoruba language-speaking polities of Nigeria, Republic of Benin and Togo.
Ogoun					0.01	4.00		Yoruba god of iron.
Open					0.01	20.00		
Opium			0.02	18.00				
Oracle					0.01	10.00		
Oro					0.02	13.50		Feminine spirit of wind in the Egugun mythology of the Yoruba, a male-only cult in Benin.
Ouidah					0.03	21.33		Coastal city of Benin.
Our lady			0.02	11.00				
Owl					0.02	16.00		
Pact			0.02	11.00	0.01	6.00		
Paradise			0.02	8.00	0.01	7.00		
Parrot feather					0.05	9.00		Both in Benin and Gabon, the red tail feathers of the African grey parrot (<i>Psittacus erithacus</i>) are worn in initiation ceremonies.
Passion			0.05	16.00				
Pastor			0.02	4.00				
Pate rouge	1				0.01	4.00		Traditional dish of Benin made of maize flour and tomato and a common ceremonial offering. Locally known as Amiwô (Fon).
Path			0.02	5.00				
Peace			0.03	8.00	0.01	5.00		
Pedophilia			0.06	11.25				
Pentecost			0.02	7.00				
Perfume					0.04	3.75		

Term	Plant species	Elements of plant world or plant products	Domain				
			Religion		Traditional religion		Meaning
			Citation frequency	Average rank	Citation frequency	Average rank	
Peter			0.03	6.50			
Phenomenon					0.01	4.00	
Physical life			0.02	15.00			
Pig					0.01	19.00	
Plants	1		0.02	2.00	0.21	6.55	
Platform			0.03	1.50			
Pobé					0.01	11.00	Town of the Ouémé valley in Benin.
Pommade	1				0.01	2.00	Cream mixed with plant extracts used to protect against evil spirits.
Pope			0.02	20.00			
Positivity			0.06	7.75			
Possibility			0.02	12.00			
Powder					0.01	12.00	
Power					0.02	7.50	
Powerlessness					0.01	2.00	
Practice			0.02	16.00	0.02	5.00	
Praise			0.02	4.00			
Prayer			0.02	5.00	0.01	5.00	
Prescription					0.01	11.00	
Priest			0.08	4.33	0.04	12.50	
Principle					0.01	23.00	
Problem			0.21	7.00			
Promise					0.01	9.00	
Prophet			0.02	3.00	0.01	14.00	
Protect			0.02	6.00			
Protection					0.06	7.33	
Protestant			0.03	8.50			

Term	Plant species	Elements of plant world or plant products	Domain				
			Religion		Traditional religion		Meaning
			Citation frequency	Average rank	Citation frequency	Average rank	
Psalm			0.09	11.83			
Pygmies					0.04	7.25	
Queen					0.02	7.00	Wife of an African traditional King.
Quietness			0.02	7.00			
Rainbow					0.02	5.50	
Ram					0.02	9.50	Male goat.
<i>Raphia</i> sp.	1		0.03	4.00	0.04	10.25	Genus of the family Arecaceae.
<i>Raphia</i> cloth	1				0.01	20.00	Traditional cloth made of young leaves of <i>Raphia</i> palms
<i>Raphia</i> (palm) leaves	1		0.07	7.50	0.02	9.17	The young leaves of the <i>Raphia</i> palm, used in a large number of ceremonies (traditional or otherwise).
Rattle			0.03	3.00	0.01	9.00	
Rebirth			0.02	10.00			
Red caolin	1		0.03	9.00	0.05	11.60	Ceremonial pigment. In Benin made from the powdered roots of <i>Baphia nitida</i> or red clay. In Gabon, made from the powdered wood of <i>Pterocarpus soyauxii</i> or, occasionally, the seeds of <i>Bixa orellana</i> .
Red cloth			0.03	9.00	0.06	10.17	
Redemption			0.07	7.00			
Red oil	1				0.20	8.47	Oil extracted from the palm <i>Elais guineensis</i> , largely used for food, medicine, and spirituality.
Refusal					0.01	6.00	
Religion					0.13	4.50	
Remedy					0.01	10.00	
Request					0.03	4.67	
Respect			0.03	2.00	0.06	7.00	
Resurrection			0.06	4.00			
Revelation			0.03	16.50			
Revenant					0.04	7.50	Person who has returned from death (general term).
Ritual			0.02	4.00	0.03	10.33	

Term	Plant species	Elements of plant world or plant products	Domain				Meaning
			Religion		Traditional religion		
			Citation frequency	Average rank	Citation frequency	Average rank	
Rivalry					0.01	16.00	
River					0.01	13.00	
Sacred grove		1			0.02	4.00	
Sacrifice			0.02	11.00	0.15	8.93	
Sacrilege					0.01	13.00	
Sadness					0.01	4.00	
Saints			0.02	7.00			
Saint sacrament			0.02	10.00			
Sakpata			0.02	4.00	0.25	4.46	Vodoun god of earth and smallpox in Benin.
Sand					0.03	3.33	
Satan			0.02	8.00	0.03	8.00	
Science			0.02	17.00	0.01	4.00	
Sea					0.01	17.00	
Sect			0.02	2.00	0.01	1.00	
See					0.01	1.00	
Self			0.02	1.00			
Seminary			0.02	5.00			
Serpent					0.02	9.50	
Share			0.02	17.00	0.01	12.00	
Sheep					0.02	9.50	
Simplicity					0.01	1.00	
Sin			0.02	4.00			
Sitar			0.03	2.00	0.05	8.00	Musical instrument played in Bwiti ceremonies.
Sitar player					0.01	5.00	
Small balaphone					0.01	8.00	Small wooden xylophone (female version).
Soap					0.02	3.50	

Term	Plant species	Elements of plant or world or plant products	Domain					
			Religion			Traditional religion		
			Citation frequency	Average rank		Citation frequency	Average rank	Meaning
Sodabi		1				0.01	5.00	Alcoholic beverage of Benin made from the fermented sap of the African oil palm (<i>Elaeis guineensis</i>).
Solution			0.06	6.00				
Song			0.07	8.00		0.03	14.33	
Sorcerer						0.05	6.20	
Sorcery						0.07	9.29	
Soul			0.02	10.00				
Species						0.01	6.00	Creature.
Spirit			0.02	20.00		0.25	5.54	
Spirituality						0.03	8.00	
Star						0.05	7.00	
Statuete			0.11	10.14		0.02	6.00	Small statue or figurine commonly made of wood.
Subjugation			0.02	6.00				
Submission			0.02	8.00		0.01	13.00	
Sun						0.02	7.00	
Symbol						0.01	12.00	
<i>Tabernanthe iboga</i>	1					0.20	4.63	Shrub of the Apocynaceae family. Sacred and medicinal plant of Gabon used in Bwiti ceremonies.
Taboo						0.02	12.00	
Tam-tam						0.02	15.00	Traditional drum.
Tchakatou						0.02	12.00	Common term to refer to witchcraft or bewitchment in Benin
Teaching						0.01	2.00	
Temple			0.09	4.40		0.01	21.00	
Terror			0.02	9.00				
Testament			0.02	3.00				
Thread						0.03	6.33	
Thrôn						0.11	8.27	A more recently introduced Vodoun in Benin said to be originally a god of the Peul tribes in Northern Ghana. This god is the protector of those suffering from physical and spiritual

Term	Plant species	Elements of plant world or plant products	Domain				Meaning	
			Religion		Traditional religion			
			Citation frequency	Average rank	Citation frequency	Average rank		
Thunder				0.03		11.67	disequilibria.	
Tolerance			0.02	8.00	0.01	14.00		
Totem					0.02	18.50		Element of the natural world (usually an animal) adopted as emblem by particular societies or tribes because of the spiritual significance attributed to it.
Tôtôssou					0.02	8.00		Village in Benin.
Tradition			0.03	10.50	0.10	4.00		
Traditional torch	1				0.10	5.33	Large ceremonial torch made from the resin of <i>Aucoumea klaineana</i> and the bark of <i>Xylopiæ aethiopica</i> .	
Trees	1				0.02		12.00	
Trust			0.03	13.50	0.01		6.00	
Truth			0.03	10.50	0.01		9.00	
Vampire					0.04		4.00	In Gabon, the term is commonly used to refer to people who, possessed by evil spirits, do evil to others.
Verse			0.06	9.25				
Vigil					0.13		7.17	La veillé, in French, a ceremony that takes place at night.
Village			0.02	11.00	0.01		17.00	
Violence					0.01		6.00	
Virgin Mary			0.02	1.00				
Vodoun			0.11	7.86				
Vodoun child					0.06		9.33	Any adept of Vodoun (adults and children).
Voice					0.01		3.00	
War			0.30	6.70				
Wash					0.01		5.00	
Water			0.02	1.00	0.03		10.00	
West					0.01		21.00	
White cloth					0.02		13.50	
White kaolin			0.03	8.00	0.05		9.80	Ceremonial pigment made of white clay.

Term	Plant species	Elements of plant world or plant products	Domain				Meaning
			Religion		Traditional religion		
			Citation frequency	Average rank	Citation frequency	Average rank	
Wisdom			0.05	5.67			
Women			0.02	13.00	0.01	3.00	
Word			0.02	13.00	0.05	6.80	
World					0.01	6.00	
Work			0.05	4.00			
Zangbêto					0.06	12.00	Traditional 'nightwatchmen' (nocturnal spirits) of Benin and Nigeria.
10 January					0.01	5.00	Day of the year when traditional faiths are officially celebrated in Benin.



Chapter Five

“Gullibility of the credulous” or ignorance of the sceptic? Why ritual plant use has pharmacological relevance^{*}

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ABSTRACT

Although ritual plant use is now recognized both for its socio-cultural importance and for its contribution to nature conservation, its potential pharmacological effects remain overlooked. Our objective was to see whether ritual plant use could have ethnopharmacological relevance through practices that involve direct physical contact with the human body. Data were collected in collaboration with traditional healers and ritual plant vendors and harvesters in Benin (West Africa) and Gabon (Central Africa). Both ritual and medicinal uses of plants were recorded. Voucher specimens were collected and identified. We documented different administration routes of ritual plants and selected those whose uses involved direct contact with the human body. Based on our quantitative market surveys and field inventories, we identified 24 commercially or otherwise culturally important species and compared their ritual uses with proven pharmacological effects from the literature. We recorded 573 plant species with 667 ritual uses, of which ca. 75% (442 species and 499 uses) implied direct contact with the human body. The most common route of administration for ritual treatments were baths, followed by oral ingestion and skin rubbing. One third (186 species) of all ritual plants doubled as medicine for physical ailments. In contrast to previous research that explained the effectivity of ritual plant use to be a matter of belief, our study provides evidence for potential pharmacological effects on its users. Ritual treatment of madness caused by evil spirits by the consumption of *Rauvolfia vomitoria* roots, for example, may be based on the species' proven anticonvulsant properties. We posit that ritual plant uses that do not involve contact with the human body may also be vehicles for the transmission of traditional medicinal knowledge. We conclude by discussing some of the possible implications of ritual plant use for public health.

Keywords: Pharmacological effect; Public health; Rituals; Traditional medicinal knowledge; Western Africa

^{*} Submitted in slightly modified form

INTRODUCTION

Traditional knowledge is generally defined as the body of know-how and practices developed and maintained by people to manage their environment (ICSU, 2014). It includes beliefs in spirits, ancestors and gods, and how these relate to society (Reyes-García, 2010). Over the past two decades, traditional knowledge has received increasing recognition for its importance in nature conservation (Berkes et al., 2000), and for the advancement of biomedical science (Young, 1983). In the case of Africa, ritual and religious traditions have been studied in detail by anthropologists (Blier, 1995; Fernandez, 1982; Herskovits, 1938), but the plants associated with these practices have barely been documented (Akendengue, 1992; de Souza, 2006; Verger, 1995; Vergiat, 1970). With the exception of psychoactive plants that are central to some religious traditions (notably, *Tabernanthe iboga* (Alper et al., 2007; Sheppard, 1994) and toxic species used in poison ordeals (e.g. *Erythrophleum suaveolens* (Abbiw, 1996; Ngounou et al., 2005), African ritual plants use has received little attention in ethnopharmacology. This is probably due to the tendency of researchers in this discipline to base their studies almost exclusively on a combination of chemical, biological, and pharmacological sciences (Reyes-García, 2010). Moreover, from bioprospecting during the colonial era, the notion emerged that African ritual plant use is too much typified by witchcraft and sorcery to be of any medicinal benefit (Voeks, 2004). Not surprisingly, ritual plant use has been described as “superstitious” (Irvine, 1961), characteristic of “under-developed peoples” (Olivier-Bever, 1986), a demonstration of “the gullibility of the credulous” (Burkill, 1995), or has simply been omitted from the otherwise extensive inventories of useful plants (Abbiw, 1996).

This attitude of neglect is indisputably changing, as demonstrated by the number of publications that acknowledge ritual plant use as an integral part of traditional healing systems (Iwu, 2014; van Andel and Ruyschaert, 2011). In practice, however, we now face the consequences of the historical contempt. For example, the Plant Resources of Tropical Africa (PROTA) series composed of 8 volumes and a web database with over 1850 articles on useful plant species (www.prota4u.org) is probably the most valuable resource on useful plants for Africa to date. Although ritual, religious, or magic uses of plants are sometimes mentioned in the separate sections on medicinal uses given for each of the species treated, these appear to be proportionally underrepresented. This is an unfortunate situation, given that PROTA’s mission is to make scientific information about useful plants accessible in Africa, yet an important aspect of societal life in the continent remains scantily covered.

Nowadays, with modern health facilities becoming more accessible to Africans, ethnomedical practitioners are likely to increasingly limit their services to illnesses that have medico-religious etiologies (Aniyam, 1987). Today, hundreds of plant species are used for ritual practices in West and Central Africa (Quiroz and van Andel, 2015), and many of these are sold in large quantities on the medicinal plant markets in the region (Quiroz et al., 2014; Towns et al., 2014; van Andel et al., 2012). The few detailed studies on ritual plant use in Africa reveal a large quantity of practices with potential pharmacological effects on the patients receiving the treatment (Bouquet, 1969). Earlier studies on ritual plants worldwide already indicated that these plants often have additional healing

properties (van Andel and Ruyschaert, 2011;Voeks, 1990), which could be the reason why they are considered sacred in the first place (van Andel et al., 2013).

Our work is on ritual practices as an expression of ethnopharmacological knowledge. We documented ritual plants in Benin (West Africa) and Gabon (Central Africa) and assessed their possible pharmacological relevance. We posed the following research questions: (1) Which plant species are used for ritual purposes in Benin and Gabon? (2) How many of these plants have known medicinal uses? (3) What is the proportion of ritual applications that imply direct contact with the human body? (4) Which species and applications suggest pharmacological effects?

METHODS

Data collection

We started at the medicinal plant markets of both countries. We conducted informal interviews with market vendors in order to identify salient ailments and the ritual plant species used to treat these. We complemented our data on (commercial) ritual plant use gathered at the markets with semi-structured interviews carried out among traditional healers. Traditional healers were reached by means of chain-referral sampling (Penrod et al., 2003). In total, our sample consisted of 57 informants (35 traditional healers and 22 market vendors) in Benin and 46 informants (38 traditional healers and 8 market vendors) in Gabon. We paid special attention to recording detailed information on plants' vernacular names, local terms for the conditions treated with these plants, preparation methods, dosage, and route of administration. Additionally, we asked our informants to explain, whenever possible at length, the symptoms, causes, and effects of the health conditions in question.

Questionnaires were completed by the collection of voucher material from all plant species cited during the interviews. We purchased the plants mentioned by vendors directly at their market stalls. We accompanied traditional healers to the sites where they collected the plants they used during their ritual treatments. These sites included communal forests and grasslands, sacred forests, home gardens, and shrines. All plants were collected following standard botanical methods (Forman and Bridson, 1989). For each specimen, two vouchers were made: one was deposited at the national herbarium of the country where the plant was collected (BEN in Benin and LBV in Gabon) and the other one deposited at Naturalis Biodiversity Center (L). Plants were identified using the Flora of Benin (Akoeigninou et al., 2006) and the Flora and Checklist of Gabon (Sosef et al., 2006; Sosef et al., 2009--; Various editors, 1960-2008). Current scientific names were updated using The Plant List (<http://www.theplantlist.org>).

Data analysis

We constructed a database of all ritual plant uses documented in Benin and Gabon and applied exclusion criteria to narrow down the list. These criteria were set in order to only include plants that had been identified to the species level and to exclude: (1) plants that had been identified to family or genus level only; (2) plants that lacked any level of identification; and (3) plants that had unspecified ritual uses. To evaluate possible pharmacological relevance of ritual plant uses, we identified nine routes of administration: oral ingestion (drink or food), baths, smoking (mixed with

tobacco), scarification, skin rubbing, burning (and inhaling the smoke), amulets, incantations, and planting in the case of sacred and protective species (Table 5.2). Plants that came in direct contact with the human body (by oral ingestion, baths, skin rub, smoking, burning or scarification) were ticked. We acknowledge the possibility that plants worn as amulets (e.g. power objects and charms) could come in contact with the human body, however, such protective charms were often placed in people's homes or fields. Therefore, for the purposes of this study, all amulets were considered not to have direct bodily contact.

Finally, we highlighted several ritual plant species for which pharmacological effects were reported in literature. Given the large number of plants used in a ritual context, we limited our selection to 24 species that were either frequently sold at the medicinal plant markets in the countries of study (Quiroz et al., 2014; Towns et al., 2014), or otherwise were cultural keystone species (Quiroz and van Andel, unpublished work). In order to assess their possible pharmacological relevance, we compared their proven pharmacological properties with the type of ritual use documented during our surveys.

RESULTS

Ritual plant species

Our initial database of ritual plant uses in Benin and Gabon contained 729 entries. We excluded 23 plants that could not be identified to species level and 39 plants with unspecified ritual uses. This resulted in a list of 667 plant products with detailed use in a ritual context. These corresponded to 573 botanical species, of which 381 were used in Benin and 243 in Gabon. Fifty-one species (7.6%) were used in both countries. Over a third of all plant species ($n = 186$) were indicated by our informants to have an additional medicinal (non-ritual) use. The botanical families most commonly used ritually were: Leguminosae (79 spp.), Euphorbiaceae (30 spp.), Malvaceae (29 spp.), Rubiaceae (26 spp.), Apocynaceae (21 spp.), Compositae (17 spp.), Cucurbitaceae (16 spp.), and Annonaceae and Lamiaceae (each 12 spp.). All species, including their vernacular and botanical names, plant parts employed, specific uses and route of administration are listed in Table S1. About 75% ($n = 499$) of all ritual plant uses (442 species) involved direct contact with the human body (Fig. 5.1a). Scarification (rubbing plant extracts into skin incisions) and inhalation by smoking or burning made up for less than 4% of the total uses, and were therefore merged under the category 'other' (Fig. 5.1b).

Ritual plants with direct contact to the human body

Baths and skin rubbing

Baths were the commonest route of administration of ritual plants ($n = 336$, Fig. 5.1b). This practice consisted in the steeping of plants in water in order to cleanse the body of adepts of traditional religions. In Benin, particularly, people elaborated soaps mixed with herbs in what is popularly known as *savon noir* (black soap). Almost 10% of plant species used in baths were also processed into ritual drinks. In fact, although many of the species used for herbal baths were not explicitly reported for their use as ritual drinks, we often observed how adepts would purposefully keep their

mouths open while taking a bath. It is worth noting that after spiritual purification (for which often plants rich in essential oils were used), herbal baths were often part of a (ritual) treatment of diseases, or taken by people in order to attain good luck.

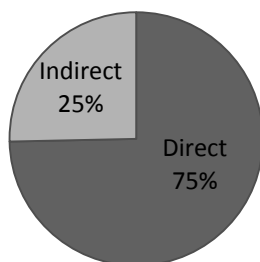
Skin rubbing, which included the preparation of ritual plants into poultices and pomades, was a practice far less popular than ritual baths. Notably, skin rubs were used in treatments against snakebites and skin conditions that included Sakpata-related diseases and wounds of mystical origin. Sakpata is the god of smallpox and earth, who can cause diseases manifested by cutaneous eruptions (notably pustules). Another important ritual use that enters in this category is the employment of plant-based pigments, which are a common element of ritual ceremonies. In Benin, the roots of *Baphia nitida* yielded a red pigment applied on the skin ceremonially. The powdered heartwood of the African padauk (*Pterocarpus soyauxii*) and the ground seeds of *Bixa orellana*, were used for the same purpose in Gabon. Although the type of ceremonial use was not specified, henna (*Lawsonia inermis*) in Benin, and the bark of *Anisophyllea purpurascens* in Gabon, were also indicated as ritual skin pigments. When rubbed on the skin, *P. soyauxii* has been found to have cytotoxic properties [Su et al., 2013], which might have a prolonged effect on the people who frequently use this plant (Table 5.1).

Oral ingestion

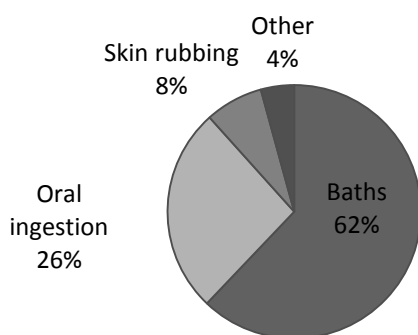
We identified 134 plant species that were orally ingested. The seeds of abata kola (*Cola acuminata*), bitter kola (*Garcinia kola*), and Guinea pepper (*Aframomum melegueta*) were simply chewed fresh as ceremonial stimulants or to increase the power of ceremonial healing treatments. They were said to ‘increase the power of words’, in a way that someone’s promise to achieve a goal would gain more weight after eating the seeds of these plants. *G. kola* nuts have been assessed for their properties in preventing damage to cellular DNA induced by aflatoxins: highly toxic and carcinogenic mycotoxins (Farombi, 2005). Some studies showed significant relationship between exposure of aflatoxin and the appearance of congenital abnormalities in hamsters (Goldblatt, 1969). This might explain why bitter kola nuts were preferred during healing ceremonies or the installation of charms to protect pregnant women in Benin, although *C. acuminata* seeds were more often used in all other types of ceremonies. Likewise, the seeds of *A. melegueta* seeds have been reported as effective in pain inhibition (Umukoro and Ashorobi, 2007), which may explain their importance in the ceremonial treatment of diseases. Although both kola nuts (*C. acuminata* and *G. kola*) were eaten as stimulants in Gabon, their use was less prevalent, likely because healing ceremonies took place as vigils under the analeptic effects of the iboga root (*Tabernanthe iboga*).

We regularly encountered plants eaten in protection against enemies (e.g. the seeds of *Abrus precatorius* and the root of *Strophanthus hispidus*), weapons (the bark of *Spondias mombin*), or snakes (notably, the leaves of both *Tylophora cameroonica* and *Bauhinia thonningii*). Because of its heart-shaped leaf, *Geophila afzelii* was eaten by people seeking to find love in Gabon. Some food plants were prepared as condiments or in sauces, chiefly for two purposes: in protection against diseases (including the return of recently cured diseases, e.g. the seeds of *Panda oleosa*) or to be

a)



b)



c)

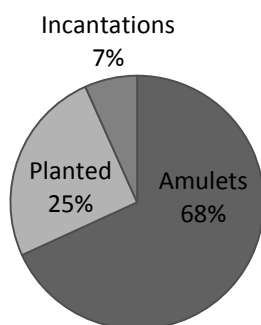


FIGURE 5.1. a) Proportion of ritual plants that come in contact with the human body, b) type of direct contact with human body, c) type of indirect contact with human body.

TABLE 5.1. Ritual uses for plant species and their demonstrated pharmacological effects compared.

Plant species	Ritual use	Plant part; route of administration	Demonstrated pharmacological effect	Plant part; route of administration	Reference
<i>Abrus precatorius</i>	Protection against evil spirits, sorcery, and enemies	Seeds; oral and amulet	Antibacterial, lethal toxicity	Seeds; oral	Bobaralaand Vadlapudi, 2009; Nelson et al., 2007
<i>Aframomum melegueta</i>	Enhancement of herbal treatments, stimulant	Seeds; oral	Analgesic	Seeds; injection	Umukoro and Ashorobi, 2007
<i>Alchornea floribunda</i>	Ceremonial stimulant	Roots; oral	Antibacterial, stimulating intoxicant	Roots, stems, leaves; in vitro	Siwe Noundou et al., 2014; PROTA, 2014
<i>Aucoumea klaineana</i>	Spiritual purification	Bark and resin; baths and inhalation	Treatment of cutaneous infections and allergies	Resin; in vitro	US Patent 6,676,952, 2004
<i>Caesalpinia bonduc</i>	Protection against skin diseases	Seeds; amulet	Immunomodulatory activity, antibacterial	Seeds; oral	Saeed and Sabir, 2001; Shukla et al., 2009
<i>Cymbopogon densiflorus</i>	Protection against evil spirits	Flowers; inhalation	Possible hallucinogenic effects	Flowers; inhalation	De Smet, 1996
<i>Dicoma tomentosa</i>	Spiritual purification	Whole plant; bath	Antiplasmodial	Whole plant; in vitro	Jansen et al., 2012
<i>Eclipta prostrata</i>	Protection against evil spirits and improving memory	Whole plant; scarification	Memory enhancer, anti-stress	Whole plant; oral	Thakur and Mengi, 2005
<i>Garcinia kola</i>	Ceremonial stimulant	Seeds; oral	Prevention of cellular DNA damage, antiviral, cytotoxic	Seeds; oral	Farombi et al., 2005
<i>Jatropha curcas</i> , <i>J. multifida</i> , <i>J. gossypifolia</i>	Protection against evil spirits, sorcery, and enemies	Whole plant; planted	Disinfectant, cytotoxic, lethal toxicity	Whole plant; oral, skin rub	Nelson et al., 2007; Thomas et al., 2008
<i>Lycopodiella cernua</i>	Protection against evil spirits	Whole plant; oral and bath	Prevents destruction of neurotransmitter acetylcholine	Whole plant; in vitro	Konrath et al., 2013
<i>Massularia acuminata</i>	Good luck	Fruits; bath	Aphrodisiac	Fruits; in vitro	Singh et al., 2013
<i>Monodora myrsinica</i>	Spiritual purification, stimulant	Seeds; oral and bath	Antibacterial	Seeds; in vitro	Cinanga et al., 2002
<i>Mucuna pruriens</i>	Protection against snakes	Whole plant; planted	Antidote against snake venom	Leaves, seed, root; in vitro	Tan et al., 2009
<i>Ocimum americanum</i>	Protective baths against diseases of mystical origin	Leaves; bath	Larvicidal	Whole plant; in vitro	Cavalcanti et al., 2004
<i>Pancratium tenuifolium</i>	Protection against evil spirits	Roots; scarification	Hallucinogenic (?), cytotoxic, antiplasmodial	Roots; in vitro	Cedron et al., 2010; De Smet, 1996; Soviecki, 2002
<i>Pterocarpus soyauxii</i>	Ceremonial pigment	Wood; skin rub	Cytotoxic	Wood; in vitro	Su et al., 2013
<i>Rauvolfia vomitoria</i>	Treatment of madness	Root bark; oral	Anticonvulsant activity	Root bark; oral	Olatokeunboh et al., 2009
<i>Sarcocephalus latifolius</i>	Bewitchment-induced malaria	Roots; baths	Antiplasmodial	Roots; in vitro	Abreu and Pereira, 2001
<i>Senega occidentalis</i>	Ritual treatment of nicotine addiction	Leaves; inhalation	Antianxiety	Leaves, oral	US Patent 13,260,454, 2010
<i>Tetrapleura tetraptera</i>	Insomnia caused by spirits	Fruits and bark; bath	Anticonvulsant and anti-inflammatory	Fruits; in vitro	Nwaiwu and Akah, 1996; Ojewole and Adewunmi, 2004
<i>Xyloptia aethiopica</i>	Protection against evil spirits	Fruits; oral	Antimicrobial, cytotoxic	Fruits; in vitro	Asekun and Adeniyi, 2004

presented as ceremonial offerings. Persons who believe in the protective powers of food offerings would eat these offerings after such ceremonies. Species used for offerings were mostly cultivated crops (e.g. cowpea, *Vigna unguiculata*), but also included wild plants.

Similar to the preparation of herbal baths, ritual drinks were prepared by soaking or boiling plants in water. In Benin, bitter drinks prepared with palm wine were a common alternative to infusions. Ritual drinks made from plants were used to treat madness or possession by evil spirits, to attract love (e.g. *Pupalia lappacea*), to attain the favour of influential people, for good luck, or for spiritual purification. Many of the ritual drinks were used in protection against bewitchment, sorcery, or evil spirits, in addition to treating Sakpata-related diseases. Protective drinks to enhance women's health either during or after pregnancy (e.g. *Pavetta corymbosa*), against infertility (e.g. *Omphalocarpum procerum*), and to protect children (e.g. *Senna siamea*) were also common.

The fact that extracts from the root bark of *Rauvolfia vomitoria* have a proven anticonvulsant activity (Siwe et al., 2014) provides an important insight to their use in the treatment of madness in Benin (Table 5.1). The symptoms of madness, which were described by our informants as "contortions caused by evil spirits who possess mad persons", were treated with a concoction of *R. vomitoria*. Likewise, the bark of *Monodora myristica*, which is prepared in a drink meant for spiritual purification, has demonstrated antibacterial effects when administered orally (Cimanga et al., 2002) (Table 5.1). When asked to elaborate about symptoms of evil spirit possession, our Beninese informants explained that these often manifested themselves as a disease or misfortune.

Other forms of direct contact

Burning, smoking and scarification were the least common routes of direct application of ritual species (Fig. 5.1b). Inhalation of smoke occurred when plant parts (usually the resin or bark of a tree, but also the roots or fruits of shrubs such as red pepper, *Capsicum annum*) were burnt as incense. In total, 16 plant species were employed as such for the exclusive purpose to protect its users against evil spirits during ceremonies. In Gabon, two types of torches made from plants were burnt during Bwiti ceremonies. One was made from the bark of the *Xylopia aethiopica* and okume resin (*Aucoumea klaineana*), and the other one from the twigs of *Aframomum giganteum*. On the markets of both countries, ready-made incense mixtures were sold. These usually contained the resin of myrrh (*Commiphora* spp.) or copal (*Copaifera* spp.) and the aromatic bulbs of sedges (*Cyperus esculentus*, *C. articulatus*, and *Kyllinga erecta*). Two *Senna* species (*S. occidentalis* and *S. sophera*) were intentionally smoked in a cigarette, mixed with tobacco, to treat nicotine addiction. Here it is relevant to mention that studies in which *Senna tora* extracts have proven successful in the treatment of anxiety (Table 5.1) also indicate that *S. occidentalis* has the same properties (US Patent 6,676,952). As cigarette-smoking is often a copying strategy against anxiety (Kassel et al., 2000), the smoking of *Senna* leaves suggests a pharmacological effect.

Scarifications, as the term suggests, consisted of inflicting scars on the skin of adepts in order to apply herbal treatments. These 'vaccinations', as they were called by informants, were applied either in protection against enemies or sorcerers, or as a mark of affiliation to a particular traditional

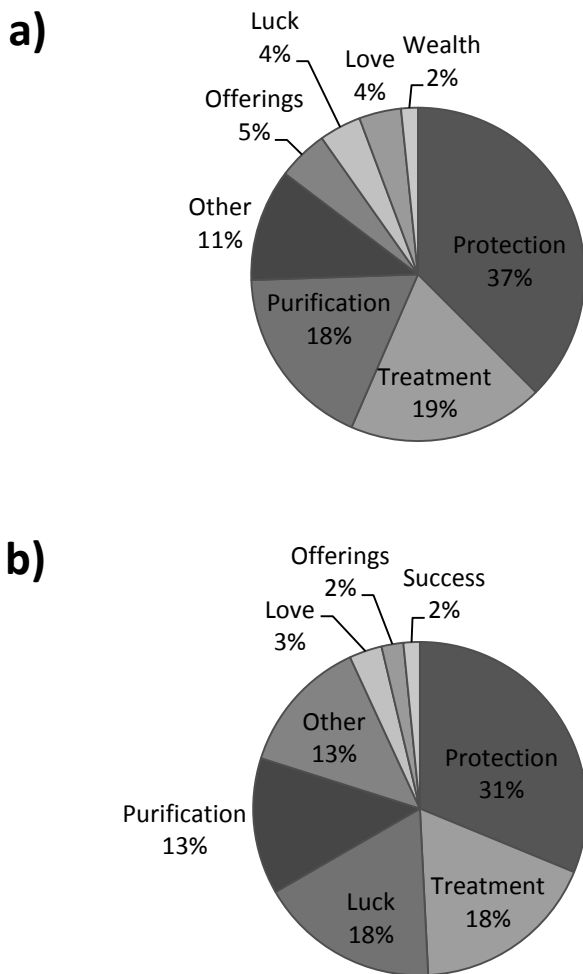


FIGURE 5.2. Salient uses for ritual plants in a) Benin and b) Gabon.

faith. In Benin, the sharp ends of the cat's claw fruits (*Martynia annua*) were used in order to make incisions in the skin, and the macerated bulbs of *Pancratium tenuifolium* rubbed in scars in protection against evil spirits. Another member of the same genus, *P. trianthum*, has potential psychoactive effects (De Smet, 1998; Cedrón et al., 2010). Given that all species of the genus share the same alkaloids, it is likely that *P. tenuifolium* has also hallucinogenic properties, apart from the cytotoxic and antiplasmodial activity of all *Pancratium* species (Olatokunboh et al., 2009). In Gabon, the juice of *Eclipta prostrata*, *Centella asiatica* and *Hymenocoleus hirsutus* leaves were applied in skin incisions in protection against evil spirits. Here, it is important to highlight the relevance of this practice as an application of natural compounds directly into the blood stream. *E.*

prostrata, for example, provides significant protection against stress induced alterations and works in the enhancement of memory (Jansen et al., 2012) which corroborates exactly the purposes indicated by our informants in Gabon: to improve their memory (Table 5.1 and Table 5.2).

Ritual plants with indirect contact to the human body

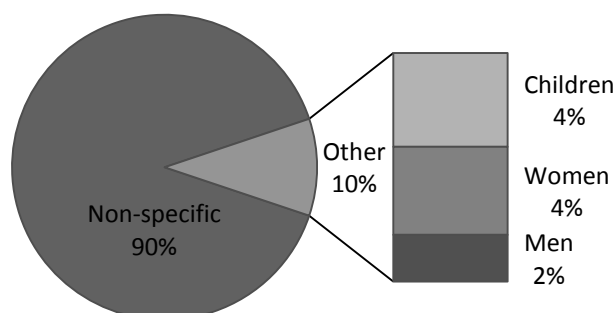
The minority of the species used ritually (174) did not come in direct contact with the human body. These plants were processed into amulets, represented otherwise restricted species, were mentioned during incantations (ritual enchantments), or served as sacred trees that were either intentionally planted or spared from felling - usually as protectors or as an abode for spirits. Some ritual plant use involved, oxymoronically, the physical absence of plants (and therefore the lack of contact with the human body), either in manner of food taboos, ritual prohibitions (e.g. *Strophanthus gratus*), or incantations, like naming the wild sage *Lantana camara* in a song to prevent the death of an ill child. Both food taboos and ritual restrictions were included in the category ‘incantations’ (Fig. 5.1c).

Amulets were sometimes worn in clothes’ pockets (e.g. the seeds of *Abrus precatorius*) or around the neck or waist (e.g. the seeds of *Caesalpinia bonduc*), but were more often kept around the homes of people, usually to ward off enemies, diseases, or sorcerers, or simply used in divination by traditional healers (e.g. the seeds of *Entada gigas* and *Cleistopholis patens*). Similarly, trees and vines were planted around homes (or spared from felling) in protection against evil spirits or snakes. Some of the species planted in protection against evil spirits include *Newbouldia laevis*, and three species of *Jatropha*. Apart from their seeds being poisonous (Nelson et al., 2007), *J. curcas*, *J. gossypifolia*, and *J. multifida* have disinfectant properties and are effective in combating skin infections (Thomas et al., 2008). The use of *A. precatorius* seeds as amulets and the planting of the *Jatropha* species in protection against sorcerers, evil spirits, and enemies, find logic when taking into account their high toxicity (Nelson et al., 2007). Intentional poisoning of adversaries by *A. precatorius* and *J. curcas* was not a rare practice in Sub-Saharan Africa in the past (De Smet, 1998). Hence, their pharmacological importance, partly symbolic (as a relic of important past plant use) and, possibly, partly prophylactic (as disinfectant) is not to be underestimated. A similar example is the planting of *Mucuna pruriens* vines in protection against snakes (Table 5.1), a species whose seeds, leaves, and roots were proven to be an effective antidote against snake venom (Tan et al., 2009).

Salient ritual applications

Almost one-third (n = 212) of the 667 ritual plant uses were used to seek supernatural protection. This type of ritual plant use was the commonest in both countries of study (Fig. 5.2). Under the category ‘other’ we grouped ritual uses that were only mentioned once or twice in the interviews and included problem solving, finding lost objects, invisibility (to escape justice), unspecified spells (which although not admittedly performed by informants, were said to be used by sorcerers), food taboos and other restrictions (Fig. 5.2). Plants used for attaining success, a salient ritual use in

a)



b)

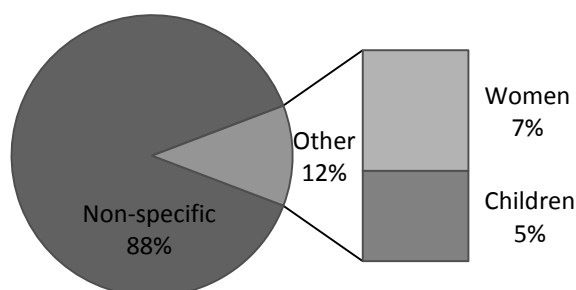


FIGURE 5.3. Proportion of ritual uses for plants per user group in a) Benin and b) Gabon

Gabon, included finding a job, passing an exam, obtaining the favour of a person in a position of power, or simply attracting wealth. It is notable that 10-12% of ritual plant species were specifically meant for use by women, men, or children (Fig. 5.3). In Gabon, we also recorded an ethnoveterinary treatment. It was said to cure dogs possessed by evil spirits and involved the twigs of *Cognauxia podolaena*.

By using ritual plants, people sought to guard off evil spirits, sorcery, bewitchment or spells, enemies (the latter being a concern encountered only in Benin), weapons, theft, and snakes. Another important concern reflected by this type of use was to seek protection against diseases said to be caused by bewitchment or envy. Figure 5.4 shows the type of diseases prevented and treated with ritual plants in Benin and Gabon. Benin differed from Gabon in the fact that people sought ritual protection and treatment of Sakpata-related ailments and sexually transmitted diseases (STDs). Although health concerns differed in both countries, we found that several conditions recognized in

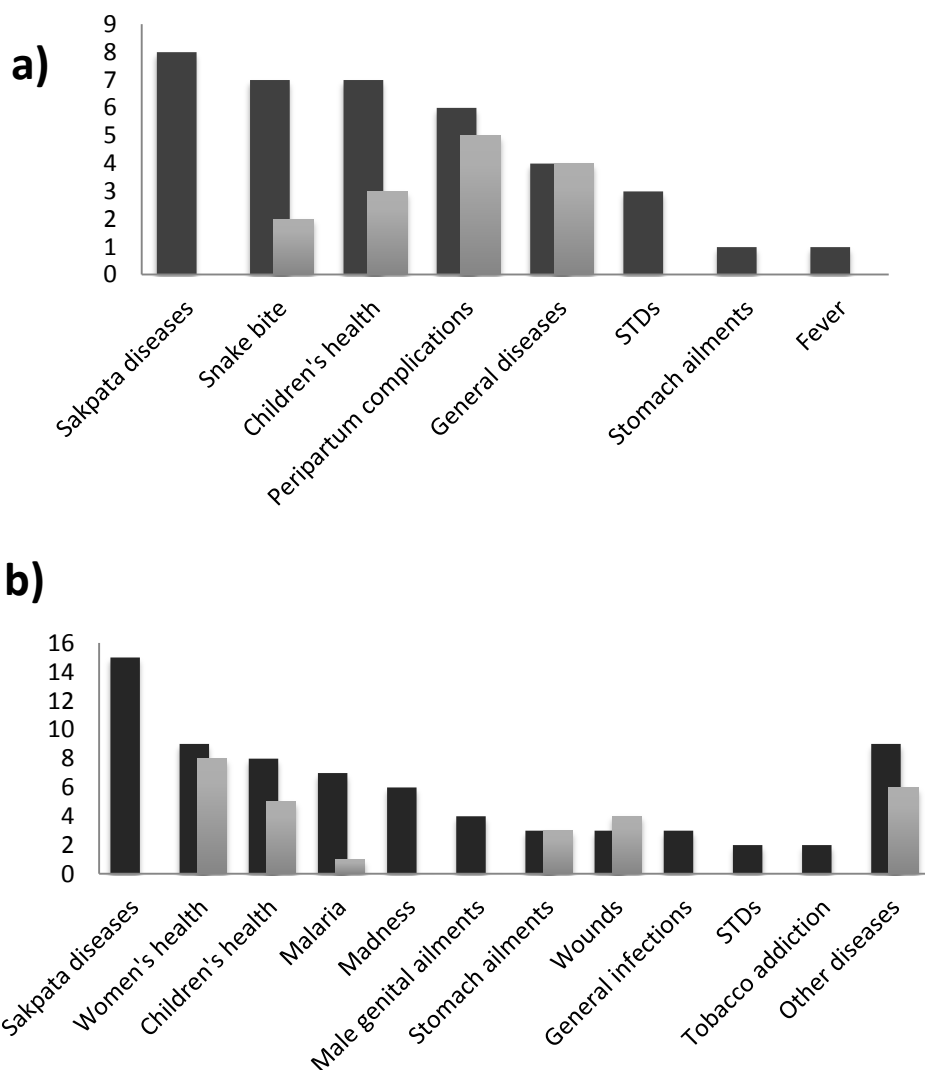


Figure 5.4. Diseases a) prevented and b) treated with ritual plants in Benin (dark bars) and Gabon (light bars).

biomedical care were the most salient ones. Malaria and conditions affecting women and children, which were salient ailments reported by our informants (Fig. 5.4b), have also been reported as important health concerns in other studies carried in Benin and Gabon (Towns, 2014).

Emic explanations to conditions treated with ritual plants

A common concept in Benin used by people in order to explain conditions treated with ritual plants was 'tchakatou'. This term was elucidated by our informants as 'bad luck' sent to one by envious

enemies. Terms such as ‘lancement’ (figuratively, the act of tossing), or ‘envoûtement’ (bewitchment) were used by some informants to explain the notion of tchakatou. Nonetheless, it was more often agreed that the latter resulted in the eventual death of the victim, while ‘lancement’ and bewitchment were only temporary states. Moreover, it was not uncommon to hear people refer to diseases recognized in biomedicine (e.g. malaria and skin infections) as ‘bizarre’, when stressing their attributed super-natural origin. Examples of such diseases were ‘le paludisme bizarre’ (bizarre malaria) and ‘la fièvre bizarre’ (bizarre fever). ‘La plaie incurable’, a chronic wound, was also attributed a supernatural origin.

Likewise, Gabonese respondents alluded to the notion of ‘le vampire’ (vampirism) as a state that could be reached by two means: possession by evil spirits or by another vampire. While the first was said to be manifested by the sudden evil doing of an otherwise good person; the second was visible in the ill health of the victim, which was believed to be ‘eaten’ by his or her malefactor. Other salient conditions treated ritually in Gabon were those that were inflicted by sorcery at night, such as ‘les fusils nocturnes’ (the nightly guns), ‘le corps nocturnes’ (the nighty bodies) and ‘le mari de nuit’ (the night-time husband). The former two affected men and women alike and were characterized by wounds, pangs, and sores whose origin was not possible to explain by natural causes. The night-time husband was a group of conditions exclusively manifested in women and sometimes in their offspring, which caused female infertility, pregnancy and childbirth complications, such as miscarriage or the sudden death of a newborn. Indistinct from the sex of the victim, ‘les vers mystiques’ (mystical worms) referred to infections, often gastro-intestinal ones, attributed to a supernatural origin. According to both our Beninese and Gabonese informants, these conditions had their causes in the ill will of enemies, or as a punishment from the spirits or ancestors for disobeying taboos, or simply by the loss of harmony in the natural environment or the human body characterized by the presence of “too much of a few elements”.

Discussion and conclusion

Our research highlights the potential pharmacological effect of ritual plants on their users, as reflected in the large proportion of treatments that involve direct contact with the human body (75%). At least 24 of the commonly used ritual species are applied in a way that suggests pharmacological effects (Table 5.1), given the documented pharmacological properties of these species. We highlighted only a small fraction of the total number of ritual species and applications we encountered during our surveys. Therefore we are confident that our study can set a precedent for future research on the physical effects of ritually applied plants.

Both in Benin and Gabon, the majority of ritual plant use was to prevent and/or treat cultural bound health syndroms (e.g. night guns), or ailments recognized in biomedicine but attributed a supernatural origin (e.g. ‘bizarre malaria’). Albeit less numerous, those uses that are characterized by the physical absence of plants (i.e. plants mentioned in incantations, food taboos, and restricted species) are also worthy of attention, as their ritual use might be a form of transmission of traditional medicinal knowledge (Cavalli-Sforza, 1981). The explanations provided by our informants to the causes and symptoms of the conditions treated with ritual plants may help us

understand why some plants, whose use at first seem to have no pharmacological effect, may after all prevent health ailments for which there are no equivalents in Western languages and experience (Warner, 1976). An example is the larvicidal properties of *Ocimum americanum* (Cavalcanti et al., 2004) and its use in protective baths against diseases of mystical origin that are manifested as infections. Moreover, it is appreciable from our results that diseases related to Sakpata, the god of smallpox, are still salient health concerns in Benin. Although smallpox has long been eradicated, the phenomena attributed to this god highlight not only important categories of past plant use but also emphasize historical events related to the social and economic outcomes of disease and epidemics (Kakpo, 2013).

Finally, two possible implications of ritual plant use for public health derive from our results. First, the possibly limited efficacy of ritual treatments in the control of epidemics - particularly, HIV/AIDS, which has its highest incidence rate in Sub-Saharan Africa (WHO, 2011). In our study, we found that people treat or believe to prevent STDs by using several ritual plants. We lack the data to ascertain the pharmacological effects of these plants on these diseases, as well as the preference of plant users to treat or prevent these diseases with plants or modern medicines. However, we must take into account that: (1) despite the progress achieved by governments and international medical organizations, the stigma around STDs (and specially HIV/AIDS) in Sub-Saharan Africa prevails (Sabapathy et al., 2012), and (2) about one-fifth of new infections in West Africa occur among people with multiple sexual partners and another one-third occurs in stable couples who do not currently self-report outside partners (UN-AIDS, 2010). Moreover, the stigma has direct relevance to health-seeking behaviours and the control and management of diseases such as STDs and HIV/AIDS (Dean and Fenton, 2010). Hence, the importance of documenting ritual plant use also allows addressing cultural practices that deter the prevention and control of epidemics.

A second implication of ritual plant use stems from the need to improve the ethical standards of the applications derived from pharmacological research. In her review of traditional knowledge systems, Reyes-García (2010) discusses the potential contribution of these systems for ethnopharmacological research, particularly in understanding how traditional knowledge is distributed in a society and who benefits from it. Species used by indigenous peoples for medicine have historically contributed to the discovery of herbal drugs, thereby assisting to improve the health of the industrialized world, but not that of the regions where this knowledge has been extracted (Kuper, 2005; Reyes-García, 2010; Stephens et al., 2006). However, the breach goes beyond that, as demonstrated by the manner in which ritual plants is discredited by outsiders as being 'a matter of belief' (thus, illustrating Reyes-García's claim). As mentioned earlier, there is a clear tendency in science to draw a sharp line between medicine and spirituality or religion. Our results illustrate how users of ritual plants in Benin and Gabon do not share this view. As it appears, limiting the relevance of ritual practices and plant use in ethnopharmacology is evidence of the ignorance of the sceptic, rather than a demonstration of "the gullibility of the credulous".

TABLE 5.2. Plant species used for ritual purposes in Benin and Gabon. Species are mentioned more than once when different plant organs are used.

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Vivima (F)	Leaves	DQ 309	Leguminosae	<i>Abrus precatorius</i> L.	Good luck		Bath	
Benin	Azekwin (F), Buchanche (T)	Seeds	DQ 37	Leguminosae	<i>Abrus precatorius</i> L.	Protection against sorcerers		Oral ingestion	
Gabon	suere-suere (Fr)	Leaves	DQ 1381	Leguminosae	<i>Abrus precatorius</i> L.	Protection against evil spirits	heart problems	Bath	
Gabon	munyenyeji (M)	Seeds	DQ 1004	Leguminosae	<i>Abrus precatorius</i> L.	Protection against evil spirits		Bath	
Benin	Gnokpeke (T)	Roots	DQ 553	Malvaceae	<i>Abutilon mauritanum</i> (Jacq.) Medik.	Treatment of foot rash caused by a Sakpata spell	Epilepsy	Bath, oral ingestion	
Benin	Booni (Y)	Fruits	DQ 889	Leguminosae	<i>Acacia nilotica</i> (L.) Delile	Treatment of diseases caused by bewitchment	Women's health	Bath, oral ingestion	
Benin	Vivi (F)	Whole plant	DQ 58	Euphorbiaceae	<i>Acalypha ciliata</i> Forssk.	Spiritual purification		Bath, oral ingestion	
Gabon	Igondjo (E)	Whole plant	DQ 1304	Euphorbiaceae	<i>Acalypha hispida</i> Burm.f.	Spiritual purification		Bath	
Benin	Ahowonglon, awangolo, gbemachu (F)	Whole plant	DQ 72	Compositae	<i>Acanthospermum hispidum</i> DC.	Attract love	malaria, high blood pressure,	Bath	
Gabon	Ojiamingan ovoel (Fa)	Whole plant	DQ 1149	Acanthaceae	<i>Acanthus latiseptalus</i> C.B.Clarke	Invisibility		Amulet	
Gabon	Mabangmebeli (Ma)	Whole plant	DQ 1424	Acanthaceae	<i>Acanthus montanus</i> (Nees) T.Anderson	Protection against evil spirits. Attract wealth	childcare	Amulet	
Benin	Mountain Thistle (En)	Whole plant	DQ 901	Acanthaceae	<i>Acanthus montanus</i> (Nees) T.Anderson	Attract wealth		Amulet	
Benin	Parakuma, heiti Welepeke (F)	Whole plant	DQ 186	Compositae	<i>Aemella caulirhiza</i> Delile	Protection against STDs believed to be caused by bewitchment	women's health	Bath	
Gabon	Ngalisi (Fa)	Whole plant	DQ 1277	Compositae	<i>Aemella caulirhiza</i> Delile	Treatment against vampires		Skin rub	
Benin	Awlepekepe (F)	Whole plant	DQ 307	Compositae	<i>Aemella uliginosa</i> (Sw.) Cass.	Attract love		Bath	
Benin	Gbanguna (F)	Roots	DQ 409	Malphiaceae	<i>Acridercarpus smeathmanii</i> (D C.) Guill. & Perr.	Restricted species	aphrodisiac	Incantation	
Benin	Blotchon (F)	Leaves	DQ 369	Peridaceae	<i>Acrostichum aureum</i> L.	Spiritual purification	childcare	Bath	
Benin	Baobab (En)	Bark	DQ 421	Malvaceae	<i>Adansonia digitata</i> L.	Spiritual purification , sacred tree	women's health	Bath	Planted
Gabon	Mobulo (Ma)	Stems	DQ 1227	Passifloraceae	<i>Adenia gracilis</i> Harms	Good luck		Bath	
Gabon	Mobulu (Bp)	Stems	DQ 1298	Passifloraceae	<i>Adenia lobata</i> (Jacq.) Engl.	Protection against evil spirits and to exorcism		Amulet	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Gabon	Tzama tzama (Fa), Potu (Nz)	Whole plant	DQ 1179	Compositae	<i>Adenostemma viscosum</i> J.R.Fo rst. & G.Forst.	Spells to destroy marriages or unions. Good luck	childcare, women's health	Bath	Amulet
Benin	Akwema (F), Eweadje (Y)	Whole plant	DQ 131	Amaranthaceae	<i>Aerva lanata</i> (L.) Juss.	Attract wealth		Bath	
Gabon	Nzoane (Fa)	Wood	DQ 1369	Leguminosae	<i>Aeschynomene elaphroxylon</i> (Guill. & Perr.) Taub.	Ceremonial objects			Amulet
Gabon	Mungunu (Fa)	Seeds	DQ 979	Zingiberaceae	<i>Aframomum albiolaceum</i> (Ridl.) K.Schum.	Protection against evil spirits. Good luck		Bath, oral ingestion	
Gabon	Nzombe (Nz)	Leaves	DQ 1052	Zingiberaceae	<i>Aframomum giganteum</i> (Oliv. & D.Harb.) K.Schum.	Good luck	swollen limbs, women's health	Bath	
Gabon	Ditundudimukue (Ma)	Seeds	DQ 997	Zingiberaceae	<i>Aframomum longipetiolatum</i> Koechlin	Attract love		Oral ingestion	
Benin	Atakwin (F)	Seeds	DQ 136	Zingiberaceae	<i>Aframomum melegueta</i> (Roscoe) K.Schum. (cf.)	Enhancement of the effectiveness of medicinal treatments		Oral ingestion	
Gabon	Lumbu tsitsi (P)	Fruits	DQ 1326	Zingiberaceae	<i>Aframomum melegueta</i> (Roscoe) K.Schum. (cf.)	Ceremonial stimulant	childcare	Oral ingestion	
Gabon	Blong bingon (Fa)	Seeds	DQ 1756	Zingiberaceae	<i>Aframomum subsericeum</i> (Oliv & D.Harb.) K.Schum.	Ceremonial stimulant		Oral ingestion	
Gabon	Muyenbi (Ma)	Wood	DQ 1400	Huaceae	<i>Afrosyrax kamerunensis</i> G.Petkins & Gilg	Exorcism		Oral ingestion	
Gabon	L'ail indigène (Fr)	Wood	DQ 1107	Huaceae	<i>Afrosyrax lepidophyllus</i> Mildbr.	Exorcism		Oral ingestion	
Gabon	muyenbi (M)	Seeds	DQ 1014	Huaceae	<i>Afrosyrax kamerunensis</i> G.Per kins & Gilg	Exorcism		Oral ingestion	
Benin	Aghakpogoto (F)	Bark	DQ 150	Leguminosae	<i>Azelia africana</i> Pers.	Protection against weapons	sexually transmitted diseases	Bath	
Gabon	Ogeda (Mi)	Seeds		Leguminosae	<i>Azelia africana</i> Pers.	Used by sorcerers to kill other people		Oral ingestion	
Benin	Kpa Kpa bga (F)	Fruits	DQ 169	Leguminosae	<i>Azelia africana</i> Pers.	Protection against theft			Amulet
Benin	Aniya (T)	Roots	DQ 297	Leguminosae	<i>Aganope stuhlmannii</i> (Taub.) Adema	Spiritual purification		Bath	
Benin	Zungan (F)	Leaves		Connaraceae	<i>Agelaea pentagyna</i> (Lam.) Baill.	Protection against sorcerers			Amulet
Gabon	Potou (Nz)	Whole plant	DQ 1059	Compositae	<i>Ageratum conyzoides</i> L.	Attract love. Protection against evil spirits	childcare	Bath	
Benin	Wedegbema (Ad), Akatu (F)	Whole plant	DQ 78	Compositae	<i>Ageratum conyzoides</i> L.	Protection against Sakpata- related diseases	gastric disorders	Bath	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Koxwe (F)	Roots	DQ 430	Apocynaceae	<i>Alafia barteri</i> Oliv.	Spiritual purification		Bath	
Benin	Ayole (F)	Roots	DQ 404	Leguminosae	<i>Albizia adianthifolia</i> (Schum.) W. Wight	Spiritual purification		Bath	
Benin	Aunre (Y)	Roots		Leguminosae	<i>Albizia ferruginea</i> (Guill. & Perr.) Benth.	Spiritual purification		Bath	
Gabon	Oignon de la brousse (F)	Whole plant	DQ 1822	Asparagaceae	<i>Albuca sudanica</i> A.Chev.	Symbol of fertility, sacred			Planted
Gabon	Alan (Fa)	Roots	DQ 1594	Euphorbiaceae	<i>Alchornea floribunda</i> Müll. Arg.	Ceremonial stimulant		Oral ingestion	
Gabon	Nkabi (Fa)	Leaves	DQ 1335	Euphorbiaceae	<i>Alchornea cordifolia</i> (Schumac h. & Thonn.) Müll. Arg.	Spiritual purification	women's health	Bath	
Benin	Gbadjedje (F)	Whole plant	DQ 585	Sapindaceae	<i>Allophylus spicatus</i> (Poir.) Radlk.	Spiritual purification		Bath	
Benin	Aloe (Fr, F), Eïra (T)	Whole plant	DQ 534	Asphodelaceae	<i>Aloe tenuifolia</i> Lam.	Treatment of wounds of supernatural origin	skin diseases, menstruation problems	Bath	
Gabon	Ofuga (Te)	Bark	DQ 964	Apocynaceae	<i>Alstonia boonei</i> De Wild.	Good luck	malaria	Bath	
Gabon	Ofuga (Te)	Wood	DQ 1238	Apocynaceae	<i>Alstonia congenensis</i> Engl.	Ceremonial objects		Oral ingestion	Amulet
Benin	Ajinje (Y)	Twigs	DQ 219	Amaranthaceae	<i>Alternanthera pungens</i> Kunth	Treatment of rashes in children caused by bewitchment		Bath	
Gabon	Mutchiembengu (Lu)	Whole plant	DQ 1809	Amaranthaceae	<i>Amaranthus blitum</i> subsp. <i>oleraceus</i> (L.)	Protection against bewitchment	tumours	Bath	
Benin	Tetepkukpa (T)	Leaves	DQ 621	Amaranthaceae	<i>Amaranthus spinosus</i> L.	Problem-solving rituals, sorcery spells		Oral ingestion	Amulet
Benin	Olonigo (Ad)	Flower	DQ 198	Araceae	<i>Amorphophallus baumannii</i> (Engl.) N.E.Br.	Protection against witchcraft			Planted
Benin	Droma (F)	Roots	DQ 651	Vitaceae	<i>Ampelocissus africana</i> (Lour.) Merr.	Treatment of diseases caused by bewitchment		Bath	
Benin	Tchokor ache (T)	Roots	DQ 513	Vitaceae	<i>Ampelocissus bombycina</i> (Baker) Planch.	Treatment of wounds of supernatural origin		Bath and skin rub	
Gabon	Ananas (Fr), Pineapple (En)	Fruits		Bromeliaceae	<i>Ananas comosus</i> (L.) Merr.	Food taboo			Incantation
Gabon	Igname de brousse (Fr)	Roots	DQ 1234	Araceae	<i>Anchomanes difformis</i> (Blume) Engl.	Treatment of bewitchment in children. Protection against miscarriage for pregnant women		Bath	
Benin	Inbere (T)	Seeds		Araceae	<i>Anchomanes dalzielii</i> N.E.Br.	Used in a ritual to increase the yield of food crops			Amulet
Benin	Mkumo agude (T)	Fruits		Commelinaceae	<i>Anelasma lanceolatum</i> Benth.	Treatment of Sakpata-related diseases		Skin rub	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Gabon	Nkonkosi (Lu), Odiannangan nfu (Fa)	Whole plant	DQ 1039	Commelinaceae	<i>Anelima beniniense</i> (P.Beauv.) Kunth	Treatment of headaches of supernatural origin		Bath	
Gabon	Kobdin (Fa)	Bark	DQ 1319	Anisophyllaceae	<i>Anisophyllea purpurascens</i> Hutch. & Dalziel	Ceremonial pigment		Skin rub	
Gabon	Moghhey (Mi), mfo (Fa)	Wood	DQ 963	Anonaceae	<i>Amickia affinis</i> (Exell) Versteegh & Sosef	Ceremonial objects	malaria		Amulet
Gabon	La Mbamba bengue (Fr)	Bark	DQ 1516	Anonaceae	<i>Amickia chlorantha</i> (Oliv.) Setten & Maas	Good luck		Bath	
Benin	Alaigoto (F)	Bark	DQ 420	Anonaceae	<i>Amickia polycarpa</i> (DC.) Setten & Maas ex I.M. Turner	Spiritual purification	malaria	Bath	
Benin	Yovo niglo (F)	Leaves	DQ 723	Anonaceae	<i>Amoma muricata</i> L.	Treatment of infections in children		Bath, oral ingestion	
Benin	Nyoki kloma (F)	Leaves	DQ 205	Anonaceae	<i>Amoma senegalensis</i> Pers.	Spiritual purification. Protection against snake bite	gastric disorders	Bath and skin rub	
Benin	African apple tree (En)	Fruits		Anonaceae	<i>Amoma senegalensis</i> Pers.	Food taboo			Incantation
Benin	Ani (T)	Whole plant	DQ 525	Combretaceae	<i>Anogeisus leiocarpa</i> (DC.) Guill. & Perr.	Restricted species	vermifuge		Incantation
Gabon	Adjimibi (Fa)	Bark	DQ 1430	Gentianaceae	<i>Anthocleista nobilis</i> G.Don	Treatment of diseases in twins		Bath	
Benin	Gotundun, kuotundo (F)	Roots	DQ 491	Gentianaceae	<i>Anthocleista vogelii</i> Planch.	Spiritual purification. Protection against sorcerers	women's health	Bath and burning	
Benin	Irakpo (T)	Roots	DQ 511	Gentianaceae	<i>Anthocleista liebrechtiana</i> De Wild. & T.Durand	Spiritual purification	hernia	Bath, oral ingestion	
Benin	Orozo (Y)	Whole plant	DQ 194	Moraceae	<i>Antiaris toxicaria</i> Lesch.	Protection against evil spirits			Planted
Benin	Asainko (F)	Fruits	DQ 674	Anacardiaceae	<i>Antrocaryon micraster</i> A.Chev. & Guill.	Ceremonial object			Amulet
Gabon	Angokon (M), Onzakong (Fa)	Wood	DQ 1171	Anacardiaceae	<i>Antrocaryon klaineanum</i> Pierre	Ceremonial object	women's health		Amulet
Benin	Peanut (En), Azi (F)	Seeds	DQ 389	Leguminosae	<i>Arachis hypogaea</i> L.	Ceremonial offerings		Oral ingestion	
Benin	Debio (F), Mafuokomon (T)	Whole plant	DQ 864	Papaveraceae	<i>Argemone mexicana</i> L.	Protection against STDs believed to be caused by bewitchment		Bath, oral ingestion	
Benin	Liane d'argent (Fr)	Whole plant	DQ 353	Convolvulaceae	<i>Argyrea nervosa</i> (Burm. f.) Bojer	Attract wealth		Bath	
Benin	Blefutu (P)	Bark		Moraceae	<i>Artocarpus altilis</i> (Parkinson ex F.A.Zorn) Fosberg	Protection against bewitchment		Bath	
Gabon	l'apelle (Fr), rugo (M)	Leaves	DQ 1114	Asparagaceae	<i>Asparagus warneckei</i> (Engl.) Hutch.	Used by women who want to recover lost husbands			Amulet

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Gabon	Inkanba (Pu)	Whole plant	DQ 1824	Asparagaceae	<i>Asparagus flagellaris</i> (Kunth) Baker	Protection against evil spirits		Bath	
Gabon	Tjame-tjame (Mk)	Whole plant	DQ 1421	Aspleniaceae	<i>Asplenium africanum</i> Desv.	Protection against witchcraft and possession		Bath	
Gabon	Avoy (Fa)	Whole plant	DQ 1306	Acanthaceae	<i>Asystasia gangetica</i> (L.) T. Anderson	Protection against spells		Bath	
Benin	Azema (F)	Whole plant	DQ 41	Acanthaceae	<i>Asystasia gangetica</i> (L.) T. Anderson	Protection against sorcerers		Oral ingestion	
Gabon	Okume (P, M, Fa)	Resin	DQ 1647	Burseraceae	<i>Aucoumea klaineana</i> Pierre	Ceremonial object		Burning	
Gabon	Okume (P, M, Fa)	Bark	DQ 1264	Burseraceae	<i>Aucoumea klaineana</i> Pierre	Protection against evil spirits	general health improvement	Bath	
Gabon	Okume (P, M, Fa)	Leaves	DQ 969	Burseraceae	<i>Aucoumea klaineana</i> Pierre	Good luck. Protection against evil spirits	skin infections	Bath	
Gabon	Okume (P, M, Fa)	Wood	DQ 1647	Burseraceae	<i>Aucoumea klaineana</i> Pierre	Ceremonial object	handicap, paralysis		Amulet
Benin	Neem (En)	Whole plant	DQ 554	Meliaceae	<i>Azadirachta indica</i> A.Juss.	Restricted species	malaria		Planted
Gabon	Moabi (M), adjab (Fa)	Bark	DQ 1009	Sapotaceae	<i>Baillonella toxisperma</i> Pierre	Protection against evil spirits. Spiritual purification. Restricted species	aphrodisiac	Bath	Planted and incantation
Benin	Sokpekpe (Ai), Dokpakpe (F)	Roots	DQ 206	Leguminosae	<i>Baphia nitida</i> Lodd.	Spiritual purification	malaria, women's health	Bath	
Gabon	Ngokoum (F)	Bark	DQ 1260	Passifloraceae	<i>Barteria fistulosa</i> Mast.	Spiritual purification		Bath	
Gabon	Musuga (Nv)	Bark	DQ 1816	Passifloraceae	<i>Barteria nigriflora</i> Hook.f.	Treatment of female infertility		Bath	
Benin	Klo (F)	Leaves	DQ 278	Leguminosae	<i>Bauhinia purpurea</i> L.	Protection against witchcraft		Bath and oral ingestion	
Benin	Klongboma (F)	Leaves	DQ 151	Leguminosae	<i>Bauhinia reticulata</i> DC.	Protection for hunters		Oral ingestion	
Benin	Kpanoumon (T), Akluma (Ad)	Leaves	DQ 27	Leguminosae	<i>Bauhinia thonningii</i> Schumacher.	Protection against snake bites	childcare	Oral ingestion	
Gabon	Bocupingui (Bb)	Leaves	DQ 1776	Begoniaceae	<i>Begonia auriculata</i> Hook.f.	Protection against evil spirits		Oral ingestion	
Benin	Ekpado (T)	Bark	DQ 665	Leguminosae	<i>Berlinia grandiflora</i> (Vahl) Hutch. & Dalziel	Protection against sorcerers		Bath	
Gabon	Nameniele (Mk)	Wood	DQ 1248	Leguminosae	<i>Berlinia viridicans</i> Baker f.	Ceremonial objects			Amulet
Gabon	Namenan (Ba)	Leaves	DQ 1201	Compositae	<i>Bidens pilosa</i> L.	Protection against miscarriage for pregnant women	typhoid	Oral ingestion	

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								Direct	Indirect
Benin	Kpidimo kpidimo (T)	Whole plant	DQ 374	Oxalidaceae	<i>Biophytum umbraculatum</i> Welw.	Protection against miscarriage for pregnant women. Good luck	women's health	Bath, oral ingestion	
Benin	Assorogodarou (T)	Seeds	DQ 39	Bixaceae	<i>Bixa orellana</i> L.	Protection against enemies	anaemia	Oral ingestion	
Gabon	Mimundu (Og)	Seeds	DQ 1510	Bixaceae	<i>Bixa orellana</i> L.	Ceremonial pigment		Skin rub	
Benin	Lizekwin (F)	Seeds	DQ 171	Sapindaceae	<i>Blighia sapida</i> K.D.Koenig	Divination			Amulet
Benin	Kachouwey, katchu awi (F)	Whole plant	DQ 735	Nyctaginaceae	<i>Boerhavia diffusa</i> L.	Treatment of stomach ailments caused by bewitchment	women's health	Oral ingestion	
Benin	Gadagbada (F)	Leaves	DQ 916	Nyctaginaceae	<i>Boerhavia erecta</i> L.	Protection against sorcerers			Amulet
Benin	Red silk cotton tree (En)	Fruits	DQ 852	Malvaceae	<i>Bombax buonopozense</i> P.Beauv.	Used in Hevioso ceremonies			Amulet
Benin	Faux-kapok (Fr), Kponkpoul (Y), Biobio (I)	Fruits, bark, flowers	DQ 221	Malvaceae	<i>Bombax costatum</i> Pellegr. & Vuillet	Treatment of anaemia in children		Bath, oral ingestion	
Benin	Agbon (T)	Leaves		Arecaceae	<i>Borassus aethiopicum</i> Mart.	Spiritual purification		Bath	
Gabon	Oyem (Fa)	Fruits		Rubiaceae	<i>Brenania brieyi</i> (De Wild.) E.M.A.Petit	Chase away evil spirits			Amulet
Benin	Honssukokoydo (F), ira (Y), Kinshanshala (T)	Bark	DQ 223	Phyllanthaceae	<i>Bridelia ferruginea</i> Benth.	Protection against enemies	childcare, malaria, women's health, gastric disorders	Bath	
Gabon	Eso (Fa)	Bark	DQ 1307	Phyllanthaceae	<i>Bridelia micrantha</i> (Hochst.) Baill.	Treatment of stomach ailments caused by bewitchment		Oral ingestion	
Gabon	Kri Tanguimina (Nz)	Whole plant	DQ 1112	Acanthaceae	<i>Brillantaisia lancifolia</i> Lindau	Spiritual purification	anaemia, childcare	Bath	
Gabon	Dibughele dalembutoro (Bp)	Whole plant	DQ 1033	Acanthaceae	<i>Brillantaisia owarenis</i> P.Beauv.	Protection against bewitchment	flu, heart problems	Bath	
Benin	Tesuma (F)	Whole plant	DQ 368	Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Spiritual purification		Bath	
Benin	Atakpa (T)	Leaves		Leguminosae	<i>Burkea africana</i> Hook.	Treatment of snake bite caused by spells		Skin rub	
Benin	Adjikwin (F)	Seeds	DQ 413	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	Protection against skin diseases in children. Divination object	childcare		Amulet
Gabon	Digudimumbu (Ma)	Seeds	DQ 1007	Leguminosae	<i>Caesalpinia bonduc</i> (L.) Roxb.	Protection against miscarriage for pregnant women	women's health		Amulet

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Sukuluma (G)	Seeds		Leguminosae	<i>Caesalpinia pulcherrima</i> (L.) Sw.	Treatment of throat ache caused by bewitchment		Oral ingestion	
Benin	Kélékouman (F)	Whole plant	DQ 399	Leguminosae	<i>Cajanus cajan</i> (L.) Millsp.	Treatment of Sakpata-related diseases		Bath	
Benin	Kelekouman (F)	Seeds		Leguminosae	<i>Cajanus cajan</i> (L.) Millsp.	Ceremonial offerings		Oral ingestion	
Benin	Akelema (Pe)	Whole plant		Araceae	<i>Caladium bicolor</i> (Aiton) Vent.	Protection against Sakpata-related diseases			Planted
Benin	Hengba (F), Oke (Y)	Whole plant	DQ 90	Orchidaceae	<i>Calyptrochilum christyanum</i> (Rehb.f.) Summerh.	Spiritual purification. Protection against sorcerers	women's health	Bath	
Benin	Afa (T)	Whole plant		Orchidaceae	<i>Calyptrochilum emarginatum</i> (Afzel. ex Sw.) Schltr.	Spiritual purification. Restricted species		Bath	Incantation
Gabon	Gapasa mogodo (Mi)	Wood		Ochnaceae	<i>Campylospermum elongata</i> (Oliv.) Tiegh.	Ceremonial objects			Amulet
Benin	Sukusu (F)	Leaves	DQ 796	Celastraceae	<i>Campylostemon warneckeanum</i> Loes. ex Fritsch	Protection against miscarriage for pregnant women			Amulet
Benin	Akpakpu wiwi (F)	Seeds	DQ 172	Leguminosae	<i>Canavalia ensiformis</i> (L.) DC.	Protection against snake bites			Planted
Gabon	Musimina (Ma)	Seeds	DQ 998	Leguminosae	<i>Canavalia ensiformis</i> (L.) DC.	Protection against evil spirits			Planted
Benin	Legba kpakpun (F)	Seeds	DQ 243	Leguminosae	<i>Canavalia gladiata</i> (Jacq.) DC.	Divination			Amulet
Benin	Ewondudu (T)	Leaves	DQ 616	Capparidaceae	<i>Capparis brassii</i> DC.	Protection against enemies		Oral ingestion	
Benin	Piment (Fr), Vavofli, fliman (F)	Fruits	DQ 477	Solanaceae	<i>Capsicum annuum</i> L.	Protection against evil spirits	childcare	Burning	
Gabon	Tzoli (Ma)	Fruits	DQ 1002	Solanaceae	<i>Capsicum annuum</i> L.	Chase away evil spirits	women's health	Bath and burning	
Benin	Pawpaw (En), Aguidi (T)	Leaves	DQ 283	Caricaceae	<i>Carica papaya</i> L.	Used in Legba ceremonies	malaria	Bath	
Benin	Ahanzo (F)	Roots	DQ 485	Apocynaceae	<i>Carissa spinarum</i> L.	Treatment of headaches of supernatural origin	gastric disorders	Bath	
Gabon	Kota (Nz), Kara (Fa)	Leaves	DQ 985	Polygalaceae	<i>Carpolobia alba</i> G.Don	Treatment to close fontanels in infants	women's health	Bath	
Gabon	Kuta (Bb)	Whole plant	DQ 1787	Polygalaceae	<i>Carpolobia lutea</i> G.Don	Twin ceremonies			Planted
Benin	Aviado (F)	Roots	DQ 486	Polygalaceae	<i>Carpolobia lutea</i> G.Don	Exorcism	aphrodisiac	Oral ingestion	
Benin	Ayeku (F)	Fruits	DQ 251	Apocynaceae	<i>Cascabela thevetia</i> (L.) Lippold	Ceremonial object			Amulet
Benin	Agbégbèkan (F)	Whole	DQ 659	Lauraceae	<i>Cassytha filiformis</i> L.	Spiritual purification	Childcare,	Bath	

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								Direct	Indirect
		plant					women's health		
Gabon	Kolagba kolesse (T)	Whole plant	DQ 1037	Lauraceae	<i>Cassytha filiformis</i> L.	Spiritual purification	malaria, respiratory diseases	Bath	
Benin	Flawe (F)	Whole plant	DQ 871	Apocynaceae	<i>Catharanthus roseus</i> (L.) G.Don	Protection against evil spirits		Bath	Planted
Gabon	Assong (Fa)	Leaves	DQ 1093	Urticaceae	<i>Cecropia peltata</i> L.	Bwiti initiation ceremonies		Bath	
Benin	Kapok (Fr), Agougou (T)	Whole plant	DQ 537	Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn.	Sacred tree			Planted
Gabon	Kapok (Fr), Oguma (Mf)	Whole plant	DQ 1517	Malvaceae	<i>Ceiba pentandra</i> (L.) Gaertn.	Sacred tree			Planted
Benin	Aghoni (T)	Roots	DQ 583	Camabaceae	<i>Celtis zenkeri</i> Engl.	Protection for men		Bath	
Gabon	Engo (Fa)	Leaves		Urticaceae	<i>Celtis mildbraedii</i> Engl.	Protection against evil spirits		Bath	
Gabon	Membenbe (Bb)	Whole plant	DQ 1177	Apiaceae	<i>Centella asiatica</i> (L.) Urb.	Ceremonial plant for twin burials. Ritual scarification		Scarification, skin rub	
Benin	Azima (F), faux arachide (Fr)	Whole plant	DQ 119	Leguminosae	<i>Chamaecrista mimosoides</i> (L.) Greene	Spiritual purification	malaria, STDs	Bath	
Benin	Tekan (F)	Whole plant	DQ 581	Menispermaceae	<i>Chasmanthera dependens</i> Hochst.	Restricted species			Incantation
Benin	Zevonukun (F)	Whole plant	DQ 370	Compositae	<i>Chrysanthellum indicum</i> DC.	Good luck		Bath	
Benin	Azongoghe (F)	Leaves	AMT 590	Sapotaceae	<i>Chrysophyllum albidum</i> G. Don	Treatment of Sakpata-related diseases		Bath	
Gabon	Soke	Fruits		Sapotaceae	<i>Chrysophyllum subnudum</i> Baker	Ceremonial objects	digestive		Amulet
Benin	Gando (F)	Roots	DQ 121	Poaceae	<i>Chrysopogon zizanioides</i> (L.) Roberty	Protection against evil spirits or STDs caused by sorcery	women's health	Burning	
Benin	Djokodje (Y)	Roots	DQ 177	Menispermaceae	<i>Cissampelos mucronata</i> A.Rich.	Protection against bewitchment		Bath	Amulet
Benin	Djokodje (Y)	Roots	DQ 76	Menispermaceae	<i>Cissampelos owariensis</i> P.Bea uv. ex DC.	Spiritual purification		Bath	
Gabon	Abokoei (Fa)	Whole plant	DQ 1241	Vitaceae	<i>Cissus aralioides</i> (Welw. ex Baker) Planch.	Protection against evil spirits		Bath	
Benin	Tchokubalo (T)	Stems	DQ 277	Vitaceae	<i>Cissus populnea</i> Guill. & Perr.	Restricted use to adepts of the god of thunder	aphrodisiac		Incantation
Benin	Asan (F)	Whole plant	DQ 197	Vitaceae	<i>Cissus quadrangularis</i> L.	Treatment of broken bones caused by bewitchment		Skin rub	
Benin	Kakootche (T)	Whole plant	DQ 388	Cucurbitaceae	<i>Citrullus colocynthis</i> (L.) Schrad.	Treatment of swollen in feet caused by bewitchment		Skin rub	

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								Direct	Indirect
Benin	Kaka (T)	Fruits	DQ 290	Cucurbitaceae	<i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai	Treatment to improve the memory of children		Oral ingestion	
Benin	Ogwutaiwewe (T)	Leaves	DQ 549	Rutaceae	<i>Citrus aurantifolia</i> (Christm.) Swingle	Treatment of malaria caused by bewitchment		Bath	
Gabon	Mouloushj (Nz)	Leaves	DQ 1213	Rutaceae	<i>Citrus aurantifolia</i> (Christm.) Swingle	Treatment of malaria caused by bewitchment		Bath	
Benin	Ghossou azoue (F), Vertiga (G)	Leaves	DQ 490	Rutaceae	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.	Treatment of infections caused by bewitchment	childcare	Bath	
Benin	Hounzoko (F)	Seeds	DQ 244	Annonaceae	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels	Divination			Amulet
Benin	Adjangula (T)	Leaves	DQ 573	Cleomeaceae	<i>Cleome gynandra</i> L.	Spiritual purification		Bath	
Benin	Akaya (F)	Leaves	DQ 672	Cleomeaceae	<i>Cleome rutidosperma</i> DC.	Protection against evil spirits			Amulet
Benin	Wawa (Y)	Whole plant	DQ 59	Cleomeaceae	<i>Cleome viscosa</i> L.	Attract love		Bath	
Gabon	Ebele beyem (Fa)	Whole plant	DQ 1617	Lamiaceae	<i>Clerodendrum melanocrater</i> Gurke	Protection against evil spirits		Bath	
Gabon	Belbayem (Fa), Elelem (Ma)	Leaves	DQ 1320	Lamiaceae	<i>Clerodendrum splendens</i> G.Don	Treatment of diseases caused by bewitchment		Bath	
Benin	Zoflotin (P)	Whole plant	DQ 690	Lamiaceae	<i>Clerodendrum capitatum</i> (Will d.) Schumacher & Thonn.	Protection against miscarriage for pregnant women		Bath	
Benin	Azelokoma (F)	Whole plant	DQ 46	Leguminosae	<i>Clitoria falcata</i> Lam.	Protection against sorcerers		Bath	
Benin	Azankposso (F)	Whole plant	DQ 316	Leguminosae	<i>Clitoria ternatea</i> L.	Protection against sorcerers		Bath and oral ingestion	
Gabon	Eyendzie (Fa)	Leaves	DQ 1489	Convolvulaceae	<i>Cnestis ferruginea</i> Vahl ex DC.	Protection against bewitchment		Bath, oral ingestion	
Benin	Chori (Id), Gbettu (T)	Seeds	DQ 448	Bixaceae	<i>Cochlospermum planchonii</i> Ho ok.f. ex Planch.	Ceremonial object			Amulet
Benin	Agongedo (F)	Roots	DQ 457	Arecaceae	<i>Cocos nucifera</i> L.	Spiritual purification	high blood pressure, malaria, childcare	Bath	
Gabon	Ekombo (Bb)	Bark	DQ 1632	Myristicaceae	<i>Coelocaryon preussii</i> Warb.	Treatment of respiratory diseases or paralysis caused by evil spirits		Oral ingestion	
Gabon	Mbama (Tk)	Stems	DQ 1838	Cucurbitaceae	<i>Cogniauxia podolaena</i> Baill.	Made into necklace for possessed dogs			
Benin	Alita (F)	Seeds	DQ 158	Malvaceae	<i>Cola acuminata</i> (P.Beauv.) Schott & Endl.	Stimulant, divination objet	childcare	Oral ingestion	
Gabon	Ytel (Ma)	Seeds	DQ 1010	Malvaceae	<i>Cola acuminata</i> (P.Beauv.) Schott & Endl.	Ceremonial stimulant	ease birth	Oral ingestion	

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								Direct	Indirect
Benin	Wutin (F)	Whole plant	DQ 630	Malvaceae	<i>Cola gigantea</i> A.Chev.	Sacred tree			Planted
Benin	Alovionton (F)	Leaves	DQ 156	Malvaceae	<i>Cola millenii</i> K.Schum.	Treatment of heart problems in children		Oral ingestion	
Benin	Golo (F)	Seeds		Malvaceae	<i>Cola nitida</i> (Vent.) Schott & Endl.	Ceremonial stimulant		Oral ingestion	
Gabon	Taro (En), Kak'li (Tk)	Leaves	DQ 1869	Araceae	<i>Colocasia esculenta</i> (L.) Schott	Food taboo	abscess		Incantation
Benin	Alpuro (T)	Whole plant	DQ 443	Combretaceae	<i>Combretum nigricans</i> Lepr. ex Guill. & Per.	Ritual to make babies strong		Bath	
Benin	Erich (T)	Resin	DQ 566	Burseraceae	<i>Commiphora africana</i> (A.Rich.) Endl.	Chase away evil spirits		Burning	
Benin	Erich (T)	Leaves	DQ 566	Burseraceae	<i>Commiphora africana</i> (A.Rich.) Endl.	Treatment of spasms in children		Skin rub	Amulet
Benin	Erich (T)	Whole plant	DQ 566	Burseraceae	<i>Commiphora africana</i> (A.Rich.) Endl.	Protection against evil spirits			Planted
Gabon	Tabacon (A)	Whole plant	DQ 1323	Compositae	<i>Conyza sumatrensis</i> (S.F.Blake) Pruski & G.Sanebo	Good luck		Bath	
Gabon	Red Anzem (En)	Bark	DQ 956	Leguminosae	<i>Copaifera religiosa</i> J.Leonard	Protection against evil spirits	anaemia	Bath	
Benin	Alkpafllo (F), Vinkpa (F)	Fruits	DQ 882	Leguminosae	<i>Copaifera salikounda</i> Heckel	Divination			Amulet
Benin	Ninnuyi (F)	Whole plant	DQ 327	Malvaceae	<i>Corchorus olitorius</i> L.	Spiritual purification		Bath	
Benin	Tèrègougou (F)	Whole plant	DQ 196	Costaceae	<i>Costus afer</i> Ker Gawl.	Protection against sorcerers	women's health		Planted
Gabon	Mokusarera (Mi)	Roots	DQ 1883	Costaceae	<i>Costus phyllocephalus</i> K.Schum.	Treatment against diseases in twins	cough	Bath	
Gabon	Nkakoum (Fa)	Whole plant	DQ 1589	Costaceae	<i>Costus tappenbeckianus</i> J.Braun & K.Schum.	Spiritual purification		Bath	
Gabon	Mokosa gega (Mi)	Stems	DQ 1161	Costaceae	<i>Costus ligularis</i> Baker	Ceremonial object during initiation ceremonies	anaemia		Amulet
Gabon	Myan (Fa), anne sauvage (Fr)	Sap	DQ 1029	Costaceae	<i>Costus lucanistanus</i> J.Braun & K.Schum.	Blessing for initiates		Oral ingestion	
Gabon	feuiltes obamba (N)	Leaves	DQ1267	Costaceae	<i>Costus maboumiensis</i> Pellegr.	Good luck		Bath	
Gabon	Mikwisa benga (M), okossa mbumba (Om)	Whole plant	DQ 1079	Costaceae	<i>Costus phyllocephalus</i> K.Schum.	Spiritual purification		Bath	
Gabon	Oghoua (Mi)	Fruits	DQ 982	Oleaceae	<i>Coula edulis</i> Bail.	Protection against sorcery			Amulet
Benin	Ebolo (T)	Whole plant	DQ 394	Compositae	<i>Grassecephalum rubens</i> (Juss. ex Jacq.) S.Moore	Treatment of respiratory diseases or paralysis caused by			Incantation

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								Direct	Indirect
						evil spirits			
Gabon	Kadjabali (Tk)	Bark		Rubiaceae	<i>Craterispermum cerinanthum</i> Hiern	Treatment of wounds of supernatural origin		Bath	
Benin	Calébasse (Fr), igba degi (Y)	Fruits	DQ 236	Bignoniaceae	<i>Crescentia cujete</i> L.	Ceremonial object			Amulet
Benin	Oignon de la mort (F)	Whole plant	DQ 209	Amaryllidaceae	<i>Crinum glaucum</i> A.Chev.	Kept in homesteads to bring good luck			Amulet
Benin	Tonyan (F)	Whole plant	DQ 387	Amaryllidaceae	<i>Crinum jagus</i> (J.Thomps.) Dandy	Spiritual purification	Infections	Bath	
Benin	Gbo akuatu (T)	Leaves	DQ 595	Leguminosae	<i>Crotalaria retusa</i> L.	Treatment of Sakpata-related diseases		Bath	
Benin	Djelele, adjedje, adjelele man (F)	Leaves	DQ 333	Euphorbiaceae	<i>Croton gratissimus</i> Burch.	Protection against evil spirits and witches	malaria, women's health, high blood pressure		Planted
Gabon	Omamba (Ak)	Bark	DQ 1318	Euphorbiaceae	<i>Croton mayumbensis</i> J.Léonard	Spiritual purification		Bath	
Gabon	Obamba (Mi), mbamba (N)	Bark	DQ 965, DQ 981	Euphorbiaceae	<i>Croton oligandrus</i> Pierre ex Hutch.	Protection of twins and newborns. Good luck	women's health	Bath, oral ingestion	
Benin	Awgba (F)	Seeds	DQ 804	Euphorbiaceae	<i>Croton tiglium</i> L.	Said to be used by sorcerers in the preparation of spells	gastric disorders		Amulet
Gabon	Motaba (Mi)	Wood		Euphorbiaceae	<i>Crotonogyne manniana</i> Müll. Arg.	Ceremonial objects			Amulet
Benin	Goussi (F)	Fruits		Cucurbitaceae	<i>Cucumeropsis mannii</i> Naudin	Ceremonial offerings		Oral ingestion	
Benin	Donkpegan (F)	Whole plant	DQ 32	Cucurbitaceae	<i>Cucumis melo</i> L.	Spiritual purification		Bath	
Benin	Gbohounon (F)	Fruits	DQ 382	Cucurbitaceae	<i>Cucumis metuliferus</i> E.Mey. ex Naudin	Treatment of Sakpata-related diseases		Bath	
Benin	Goussi de terre (F, Fr)	Fruits	DQ 350	Cucurbitaceae	<i>Cucurbita moschata</i> (Duch. ex Lam.) Duch. ex Poir.	Ceremonial offerings		Oral ingestion	
Gabon	Ayangdzic (Fa)	Stems	DQ 1409	Araceae	<i>Culcasia scandens</i> P.Beauv.	Fibers made into ceremonial rope to attach charms			Amulet
Benin	Ayoké (F)	Roots	DQ 883	Hypoxidaceae	<i>Curculigo pilosa</i> (Schumacher & Thonn.) Engl.	Attract wealth	women's health		Amulet
Benin	Edigo (T)	Bark	DQ 663	Araliaceae	<i>Cussonia arborea</i> Hochst. ex A.Rich.	Protection for newborns		Bath	
Gabon	Nzoeng (Fa)	Stems		Rubiaceae	<i>Coviera pierrei</i> N.Hallé	Protection against evil spirits			Amulet
Benin	Koufla (F)	Whole plant	DQ 826	Commelinaceae	<i>Cyanotis lanata</i> Benth.	Spiritual purification		Bath	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Vivima te, honsicusa (F)	Whole plant	DQ 320	Compositae	<i>Cyanthillium cinereum</i> (L.) H. Rob.	Protection against enemies	childcare	Oral ingestion	
Gabon	mdum (P, N)	Bark	DQ 960	Leguminosae	<i>Cylindrodiscus gabunensis</i> Harm s	Good luck		Bath	
Benin	Tchama (F)	Leaves	DQ 318	Poaceae	<i>Cymbopogon citratus</i> (DC.) Stapf	Restricted species			Incantation
Gabon	Ditsasango (Bp)	Flower		Poaceae	<i>Cymbopogon densiflorus</i> (Steud.) Stapf	Chase away evil spirits		Burning	
Gabon	Nitsatsagu (P)	Inflorescen ce	DQ 1036	Poaceae	<i>Cymbopogon densiflorus</i> (Steu d.) Stapf	Mourning rituals		Bath	
Gabon	Gepungulele (E)	Fruits		Apocynaceae	<i>Cynanchum acuminatum</i> Hum b. & Bonpl. ex Schult.	Food taboo			Incantation
Benin	Bagagoto, bougoto (F)	Bark	DQ 414	Leguminosae	<i>Cynometra megalophylla</i> Harms	Protection against evil spirits	women's health		Amulet
Benin	Afyo (F)	Roots	DQ 460	Cyperaceae	<i>Cyperus esculentus</i> L.	Chase away evil spirits	aphrodisiac	Burning	
Gabon	batsasu (M)	Roots	DQ 1051	Cyperaceae	<i>Cyperus articulatus</i> L.	Protection against evil spirits		Burning	
Gabon	Tsasagou (Bp)	Whole plant		Cyperaceae	<i>Cyperus articulatus</i> L.	Protection against evil spirits, Twin ceremonies	women's health	Bath	
Benin	Bongbo (T)	Leaves	DQ 274	Vitaceae	<i>Cyphostemma adenocaula</i> (Steud. ex A. Rich.) Desc. ex Wild & R.B. Drumm.	Treatment of Sakpata-related diseases		Bath	
Benin	Bongbo (T)	Leaves	DQ 680	Vitaceae	<i>Cyphostemma sokodense</i> (Gilg & M. Brandt) Desc.	Treatment of Sakpata-related diseases		Bath	
Gabon	Osigo (Mi)	Bark		Burseraceae	<i>Dacryodes buettneri</i> (Engl.) H.J.J. Lam	Treatment of skin diseases of supernatural origin		Bath	
Gabon	Ngengen (Fa)	Whole plant		Euphorbiaceae	<i>Dalechampia ipomoeifolia</i> Ben th.	Protection against evil spirits		Bath	
Gabon	paungu (P), mutanghani (M)	Bark	AMT 1029	Leguminosae	<i>Daniellia klainei</i> A. Chev.	Good luck	sore body	Bath	
Benin	Azeglo (F)	Leaves	DQ 42	Leguminosae	<i>Daniellia oliveri</i> (Rolfe) Hutch. & Dalziel	Protection against evil spirits		Bath	
Gabon	Oteva (Mi)	Bark		Irvingiaceae	<i>Desbordesia insignis</i> Pierre	Treatment of female infertility			Amulet
Benin	Omini (Y)	Whole plant	DQ 54	Leguminosae	<i>Desmodium gongelicum</i> (L.) DC.	Attract love		Bath	
Gabon	Onduonetchina (Tk)	Leaves		Leguminosae	<i>Desmodium triflorum</i> (L.) DC.	Treatment of torso pain with a mystical origin		Skin rub	
Benin	Emon (T)	Leaves	DQ 50	Leguminosae	<i>Desmodium velutinum</i> (Willd.) DC.	Spiritual purification		Bath	
Gabon	Pinde batabe (Nz)	Whole plant	DQ 1027	Leguminosae	<i>Desmodium adscendens</i> (Sw.) DC.	Good luck	women's health	Skin rub	

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								Direct	Indirect
Gabon	Ogboule (Tk)	Bark		Leguminosae	<i>Dialium englerianum</i> Henriq.	Treatment of anaemia of mystical origin		Bath, oral ingestion	
Benin	Gniondo (T)	Leaves	DQ 508	Dichapetalaceae	<i>Dichapetalum oblongum</i> (Hoo k.f. ex Benth.) Engl.	Treatment of madness caused by spirit possession		Oral ingestion	
Benin	Hounzogotosikwin (G)	Whole plant	DQ 495	Leguminosae	<i>Dichrostachys cinerea</i> (L.) Wight & Arn.	Spiritual purification		Bath	
Benin	Axexe (F)	Whole plant	DQ 23	Compositae	<i>Dicoma tomentosa</i> Cass.	Spiritual purification		Bath	
Benin	Eran (T)	Whole plant	DQ 819	Poaceae	<i>Digitaria leptorhachis</i> (Plig.) Stapf	Spiritual purification		Bath	
Gabon	Disesi (Bp)	Leaves		Melastomataceae	<i>Dinophora speneroides</i> Benth.	Ceremonial offerings	increase appetite, anaemia	Oral ingestion	
Gabon	Ngogolo (M), le mille pats de la rivière (Fr)	Seeds	DQ 1042	Leguminosae	<i>Dioclea hexandra</i> (Ralph) Mab.	Protection against accidents in the forest	muscle pain		Amulet
Benin	Lokokwin (F)	Seeds	DQ 245	Leguminosae	<i>Dioclea reflexa</i> Hook f.	Divination			Amulet
Gabon	Mussimene (Ma)	Seeds	DQ 1006, DQ 996	Leguminosae	<i>Dioclea reflexa</i> Hook f.	Attain the favour of influential people		Oral ingestion	
Gabon	Evusa (Fa)	Leaves		Rubiaceae	<i>Diodellea scandens</i> (Sw.) Bacigalupo & E.L.Cabral	Protection against evil spirits		Bath	
Benin	Inthookinko (T)	Roots	DQ 627	Dioscoreaceae	<i>Dioscorea alata</i> L.	Ceremonial offerings		Oral ingestion	
Benin	Ewueu esi (T)	Roots	DQ 464	Dioscoreaceae	<i>Dioscorea bulbifera</i> L.	Ceremonial offerings		Oral ingestion	
Benin	Ewe eshwe gbene (Y)	Roots	DQ 820	Dioscoreaceae	<i>Dioscorea burkittiana</i> J.Miège	Ceremonial offerings		Oral ingestion	
Benin	Tevi hunton (F)	Roots	DQ 499	Dioscoreaceae	<i>Dioscorea dumetorum</i> (Kunth) Pax	Ceremonial offerings		Oral ingestion	
Benin	Aboko (F), Latchiri (T)	Roots	DQ 348	Dioscoreaceae	<i>Dioscorea minutiflora</i> Engl.	Ceremonial offerings		Oral ingestion	
Benin	Ogbukingko (T)	Roots	DQ 520	Dioscoreaceae	<i>Dioscorea preussii</i> Pax	Ceremonial offerings		Oral ingestion	
Benin	Kokoro (T)	Roots	DQ 767	Dioscoreaceae	<i>Dioscorea sagittifolia</i> Pax	Ceremonial offerings		Oral ingestion	
Gabon	Mbongo amome (Mi)	Bark, wood		Ebenaceae	<i>Diospyros mannii</i> Hiern	Protection against evil spirits		Bath	
Gabon	Mukemu (E)	Leaves		Melastomataceae	<i>Dissothis multiflora</i> (Sm.) Triana	Treatment of wounds of supernatural origin		Skin rub	
Gabon	Ovenge (Mi)	Bark	DQ 961	Leguminosae	<i>Disemonanthus benthamianus</i> Baill.	Protection against weapons and accidents		Bath	

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								Direct	Indirect
Benin	Any (F)	Leaves	DQ 157	Asparagaceae	<i>Dracaena arborea</i> (Willd.) Link	Protection against snakes. Treatment of female infertility		Oral ingestion	Planted
Gabon	Ghecondondo (Bb)	Leaves		Asparagaceae	<i>Dracaena camerooniana</i> Baker	Protection for new-borns		Bath	
Gabon	Bango (Tk)	Bark		Asparagaceae	<i>Dracaena mannii</i> Baker	Protection against miscarriage for pregnant women		Bath and oral ingestion	
Gabon	Endo (Bb)	Whole plant		Asparagaceae	<i>Dracaena phrynioides</i> Hook.	Sacred plant of Nyembé secret society		Planted	
Benin	Olauru (T)	Leaves	DQ 624	Asparagaceae	<i>Dracaena arborea</i> (Willd.) Link	Protection against evil spirits		Planted	
Gabon	Muyunguo (Ma)	Bark	DQ 1061	Putranjivaceae	<i>Drypetes gossweileri</i> S.Moore	Protection against snake bite		Skin rub	
Gabon	aka (Fa)	Fruits	DQ 978	Malvaceae	<i>Duboscia macrocarpa</i> Bocq.	Ceremonial object		Amulet	
Gabon	Aka (Fa)	Fruits		Malvaceae	<i>Duboscia macrocarpa</i> Bocq.	Protection against verbal threats		Amulet	
Benin	Yerma (Pe)	Whole plant	DQ 259	Acanthaceae	<i>Dyschoriste nagchana</i> (Nees) Bennet	Treatment of madness caused by spirit possession		Oral ingestion	
Gabon	lipital (N)	Whole plant	DQ 1068	Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clements	Chase away evil spirits	digestive, sprained joints	Oral ingestion	Planted
Benin	Godo (F)	Whole plant	DQ 322	Amaranthaceae	<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clements	Chase away evil spirits		Planted	
Gabon	Mubindisa (Ms)	Whole plant	DQ 1064	Compositae	<i>Eclipta prostrata</i> (L.) L.	Ritual scarification and good memory	childcare	Scarification	
Benin	Ndidudu (T)	Roots	DQ 640	Boraginaceae	<i>Ehretia cymosa</i> Thom.	Treatment of toothache believed to be caused by envy		Oral ingestion	
Benin	Togble (F)	Whole plant	DQ 789	Pontederiaceae	<i>Eichhornia crassipes</i> (Mart.) Solms	Good luck		Bath	
Benin	Okgbo (T)	Seeds	DQ 288	Arecaceae	<i>Elaeis guineensis</i> Jacq.	Divination, offerings		Oral ingestion	
Gabon	Ngare (Tk)	Whole plant		Iridaceae	<i>Eleutherine bulbosa</i> (Mill.) Urb.	Protection against lightning		Planted	
Gabon	Moukoura (Bp)	Whole plant	DQ 971	Acanthaceae	<i>Elythria marginata</i> Vahl	Good luck		Bath	
Gabon	Oreille du chien (Fr), mibeles (N), alomyu (Fa)	Whole plant	DQ 970	Asteraceae	<i>Emilia coccinea</i> (Sims) G.Don	Good luck	high blood pressure	Bath	
Gabon	Nkame (F)	Whole plant		Loranthaceae	<i>Englerina gabonensis</i> (Engl.) Balle	Protection against bewitchment		Bath	
Benin	Ahlon lon kw'in (F), Fomfom (T)	Seeds	DQ 857	Musaceae	<i>Ensete livingstonianum</i> (1.Kirk) Cheesman	Ceremonial object		Amulet	
Benin	Akpogbowewe	Bark	DQ 550	Leguminosae	<i>Entada africana</i> Guill. & Perr.	Spiritual purification		Bath	

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								Direct	Indirect
(T)									
Benin	Gbagarakun, gbagbada (F)	Seeds	DQ 412	Leguminosae	<i>Entada gigas</i> (L.) Fawc. & Rendle	Divination	childcare		Amulet
Benin	Igila (T)	Bark	DQ 498	Meliaceae	<i>Entandrophragma candollei</i> Harms	Protection against enemies		Skin rub	
Gabon	Odjuko (Mi)	Wood		Meliaceae	<i>Entandrophragma utile</i> (Dawe & Sprague) Sprague	Ceremonial objects			Amulet
Gabon	Gheeta (Bb)	Wood		Arecaceae	<i>Eremospatha macrocarpa</i> H. Wendl.	Ceremonial objects			Amulet
Benin	Lema (F)	Whole plant		Leguminosae	<i>Eriosema laurentii</i> De Wild.	Spiritual purification		Bath	
Benin	Kpakesigoto (F)	Whole plant	DQ 201	Leguminosae	<i>Erythrina senegalensis</i> DC.	Protection against evil spirits			Planted
Benin	Ekpoyobo (Y)	Bark	DQ 483	Leguminosae	<i>Erythrophleum africanum</i> (Benth.) Harms	Protection against evil spirits		Bath	
Gabon	Mkas (Nz)	Bark	DQ 959	Leguminosae	<i>Erythrophleum ivorense</i> A.Chev.	Spells to kill other people	painful feet, swollen limbs	Oral ingestion	
Gabon	Elon (Fa)	Bark		Leguminosae	<i>Erythrophleum suaveolens</i> (Guill. & Perr.) Brenan	Spells to kill other people		Oral ingestion	
Benin	Oro (Y)	Whole plant	DQ 159	Leguminosae	<i>Erythrophleum suaveolens</i> (Guill. & Perr.) Brenan	Used to find things that have been lost or stolen			Incantation
Benin	Eucalyptus (Fr)	Bark	DQ 341	Myrtaceae	<i>Eucalyptus camaldulensis</i> Dehnlh.	Protection against evil spirits	cold	Bath	
Benin	Hundi hundi (F)	Whole plant	DQ 684	Euphorbiaceae	<i>Euphorbia comoluloides</i> Hochst. ex Benth.	Good luck		Bath	
Benin	Lekuleku, anosika (F)	Whole plant	DQ 69	Euphorbiaceae	<i>Euphorbia hirta</i> L.	Attract love	women's health	Bath	
Benin	Assani (G)	Whole plant	DQ 914	Euphorbiaceae	<i>Euphorbia hyssopifolia</i> L.	Spiritual purification		Bath	
Benin	Oro onigbo (T)	Whole plant	DQ 633	Euphorbiaceae	<i>Euphorbia kamerunica</i> Pax	Protection of fields and homes from sorcerers			Planted
Benin	Oro olombo (T)	Whole plant	DQ 636	Euphorbiaceae	<i>Euphorbia tirucalli</i> L.	Protection of Sakpata shrines			Planted
Benin	Oro (Y)	Whole plant		Euphorbiaceae	<i>Euphorbia unispina</i> N.E.Br.	Said to be used by sorcerers in the preparation of spells		Oral ingestion	
Benin	Kusu kusu (F)	Whole plant	DQ 174	Convolvulaceae	<i>Evolvulus alsinoides</i> (L.) L.	Protection against law officers	childcare		Amulet
Benin	Agbedokota (T)	Roots	DQ 648	Moraceae	<i>Ficus abutilifolia</i> (Miq.) Miq.	Spiritual purification		Bath	
Benin	Adago (T)	Whole plant	DQ 521	Moraceae	<i>Ficus lutea</i> Vahl	Plant that governs one of the Fa oracle signs			Incantation

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								Direct	Indirect
Benin	Okpoto (T)	Bark	DQ 296	Moraceae	<i>Ficus sur</i> Forssk.	Protection against enemies		Bath	
Benin	Gbokoka (F)	Bark	DQ 254	Moraceae	<i>Ficus thonningii</i> Blume	Ritual object			Amulet
Gabon	Mobende (Mi)	Bark		Moraceae	<i>Ficus thonningii</i> Blume	Ceremonial objects			Amulet
Benin	Bafle (Ad)	Leaves	DQ 711	Moraceae	<i>Ficus umbellata</i> Vahl	Protection against miscarriage for pregnant women	haemorrhoids	Bath	
Benin	Oguro (Y)	Bark	DQ 785	Moraceae	<i>Ficus vallis-choudae</i> Delile	Spiritual purification		Bath	
Gabon	Mbudji (Nz)	Bark	DQ 955	Rubiaceae	<i>Fleroya ledermannii</i> (K.Krause) Y.F.Deng	Good luck	digestive, women's health	Bath	
Benin	Alotrobadiiki (F), Kakakaka (T)	Whole plant	DQ 476	Phyllanthaceae	<i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	Spiritual purification. Protection against Sakpata- related diseases	malaria, women's health	Bath	
Gabon	Owade (Mi)	Seeds		Clusiaceae	<i>Garcinia epunctata</i> Stapf	Ceremonial stimulant		Oral ingestion	
Gabon	Mukoka (M)	Wood	DQ 992	Clusiaceae	<i>Garcinia kola</i> Heckel	Ceremonial stimulant	aphrodisiac	Oral ingestion	
Benin	Ahoé (F)	Seeds	DQ 138	Clusiaceae	<i>Garcinia kola</i> Heckel	Stimulant. Divination object	childcare	Oral ingestion	
Gabon	Bondjo (Mi)	Seeds		Clusiaceae	<i>Garcinia mannii</i> Oliv.	Ceremonial stimulant		Oral ingestion	
Benin	Hedmadje (F)	Leaves	DQ 29	Rubiaceae	<i>Gardenia nitida</i> Hook.	Spiritual purification		Bath	
Benin	Tatakplannan, dakpla (F)	Roots	DQ 106	Rubiaceae	<i>Gardenia ternifolia</i> Schumach. & Thonn.	Protection against sorcerers	high blood pressure, gastric disorders, malaria	Bath	
Gabon	Ndjejo (Mi)	Bark		Rubiaceae	<i>Gardenia ternifolia</i> Schumach. & Thonn.	Treatment of wounds of supernatural origin		Skin rub	
Gabon	Matchumangui (N), Dourai da mourim (Bp)	Whole plant	DQ 1056	Rubiaceae	<i>Geophila afzelii</i> Hiern	Good luck. Attract love	digestive	Bath, oral ingestion	
Benin	Aixa (F)	Leaves	DQ 75	Rubiaceae	<i>Geophila afzelii</i> Hiern	Protection against bewitchment		Bath	
Gabon	Duba (Bb)	Leaves		Rubiaceae	<i>Geophila lancistipula</i> Hiern	Good luck		Bath	
Benin	Abov botor (Y)	Whole plant	DQ 522	Rubiaceae	<i>Geophila repens</i> (L.) I.M. Johnst.	Spiritual purification		Bath	
Benin	Hankun (F)	Whole plant	DQ 580	Colchiaceae	<i>Gloriosa superba</i> L.	Good luck			Planted
Benin	Ore-we (T)	Fruits	DQ 879	Malvaceae	<i>Gossypium arboreum</i> L.	Ceremonies to get rid of spells		Skin rub	

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								Direct	Indirect
						or to make pacts with sorcerers			
Gabon	Mukondou (Bp)	Fruits		Malvaceae	<i>Gossypium barbadense</i> L.	Ceremonial objects			Amulet
Benin	Sankafouma (F)	Whole plant	AMT 592	Malvaceae	<i>Gossypium hirsutum</i> L.	Treatment of madness caused by spirit possession		Oral ingestion	
Gabon	Otunga (Fa)	Leaves		Annonaceae	<i>Greenwayodendron suaveolens</i> (Engl. & Diels) Verde.	Spiritual purification		Bath	
Benin	Ore (T)	Stems	DQ 523	Malvaceae	<i>Grewia carpinifolia</i> Juss.	Restricted species	abortifacient	Skin rub	
Gabon	Kewozengo (Lu)	Bark		Leguminosae	<i>Guibourtia chie</i> (A.Chev.) J.Leonard	Spiritual purification		Bath	
Gabon	Kevasingo (Fa), obaka (M)	Bark		Leguminosae	<i>Guibourtia tessmannii</i> (Harms) J.Leonard	Good luck. Restricted species	high blood pressure, diabetes aphrodisiac, women's health	Bath	Incantation
Benin	Azongbo (F)	Whole plant	DQ 31	Poaceae	<i>Hackelochloa granularis</i> (L.) Kuntze	Spiritual purification		Bath	
Gabon	Musasa (E)	Wood		Hypericaceae	<i>Harungana madagascariensis</i> Lam. ex Poir.	Construction of Bwiti altars			Amulet
Benin	Ebo (T)	Bark	DQ 524	Hypericaceae	<i>Harungana madagascariensis</i> Lam. ex Poir.	Protection against stomach ailments caused by bewitchment	malaria, gastric disorders	Bath, oral ingestion	
Gabon	Rumuenu (Pu)	Whole plant	DQ 1121, DQ 1026	Rubiaceae	<i>Heinsia crinita</i> (Afzel.) G.Taylor	Attain success		Bath	
Gabon	Nisabi (Mk)	Bark		Oleaceae	<i>Heisteria parvifolia</i> Sm.	Spiritual purification		Bath	
Gabon	Mugamba (Bp)	Fruits		Oleaceae	<i>Heisteria zimmereri</i> Engl.	Used by women to prevent their men from abandoning them			Amulet
Benin	Klonklonson (F)	Whole plant	DQ 306	Boraginaceae	<i>Heliotropium indicum</i> L.	Treatment of Sakpata-related diseases	high blood pressure	Bath	
Benin	Wiwé (Y), Dlo (F)	Whole plant	DQ 76	Pontederiaceae	<i>Heteranthera callifolia</i> Rchb. ex Kunth	Good luck		Bath	
Benin	Xexema (F)	Whole plant	DQ 176	Melastomataceae	<i>Heterotis rotundifolia</i> (Sm.) Jacq.-Fel.	Spiritual purification	women's health	Bath	
Benin	Houmassivovo (F), Hungbe (Ad)	Whole plant	DQ 325	Malvaceae	<i>Hibiscus acetosella</i> Welw. ex Hieron	Protection against sorcerers	childcare, malaria		Planted
Gabon	Esang (Fa)	Leaves		Malvaceae	<i>Hibiscus sabdariffa</i> L.	Treatment of wounds of supernatural origin		Skin rub	
Benin	Kpakloman (F), Oseille sauvage	Whole plant	DQ 342	Malvaceae	<i>Hibiscus surattensis</i> L.	Protection against sorcerers	women's health		Planted

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								Direct	Indirect
(Fr)									
Benin	Ano (T)	Leaves	DQ 67	Phytolaccaceae	<i>Hillertia latifolia</i> (Lam.) H. Walter	Attract love		Bath, oral ingestion	
Gabon	Oignon de la brousse (F)	Whole plant		Amaryllidaceae	<i>Hippeastrum puniceum</i> (Lam.) Voss	Good luck		Bath	
Benin	Akogbo (F)	Whole plant		Salicaceae	<i>Homalium le-testui</i> Pellegr.	Restricted species			Incantation
Benin	Ilu femi (Y)	Whole plant	DQ 71	Araliaceae	<i>Hydrocotyle bonariensis</i> Lam.	Spiritual purification		Bath	
Gabon	Ontcholu (Tk)	Wood		Phyllanthaceae	<i>Hymenocardia ulmoides</i> Oliv.	Construction of Bwiti altars			Amulet
Benin	Tchonkoko (T)	Whole plant	DQ 377	Phyllanthaceae	<i>Hymenocardia acida</i> Tul.	Good luck		Bath	
Gabon	Esekule (Fa)	Leaves		Rubiaceae	<i>Hymenocoleus hirsutus</i> (Benth.) Robbr.	Ritual scarification		Scarification	
Benin	Awalinguin (F)	Roots	DQ 407	Rubiaceae	<i>Hymenodictyon floribundum</i> (Steud. & Hochst.) B.L. Rob.	Protection against evil spirits		Bath	
Gabon	Alozonge (Fa)	Stems		Marantaceae	<i>Hypselodelphys violacea</i> (Ridl.) Milne-Redth.	Construction of Bwiti altars			Amulet
Benin	Egon (T)	Stems	DQ 761	Poaceae	<i>Imperata cylindrica</i> (L.) Racusch.	Protection against sorcerers			Amulet
Benin	Kea fumitiche (T)	Roots	DQ 772	Leguminosae	<i>Indigofera dendroides</i> Jacq.	Protection against enemies		Oral ingestion	
Benin	Agondje (F)	Leaves	DQ 33	Leguminosae	<i>Indigofera hirsuta</i> L.	Spiritual purification		Bath, oral ingestion	
Benin	Waraougu (F)	Whole plant	DQ 791	Leguminosae	<i>Indigofera spicata</i> Forssk.	Attract love			Amulet
Benin	Djémigbo (F), Axe de du Nord (Fr, F)	Whole plant	DQ 895	Convolvulaceae	<i>Ipomoea argenteaurata</i> Hallier f.	Protection against evil spirits		Bath	
Benin	Atoyoe (F)	Whole plant	DQ 571	Convolvulaceae	<i>Ipomoea fistulosa</i> Mart. ex Choisy	Spiritual purification		Bath	
Gabon	Nichobi (Ak)	Whole plant		Convolvulaceae	<i>Ipomoea mauritiana</i> Jacq.	Good luck		Bath	
Benin	Funchele (F)	Whole plant	DQ 102	Convolvulaceae	<i>Ipomoea pileata</i> Roxb.	Rituals to break spells left behind by dead people			Amulet
Gabon	Otunden (Fa)	Stems		Convolvulaceae	<i>Ipomoea pileata</i> Roxb.	Treatment of female infertility			Amulet
Benin	Ainadje (F), Senewammi (G)	Whole plant	DQ 183	Convolvulaceae	<i>Ipomoea quamoclit</i> L.	Spiritual purification	women's health	Bath	
Gabon	Uba (Mi)	Bark		Irvingiaceae	<i>Irvingia gabonensis</i> (Aubry- Lecomte ex O'Rorke) Baill.	Treatment of female infertility			Amulet

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								Direct	Indirect
Benin	Kirikpokpo (T)	Whole plant	DQ 103	Euphorbiaceae	<i>Jatropha curcas</i> L.	Protection against evil spirits			Planted
Benin	Ketiḡbokugh (T)	Whole plant	DQ 317	Euphorbiaceae	<i>Jatropha gossypifolia</i> L.	Protection against evil spirits		Bath	Planted
Benin	Akpawi (F)	Whole plant	DQ 289	Euphorbiaceae	<i>Jatropha multifida</i> L.	Protection against evil spirits			Planted
Benin	Houmanssieton (F)	Whole plant	DQ 303	Acanthaceae	<i>Justicia secunda</i> Vahl	Treatment of malaria caused by bewitchment		Bath	
Gabon	Everem (Fa), madijudjuga (P)	Whole plant	DQ 1035	Crassulaceae	<i>Kalanchoe crenata</i> (Andrews) Haw.	Spiritual purification	respiratory diseases	Bath	
Benin	Afama, afama avo (F)	Whole plant	DQ 141	Crassulaceae	<i>Kalanchoe crenata</i> (Andrews) Haw.	Spiritual purification. Protection against evil spirits. Restricted species		Bath	Planted, incantation
Benin	Cascdral, zousagoto (F)	Bark	DQ 228	Meliaceae	<i>Khaya senegalensis</i> (Desv.) A. Juss.	Protection against evil spirits and witches	malaria, women's health	Bath	
Benin	Flagbo (F)	Leaves	DQ 83	Meliaceae	<i>Khaya senegalensis</i> (Desv.) A. Juss.	Treatment of madness caused by spirit possession		Oral ingestion	
Benin	Gnanblikpo (F)	Fruits	DQ 40	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	Treatment for the enlargement of male genitals	aphrodisiac	Skin rub	
Benin	Faux baobab (Fr), Kpando (T)	Leaves	DQ 40	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	Treatment for the enlargement of male genitals	women's health	Skin rub	
Benin	Dogbo dogbo (Y) Kadjidji (F)	Roots	DQ 806	Cyperaceae	<i>Kyllinga erecta</i> Schumacher	Protection against evil spirits		Burning	
Benin	Kablougoudui (F)	Whole plant	DQ 360	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	Protection against Sakpata-related diseases	childcare		Amulet
Benin	Igba dekofo (Y), Weblikpin (F)	Fruits	DQ 237	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	Ceremonial object			Amulet
Gabon	Pivam (Tk)	Fruits	DQ 1038	Cucurbitaceae	<i>Lagenaria breviflora</i> (Benth.) Roberty	Protection against snake bite	childcare	Skin rub	
Benin	Goussi (F), Ado (Y)	Fruits	DQ 312	Cucurbitaceae	<i>Lagenaria siceraria</i> (Molina) Standl.	Ceremonial object			Amulet
Benin	Zuzugoto (F), Aku (T)	Bark	DQ 225	Anacardiaceae	<i>Lannea acida</i> A. Rich.	Protection for children	malaria, childcare	Bath	
Benin	Houmansin tekan non, humansin kekan (F)	Bark	DQ 408	Anacardiaceae	<i>Lannea barkeri</i> (Oliv.) Engl.	Protection for children	gastric disorders	Bath	
Gabon	Bikona (Fa), lethok (N)	Bark	DQ 962	Anacardiaceae	<i>Lannea welwitschii</i> (Hiern) Engl.	Good luck	women's health	Bath	
Benin	Tchto, ratchayo (F)	Whole plant	DQ 795	Verbenaceae	<i>Lantana camara</i> L.	Ritual for people who have broken a taboo. Ritual to prevent the death of an ill child	childcare	Bath	Incantation

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Gabon	Munju (Nz)	Whole plant	DQ 1028	Stemonuraceae	<i>Lasianthera africana</i> P.Beauv.	Good luck		Bath	
Benin		Whole plant	DQ 35	Compositae	<i>Launaea taraxacifolia</i> (Willd.) Amin ex C.Jeffrey	Spiritual purification		Bath	
Benin	Henné (Fr), Lali (T)	Leaves	DQ 167	Lythraceae	<i>Lawsonia inermis</i> L.	Ceremonial pigment. Spell to cause impotence in men		Skin rub	
Benin	Wawa (T)	Leaves	DQ 502	Sapindaceae	<i>Lecaniodiscus cupanioides</i> Planch. ex Benth.	Attract wealth		Bath	
Gabon	Mbala (P), Igalameroghrou (E)	Leaves	DQ 1025	Vitaceae	<i>Leea guineensis</i> G.Don	Good luck		Bath	
Benin	Dawili (De)	Whole plant	DQ 838	Lamiaceae	<i>Leonotis nepetifolia</i> (L.) R.Br.	Protection for children		Bath	
Gabon	Malamanzongo (Bp)	Flower		Lamiaceae	<i>Leonotis nepetifolia</i> (L.) R.Br.	Treatment of female infertility		Bath, oral ingestion	
Benin	Aklala (F)	Leaves	DQ 683	Verbenaceae	<i>Lippia rugosa</i> A.Chev.	Spiritual purification		Bath	
Gabon	Afi (Fa)	Flower		Verbenaceae	<i>Lippia multiflora</i> Moldenke	Chase away evil spirits		Burning	
Gabon	Djanzukun (P), afing (Fa),	Whole plant	DQ 973	Verbenaceae	<i>Lippia rugosa</i> A.Chev.	Good luck	women's health	Bath	
Gabon	Njamale (Mk)	Whole plant		Campanulaceae	<i>Lobelia gilletii</i> De Wild.	Used by women who want to recover lost husbands			Amulet
Gabon	Azobe (Fa), Okoka (Bb)	Bark		Ochnaceae	<i>Lophira alata</i> Banks ex C.F. Gaertn.	Protection against bewitchment		Bath	
Benin	Banió (Y), Kpapasá (T)	bark	DQ 220	Ochnaceae	<i>Lophira lanceolata</i> Tiegh. ex Keay	Treatment of anaemia in children	malaria, gastric disorders	Bath, oral ingestion	
Benin	Eponge traditionell (Fr)	Fruits	DQ 365	Cucurbitaceae	<i>Luffa cylindrica</i> M.Roem.	Spiritual purification		Bath	
Benin	Zentiti, retiti (F)	Whole plant	DQ 30	Lycopodiaceae	<i>Lycopodiella cernua</i> (L.) Pic. Sern.	Protection against evil spirits	childcare	Bath	
Gabon	Ghanga (Bb)	Stems		Lygodiaceae	<i>Lygodium smithianum</i> C. Presl	Ceremonial objects			Amulet
Gabon	Insaha la muele (B), Assas (Fa)	Leaves	DQ 1024	Euphorbiaceae	<i>Macaranga monandra</i> Müll.Arg.	Protection against evil spirits		Bath	
Gabon	Insaha la muele (Bb)	Leaves		Euphorbiaceae	<i>Macaranga spinosa</i> Müll.Arg.	Attract love		Bath	
Benin	Tchutchugrutchu (F)	Leaves	DQ 800	Capparidaceae	<i>Maerua duchesnei</i> (De Wild.) F.White	Said to be used by sorcerers in the preparation of spells			Amulet
Gabon	Mususu (Lu)	Bark		Rhamnaceae	<i>Maesopsis eminii</i> Engl.	Spiritual purification		Bath	
Benin	Kise kise ma (F), Alindja (Id)	Whole plant	DQ 178	Euphorbiaceae	<i>Mallotus oppositifolius</i> (Geisel) Müll.Arg.	Protection against evil spirits and witches. Restricted species			Amulet, incantation

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								Direct	Indirect
Benin	Mangue goto, manga goto (F)	Bark	DQ 704	Anacardiaceae	<i>Mangifera indica</i> L.	Protection for men	aphrodisiac	Bath	
Benin	Kutuma asu (Ad)	Leaves, root	DQ 709	Euphorbiaceae	<i>Manihot esculenta</i> Crantz	Ceremonial offerings		Oral ingestion	
Gabon	Cassave, manioc (Fr)	Leaves	DQ 709	Euphorbiaceae	<i>Manihot esculenta</i> Crantz	Food taboo			Incantation
Benin	Emedo (T)	Bark	DQ 641	Sapotaceae	<i>Manilkara zapota</i> (L.) P. Royen	Protection against diseases caused by witchcraft		Burning	
Gabon	inja la muele (B)	Leaves	DQ 1022	Euphorbiaceae	<i>Maprounea membranacea</i> Pax & K. Hoffm.	Spiritual purification		Bath	
Gabon	Bilambesu (My)	Bark		Euphorbiaceae	<i>Maprounea membranacea</i> Pax & K. Hoffm.	Protection for new-borns		Bath	
Gabon	Kaisieli (Tk)	Leaves		Euphorbiaceae	<i>Maprounea africana</i> Müll. Arg.	Protection against diseases caused by witchcraft		Bath	
Gabon	Otsa (Mi)	Fruits		Chrysobalanaceae	<i>Maranthes chrysophylla</i> (Oliv.) Prance ex F. White	Food taboo			Incantation
Benin	Tchonkoko (T)	Roots	DQ 266	Chrysobalanaceae	<i>Maranthes polyandra</i> (Benth.) Prance	Protection against evil-doers	aphrodisiac	Oral ingestion	
Benin	Tchiningo (T)	Bark	DQ 602	Bignoniaceae	<i>Markhamia tomentosa</i> (Benth.) K. Schum. ex Engl.	Protection against evil spirits	vermifuge	Burning	
Benin	Azetofin (F)	Fruits	DQ 168	Martyniaceae	<i>Marrynia annua</i> L.	Protection against evil spirits		Scarification	
Gabon	Pink magic (En), Elecan (Lu)	Fruits	DQ 1001, DQ 999	Rubiaceae	<i>Massularia acuminata</i> (G. Don) Bullock ex Hoyle	Good luck	sprained limbs, women's health	Bath	
Gabon	Okeku (Fa)	Leaves		Marantaceae	<i>Megaphrynium macrostachyum</i> (K. Schum.) Milne-Redh	Ceremonial offerings			Amulet
Benin	Irewa (T)	Leaves	DQ 285	Malvaceae	<i>Melochia melissifolia</i> Benth.	Spiritual purification		Bath	
Benin	Alovi aton, alofiantoma (F)	Whole plant	DQ 188	Convolvulaceae	<i>Merremia quinquefolia</i> (L.) Hallier f.	Protection against evil spirits		Bath	
Gabon	Ogandaga (My)	Leaves		Pandaceae	<i>Microdesmis camerunensis</i> J. Léonard	Resolve disputes	general health improvement		Amulet
Gabon	Duganda (Lu)	Leaves		Pandaceae	<i>Microdesmis afrodecandra</i> Floret, A. M. Louis & J. M. Reitsma	Spiritual purification		Bath	
Benin	Egné (Y), Egn (T)	Whole plant	DQ 644	Euphorbiaceae	<i>Microstachys chamaelea</i> (L.) Müll. Arg.	Spiritual purification	gastric disorders	Bath	
Benin	Iroko (En)	Whole plant	DQ 190	Moraceae	<i>Milicia excelsa</i> (Welw.) C. C. Berg	Sacred tree			Planted
Gabon	Iroko (En)	Whole plant		Moraceae	<i>Milicia excelsa</i> (Welw.) C. C. Berg	Sacred tree			Planted

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								Direct	Indirect
Benin	Lokotin (F)	Bark	DQ 865	Moraceae	<i>Millettia excelsa</i> (Welw.) C.C.Berg	Protection against evil spirits	post-partum cleanses	Oral ingestion	
Gabon	Mbota (E)	Wood		Leguminosae	<i>Millettia laurentii</i> De Wild.	Construction of Bwiti altars			Amulet
Benin	La honte (Fr)	Whole plant		Leguminosae	<i>Mimosa pudica</i> L.	Used by women to prevent their men from abandoning them			Amulet
Benin	Vehun (F)	Whole plant		Leguminosae	<i>Mimosa quadrivalvis</i> var. <i>lepto carpa</i> (DC.) Barneby	Spiritual purification		Bath	
Benin	Ioroma (F), Tugbase (F)	Whole plant	DQ 48	Molluginaceae	<i>Mollugo nudicaulis</i> Lam.	Protection against evil spirits		Bath	
Benin	Nyesike (F), Aslosikan (G)	Whole plant	DQ 876	Cucurbitaceae	<i>Momordica balsamina</i> L.	Protection against Sakpata- related diseases		Bath	
Gabon	Babumbolo (Lu)	Whole plant		Cucurbitaceae	<i>Momordica balsamina</i> L.	Spiritual purification		Bath	
Benin	Tchati (T)	Fruits	DQ 219	Cucurbitaceae	<i>Momordica charantia</i> L.	Treatment of Sakpata-related diseases	high blood pressure	Bath	
Gabon	Mabumbolu (P), misutsulu (N)	Whole plant	DQ 972	Cucurbitaceae	<i>Momordica charantia</i> L.	Good luck	childcare, high blood pressure, malaria, diabetes	Bath	
Benin	Tchigoun (F)	Roots	DQ 107	Apocynaceae	<i>Mondia whitei</i> (Hook.f.) Skeels	Protection against sorcerers	aphrodisiac	Bath	
Benin	Sasalikwin (F)	Seeds	DQ 890	Annonaceae	<i>Monodora myristica</i> (Gaertn.) Dunal	Ceremonial stimulant	women's health	Oral ingestion	
Gabon	Nzingu (Ma)	Seeds	DQ 1043	Annonaceae	<i>Monodora myristica</i> (Gaertn.) Dunal	Spiritual purification	women's health	Bath	
Gabon	Fep (Fa)	Bark	DQ 980	Annonaceae	<i>Monodora myristica</i> (Gaertn.) Dunal	construction of Bwiti temples			Amulet
Benin	Kwensima (F)	Leaves	DQ 191	Rubiaceae	<i>Morinda lucida</i> Benth.	Attract love	childcare	Bath	
Benin	Hundihundigoto (F)	Bark	DQ 111	Rubiaceae	<i>Morinda lucida</i> Benth.	Treatment of female infertility		Bath	
Benin	Ewe ile (Y)	Leaves	DQ 944	Moringaceae	<i>Moringa oleifera</i> Lam.	Ceremonial offerings		Oral ingestion	
Benin	Akpakpu wewe (F)	Seeds	DQ 173	Leguminosae	<i>Mucuna pruriens</i> (L.) DC.	Protection against snakes		Planted	
Benin	Vestú (F)	Seeds	DQ 248	Leguminosae	<i>Mucuna sloanei</i> Fawc. & Rendle	Divination			Amulet
Benin	Ori oka (Y)	Leaves		Cucurbitaceae	<i>Mukia maderaspatana</i> (L.) M.Roem.	Protection against diseases caused by witchcraft		Oral ingestion	
Benin	Tchrigou (F)	Leaves	DQ 787	Rutaceae	<i>Murraya paniculata</i> (L.) Jack	Treatment of malaria caused		Bath	

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								Direct	Indirect
						by bewitchment			
Gabon	Bapung (Ak)	Leaves		Rubiaceae	<i>Massaenda soyauxii</i> Bittner	Protection against theft		Bath	
Benin	Atinken (F)	Fruits	DQ 878	Myrtaceae	<i>Myrcianthes fragrans</i> (Sw.) McVaugh	Protection for newborns		Oral ingestion	
Gabon	afunlum (Fa)	Leaves	DQ 1223	Moraceae	<i>Myrianthus serratus</i> (Trécul) Benth.	Good luck		Bath	
Benin	Opepe (Y)	Wood		Rubiaceae	<i>Nauclea diderrichii</i> (De Wild.) Merr.	Ceremonial object	aphrodisiac		Amulet
Benin	Atiti (Pe)	Whole plant	DQ 260	Acanthaceae	<i>Nelsonia canescens</i> (Lam.) Spreng.	Rituals to revert spells			Amulet
Benin	Eaw (T)	Seeds	DQ 646	Leguminosae	<i>Neonotonia wightii</i> (Wight & Arm.) J.A. Lackey	Protection against snake bites		Oral ingestion	
Benin	Djelema (F)	Whole plant		Nephrolepidaceae	<i>Nephrolepis biserrata</i> (Sw.) Schott	Protection against Sakpata- related diseases			
Gabon	Ayangyo (F)	Whole plant		Nephrolepidaceae	<i>Nephrolepis biserrata</i> (Sw.) Schott	Spiritual purification		Bath	
Gabon	Tsengingi (Nz)	Whole plant		Nephrolepidaceae	<i>Nephrolepis undulata</i> (Afzel. ex Sw.) J. Sm.	Good luck		Bath	
Gabon	Onana (Bb)	Stems		Araceae	<i>Nepenthes afzelii</i> Schott	Fibers made into ceremonial rope to attach charms			Amulet
Benin	Adjamangoto (F)	Bark	DQ 482	Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	Spiritual purification	women's health	Bath	
Benin	Xettin, Kpatiman (F)	Whole plant	DQ 104	Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	Planted in protection against evil spirits			Planted
Gabon	Douvindegitsa (Bp)	Leaves		Bignoniaceae	<i>Newbouldia laevis</i> (P.Beauv.) Seem.	Spiritual purification		Bath	
Benin	Tabac (Fr), Azewewe (F)	Leaves	DQ 379	Solanaceae	<i>Nicotiana tabacum</i> L.	Good luck		Bath	
Benin	Kesu kesu (F)	Leaves	DQ 51	Lamiaceae	<i>Ocimum americanum</i> L.	Attract love	childcare	Bath	
Benin	Cohou (G)	Whole plant	DQ 302	Lamiaceae	<i>Ocimum basilicum</i> L.	Protection against diseases caused by witchcraft		Oral ingestion	
Benin	Tchayo, dan tchayo (F)	Leaves	DQ 181	Lamiaceae	<i>Ocimum gratissimum</i> L.	Spiritual purification	women's health	Bath	
Gabon	Malundumb (Ms)	Whole plant		Lamiaceae	<i>Ocimum gratissimum</i> L.	Good luck	childcare, malaria, women's health	Bath	
Gabon	Ossim (Fa)	Whole plant	DQ 1041, DQ 1113	Lamiaceae	<i>Ocimum americanum</i> L.	Good luck, protection against diseases of mystical origin	respiratory diseases, women's health	Bath	

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								Direct	Indirect
Gabon	Ekobe (Fa)	Bark		Oleaceae	<i>Olex standtii</i> Engl.	Ceremonial objects			Amulet
Benin	Métindo (F)	Roots	DQ 493	Oleaceae	<i>Olex subscorpioides</i> Oliv.	Protection against sorcerers	aphrodisiac	Oral ingestion	
Benin	Mitin (F)	Bark	DQ 108	Oleaceae	<i>Olex subscorpioides</i> Oliv.	Protective baths against weapons	painful legs	Bath	
Benin	Azanglo (F)	Leaves	DQ 44	Rubiaceae	<i>Oldenlandia affinis</i> (Roem. & Schult.) DC.	Protection against sorcerers		Bath, oral ingestion	
Gabon	Nambibot (Fa)	Leaves		Rubiaceae	<i>Oldenlandia lancifolia</i> (Schumacher) DC.	Enhancement of the effectiveness of medicinal treatments		Oral ingestion	
Gabon	Poutcho (Sa)	Bark, fruits		Sapotaceae	<i>Omphalocarpum procerum</i> P.Beauv.	Treatment of female infertility		Bath, oral ingestion	
Benin	Koloro (Ti)	Fruits	DQ 637	Salicaceae	<i>Oncoba spinosa</i> Forssk.	Ceremonial object		Amulet	
Benin	Nyondo (T)	Whole plant	DQ 653	Opiliaceae	<i>Opilia amentacea</i> Roxb.	Protection against evil spirits		Bath	
Gabon	Mburwe (Bb)	Fruits		Lecythidaceae	<i>Oubangia africana</i> Baill.	Food taboo		Incantation	
Benin	Kudjé kudjé (F)	Whole plant	DQ 66	Oxalidaceae	<i>Oxalis corniculata</i> L.	Attract love		Bath	
Gabon	Didjodjoru (Nv)	Leaves	DQ 1148	Commelinaceae	<i>Polisota ambigua</i> (P.Beauv.) C.B.Clarke	Protection against evil spirits		Bath	
Benin	Agbato abo (Ti)	Whole plant	DQ 639	Commelinaceae	<i>Polisota hirsuta</i> (Thumb.) K.Schum.	Protection against evil spirits		Burning	
Benin	Mekukuyama, kooyoma (F)	Roots	DQ 276	Amaryllidaceae	<i>Pancratium tenuifolium</i> Hochst. ex A.Rich.	Protection against evil spirits	childcare	Scarification	
Benin	Zoxume sabla (Ad), Gbeke gbeke (T)	Whole plant	DQ 719	Amaryllidaceae	<i>Pancratium tenuifolium</i> Hochst. ex A.Rich.	Protection against evil spirits	asthma	Skin rub	
Gabon	Ando (Fa)	Seeds	DQ 984	Pandaceae	<i>Panda oleosa</i> Pierre	Protection against the return of diseases of mystical origin		Oral ingestion	
Benin	Ogbokneko (T)	Flower	DQ 614	Aristolochiaceae	<i>Pararistolochia goldiana</i> (Hook.f.) Hutch. & Dalziel	Treatment of foot rash caused by a Sakpata spell	aphrodisiac	Skin rub	
Benin	Tchaklaman (G), Agao (T)	Leaves	DQ 275	Leguminosae	<i>Parkia biglobosa</i> (Jacq.) G.Don	Protection against sorcerers	women's health	Oral ingestion	
Gabon	Ndjendja (Bp)	Fruits	DQ 1829	Passifloraceae	<i>Paropsia grewtoides</i> Welw. ex Mast.	Tied to the legs of infants to make them walk sooner			
Benin	Avunjemetri, avuneme (F)	Whole plant	DQ 143	Passifloraceae	<i>Passiflora foetida</i> L.	Spiritual purification	childcare	Bath	
Gabon	Miran (Bp)	Whole plant		Sapindaceae	<i>Paullinia pinnata</i> L.	Attract love and good luck		Bath	
Benin	Loxwi (F)	Leaves	DQ 153	Rubiaceae	<i>Pavetta corymbosa</i> (DC.) F.N.Williams	Protection against miscarriage for pregnant women	malaria	Bath, oral ingestion	

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								Direct	Indirect
Benin	Gongoako (T), Tchakatouma (F)	Leaves	DQ 73	Rubiaceae	<i>Pavetta crassipes</i> K.Schum.	Spiritual purification	malaria	Bath	
Benin	Likun (F)	Seeds		Poaceae	<i>Pennisetum glaucum</i> (L.) R.Br.	Treatment of female infertility			Amulet
Gabon	ebeig (Fa), mupanjii (N)	Bark	DQ 995	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Good luck	women's health	Bath	
Gabon	imupanzi (M), inhansa (B)	Leaves	DQ 1023	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Good luck		Bath	
Benin	Dengwikwin (F)	Seeds	DQ 676	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Divination			Amulet
Benin	Dengwi (F)	Fruits	DQ 164	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Protection against theft			Amulet
Gabon	Oba (Mi)	Fruits	DQ 993	Leguminosae	<i>Pentaclethra macrophylla</i> Benth.	Protection against weapons and accidents			Amulet
Benin	Fifaman (Ai), Sinfifama (F)	Whole plant	DQ 799	Piperaceae	<i>Peperomia pellicida</i> (L.) Kunth	Protection against enemies		Bath	
Benin	Ghangina wewe (F), Okuugbon (T)	Bark	DQ 698	Asclepiadaceae	<i>Periploca calophylla</i> (Wight) Falc.	Protection against enemies. Good luck	aphrodisiac	Bath	
Gabon	Ntchovi (My)	Leaves	DQ 1135	Apocynaceae	<i>Periploca nigrescens</i> Afzel.	Protection for fishermen. Good luck		Bath	
Gabon	Ebindjo (Mi)	Fruits		Lecythidaceae	<i>Petersianthus macrocarpus</i> (P. Beauv.) Liben	Food taboo			Incantation
Benin	Zoroman (F)	Whole plant	DQ 366	Phytolaccaceae	<i>Petiveria alliacea</i> L.	Ingredient in Sakpata spells			Amulet
Benin	Homefado (F)	Whole plant	DQ 93	Acanthaceae	<i>Phalopsis ciliata</i> (Willd.) Hepper	Treatment of female infertility		Bath	
Benin	Ahoma (F)	Leaves	DQ 82	Leguminosae	<i>Philenoptera cyanescens</i> (Schum. & Thonn.) Roberty	Protection against poisoning		Bath, oral ingestion	
Benin	Helwe (F), Kunse kunse (F)	Whole plant	DQ 202	Phyllanthaceae	<i>Phyllanthus amarus</i> Schumach. & Thonn.	Protection against sorcerers	malaria, women's health	Bath, oral ingestion	Amulet
Benin	Agemon kogu (T)	Whole plant	DQ 658	Phyllanthaceae	<i>Phyllanthus muellerianus</i> (Kuntze) Exell	Treatment of female infertility		Bath, oral ingestion	
Benin	Degoma (F)	Whole plant	DQ 788	Polypodiaceae	<i>Phymatosorus scolopendria</i> (B urm. f.) Pic. Serp.	Protection against Sakpata- related diseases		Bath	
Benin	Ayokpe (F)	Seeds	DQ 679	Apocynaceae	<i>Picralima nitida</i> (Stapf) T.Durand & H.Durand	Ceremonial stimulant		Oral ingestion	
Benin	Lenlenkwin (F)	Seeds	DQ 677	Piperaceae	<i>Piper guineense</i> Schumach. & Thonn.	Used to increase the power of words		Oral ingestion	
Gabon	abonza (Fa), malento (N)	Whole plant	DQ 1032	Piperaceae	<i>Piper umbellatum</i> L.	Ceremonial offerings	hemorrhoids		Amulet
Gabon	Tom (Fa)	Wood		Leguminosae	<i>Piptadeniastrum africanum</i> (H ook. f.) Brenan	Ceremonial objects			Amulet

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Foutou (Ad)	Whole plant	DQ 728	Araceae	<i>Pistia stratiotes</i> L.	Used in spell to bring misfortune to businessmen		Burning	
Benin	Gomido (G)	Whole plant	DQ 622	Leguminosae	<i>Pithecellobium dulce</i> (Roxb.) Benth.	Protection against evil spirits		Bath	
Gabon	feuilles de brousse (Fr)	Whole plant	DQ 1133	Pteridaceae	<i>Pityrogramma calomelanos</i> (L.) Link	Good luck		Bath	
Gabon	Ghetodho (Mi), istila (Fa)	Bark	DQ 958	Euphorbiaceae	<i>Pigiosyles africana</i> (Mull.Arg.) Prain	Spiritual purification	childcare, luck	Bath	
Gabon	Ava (Fa)	Leaves		Lamiaceae	<i>Plectranthus monostachyus</i> (P. Beauv.) B.J.Pollard	Treatment of stomach ailments caused by bewitchment		Oral ingestion	
Benin	Banvillekou (F)	Whole plant	DQ 378	Lamiaceae	<i>Plectranthus monostachyus</i> (P. Beauv.) B.J.Pollard	Good luck		Bath	
Gabon	Intabi (Bb)	Whole plant		Lamiaceae	<i>Plectranthus occidentalis</i> B.J.P ollard	Used by women to prevent their men from abandoning them		Bath	
Benin	Gnamalogu (Ad)	Whole plant	DQ 722	Plumbaginaceae	<i>Plumbago zeylanica</i> L.	Ritual to find back lost things			Amulet
Gabon	Muvogi (Ma), aye (Fa)	Fruits	DQ 983	Anisophylleaceae	<i>Poga oleosa</i> Pierre	Protection against diseases caused by witchcraft	childcare, epilepsy	Oral ingestion	
Benin	Kpeseto (F), Muye muye (F)	Whole plant	DQ 128	Caryophyllaceae	<i>Polycarpon prostratum</i> (Forsk.) Ash. & Schweinf.	Protection against evil spirits		Bath	
Benin	Afero (Y), N'Kpatale (T)	Whole plant	DQ 53	Polygalaceae	<i>Polygala arenaria</i> Willd.	Protection against snake bites	women's health	Bath	
Benin	Dri (F)	Whole plant	DQ 338	Portulacaceae	<i>Portulaca grandiflora</i> Hook.	Attract love		Bath	
Benin	Afla (F)	Leaves	DQ 105	Portulacaceae	<i>Portulaca oleracea</i> L.	Protection against evil spirits		Oral ingestion	
Gabon	Tsamba (Mi), ouamanta (M)	Whole plant	DQ 1044	Portulacaceae	<i>Portulaca quadrifida</i> L.	Treatment of headaches of supernatural origin		Bath, oral ingestion	
Benin	Enhuma (Ad)	Whole plant	DQ 731	Portulacaceae	<i>Portulaca quadrifida</i> L.	Unspecified sorcery spells			Amulet
Benin	Agouégbé (F)	Leaves	DQ 270	Leguminosae	<i>Prosopis africana</i> (Guill. & Perr.) Taub.	Protection against evil spirits	childcare	Bath	
Benin	Kake (F)	Whole plant	DQ 403	Leguminosae	<i>Prosopis africana</i> (Guill. & Perr.) Taub.	Protection against evil spirits		Planted	
Benin	Tchanguigui (T), Aindorokpo (F)	Roots	DQ 487	Meliaceae	<i>Pseudocedrela kotschy</i> (Schweinf.) Harms	Treatment of stomach ailments caused by bewitchment		Oral ingestion	
Gabon	Nbagbge (Fa)	Wood		Myrtaceae	<i>Psidium guajava</i> L.	Ceremonial objects			Amulet
Gabon	Nziwale (Mk)	Leaves		Rubiaceae	<i>Psychotria latistipula</i> Benth.	Good luck		Bath	
Benin	Magbey vidéy (F)	Leaves	DQ 422	Rubiaceae	<i>Psychotria vogeliana</i> Benth.	Protective baths against bewitchment	childcare	Bath	

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								Direct	Indirect
Gabon	Guisofo (E)	Flower		Rubiaceae	<i>Psychothria ledermannii</i> (K. Krause) Figueiredo	Good luck		Bath	
Gabon	Eichenguegue (Mi)	Leaves		Dennstaedtiaceae	<i>Peridium aquilinum</i> (L.) Kuhn	Worn by men during Bwiti ceremonies		Skin rub	
Benin	Gbagbe (F)	Leaves	DQ 809	Leguminosae	<i>Pterocarpus erinaceus</i> Poir.	Spiritual purification for Fa oracle priests. Restricted species	stomachache	Bath	Incantation
Benin	Gbenhgi (T)	Whole plant		Leguminosae	<i>Pterocarpus santalinoides</i> DC.	Restricted species			Incantation
Gabon	Padauk (En, Fr)	Wood	DQ 1017	Leguminosae	<i>Pterocarpus soyauxii</i> Taub.	Ceremonial pigment		Skin rub	
Benin	Tiedagbokokwin (F)	Fruits	DQ 435	Amaranthaceae	<i>Pupalia lappacea</i> (L.) Juss.	Treatment of female infertility. Attract love	headache, childcare	Bath, oral ingestion	
Benin	Goduwe (F)	Whole plant	DQ 91	Amaranthaceae	<i>Pupalia lappacea</i> (L.) Juss.	Attract love	women's health	Bath	
Gabon	issombu	Bark	DQ 966,	Myristicaceae	<i>Pycnanthus angolensis</i> (Welw.) Warb.	Good luck	respiratory diseases	Bath	
Gabon	Musieguéri (Lu)	Wood	DQ 989	Simaroubaceae	<i>Quassia gabonensis</i> Pierre	Protection against evil spirits	aphrodisiac	Bath	
Benin	Dekwui, de (F)	Seeds	DQ 247	Arecaceae	<i>Raphia hookeri</i> G.Mann & H.Wendl.	Divination	childcare		Amulet
Benin	Asofeyeye (Y)	Leaves	DQ 148	Apocynaceae	<i>Rauwolfia vomitoria</i> Afzel.	Treatment of madness caused by spirit possession	post-partum hemorrhage	Oral ingestion	
Benin	Letin, Iewedo (F)	Roots	DQ 165	Apocynaceae	<i>Rauwolfia vomitoria</i> Afzel.	Treatment of madness caused by spirit possession	aphrodisiac	Oral ingestion	
Gabon	Tchodosodo (Mi)	Stems		Zingiberaceae	<i>Renealmia polypus</i> Gagnep.	Ceremonial objects			Amulet
Benin	Kpakplakan (F)	Wood	DQ 92	Icacinaceae	<i>Rhaphiostylis beninensis</i> (Hook.f. ex Planch.) Planch. ex Benth.	Protection for newborns	gastric disorders	Bath	
Benin	Kpatidehi (F)	Whole plant		Malvaceae	<i>Rhodognaphalon brevicuspe</i> (S. prague) Roberty	Restricted species			Incantation
Benin	Edigo (T)	Leaves	DQ 273	Euphorbiaceae	<i>Ricinodendron heudelotii</i> (Bail.) Heckel	Protection for newborns		Bath	
Benin	Feifefutu (T)	Whole plant	DQ 564	Euphorbiaceae	<i>Ricinus communis</i> L.	Planted in protection of ceremonial places	fever		Planted
Benin	Egido eta (T)	Bark	DQ 606	Capparidaceae	<i>Richiea capparoides</i> (Andrews) Britten	Treatment of headaches of supernatural origin		Bath	
Benin	Amedje (T)	Leaves	DQ 504	Connaraceae	<i>Rourea coccinea</i> (Schumacher & Thonn.) Benth.	Protective baths against spells	diarrhea	Bath	
Benin	Plante corail (Fr)	Whole plant	DQ 899	Plantaginaceae	<i>Russelia equisetiformis</i> Schldl. & Cham.	Protection against evil spirits			Planted
Gabon	Mupuga (Pu)	Whole plant		Rubiaceae	<i>Sabicea mildbraedii</i> Wernham	Resolve disputes			Amulet

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Hutchabu (F)	Seeds	DQ 675	Humiriaceae	<i>Sacoglottis gabonensis</i> (Baill.) Urb.	Protection against evil spirits	gastric disorders		Amulet
Benin	Zunkusi (F)	Seeds	DQ 577	Celastraceae	<i>Solacia erecta</i> (G. Don) Walp.	Treatment of malaria caused by bewitchment		Bath	
Benin	Kpayando, kpoingado (F)	Roots	DQ 488	Asparagaceae	<i>Sansevieria liberica</i> Gérôme & Labroy	Spiritual purification	malaria	Bath	
Benin	Kponja (F)	Whole plant	DQ 149	Asparagaceae	<i>Sansevieria liberica</i> Gérôme & Labroy	Protection against evil spirits. Spiritual purification	impotence	Bath	Planted
Gabon	Nkai (Tk)	Whole plant		Asparagaceae	<i>Sansevieria liberica</i> Gérôme & Labroy	Protection against evil spirits			Planted
Gabon	Eba (Fa)	Wood		Burseraceae	<i>Santiria trimera</i> (Oliv.) Aubrév.	Ceremonial objects			Amulet
Benin	Kudo, kodo (F)	Roots	DQ 427	Rubiaceae	<i>Sarcocephalus latifolius</i> (Sm.) E.A. Bruce	Treatment of malaria caused by bewitchment	women's health	Bath	
Gabon	Dikobekobe (Bb)	Wood		Malvaceae	<i>Scaphopetalum thomieri</i> De Wild. & T. Durand	Ceremonial objects			Amulet
Benin	Axonxu (F), Gumagan (F)	Fruits	DQ 881	Oleaceae	<i>Schrebera arborea</i> A. Chev.	Divination	childcare		Amulet
Benin	Amakuku, aman kwikwi (F)	Whole plant	DQ 128	Solanaceae	<i>Schwenkia americana</i> Kunth	Protection against sorcerers	women's health	Bath	
Gabon	Fafolo (Fa)	Whole plant		Cyperaceae	<i>Scleria boivinii</i> Steud.	Treatment for bed-wetting in children	heart pain	Skin rub	
Benin	Vivima te, vivimanteton (F)	Whole plant	DQ 372	Plantaginaceae	<i>Scoparia dulcis</i> L.	Good luck	childcare	Bath	
Gabon	Osimiale (Fa)	Whole plant	DQ 1045	Plantaginaceae	<i>Scoparia dulcis</i> L.	Attain the favor of influential people. Good luck	respiratory diseases	Bath	
Gabon	L'ai indigine (Fr), munyenbi (M).	Bark	DQ 1107, DQ 1019	Leguminosae	<i>Scorodophloeus zenkeri</i> Harms	Exorcism		Oral ingestion	
Gabon	Pekintchori (Bp), njovi yango (P)	Whole plant		Apocynaceae	<i>Secamone afzelii</i> (Schult.) K. Schum	Protection against evil spirits. Good luck		Bath	
Benin	Bwelé (F), Ngat (T), Kpatale (Td)	Whole plant	DQ 112	Polygalaceae	<i>Securidaca longipedunculata</i> F. resen.	Attain the favor of influential people	women's health	Oral ingestion	
Gabon	Alroyhroy (Om), Magoyui (Ma)	Whole plant	DQ 1016	Selaginellaceae	<i>Selaginella myosurus</i> Alston	Good luck. Ceremonial object	women's health	Bath, skin rub	
Benin	Botiowo (T)	Whole plant	DQ 734	Leguminosae	<i>Senna alata</i> (L.) Roxb.	Planted in protection against sorcerers			Planted
Benin	Kenkiliba (F)	Whole plant	DQ 319	Leguminosae	<i>Senna occidentalis</i> (L.) Link	Treatment to complications during delivery	malaria	Skin rub	
Benin	Ayaxenu (F)	Leaves	DQ 725	Leguminosae	<i>Senna occidentalis</i> (L.) Link	Treatment for tobacco addiction	malaria	Smoked	Amulet
Benin	Cassia, zangla (F)	Leaves	DQ 406	Leguminosae	<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Treatment of complications during delivery, protection for	malaria	Skin rub, oral ingestion	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
						infants against diseases			
Benin	Kenu (F)	Whole plant	DQ 913	Leguminosae	<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Restricted species			Incantation
Benin	Arandjulo (T)	Leaves	DQ 601	Leguminosae	<i>Senna sophora</i> (L.) Roxb.	Treatment for tobacco addiction		Smoked	
Benin	Aghomankwin (F)	Seeds	DQ 324	Pedaliaceae	<i>Sesamum indicum</i> L.	Ceremonial offerings	ease birth	Oral ingestion	
Benin	Adoma (F)	Whole plant	DQ 788	Malvaceae	<i>Sida acuta</i> Burm.f.	Protection when trying to scape justice. Spiritual purification		Bath	
Benin	Lelikomi (F)	Whole plant	DQ 56	Malvaceae	<i>Sida javensis</i> Cav.	Attract love		Bath	
Benin	Afele (T)	Stems	DQ 287	Malvaceae	<i>Sida spithosa</i> L.	Protection against fever		Bath	Amulet
Benin	Gomfa (T)	Roots	DQ 661	Smilacaceae	<i>Smilax anceps</i> Willd.	Treatment of Sakpata-related diseases	women's health	Bath	
Benin	Leku leku (F), Enkana magbo (Y)	Whole plant	DQ 68	Smilacaceae	<i>Smilax anceps</i> Willd.	Attract love		Bath	
Gabon	Boudiambou (Bp)	Whole plant		Compositae	<i>Solanecio angulatus</i> (Vahl) C.Jeffrey	Exorcism		Skin rub	
Benin	Imoro (T)	Fruits		Solanaceae	<i>Solanum americanum</i> Mill.	Treatment to increase appetite in infants	appetite	Bath	
Gabon	Nzangou (Nz)	Leaves		Solanaceae	<i>Solanum americanum</i> Mill.	Exorcism		Skin rub	
Gabon	Pivi (Mi)	Fruits		Solanaceae	<i>Solanum incanum</i> L.	Ceremonial offerings		Oral ingestion	
Gabon	Dongio (Fa)	Fruits		Solanaceae	<i>Solanum rudepannum</i> Dunal	Spiritual purification		Bath	
Benin	Bamomi (Y)	Whole plant	DQ 582	Solanaceae	<i>Solanum rudepannum</i> Dunal	Protection against sorcerers			Planted
Gabon	Mineka (P)	Fruits	DQ 1067	Solanaceae	<i>Solanum anguivi</i> Lam.	Exorcism	women's health		
Benin	Nkoaudi (T)	Leaves	DQ 603	Solanaceae	<i>Solanum dasyphyllum</i> Schumacher & Thonn.	Protection against bullets and weapons	teething	Bath, oral ingestion	
Benin	Kpokpo (N), Lokoman (F)	Leaves	DQ 218	Poaceae	<i>Sorghum bicolor</i> L.	Treatment of malaria caused by bewitchment. Restricted species	anaemia	Bath	Incantation
Benin	Boba (T)	Seeds	DQ 768	Poaceae	<i>Sorghum bicolor</i> L.	Ceremonial offerings. Restricted species		Oral ingestion	Incantation
Benin	Adadegoto (F)	Bark	DQ 425	Bignoniaceae	<i>Spathodea campanulata</i> P.Beauv.	Treatment of STDs believed to be caused by witchcraft or envy	female infertility	Oral ingestion	

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								Direct	Indirect
Benin	Kpedo (F), Akerigbo (Y)	Roots	DQ 542	Menispermaceae	<i>Sphenocentrum jollyanum</i> Pierre	Protection against evil spirits	aphrodisiac	Bath, oral ingestion	
Benin	Adorokpo (F)	Whole plant	DQ 28	Menispermaceae	<i>Sphenocentrum jollyanum</i> Pierre	Spiritual purification		Bath	
Benin	Alikongoto (F), Yeyatche (T)	Bark	DQ 152	Anacardiaceae	<i>Spondias mombin</i> L.	Protection against weapons	women's health	Oral ingestion	
Benin	Ekwigbe (Ad)	Whole plant		Poaceae	<i>Sporobolus pyramidalis</i> P.Beauv.	Restricted species			Incantation
Benin	Alotrohe (F)	Whole plant	DQ 142	Verbenaceae	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	Attain the favor of influential people	women's health	Skin rub	
Benin	Nyimodu (F)	Whole plant	DQ 199	Verbenaceae	<i>Stachytarpheta indica</i> (L.) Vahl	Good luck		Bath, skin rub	
Gabon	Ogobe (Mi)	Bark		Myristicaceae	<i>Staudtia kamerunensis</i> var. <i>gabonensis</i> (Warb.) Foulloy	Protection of hunters against danger		Bath	
Gabon	Nzombo (Nz)	Leaves		Acanthaceae	<i>Stenandrium guineense</i> (Nees) Vollesen	Spiritual purification		Bath	
Benin	Ola-oko (T), Housouna (F)	Leaves	DQ 282	Malvaceae	<i>Sterculia setigera</i> Delile	Protection against evil spirits. Restricted species	cough	Bath	Incantation
Benin	Adjadin (T)	Leaves	DQ 562	Bignoniaceae	<i>Stereospermum kunthianum</i> Ch am.	Protective drink against bewitchment	gastric disorders	Oral ingestion	
Gabon	bongi (P)	Inflorescen ce	AMT 1355	Poaceae	<i>Streptogyna crinita</i> P.Beauv	Spiritual purification		Bath	
Gabon	Monai (Bb)	Latex		Apocynaceae	<i>Strophanthus gratus</i> (Wall. & Hook.) Baill.	Restricted species	arrow poison		
Benin	Logbo (Ad), Adikoun, Tchakpa (F)	Roots	DQ 215	Apocynaceae	<i>Strophanthus hispidus</i> DC.	Protection against enemies and sorcerers	vermifuge	Bath, oral ingestion	
Benin	Tchae (T)	Leaves	DQ 538	Apocynaceae	<i>Strophanthus sarmentosus</i> DC.	Spiritual purification for Fa oracle priests	gastric disorders	Bath	
Gabon	dirembi (P)	Fruits	DQ 1110	Loganiaceae	<i>Strychnos aculeata</i> Soler.	Ceremonial stimulant		Oral ingestion	
Gabon	Mweya (Mi)	Bark		Loganiaceae	<i>Strychnos icaja</i> Baill.	Used by sorcerers to kill other people		Oral ingestion	
Benin	Djatibololi (P)	Bark	DQ 851	Loganiaceae	<i>Strychnos innocua</i> Delile	Spiritual purification		Bath	
Benin	Agogo (Id)	Bark	DQ 451	Loganiaceae	<i>Strychnos spinosa</i> Lam.	Spiritual purification		Bath	
Gabon	dirembi (P)	Fruits	DQ 1109	Loganiaceae	<i>Strychnos icaja</i> Baill.	Ceremonial stimulant		Oral ingestion	
Benin	Aduma, aminglon (F)	Whole plant	DQ 373	Leguminosae	<i>Sylosanthes erecta</i> P.Beauv.	Spiritual purification	childcare	Bath	
Benin	Kpatado (F)	Leaves	DQ 114	Sapotaceae	<i>Synsepalum dulcificum</i> (Schumacher & Thonn.) Daniell	Attract wealth	backache	Bath	

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								Direct	Indirect
Benin	Ainken, atikenbodota (F)	Fruits	AMT 116	Myrtaceae	<i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry	Protection for newborns	women's health	Oral ingestion	
Benin	Miammi (G)	Whole plant	DQ 449	Myrtaceae	<i>Syzygium guineense</i> (Willd.) DC.	Spiritual purification	childcare	Bath	
Gabon	Irugu (Bp)	Leaves	DQ 1612	Apocynaceae	<i>Tabernaemontana brachyantha</i> a Stapf	Protection against insects sent by sorcerers		Bath	
Gabon	Graines de bois sacré (Fr)	Fruits	DQ 1088	Apocynaceae	<i>Tabernanthe iboga</i> Baill.	Ceremonial stimulant		Oral ingestion	
Gabon	Iboga (Fa, N), Bois sacré (Fr)	Roots	DQ 974	Apocynaceae	<i>Tabernanthe iboga</i> Baill.	Ceremonial stimulant		Oral ingestion	
Benin	Tchare (T)	Leaves	DQ 696	Dioscoreaceae	<i>Tacca leontopetaloides</i> (L.) Kuntze	Treatment of Sakpata-related diseases		Bath	
Benin	Adodoako (T)	Whole plant	DQ 295	Talinaceae	<i>Talinum fruticosum</i> (L.) Juss.	Prevention of mishaps. Spiritual purification		Bath	Planted
Benin	Iroko (G)	Roots	DQ 780	Cucurbitaceae	<i>Telfairia occidentalis</i> Hook.f.	Spiritual purification		Bath	
Benin	Agoma (F)	Leaves	DQ 74	Leguminosae	<i>Tephrosia elegans</i> Schum.	Protective baths against witchcraft		Bath	
Gabon	mbraha (N), Ofé (Fa), tsamu (M)	Fruits	DQ 1123	Leguminosae	<i>Tephrosia vogelii</i> Hook.f.	Good luck. Ceremonial stimulant		Bath, oral ingestion	
Benin	Ndimu (N)	Roots	DQ 813	Combretaceae	<i>Terminalia avicennioides</i> Guill. & Perr.	Protection against evil spirits		Bath	
Benin	N'di (T)	Roots	DQ 547	Combretaceae	<i>Terminalia macroptera</i> Guill. & Perr.	Treatment of Sakpata-related diseases	toothache	Bath, oral ingestion	
Benin	Azin (F)	Whole plant	DQ 592	Combretaceae	<i>Terminalia neotaliala</i> Capuron	Spiritual purification		Bath	
Benin	Bero (De)	Bark	DQ 591	Combretaceae	<i>Terminalia superba</i> Engl. & Diels	Treatment of female infertility		Bath, oral ingestion	
Gabon	Muru (Ak)	Sap		Dilliniaceae	<i>Tetracera alnifolia</i> Willd.	Treatment of poisoning caused by witchcraft in children		Oral ingestion	
Benin	Lenja, kpatado (F)	Fruits	DQ 116	Leguminosae	<i>Tetrapleura tetraptera</i> (Schum. & Thonn.) Taub.	Treatment of insomnia caused by evil spirits		Oral ingestion	
Gabon	ya ramponu (N), Osaga (Mi)	Fruits	DQ 954	Leguminosae	<i>Tetrapleura tetraptera</i> (Schum & Thonn.) Taub.	Protection against insect plagues and foraging animals in cultivated fields. Good luck		Bath	
Gabon	tsele (N)	Bark	DQ 957	Leguminosae	<i>Tetrapleura tetraptera</i> (Schum & Thonn.) Taub.	Good luck		Bath	
Benin	Cacotier (Fr)	Leaves	DQ 161	Malvaceae	<i>Theobroma cacao</i> L.	Treatment for the enlargement of male genitals	aphrodisiac	Skin rub	
Benin	Ochokumunku (T)	Roots	DQ 300	Balanophoraceae	<i>Thonningia sanguinea</i> Vahl	Treatment of insomnia caused by evil spirits	malaria	Oral ingestion	
Benin	Guidofo (T)	Whole plant	DQ 568	Compositae	<i>Tithonia diversifolia</i> (Hemsl.) A.Gray	Treatment of malaria caused by bewitchment		Bath	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Azoma (F)	Whole plant	DQ 175	Euphorbiaceae	<i>Tragia senegalensis</i> Müll.Arg.	Protection against enemies. Good luck		Bath	
Gabon	Munyedi (Bp)	Wood		Malvaceae	<i>Treculia africana</i> Decne. ex Trécul	Ceremonial objects			Amulet
Gabon	Edzip (Fa)	Bark		Malvaceae	<i>Treculia erinacea</i> A. Chev.	Treatment of female infertility		Bath	
Benin	Akokpla (F)	Whole plant	DQ 96	Aizoaceae	<i>Trianthema portulacastrum</i> L.	Spiritual purification		Bath	
Benin	Gando (F)	Whole plant	DQ 121	Zygophyllaceae	<i>Tribulus terrestris</i> L.	Treatment of STDs believed to be caused by witchcraft or envy		Oral ingestion	
Benin	Itchiku (T)	Roots	DQ 563	Meliaceae	<i>Trichilia emetica</i> Vahl	Protection against snake bites		Skin rub	
Gabon	Revuto (Sa)	Bark		Anacardiaceae	<i>Trichoscypha acuminata</i> Engl.	Exorcism		Bath	
Benin	Olombingo (T)	Roots	DQ 299	Menispermaceae	<i>Triclisia subcordata</i> Oliv.	Treatment of stomach ailments caused by bewitchment		Oral ingestion	
Gabon	Masses (Ma)	Whole plant		Melastomataceae	<i>Tristemma hirtum</i> P. Beauv.	Treatment of female infertility		Bath	
Benin	Adorokpo (F)	Roots	DQ 542	Meliaceae	<i>Turraea heterophylla</i> Sm.	Treatment believed to enlarge the penis of small boys	aphrodisiac	Skin rub	
Benin	Tegbeusu (F)	Leaves	DQ 147	Apocynaceae	<i>Tylophora cameroonica</i> N.E.Br.	Protective plant for hunters. Protection for pregnant women who want to avoid cesarean delivery	women's health	Oral ingestion	
Gabon	Aborganbi (Fa)	Whole plant		Apocynaceae	<i>Tylophora sylvatica</i> Deene.	Protection against evil spirits		Bath	
Benin	Asinsinman (F), Gbinda (T)	Whole plant	DQ 126	Leguminosae	<i>Uvaria picta</i> (Jacq.) DC.	Protective against evil spirits	childcare	Bath	
Gabon	Poonga (Bb)	Fruits		Malvaceae	<i>Urena lobata</i> L.	Protection against evil spirits		Bath	
Benin	Ahawu (F)	Whole plant	DQ 829	Lentibulariaceae	<i>Utricularia arenaria</i> A.DC.	Spiritual purification		Bath	
Benin	Erunjuit (Y)	Roots	DQ 277	Annonaceae	<i>Uvaria chamae</i> P.Beauv.	Treatment of anemia in children	women's health	Bath, oral ingestion	
Benin	Arindijo (T)	Bark	DQ 560	Annonaceae	<i>Uvaria chamae</i> P.Beauv.	Treatment of anemia in children	hernia	Bath, oral ingestion	
Gabon	Onduma (Mi)	Roots		Orchidaceae	<i>Vanilla africana</i> Lindl.	Fabrication of ceremonial harps			Amulet
Benin	Orungo (Y)	Whole plant	DQ 818	Compositae	<i>Vernonia ambigua</i> Kotschy & Peyr.	Spiritual purification		Bath	
Gabon	Noandjo (Fa)	Whole plant		Compositae	<i>Vernonia amygdalina</i> Delile	Spiritual purification	digestive	Bath	

Country	Vernacular name (Language)	Part used	Specimen code	Family	Genus and species	Ritual use	Medicinal use	Contact with human body	
								Direct	Indirect
Benin	Aloma (Ad)	Leaves	DQ 323	Compositae	<i>Vernonia amygdalina</i> Delile	Treatment of Sakpata-related diseases		Bath	
Benin	Ekpa (T)	Leaves	DQ 391	Leguminosae	<i>Vigna subterranea</i> (L.) Verde.	Protection for men		Bath	
Benin	Cowpea (En)	Seeds	DQ 951	Leguminosae	<i>Vigna unguiculata</i> (L.) Walp.	Food taboo			Incantation
Benin	Emine (T)	Whole plant	DQ 509	Sapotaceae	<i>Viellaria paradoxa</i> C.F. Gaertn.	Protection against evil spirits		Bath	
Benin	Wugo (F)	Roots	DQ 509	Sapotaceae	<i>Viellaria paradoxa</i> C.F. Gaertn.	Protection against snake bites		Bath	
Benin	Hounsukokwedo (F)	Seeds	DQ 821	Sapotaceae	<i>Viellaria paradoxa</i> C.F. Gaertn.	Ceremonial offerings. Protection against evil spirits		Oral ingestion	
Benin	Ori gogwe (Id)	Leaves	DQ 452	Lamiaceae	<i>Vitex chrysocarpa</i> Planch.	Spiritual purification		Bath	
Benin	Fonkpa (F), Koto (F)	Bark	DQ 558	Lamiaceae	<i>Vitex doniana</i> Sweet	Spiritual purification		Bath	
Gabon	Dibongu (Bp)	Wood	DQ 1688	Lamiaceae	<i>Vitex doniana</i> Sweet	Ceremonial objects			Amulet
Gabon	Gepogbe (Mi)	Wood	DQ 1820	Lamiaceae	<i>Vitex madiensis</i> Oliv. subsp. <i>madiensis</i>	Ceremonial objects			Amulet
Benin	Le (F)	Whole plant		Apocynaceae	<i>Voacanga africana</i> Stapf ex Scott-Elliott	Restricted species			Incantation
Gabon	Nichou (Mk)	Leaves	DQ 1406	Apocynaceae	<i>Voacanga bracteata</i> Stapf	Attract love		Bath	
Gabon	Milumemugan (P), kala (M)	Fruits	DQ 1003	Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	Protection against evil spirits	digestive, spice.	Bath	
Benin	Kpechereku (F), Eru (Y), Eru (Na)	Fruits	DQ 233	Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	Treatment of wounds of supernatural origin	women's health	Oral ingestion	
Gabon	Okala (Fa), Ogha (Bb)	Bark		Annonaceae	<i>Xylopia aethiopica</i> (Dunal) A.Rich.	Construction of Bwiti temples. Protection against evil spirits		Burning	Amulet
Benin	Ekun madame (F)	Leaves	DQ 629	Annonaceae	<i>Xylopia longipetala</i> De Wild. & T. Durand	Spiritual purification		Bath	
Gabon	Muranga (Lu)	Fruits		Annonaceae	<i>Xylopia staudtii</i> Engl. & Diels	Exorcism		Bath	
Gabon	Olom (Fa)	Wood		Rutaceae	<i>Zanthoxylum heitzii</i> (Aubrév. & Pellegr.) P. G. Waterman	Protection against sorcerers	STDs	Bath	
Benin	Xe, Xema (F)	Leaves	DQ 947	Rutaceae	<i>Zanthoxylum zanthoxiloides</i> (Lam.) Zepern. & Timler	Protection against diseases caused by witchcraft	vermifuge	Bath	
Benin	Xetin (F)	Wood	DQ 182	Rutaceae	<i>Zanthoxylum zanthoxiloides</i> (Lam.) Zepern. & Timler	Ceremonial object			Amulet
Benin	Miechu (Y)	Leaves	DQ 79	Leguminosae	<i>Zapoteca portoricensis</i> (Jacq.) H.M. Hern.	Protective baths against witchcraft		Bath	
Benin	Maize (En), Maïs (Fr)	Seeds	DQ 395	Poaceae	<i>Zea mays</i> L.	Ceremonial offering for twins. Restricted species	aphrodisiac	Oral ingestion	Incantation

Chapter Six

General discussion and conclusions

“If we knew what it was we were doing, it would not be called research, would it?”

Albert Einstein

INTRODUCTION

The overall aim of thesis was to advance the understanding of the different dimensions of plant use in the context of traditional religions in two western African countries: first, by documenting the use of plants by adepts of Vodoun in Benin and Bwiti in Gabon and; second, by exploring the associated knowledge that sustains these practices. Its purpose was to contribute to an improved plant resource management and, ultimately, the development of culturally appropriate interventions aimed at the conservation of useful plant species and their ecosystems, as well as the improvement of human health in settings similar to those of our countries of study.

Departing from the disciplinary perspective of ethnobotany, this work included theories and quantitative and qualitative methods of data collection and analysis drawn from botany, anthropology, ethnology, ecology, and economics. In summary, we found that ritual plants were the largest use category for which vendors catered in the markets of Benin (Chapter Two). Although not included as a chapter in this thesis, we obtained similar results in Gabon (Townsend et al., 2014). We also found evidence that restrictions (such as taboos and sacrifices) were an indication of resource scarcity of ritual plants (Chapter Three). These results were used to identify species that will potentially suffer from overharvesting in West Africa (Van Andel et al., 2015). Moreover, we learnt that plants played a central role in the religious traditions of Benin and Gabon, both for adepts and non-adepts of Vodoun and Bwiti (Chapter Four). Finally, we discovered that an important proportion of the ritual applications of plants used in our countries of study suggest a pharmacological effect on their users, as opposed to previous assumptions that their effectiveness was a matter of belief (Chapter Five).

In this chapter, I will discuss our work's key findings and some of its theoretical and methodological issues, while placing them in a broader context.

EVALUATION OF RESEARCH FINDINGS

In the chapters of this thesis, we discussed those findings that responded to the individual chapters' questions and hypotheses. In this section, I will address the questions identified in the General Introduction (Chapter One) of this work and which stemmed from the overall aim of this thesis.

1. What is the role of plants in the religious traditions of Benin and Gabon?

Previous work by Herskovits (1938), Verger (1997), Raponda-Walker and Sillans (1961 and 1962), and Tessmann (1913) highlighted the anthropological importance of plants in the traditional religions of Benin and Gabon. Our work corroborates this claim by providing evidence of the cultural importance of plants in this realm from an insider's perspective (Chapter Four). At the same time, it points to a tighter intertwining of plants and other elements of traditional religions such as human health (Chapter Five) and natural resource management (Chapter Three). These will be discussed in more detail.

2. What makes plants ritual?

Previous studies on human-nature relations have categorised non-human and non-physical agency as 'religious'. Without a conceptual framework behind this notion of religion and the plethora of terms that belong to its semantic field (among them, ritual), the term itself has remained elusive. We have made a point of including emic perspectives in our analyses (Chapters Three, Four, and Five). However, not unlike those previous studies, we have continued to use the notions that are known to us, researchers educated in the West, to characterise supernatural agency in our countries of study. The results of our cultural domain analysis (Chapter Four) confirmed what we, based on our bibliographical sources, had previously assumed about the perceptions of Beninese and Gabonese people on religion: that the term reflects notions based on Western thought and values. Therefore, by asking ourselves what makes plants ritual we are addressing a category that derives from Western experience and speech: ritual as the practical matrix of religious (Rappaport, 1999). To explain what makes plants ritual from an emic perspective would require that our informants first admit that what they do is, indeed, performing rituals, and then that consensus is reached about the actual meaning of the word. Hence, the more suitable question to ask would be: What makes us, Western scholars, believe that the plants used by Beninese and Gabonese people are ritual?

In Chapter One, rituals were defined as ceremonial activities that took place in the context of Vodoun in Benin and Bwiti in Gabon. This framework can doubtless be scrutinized by relegating our definition of ritual to the solemn act of sacred observance suggested by 'ceremonial'. This would conceptually exclude activities that did not take place in a formal setting. Nonetheless, there were some immediately dependable data collection criteria that prevented the curtailment of our results, namely, our focus on traditional healers whose method of diagnosis involved consultation with supernatural agents. Following those guidelines, we documented plants used in and outside of ceremonies, plants used not only as medicine, but also as amulets, food, offerings, insecticides, living fences (Chapter Five), construction material, and musical instruments (Chapter Four). Ritual plants, then, are not so special, or are they? Beyond any hermeneutical interpretation of ritual, our results show that the plants Gabonese and Beninese people use in, what we have categorised as rituals, also serve the same purposes as non-ritual plants (i.e. medicine, food, living fences, etc.). Their applications are a way to transmit medicinal knowledge (Chapter Five), to guarantee their conservation (for example, by taboos or as sacred forests) (Chapter Three), and to express traditional ecological knowledge. An example of the latter is the use of the wart fern, *Phymatosorus*

scolopendria, which is employed in Benin in protective baths against Sakpata diseases. People only use those individuals that are found growing on palms, hence its name in the Fon language, *Degoma*, the leaf that grows on *De* (palm). Because of their epiphytic habit, these fern plants are said to be immune to the powers of Sakpata, who, apart from being the god of smallpox, is also the god of earth. The sori of the fern resemble the pustules caused by Sakpata diseases on the skin as well.

3. What are the implications of ritual plant use for the conservation of nature?

Assembling the results obtained in Chapters Two and Three, it is possible to advance some assumptions about the implications of ritual plant use for nature conservation in Benin. By contrasting the number of restricted and protected species, we found an indication of the intent of traditional healers to protect the species that they perceived as scarce (Chapter Three). Our work is not the only piece of evidence pointing to how the practices that surround ritual plant use can potentially contribute to the conservation of nature. For Benin, there is a substantial body of research documenting the contribution of traditional religions to the conservation of plant (Ouinavi et al., 2005) and animal species (Sinsin et al., 2002), forests (Ceperley et al., 2010; Sokpon and Agbo, 1999), aquatic ecosystems (Anyiam, 1999), and even the varietal diversity of food crops (Zannou et al., 2007). Moreover, there is evidence of the negative effect that follows the abandonment of traditional religions for Western ones on the conservation of sacred groves (Juhé-Beaulaton, 2006; Koutchika et al., 2013). While it is irrefutable that the commercialisation of some medicinal plant species poses sustainability issues in the country (van Andel et al., 2015), results must be interpreted with caution. In spite of ritual plants being the largest use category in the markets of Benin (Chapter Two), we cannot ascertain the exact impact of their trade, as many of these plants have several non-ritual uses, such as timber, and the proportion of extracted volumes that corresponds to ritual uses is not known.

Although the case of Gabon resembles that of Benin in some aspects, there is very little proof supporting an assumption as above. In spite of the evidence that taboos and sacrifices respond to a perceived scarcity of ritual plants, this link is not substantiated by the active protection of restricted species by traditional healers and adepts (Chapter Three). Moreover, ritual plants are the most largely represented use category in the country's herbal medicine markets (Townes et al., 2014). However, just as in Benin, we do not know the extent to which ritual purposes drive the market-oriented harvest of plants. This is of particular interest for *Tabernanthe iboga*, whose harvest from the wild has become an issue of concern for international nature conservation organisations operating in the country (R. Starkey and R. J. Parnell, personal communication). Although *T. iboga* is the cultural keystone species of Bwiti (Chapter Four), volumes larger than the ones found at the local markets are illegally exported to North America and Europe for recreational uses and the alternative treatment of drug addiction (Mahop et al., 2004; Shaw and Lavan, 2012).

4. What is the ethnopharmacological relevance of ritual plant use?

The ethnopharmacological relevance of ritual plants has commonly been discarded on the assumption that their effectiveness is caused by a placebo effect. The theoretical framework of ethnopharmacology notwithstanding, plant use in ethnomedicine studies have typically focused on the chemical properties of herbal medicine (Reyes-García, 2010). This might help understand why ritual plants have been discredited of any ethnopharmacological effect in the past. In this study, we have learnt that people in Benin and Gabon prevent and treat diseases that are attributed a supernatural cause in the same manner pathogens are recognised in biomedicine (Chapter Five). Moreover, from the data we obtained we found that plant use in a traditional religious context was a vehicle for the transmission of traditional medicinal knowledge (Chapter Five). This was evidenced by: (1) people's explanations of the causes and symptoms of the diseases they treated with what we, the outsiders, considered ritual plants and; (2) the frequency with which those plants doubled as medicinal. Moreover, we learnt that our informants acknowledged taboos as practices that had permitted their ancestors to exist in equilibrium with their entourage and that disobeying these may be a cause of illness (Chapter Three). Similar to the results of Begossi et al. (2004), the association between breaking a taboo and the causes of disease acknowledged by our informants may be another indication that ritual plants have a pharmacological effect on their users. Thus, we can speak of ritual plants as plants that have ethnopharmacological relevance comparable with explicitly medicinal plants.

5. What is the role of religious traditions in the cultural and social environments of Benin and Gabon?

The role of religious traditions in the social environments of Benin and Gabon is manifold. The empirical findings provided in Chapter Two and those published by Towns et al. (2014) provide the evidence to affirm that ritual plants are the backbone of the medicinal plant trade in Benin and Gabon. In Benin, particularly, the work of Djagoun et al., (2013) corroborates the economic relevance of religious traditions beyond the herbal medicine market: wildlife is harvested and sold in substantial quantities for ritual purposes. This adds to the important role that these traditions play in the conservation of nature discussed earlier in this chapter. Moreover, beyond the potentially beneficial or detrimental influence they can have on the management of human health in Benin and Gabon, religious traditions reflect local health concerns (Chapter Five) and neglected diseases (Vossen et al., 2014).

Further, ritual practices in Benin and Gabon highlight, not only historical events related to past diseases (Chapter Five), but other historical milestones that shaped the local or ethnic identities in these two countries. At the ethnic level, for example, the worshiping of *Milicia excelsa* represents not only a reservoir of many traditional values (Ouinsavi et al. 2005), but it also embodies the lineage of tribes that, via Togo, migrated from Ghana to present-day Benin (Juhé-Beaulaton and Roussel, 2003). In this regard, historical exchanges are also reflected in the manner non-indigenous flora and diseases have been adapted to the local pharmacopoeia. In Benin, for example, Neotropical plants have reached an important status not only in the treatment of endemic health concerns (e.g.

Lantana camara, which is used in an incantation to prevent the death of an ill child), but also non-endemic diseases (e.g. *Argemone mexicana*, which is used in the treatment of syphilis – amongst other sexually transmitted diseases). The fact that Gabon has proportionally fewer introduced species is also reflected in its non-indigenous medicinal flora. Nonetheless, plants such as *Eleutherine bulbosa* (indigenous to Central and South America) are kept around homesteads in protection against lightning.

As it appears, there is more to religious traditions than the enactment of medicinal and ecological knowledge through rituals. In fact, the evidence above points to a more complex and dynamic social and cultural system. This, I shall discuss in the following section.

REFLECTIONS ON THE THEORETICAL FRAMEWORK

I will start this section by allowing myself the boldness of disagreeing with Einstein, and say that research (in my opinion, at least) should involve a minimum degree of awareness of what one is doing. Nonetheless, I have included the quote at the beginning of this chapter, not because I wanted to publically challenge this view, but because it epitomises my experience in formulating, conducting, analysing, and publishing research on religion. As evidenced by the discussion above, combining emic and etic perspectives to study the use and importance of ritual plants in our countries of study has been an intellectual exercise requiring constant reflection. I would like to illustrate how this work has taken shape, as a result not only of reflecting, but of inflecting the conceptual framework of its central working term: religion. I will end this section with a closer inspection of one of the underlying assumptions that allowed for comparisons between Benin and Gabon, namely, floristic richness.

Naming the beast (or framing research in religion and supernatural agency)

As I started formulating this research, I approached religion from a viewpoint that was primarily based on two aspects. The first one was my own notion of the term, which was determined by my personal experiences in life. These experiences started during my childhood and teenage years growing up in Mexico in a family at times devoted and, at times observant of Catholicism. Mexico is a country where Catholicism has been syncretised with several aspects of different pre-Hispanic cosmovisions. Religion in Mexico is not only alive, but has permeated many of the customs that make up the country's *mestizo* identity: from our culinary traditions to our daily speech. These contrasts are exemplified by the *pan de muerto* we eat to celebrate our Day of the Dead, and *camarones a la diablo* for Easter; or *Ojalá* – a lexical transformation of the Arabic *Inshallah*, God willing, to Spanish - and the notion of *el Chamuco* – a term of possible Nahuatl origin (Vera, 2014) used in our frequent reference to the devil. Adding to this, my notion of religion has been shaped by the many years I have lived in Europe exposed to the patchwork of religiosity and secularity that makes the continent (Halman and Draulans, 2006) and, particularly, the Netherlands. Further, my exposure to Buddhism and the *Phi* cult as a university exchange student in Thailand, Islam while carrying out research in Yemen, and a handful of Protestant churches while working for a non-governmental organization in Liberia.

The second aspect was based on the body of literature, discussed in Chapter One, that I started to review for my research proposal, that dealt with the intersection between human, non-human and non-physical agency in natural resource management. Although the literature did not provide definitions for the terminology used (e.g. ‘sacred’, ‘ritual’, ‘magic’, etc.), I knew what the authors were referring to. At that point, I was yet to come across Bowie’s observation on the manner in which most things religious have been treated in anthropology, the “I-know-it-when-I-see-it” line of argument (Bowie, 2008), which we have discussed in Chapter Four. It did not take long after having written my proposal that I found myself in the field, documenting forms of plant use I had previously encountered while living in other countries. In Benin, people wrapped the trunks of *Iroko* trees in fabrics, as a mark of sacredness, just as people in Thailand tied brocades around their *Nang Mai* trees (*Hopea odorata*, *Musa* spp., *Ficus* spp.). They wore plant-based amulets, just like people in Mexico used *ojo de venado* (amulets made from the seeds of *Mucuna pruriens*) to protect themselves against enemies and envy. They brushed plants against their bodies in order to chase evil spirits away, the same way people did with the branches of the *pirul* tree (*Schinus molle*), also in Mexico. People also managed their plant resources (particularly, cultivated crops used as offerings), in a similar fashion as people in Yemen followed precepts stipulated in the Holly Quran. There it was, ‘religion’. I knew it, and I was seeing it.

Had I stuck to only what I knew, I would have probably discriminated against a substantial part of the information people shared with me. More often than not, my informants would indicate uses for plants that, from my point of view, did not fit the category I was interested in. For example, right after showing me a plant used for, say, the elaboration of amulets, an informant would explain how a plant growing nearby was used for treating cough. Taking notes and pressing plants under the scorching sun for hours on end, I was often tempted to dismiss uses for plants that were not categorically ‘ritual’. However, I had to be accountable for my theoretical framework: I was looking for patterns of plant use in Benin and Gabon that were influenced by supernatural agents, which meant that I had to record the plants used by healers whose method of diagnosis involved consultation with the spirits and ancestors. Besides, I thought, “documenting all those useful, non-ritual plants can never hurt - somebody else can use this information”. In the end, this not only prevented a potential collection bias, but served to substantiate an important finding of this work: that ritual plants have ethnopharmacological relevance. But that I would only know later, after going through, and making sense of the data I had collected.

Right from the onset, one of the objectives of this study was to include emic perspectives in our analyses (it is not for nothing that an entire chapter of this thesis was devoted to understanding Bwiti and Vodoun from the perspective of local people in Gabon and Benin). Although the results of our Cultural Domain Analysis seemed very straightforward, articulating how Beninese and Gabonese people perceived religion and how they perceived *their own* religion proved a very challenging exercise. Our assumptions and findings formed a syllogism of sorts: Religion is, by definition, the worshipping of gods and spirits. In Bwiti and Vodoun, people worship gods and spirits. Therefore, Bwiti and Vodoun are religions. People in Benin and Gabon appear to understand religion the way we do in the West. People in Benin and Gabon do not appear to regard *their own*

religion the same way we see it. Therefore, Bwiti and Vodoun should receive a different categorical name to account for this difference. The name should be one that can be understood by both Western and non-Western audiences. Since religion is a term understood by anyone who speaks the English language, then it is a valid proxy to categorise Vodoun and Bwiti. However, from an emic perspective, Vodoun and Bwiti are not seen as religions. Another term should be used, but it must be one both Western and non-Western audiences understand. Religion is a good proxy. But Beninese and Gabonese people do not perceive their own religion the same way we do. *Ad infinitum!* Technically speaking, I was in a hermeneutic circle.

The process I described above (the hermeneutic circle) did not happen overnight. It was a repeated process that occurred throughout the four years it took me to conduct this research. This can be seen in the manner in which I have referred to our work throughout that period. It includes referring to the plants that I focused on for collecting as ‘sacred plants’ (e.g. on our project’s website <http://osodresie.wikispaces.com>), and referring to the activities of the people I worked with did as ‘traditional spiritual values’ (Quiroz, 2012a) or ‘traditional religious beliefs’ (Quiroz, 2012b). Finally, as suggested by one of the reviewers of our publication on taboos (Chapter Three), to simply adopt the jargon of the trade and use ‘traditional religions’. It was a process that was sometimes charged with emotion. Often I felt very lost, to the point that I questioned everything I had done so far. What was it I had been looking for in the field? Had I chosen the right criteria to select my informants? Had I asked the right questions?

I solved the conflict posed by the hermeneutic circle I solved by using diatopical hermeneutics (Chapter One). Unfortunately (for me), it did not imply that I broke free from the circular pattern. Yet, as Panikkar (1980) states, the circular character of interpretation does not make it impossible to interpret a phenomenon. Instead, it stresses that its meaning must be found within its cultural, historical, and literary context. For example, both in Benin and Gabon, it is not uncommon to hear people refer to their traditional healers as ‘charlatans’. It is not that people necessarily believe that traditional healers perform fraudulent medical practices, but rather use the term that their colonisers (from whom they learnt the language in which they can communicate with Western researchers) used to refer to their healers. As a newly arrived foreigner to Benin, I was shocked to hear traditional healers sometimes referring to themselves as “charlatans”. Yet, with the “cultural, historical, and literary” context that Panikkar spoke of in mind, I was able to quickly overcome the shock and found yet another type of ‘currency’ (apart from *Bokonon*, *Babalawo*, or *Nganga*) that helped to identify those informants who healed people in consultation with supernatural agents.

Moreover, aside from its usefulness in communicating research findings in a language that is familiar to a readership outside of Benin and Gabon (and to communicate with informants in those countries), diatopical hermeneutics can serve a wider purpose: to critically question the notions we take for granted in research. Drawing a parallel with our study in Benin and Gabon, I propose an about-facing of diatopical hermeutics to reflect on the extent to which supernatural entities exercise agency in the West. As I write this text, Sinterklaas is being celebrated in the Netherlands. For those readers of this work who are not acquainted with this custom, Sinterklaas is a traditional figure in Europe based on Nikolaos of Myra, a 4th-century Greek Christian Bishop, who was later sanctified

because of the miracles we was said to perform (Cunningham, 2008). He is also one sources of the Christmas icon Santa Claus (Clark, 1998). Although the religious backgrounds of entities such as Sinterklaas, Santa Claus, and the Easter Bunny were more notorious in the past (Voas, 2009), they are nowadays celebrated mostly without people discrediting (or even acknowledging) their supernatural character. With the exception of children, perhaps, people do not believe that anybody can enter their home through a chimney, or that a rabbit can lay hand-painted eggs. Yet, these traditions are alive and an entire botanical economy surrounds them (e.g. several spices used in the elaboration of Sinterklaas pastry; *Picea* spp., *Abies* spp., and *Pinus* spp. for Christmas; *Narcissus* spp. for Easter). The environmental impact of producing the plant-derived paraphernalia consumed for these festivities is acknowledged by Western science without discrediting the supernatural agentive forces involved. This is evidenced by the countless studies aimed to alleviate plague infestations caused by, for example, Christmas tree monocultures (e.g. Shaw et al., 2011). Why then not bringing this attitude of enquiry to non-Western contexts and, instead of fearing the supernatural in African traditional religions, acknowledge their potential role (positive or negative) in the human-nature relation?

To close, I would like to summarise by saying that using diatopical hermeneutics to frame, conduct, analyse, and publish research on supernatural agency has been like staring at the Penrose steps (i.e. a never-ending loop that gives the illusion of forward motion). Nonetheless, it has doubtlessly been a useful method to keep things in perspective. Reflecting on this theoretical framework, I have learnt that Bwiti and Vodoun, apart from being religions in the Western sense, are lifestyles that reflect a holistic view of human health and the natural environment, not only in the present, but also in the past. Moreover, I learnt that it was not as relevant to define what, and especially why something should be considered as religious, but rather, to address the agency supernatural entities exercise in a context of plant use – be it in the manner of Sinterklaas or as African ancestors and gods, as was the case here.

Floristic richness: a predictor for ethnofloristic richness?

As mentioned in the first chapter of this thesis, we chose Benin and Gabon for our study because of their shared ancestry of Afro-Caribbean groups. The cultural and phytogeographical differences between these two countries, however, would enable us to make comparisons about the human-nature relationship that this thesis set out to study. From the perspective of resource availability, we had expected that the apparent difference in number of plant species in each country would be reflected in their ethnofloristic richness. Accordingly, the hypotheses in Chapter Three drew upon the number of vascular plant species present in each country (in Benin, 2800, and in Gabon, 4700, at least) to predict richness in ritual plant use. Similarly, our hypotheses in Chapter Two were based on the different number of plant species between Benin and Ghana (the latter, just as Gabon, is species-richer than the former). Contrary to our expectations, however, we encountered more ritual uses for plants in Benin (414), than in Gabon (256). A similar trend is visible in the work of Towns (2014), who compared plant use amongst Beninese and Gabonese women. Both Towns' and our findings suggest that floristic richness does not necessarily predict richness in plant use. In reviewing the

literature, there are only a few studies that have assessed the importance of useful species richness as a correlate of general species richness (Lira et al., 2009; Pérez-Nicolás, 2014). Although trends similar to ours are observable from the results of those authors, their studies, unlike our, were not carried out in different phytogeographic areas, or, when they were (e.g. Madamombe-Manduna et al., 2009), the focus has been on different research objectives. As a result, they have not explored the reasons behind those findings. Nonetheless, there are a few possibilities to explain this inconsistency.

First, Gabon may be species-richer than Benin, but one may ask: Is this floristic richness also available to people? To start answering this question, one can consider species evenness as a limiting factor of availability. In this regard, the findings of ter Steege et al. (2013) in their work in the Amazon forest pose an assumption worth considering here. They assume that the bulk of diversity is located in the dense rainforest, where people do not live. In our study we found that although Benin is less forested than Gabon, the forest there is much more accessible to people. If the Upper and Lower Guinean forest blocks also show a pattern similar to the one found by ter Steege and colleagues in the Amazon, then it can be said that accessibility may play a role in ethnofloristic richness. In a similar line of argument, population density in Gabon is much lower than in Benin. It is also a possibility that traditional knowledge is therefore less easily transmitted and shared, thus it tends to remain more local. If that were true, one would not get all available information present in the area, even by covering the country as we have done.

Another explanation might be found in the historical differences of human settlements and how these are related to the development of knowledge profiles regarding the use and management of nature (van Andel et al., 2014). In Benin, the interaction between people of different ethnicities and natural backgrounds has taken place since at least the second millennium BC (Connah, 1987). Gabon, on the other hand, has been relatively more recently inhabited by Bantu tribes. These tribes came from (in most probable chronological order) the west, the south, and the north (Grollemund and Hombert, 2012). The Bantu tribes we worked with are known to have adopted Bwiti from the Mbenga people (otherwise known as Pygmies), who, in turn, had been living longer in the forests of the Congo Basin (Klieman, 2003). Although the Mbenga were not amongst our target groups, during our fieldwork in Gabon, we worked with a few Babongo informants, who were pointed out as experts by the mixed Mitsogo-Babongo communities where we worked. Hence, if the assumptions above are correct, we might have obtained a larger number of useful plants by had we worked with more Babongo (or Mbenga) people in Gabon.

Lastly, I cannot rule out the possibility that our sampling effort has not been sufficient. The duration of our stay in Benin was not only two months longer than in Gabon, but we also visited the former twice (six months in 2011 and one additional month in 2012). Moreover, although we interviewed more traditional healers in Gabon than in Benin, interviews with Gabonese informants were not as lengthy as those we conducted in Benin. This was mainly due to the fact that in our planning, we did not contemplate the time required to obtain the necessary research permits to conduct our work in Gabon, which delayed us a few weeks. This, together with the much larger size

of Gabon and the difficult accessibility to many areas, forced us to spend less time at each location so that we could cover as many areas in the country as possible.

IMPLICATIONS OF RESEARCH FINDINGS

The development of development

Anyone reading this thesis with some experience in West Africa might have found it odd that earlier in this chapter I acknowledged my stay in Liberia as one that exposed me to “a handful of Protestant churches.” I neither forgot nor purposefully omitted any account of my experience with that country’s religious traditions. In fact, I had, if any, very little exposure to traditional religions in Liberia. This was due to the fact that the organisation I worked for strongly discouraged its workers from engaging with this topic. Partly for this reason and partly because of the secrecy that is expected from those initiated in these traditions, my Liberian colleagues were very discrete, if not censorial, of anything related to secret societies (in spite of the fact that all of them had been initiated in these traditions). Thus, my encounters with traditional religion were basically limited to the two or three times our project vehicle had to pull over and wait for the ‘bush devil’, who would be walking on a dirt road, on his way back from a nearby village, to zoom out of sight into the depth of the forest. Just as in Gabon, Liberia’s most prominent secret societies, Poro and Sande, are recognised as social institutions that, by inclusion of their ancestors and spirits, have traditionally regulated roles in society and the relationship between humans and nature. Several studies provide evidence that, the attitude to which I was confronted during my assignment in that country is not just an isolated case, but in fact, a widespread approach that has curtailed the success of development since the inception of international cooperation in the country (De Carvalho and Schia, 2011; Green, 1992; Heaner, 2008; Højbjerg, 2007; Kellemu, 1967; Reddy, 2014; Whalen, 1983).

Although the cases of Benin and Gabon appear to be different to that of Liberia (at least with regards to the tolerance of Bwiti and Vodoun by non-adepts), it is still worth noting how scientific attitudes towards the religious, might have an impact on development policy. Brown and Westway (2011) point out how most analyses and, certainly most policy approaches, emphasise resources and infrastructure to support development interventions, but do not acknowledge people’s personal motivations, beliefs, and desires. An issue emerging from our findings on the ethnopharmacological relevance of ritual plants relates specifically to the need for government and international health programmes not to overlook the extent to which health-seeking behaviour can be influenced and shaped by local religious traditions. The evidence provided in this thesis adds to the body of literature that highlights cultural bound diseases as an indication of neglected or underlying diseases and possible harmful plant remedies (Towns, 2014; Vossen et al., 2014). This aspect grows in importance in light of the recent outbreak of Ebola in West Africa. Funeral rites have been identified as the main cause for the spreading of Ebola in the region. However, behind the resistance to response units by Ebola-hit communities, there are ‘back stories’ linked to earlier problematic encounters characterised by the neglect of traditional institutions (such as traditional healers) by development organisations (Fairhead, 2014). A success story on how traditional Surinamese burial rituals have been integrated into official funeral practices in the Netherlands and are offered to

migrant clientele (van der Pijl, 2007), not only justifies the importance, but highlights the potential value of acknowledging religious traditions in a setting where Western values are predominant – as is the case in international development.

Theoretical contributions to the field of ethnobiology

Placed in a theoretical perspective, this study contributes to advancing the understanding of the human-nature relation when supernatural agency is enacted through human agents. In Chapter Three, we reviewed a number of studies that have addressed the origin and necessity of taboos in traditional societies, and have primarily concentrated on the use of wild animals as food. We checked for restrictions that go beyond food taboos and that do not necessarily respond to health needs (such as food taboos that apply to pregnant women or the ill) and found that different explanations apply to organisms lower in the food chain (i.e. plants). Although we encountered food taboos in our work and these appeared to follow the premise formulated in previous works (that taboos are implemented by people who have plenty of resources at their disposal), taboos on plant use that respond to ritual mandates are a form of adaptive management of natural resources and they reflect resource scarcity.

With respect to theoretical perspectives on traditional knowledge, we have corroborated previous claims that rituals are a form of preserving and transmitting traditional medicinal and ecological knowledge. In the particular case of ethnopharmacology, this study has also advanced the understanding of the ritual application of plants as a form of preventive medicine. This is illustrated by the manner in which people in our countries of study protect and treat themselves against supernatural agents in the same fashion pathogens are treated in biomedicine.

Lastly, the conceptual framework of this thesis constitutes an important contribution to the study of an often-neglected aspect of societal life in western Africa, and how it is approached by Western science. Particularly, by means of diatopical hermeneutics we have simultaneously approached religion and traditional religions from an emic perspective and from an outsider's viewpoint. The lessons to be learnt from this approach do not only apply to the understanding of western African traditional religions and how plant resources are managed as a result of the supernatural agentive forces in this context. Rather, they can contribute to the understanding of how our Western supernatural entities (e.g. the Easter Bunny and Santa Claus) exercise a hegemonic agency that shapes not only cultural identity in a globalised world, but massively influences plant consumption patterns and thereby contributes to the intensified exploitation of natural resources worldwide.

Contributions to other disciplines

One of the immediate outcomes of our fieldwork in Gabon was the number of plant species we encountered (and vouchered as herbarium specimens) for which no occurrence had been recorded in the country (Quiroz, 2012b). The majority of these plants corresponded either to cultivated, edible species (e.g. taro, *Colocasia esculenta*, and lima beans, *Phaseolus lunatus*), garden escapes (e.g. *Jatropha gossypifolia*), or simply, pioneer vegetation (e.g. *Cecropia peltata*). The contribution of our work to the field of botany does not rest on the 21 records for Gabon that had not previously

been recorded on the checklist of Gabon (Sosef et al., 2006) – from which, nine have since been included on the Plants of Gabon website (<http://herbaria.plants.ox.ac.uk/bol/gabon>). Ultimately, twelve is not a significant figure when taking into account the fact that the country's flora is comprised of at least 4700 species (Sosef et al., 2006). Rather, it rests on the potential contribution of ethnobotanical research in the overcoming of collection bias. Without undervaluing the work of others, especially not that of all the botanists and parataxonomists who contributed to Naturalis' six-million-specimen herbarium collection, yet to date, large forest species and a few plant families are over-represented in the African plant section of the collection (WUR, 2014). This situation is not unique to the Dutch herbarium collections. Globally, weeds, cultivated, and introduced plants are generally not well documented either (Delisle et al., 2003; Rich and Woodruff, 1992; Urmi and Schnyder, 2000). The shortcomings of this collection bias is particularly relevant when considering the worldwide decrease in funds allotted to fundamental research (e.g. classic taxonomical studies, which involve copious plant collecting), in favour of applied research (Lavoie, 2013). Applied research projects that make use of herbarium specimens often call for the collection of larger quantities of herbarium specimens in order to secure the accuracy of results in distribution modelling (e.g. Feeley and Silman, 2011; van Andel et al., 2015), and DNA barcoding (Gaudeul and Rouhan, 2013). Moreover, collections of cultivated plants used by indigenous peasants in the tropics are much needed for the documentation of traditional landraces of cultivated crops (van Andel et al., unpublished work). In short, our new records for Gabon, albeit a few, corroborate the claims of scientists performing applied research that not all the diversity that is out there has been documented with verifiable scientific evidence.

RECOMMENDATIONS FOR FUTURE RESEARCH

What we do not know (yet)

To end the discussion of this work, I must once more return to the discussion on taboos. This time, however, I would like to highlight the possibilities for future research in this topic. Begossi et al. (2004) and Henrich and Henrich (2010) demonstrated that organisms at higher trophic levels more often become objectified as food taboos than those at lower trophic levels, and that taboos reflect a means to prevent health hazards. As plants are even lower in the food web, and our different explanation for taboos related to them, might indicate that taboos are manifested at different levels, in different forms, to respond to different needs. In Gabon, for example, some of the food taboos included the consumption of forest fruits. Perhaps, more explanation could be found in comparing whether these are also keystone foods for forest fauna. We did not approach other types of taboos (kinship, illness, or gender) nor include animal species in our analysis. Although, we are aware that there are taboos that restrict the use of animals and abiotic resources (e.g. water). Although, and especially after we learnt, that traditional religion is not just the worshipping of gods, but also the managing of human health, it makes sense to consider other health-related taboos. For this purpose, an approach similar to the one used by Henrich and Henrich (2010) could be employed. These authors asked their informants to explain, species by species, the reasons why taboos existed. We did not do this in our study (instead, asked the general purpose of taboos), but could in the future

obtain evidence of a more specialised medicinal or ecological knowledge. This is a field that deserves further enquiry.

Finally, the introduction to Chapter Three highlighted the limited applicability of research on traditional religions as a means for the conservation of nature. While this research has employed a simple methodological approach to obtain baseline data on endangered species, there are other potential points of further research. For example, an approach similar to that of Henrich and Henrich (2010) could help in advancing the understanding of the link between perceived scarcity of ritual plants and attempts by people to protect these. Also, more detailed market surveys could be performed in order to ascertain the proportion (volume-wise) of ritual plant species sold at the market. During fieldwork in the interior of Gabon, we saw *T. iboga* frequently being cultivated by traditional healers in their gardens. To assess the sustainability of iboga production, additional research is needed on the proportions of traded volumes of this species that come from cultivated or wild resources. Further, this work has gathered empirical data on the role of traditional religions in the management and conservation of plant resources in Benin and Gabon. While insight has been gained on the practices based on traditional (ecological and medicinal) knowledge at the plant individual level, it is important to highlight the potential effect of ritual practices at other levels of biological organisation, particularly, at the genetic level. Previous studies in Benin have confirmed the role that traditional religions play in the maintenance of genetic diversity of yams (*Dioscorea* spp.) and cowpea (*Vigna unguiculata*) (Zannou et al., 2007). During our fieldwork in Benin, we documented the management strategies, uses, and folk taxonomy of not only ritual, wild and domesticated yams, but also of calabashes (*Lagenaria siceraria* and *L. breviflora*), and other semi-domesticated food plants such as *Hibiscus surattensis* and *H. acetocella* (Brière, 2012). In Gabon, we documented efforts of in situ conservation of *Gnetum* spp. by local people (Quiroz, 2012b). These additional species could be the subjects of further investigations on incipient domestication and maintenance of crop genetic diversity.

FINAL CONCLUSIONS

Through this study of supernatural agency in the human-nature relationship in western Africa, I reach five conclusions about ritual plant use:

1. Plants and other elements of the natural world play a central role in the religious traditions of Benin and Gabon, both for adepts and non-adepts of these traditions.
2. Social mechanisms such as taboos and sacrifices are a form of adaptive management of plant resources that respond to perceived scarcity of ritual plants by their users.
3. Ritual applications of plants used in our countries of study suggest a pharmacological effect on their users, as opposed to the previous assumption that their effectiveness is a matter of belief.
4. By being the backbone of the medicinal plant trade in Benin and Gabon, ritual plants represent an important source of income for a substantial sector of the population of these two countries.

5. The Western notion of 'ritual', in the context of western African plant use is an important mechanism for the preservation and transmission of ecological, historical, and medicinal knowledge.

These conclusions point to the need to question the assumptions upon which the study of plant use in western African and, ultimately, in most non-Western settings has been predominantly approached. The results from this thesis provide evidence to confirm that, so far, science has missed out on insights on the economic importance and ethnopharmacological and ethnoecological relevance of ritual plant use in western Africa. In this respect, a problem to overcome is not to define religion, but to reconcile the systematic study of the natural and physical world (i.e. science) with the non-physical and supernatural underlying forces that affect the physical world. Thus, I further conclude that as long as the agentive force of supernatural entities is comprehensibly acknowledged, considering these practices as 'religious' is justified from an etic perspective.

Finally, in spite of its possible flaws, this work should be recognised as an effort to advance and stimulate reflection on the manner in which supernatural agency has been typically approached in ethnobiology. Therefore, by highlighting its drawbacks, I do not attempt to replace the predominant approach in the study of human-nature relations in non-Western settings, but to identify the opportunities to fill the gaps.

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Samenvatting

Planten spelen nog steeds een doorslaggevende rol binnen de Afrikaanse traditionele geneeskunst, omdat grote sectoren van de populatie op dit continent de voorkeur geven aan of in belangrijke mate vertrouwen op een behandeling met kruiden als hun primaire bron van gezondheidszorg. Traditionele geneeskunde, gedefinieerd als de som van kennis, bekwaamheden en praktijken om ziekten te voorkomen en te behandelen, omvat vaak het consulteren van spirituele genezers en waarzeggers, die op hun beurt bovennatuurlijke entiteiten raadplegen om hun patiënten te diagnosticeren. Vaak worden de tradities en rituelen gerelateerd aan deze praktijken geclassificeerd als “obsuur” en door de academische wereld als onwetenschappelijk gezien.

Het algemene doel van dit proefschrift is het verbeteren van het begrip van de verschillende dimensies van het gebruik van planten binnen de context van traditionele religies in twee West Afrikaanse landen: Benin en Gabon. Allereerst via het documenteren van plantgebruik door aanhangers van Voudoun in Benin en Bwiti in Gabon, en daarna via exploratie van de geassocieerde kennis die deze praktijken ondersteunen. Het doel daarvan is om bij te dragen aan een verbeterd management van botanische hulpbronnen en uiteindelijk de ontwikkeling van cultureel aanvaardbare interventies gericht op de bescherming van nuttige plantensoorten en hun ecosystemen, alsmede de verbetering van de menselijke gezondheid binnen een achtergrond vergelijkbaar met onze studielanden.

Uitgaande van het disciplinaire perspectief van de etnobotanie, omvat dit werk vanuit de botanie, antropologie, ethologie, ecologie en farmacologie overgenomen theorieën en kwantitatieve en kwalitatieve methoden voor het verzamelen van data en het analyseren van deze data. De gegevens werden verzameld gedurende een periode van meer dan een jaar, die was verdeeld in twee veldwerkperiodes: één in Benin en één in Gabon.

Dit proefschrift is onderverdeeld in zes hoofdstukken. In Hoofdstuk Eén etaleerde ik het conceptuele raamwerk en introduceerde de onderzoeksgebieden. Gebaseerd op het bepalen van de relevantie voor deze studie, gaf ik het kader aan voor de algemene doelstellingen en onderzoeksvragen.

Medicinale planten worden niet alleen erkend voor hun belang in het voldoen aan de gezondheidsbehoeften van mensen in Afrika ten zuiden van de Sahara, maar ook voor de rol die hun commercialisatie speelt als een bron van inkomsten voor kwetsbare groepen. Ondanks deze erkenning is er weinig bekend over de implicaties van de handel in medicinale planten voor de duurzaamheid van de oogst van de betreffende soorten, vooral omdat gegevens over de omvang en diversiteit aan soorten die op markten worden verkocht niet beschikbaar zijn. In Hoofdstuk Twee behandelden we deze lacune door een schatting te geven van de omvang en economische waarde van de binnenlandse markt in medicinale kruiden in Benin. We onderstreepten ook dat lokale gezondheidsproblemen zich weerspiegelen in de medicinale plantenmarkt en vonden dat rituele planten de grootste gebruikscategorie omvatten waarvoor verkopers materiaal aanleveren op de

markten van Benin. Bovendien suggereerden we enkele soorten met mogelijke duurzaamheidskwesties.

In Hoofdstuk Drie verkenden we de potentiële link tussen twee verschillende sociale mechanismen die het gebruik van botanische hulpbronnen reguleren (taboes en offers) en de schaarsheid van rituele planten in Benin en Gabon. De wetenschappelijke discussie rond de oorsprong en noodzaak van taboes toonde aan dat deze bestaan als middel om potentiële ziekten te voorkomen of het gebruik van natuurlijke hulpbronnen te controleren. Bovendien heeft empirische onderzoek aangetoond dat taboes de schaarsheid van de hulpbron reflecteren. Deze studies hebben echter een primaire focus op het gebruik van wilde dieren als voedsel. Via het verkrijgen van kwantitatieve gegevens gebaseerd op vragenlijsten van lokale informanten, vonden we bewijs dat beperkingen (zoals taboes en offers) een indicatie waren voor schaarsheid van rituele planten, waarmee we voortgang boeken met nieuwe verklaringen voor het bestaan van deze sociale mechanismen.

In Hoofdstuk Vier behandelen we twee van de noties die centraal staan in onze studie: ‘religie’ en ‘traditionele religie’, ditmaal gedefinieerd door de personen die dit geloof zelf belijden in Benin en Gabon. Plantgebruik binnen de context van traditionele religie is doorgaans beschreven vanuit het perspectief van een buitenstaander. Hetzelfde geldt voor religie en traditionele religies. In dit hoofdstuk leerde we dat planten een centrale rol spelen in de religieuze tradities van Benin en Gabon, zowel voor aanhangers als niet-aanhangers van Voudoun en Bwiti.

In de westerse wetenschap stelt men dat het effect van rituele planten op de volksgezondheid een kwestie is van geloof. In Hoofdstuk Vijf bediscussieerden we het potentiële farmacologische effect van de economisch en cultureel belangrijkste rituele planten op hun gebruikers. Dat deden we door hun manier van toedienen te vergelijken met bewezen farmacologische eigenschappen van die plantensoorten verzameld uit de literatuur. Bovendien beschreven we volkscategorieën van ziekten gerelateerd aan bovennatuurlijke vectoren (b.v. kwade geesten, voorouders en tovenaars) als ook erkende ziekten binnen de medische wetenschap die door de bevolking van Benin en Gabon echter worden toegewezen aan bovennatuurlijke oorzaken. In beide landen heeft een belangrijk deel van de rituele toepassingen van planten een mogelijk farmacologisch effect op de gebruikers, omdat de meeste planten oraal worden toegediend, op de huid gesmeerd, of direct in de bloedbaan worden gebracht.

Ten slotte, in Hoofdstuk Zes, behandel ik de onderzoeksvragen geformuleerd in Hoofdstuk Eén en bediscussieer de methodologische kwesties van ons werk als ook haar implicaties voor andere wetenschappelijke disciplines. Ik belicht ook de mogelijke toepassing van de onderzoeksresultaten binnen de natuurbescherming en ontwikkelingssamenwerking, alsmede enkele mogelijkheden voor verder onderzoek. Bovendien trek ik een vijftal conclusies over Bwiti en Voudoun in onze twee landen: (1) Planten en andere elementen van de natuurlijke wereld spelen een centrale rol in de religieuze tradities van Benin en Gabon, zowel voor aanhangers als niet-aanhangers van deze tradities. (2) Sociale mechanismen zoals taboes en offers zijn een vorm van adaptief beheer van botanische hulpbronnen die overeenkomt met een begrip van schaarsheid van rituele planten bij hun gebruikers. (3) Rituele toepassingen van planten in onze studie-landen suggereren een

farmacologisch effect op hun gebruikers, tegenstrijdig met eerdere aannames dat hun effectiviteit een kwestie is van geloof. (4) Doordat ze de ruggengraat vormen van de handel in medicinale planten in Benin en Gabon, vormen rituele planten een belangrijke bron van inkomsten voor een substantieel deel van de bevolking van deze twee landen. (5) De westerse notie van 'ritueel' binnen de context van plantengebruik in West Afrika is een belangrijk mechanisme voor het behouden en doorgeven van ecologische, historische en medicinale kennis. Deze conclusies wijzen op de noodzaak om de aannames waarop de studie van plantgebruik in de West Afrikaanse context doorgaans wordt benaderd ter discussie te stellen. Tot slot concludeerde ik dat, zolang de werking via bovennatuurlijke eenheden wordt erkend, het beschouwen van deze praktijken als 'religieus' gerechtvaardigd is vanuit een *etic* perspectief.

Summary

Plants still play an overriding role in African traditional medicine, as large sectors of the continent's population prefer or considerably rely on herbal treatments as their primary source of health care. Traditional medicine, which is defined as the sum of knowledge, skills, and practices used to prevent and treat diseases, often involves consultation with spiritual healers and diviners, who in turn consult supernatural entities to diagnose their patients. At the same time, these traditions and the rites that are related to their practice are categorised as “obscure” and considered unscientific by academia.

The overall aim of this thesis was to advance the understanding of the different dimensions of plant use in the context of traditional religions in two western African countries: Benin and Gabon. First, by documenting the use of plants by adepts of Vodoun in Benin and Bwiti in Gabon; and second, by exploring the associated knowledge that sustains these practices. Its purpose was to contribute to an improved plant resource management and, ultimately, the development of culturally appropriate interventions aimed at the conservation of useful plant species and their ecosystems, as well as the improvement of human health in settings similar to those of our countries of study.

Departing from the disciplinary perspective of ethnobotany, this work included theories and quantitative and qualitative methods of data collection and analysis drawn from botany, anthropology, ethnology, ecology, and pharmacology. Data were collected in a period of more than a year, which was divided in two fieldwork stays, each in Benin and Gabon.

This thesis was organised into six chapters. In Chapter One, I laid out the conceptual framework and introduced the study sites. Based on an assessment of the relevance of this study, I framed its overall objective and research questions.

Medicinal plants are not only acknowledged for their importance in satisfying the health needs of people in sub-Saharan Africa, but also for the role their commercialization plays as a source of income for vulnerable groups. In spite of this recognition, little is known about the implications of medicinal plant trade for the sustainability of the plant species involved, especially when data on the volume and diversity of species sold at the markets are not available. In Chapter Two, we addressed this gap by providing an estimation of the volume and economic value of the domestic market in herbal medicine in Benin. We also highlighted local health concerns reflected by the medicinal plant market and found that ritual plants were the largest use category for which vendors catered in the markets of Benin. Additionally, we suggested some species with possible sustainability issues.

In Chapter Three, we explored the potential link between two different social mechanisms that regulate the use of plant resources (taboos and sacrifices) and the scarcity of ritual plants in Benin and Gabon. The scholarly discussion around the origin and necessity of taboos has found these to exist either as a means to avoid potential diseases or to control the use of natural resources. Moreover, empirical data has shown that taboos reflect resource abundance. These studies, however, have primarily focussed on the use of wild animals as food. By providing quantitative data based on questionnaires with local informants, we found evidence that restrictions (such as taboos and

sacrifices) were an indication of resource scarcity of ritual plants, thus advancing new explanations to the existence of these social mechanisms.

In Chapter Four, we revised two of the notions that are central to our study: ‘religion’ and ‘traditional religion’, this time as defined by the people who profess these faiths in Benin and Gabon. Plant use in the context of traditional religions has been commonly described from an outsider’s perspective. The same is true for religion and traditional religions. In this chapter, we learnt that plants played a central role in the religious traditions of Benin and Gabon, both for adepts and non-adepts of Vodoun and Bwiti.

In Western science, the effects of ritual plants on human health have been proposed to be a matter of belief. In Chapter Five, we discussed the potential pharmacological effect of culturally salient and economically important ritual plants on their users. We did that by contrasting their mode of application to proven pharmacological properties gathered from the literature. Additionally, we described folk categories of illness related to supernatural agents (e.g. evil spirits, ancestors, and sorcerers), as well as diseases recognised by biomedicine but that are attributed supernatural causes by people in Benin and Gabon. We discovered that in both countries an important proportion of the ritual applications of plants suggest a pharmacological effect on their users.

Finally, in Chapter Six, I addressed the research questions formulated in Chapter One and discussed our work’s methodological issues as well as its implications to other scientific disciplines. I also highlighted the possible applications of the research results in informing nature conservation and human development interventions, as well as some possibilities for future research. Moreover, I reached five conclusions about Bwiti and Vodoun in our countries of study: (1) Plants and other elements of the natural world play a central role in the religious traditions of Benin and Gabon, both for adepts and non-adepts of these traditions. (2) Social mechanisms such as taboos and sacrifices are a form of adaptive management of plant resources that respond to perceived scarcity of ritual plants by their users. (3) Ritual applications of plants used in our countries of study suggest a pharmacological effect on their users, as opposed to the previous assumption that their effectiveness is a matter of belief. (4) By being the backbone of the medicinal plant trade in Benin and Gabon, ritual plants represent an important source of income for a substantial sector of the population of these two countries. (5) The Western notion of ‘ritual’ in the context of western African plant use is an important mechanism for the preservation and transmission of ecological, historical, and medicinal knowledge. These conclusions point to the need to question the assumptions upon which the study of plant use in the western African context has been typically approached. Finally, I concluded that as long as the exercise of agency by supernatural entities is acknowledged, considering these practices as ‘religious’ is justified from an etic perspective.

Résumé

Les plantes jouent encore un rôle primordial dans la médecine traditionnelle africaine, que de vastes secteurs de la population du continent préfèrent ou comptent considérablement sur les traitements à base de plantes comme leur principale source de soins. La médecine traditionnelle, qui est définie comme la somme des connaissances, des compétences, et des pratiques utilisées pour prévenir et traiter les maladies, implique souvent des consultations avec des guérisseurs et des devins qui, à leur tour, consultent des entités surnaturelles pour diagnostiquer leurs patients. En même temps, ces traditions et les rites qui sont liés à leur pratique sont catégorisés comme “obscurés” et considérés comme non scientifiques par une grande partie de la communauté scientifique.

L'objectif général de cette thèse fut de faire progresser la compréhension des différentes dimensions de l'utilisation des plantes dans le contexte des religions traditionnelles dans deux pays de l'Afrique occidentale: le Bénin et le Gabon. Tout d'abord, en documentant l'utilisation des plantes par les adeptes de Vodoun au Bénin et du Bwiti au Gabon; et, deuxièmement, en explorant des connaissances associées qui soutiennent ces pratiques. Son but fut de contribuer à une meilleure gestion des ressources végétales et, finalement, le développement des interventions culturellement appropriées visant à la conservation des espèces végétales utiles et de leurs écosystèmes, ainsi que l'amélioration de la santé humaine dans des contextes similaires à ceux de nos pays d'étude.

Cette thèse s'organisa en six chapitres. Dans le premier chapitre, nous exposâmes le cadre conceptuel du travail et nous présentâmes les sites d'étude. Basé sur une évaluation de la pertinence de cette étude, nous encadrâmes ses objectifs et les questions de recherche générales.

Les plantes médicinales ne sont pas seulement reconnues pour leur importance dans la satisfaction des besoins de santé des personnes en Afrique sub-saharienne, mais aussi pour le rôle que leur commercialisation joue comme une source de revenu pour des groupes vulnérables. Malgré cette reconnaissance, peu est connu sur les implications du commerce des plantes médicinales pour la durabilité des espèces végétales concernées, en particulier quand les données sur le volume et la diversité des espèces vendues sur les marchés ne sont pas disponibles. Dans le deuxième chapitre, nous abordâmes cette lacune en offrant une estimation du volume et de la valeur économique du marché domestique des plantes médicinales au Bénin. Également, nous soulignâmes les problèmes de santé locaux reflétés par le marché de plantes médicinales et constatâmes que les plantes rituelles furent la plus grande catégorie d'utilisation pour laquelle les vendeurs approvisionnèrent les marchés du Bénin. De plus, nous identifîâmes certaines espèces ayant des problèmes de durabilité possibles.

Dans le troisième chapitre, nous explorâmes le lien potentiel entre deux différents mécanismes sociaux qui régissent l'utilisation des ressources végétales (des tabous et des sacrifices) et la rareté des plantes rituelles au Bénin et au Gabon. La discussion scientifique autour de l'origine et la nécessité de tabous trouva ces restrictions comme un moyen d'éviter les maladies potentielles ou de contrôler l'utilisation des ressources naturelles. En outre, les données empiriques montrèrent que les tabous reflètent l'abondance des ressources. Ces études, cependant, se focalisèrent principalement sur l'utilisation des animaux sauvages comme aliments. En fournissant des données quantitatives

basées sur des questionnaires avec des informateurs locaux, nous trouvâmes des preuves que les restrictions (telles que les tabous et les sacrifices) sont une indication de la rareté de plantes rituelles, avançant ainsi de nouvelles explications à l'existence de ces mécanismes sociaux.

Dans le quatrième chapitre, nous révisâmes deux des notions qui sont au cœur de notre étude: 'la religion' et 'la religion traditionnelle', cette fois telles que définies par les gens qui professent ces religions au Bénin et au Gabon. L'utilisation des plantes dans le contexte des religions traditionnelles fut souvent décrite dans une perspective *etic*. La même chose peut être dite pour la religion et les religions traditionnelles. Dans ce chapitre, nous apprîmes que les plantes jouent un rôle central dans les traditions religieuses du Bénin et du Gabon, à la fois pour les adeptes et les non-adeptes du Vodoun et du Bwiti.

Dans la science occidentale, les effets des plantes rituelles sur la santé humaine furent interprétés comme une question de croyance. Dans le cinquième chapitre, nous discutâmes l'effet pharmacologique potentiel des plantes rituelles les plus représentatives sur le plan économique et culturel sur leurs utilisateurs. Nous le fîmes en comparant leur mode d'application aux propriétés pharmacologiques éprouvées recueillies dans la littérature. En outre, nous décrivâmes les catégories populaires de maladies liées à des agents surnaturels (par exemple, les mauvais esprits, les ancêtres, et sorciers), ainsi que des maladies reconnues par la biomédecine, mais qui sont parfois attribuées des causes surnaturelles au Bénin et au Gabon. Nous découvrâmes que dans les deux pays une proportion importante des applications rituels de ces plantes suggèrent un effet pharmacologique sur leurs utilisateurs.

Finalement, dans le sixième chapitre, nous adressâmes les questions de recherche générales formulées au premier chapitre et discutâmes des questions méthodologiques de notre travail ainsi que ses implications pour d'autres disciplines scientifiques. Nous soulignâmes également les applications possibles des résultats de la recherche pour informer la planification de la conservation de la nature et des interventions de développement humain, ainsi que des possibilités pour la recherche future. En outre, nous arrivâmes à cinq conclusions sur le Bwiti et le Vodoun dans nos pays d'étude: (1) Les plantes et autres éléments du monde naturel jouent un rôle central dans les traditions religieuses du Bénin et du Gabon, à la fois pour les adeptes et les non-adeptes de ces traditions. (2) Les mécanismes sociaux tels que les tabous et les sacrifices sont une forme de gestion adaptative des ressources végétales qui répondent à la rareté perçue de plantes rituelles par leurs utilisateurs. (3) Les applications rituelles de plantes utilisées dans nos pays d'étude suggèrent un effet pharmacologique sur leurs utilisateurs, contrariant l'hypothèse précédente selon laquelle leur efficacité ne fut qu'une question de croyance. (4) En étant l'épine dorsale du commerce des plantes médicinales au Bénin et au Gabon, les plantes rituelles représentent une source importante de revenus pour un secteur substantiel de la population de ces deux pays. (5) La notion occidentale du 'rituel' dans le contexte de l'utilisation des plantes rituelles en Afrique occidentale est un mécanisme important pour la préservation et la transmission des connaissances écologiques, historiques, et médicinale. Ces conclusions soulignent la nécessité de remettre en question les hypothèses sur lesquelles l'étude de l'utilisation des plantes dans le contexte ouest-africain furent généralement abordées. Pour finir, nous conclusâmes que tant que la capacité des entités surnaturelles d'agir sur

des personnes est reconnue, considerer ces pratiques comme ‘religieuses’ est justifiée d’un point de vue *etic*.

Resumen

Las plantas siguen desempeñando un papel primordial en la medicina tradicional africana. Amplios sectores de la población del continente prefieren o dependen considerablemente de los tratamientos a base de plantas como su fuente primaria de atención médica. La medicina tradicional, que se define como la suma de conocimientos, habilidades y prácticas utilizadas para prevenir y curar las enfermedades, a menudo implica la consulta con curanderos y adivinos, quienes a su vez consultan entidades sobrenaturales para diagnosticar a sus pacientes. Al mismo tiempo, estas tradiciones y los ritos que están relacionados con su práctica son calificados como "oscuros" y son considerados poco científicos por la comunidad académica.

El objetivo general de esta tesis fue mejorar la comprensión de las diferentes dimensiones del uso de las plantas en el contexto de las religiones tradicionales en dos países de África occidental: Benín y Gabón. En primer lugar, mediante la documentación del uso de plantas por los adeptos de Vudú en Benín y Bwiti en Gabón; y en segundo lugar, mediante la exploración de los conocimientos asociados que sustentan estas prácticas. El propósito fue de contribuir a una mejor gestión de los recursos vegetales y, circunstancialmente, al desarrollo de intervenciones culturalmente apropiadas con miras a la conservación de las especies de plantas útiles y sus ecosistemas, así como la mejora de la salud humana en entornos similares a los de los países de estudio.

Partiendo de la perspectiva disciplinaria de la etnobotánica, este trabajo incluye teorías y métodos cuantitativos y cualitativos para la colecta y el análisis de datos extraídos de las diferentes disciplinas como la botánica, la antropología, la etnología, la ecología y la farmacología. Los datos fueron obtenidos en un período de más de un año, que se dividió en dos estancias de trabajo de campo, una en Benín y otra en Gabón.

Esta tesis se estructuró en seis capítulos. En el capítulo primero, se presentó el marco conceptual y se introdujo al lector a los sitios de estudio. En base a la evaluación de la relevancia de este estudio, se definieron sus objetivos y las preguntas generales de investigación.

Las plantas medicinales no sólo son reconocidas por su importancia en la satisfacción de las necesidades de salud de las personas en el África subsahariana, pero también por el papel que su comercialización desempeña como fuente de ingresos para los grupos vulnerables. A pesar de este reconocimiento, poco se sabe sobre las implicaciones del comercio de las plantas medicinales para la sostenibilidad de las especies vegetales involucradas, especialmente cuando los datos sobre la cantidad y la diversidad de las especies que se venden en los mercados no están disponibles. En el capítulo segundo, se abordó este vacío proporcionando una estimación la cantidad y del valor económico del mercado doméstico de plantas medicinales en Benín. También se resaltaron los problemas de salud locales reflejados por el mercado de plantas medicinales y se encontró que las plantas rituales fueron la categoría de uso más grande para la cual los vendedores abastecen los mercados de Benin. Además, se sugirieron algunas especies con posibles problemas de sostenibilidad.

En el capítulo tercero, se exploró la posible relación entre dos tipos de mecanismos sociales que regulan el uso de los recursos vegetales (los tabúes y los sacrificios) y la escasez de plantas rituales en Benín y Gabón. En el debate académico en torno al origen y la necesidad de los tabúes se ha afirmado que estos existen ya sea como un medio para evitar posibles enfermedades o para controlar el uso de los recursos naturales. Por otra parte, los datos empíricos han demostrado que los tabúes reflejan una abundancia de recursos. Estos estudios, sin embargo, se han centrado principalmente en el uso de animales salvajes como fuentes de alimento. Al proporcionar datos cuantitativos basados en cuestionarios con informantes locales, en esta tesis se obtuvo evidencia de que las restricciones (como los tabúes y los sacrificios) son una indicación de la escasez de recursos de plantas rituales, proporcionando así nuevas explicaciones a la existencia de estos mecanismos sociales.

En el capítulo cuarto, se revisaron dos de los conceptos que son fundamentales para el presente estudio: ‘la religión’ y ‘la religión tradicional’, esta vez definidos por las personas que profesan estas religiones en Benín y Gabón. Comúnmente, el uso de plantas en el contexto de las religiones tradicionales ha sido descrita desde una perspectiva *etic*. Lo mismo es cierto para la religión y las religiones tradicionales. En este capítulo, se constató que las plantas juegan un papel central en las tradiciones religiosas de Benín y Gabón, tanto para los adeptos como para los no adeptos de Vudú y Bwiti.

En la ciencia occidental, los efectos de las plantas rituales sobre la salud humana han sido considerados como una cuestión de creencia. En el capítulo quinto, se discutió el potencial del efecto farmacológico de algunas plantas rituales culturalmente sobresalientes y económicamente importantes en sus usuarios. Esto se hizo contrastando su modo de aplicación con las propiedades farmacológicas obtenidas de la literatura. Además, se describieron las categorías populares de enfermedades relacionadas con los agentes sobrenaturales (tales como los malos espíritus, los antepasados, y los brujos), así como las enfermedades reconocidas por la biomedicina, pero a las que las personas en Benín y Gabón atribuyen causas sobrenaturales. Se descubrió que en ambos países una proporción importante de las aplicaciones rituales de las plantas sugieren un efecto farmacológico sobre sus usuarios.

Por último, en el capítulo sexto, se abordaron las preguntas de investigación formuladas en el capítulo primero y se discutieron las cuestiones metodológicas de este trabajo, así como sus implicaciones para otras disciplinas científicas. También se destacaron las posibles aplicaciones de los resultados de la investigación que conciernen a la conservación de la naturaleza y las intervenciones de desarrollo humano, así como algunas posibilidades para la futura investigación. Además, se llegó a cinco conclusiones sobre el Bwiti y el Vudú en los países de estudio: (1) Las plantas y otros elementos del mundo natural desempeñan un papel fundamental en las tradiciones religiosas de Benín y Gabón, tanto para los adeptos como los no adeptos de estas tradiciones. (2) Los mecanismos sociales como los tabúes y los sacrificios son una forma de manejo adaptativo de los recursos vegetales que responden a la escasez de plantas rituales percibida por sus usuarios. (3) Las aplicaciones rituales de las plantas utilizadas en los países de estudio sugieren un efecto farmacológico sobre sus usuarios, a diferencia del supuesto que su eficacia es una cuestión de creencia. (4) Al ser la espina dorsal del comercio de plantas medicinales en Benín y Gabón, las

plantas rituales representan una importante fuente de ingresos para un sector sustancial de la población de estos dos países. (5) La noción occidental de ‘ritual’ en el contexto del uso de plantas de África occidental es un mecanismo importante para la preservación y transmisión del conocimiento ecológico, histórico y medicinal. Estas conclusiones apuntan a la necesidad de cuestionar los supuestos teóricos en los que el estudio del uso de las plantas en el contexto africano occidental ha sido típicamente abordado. Finalmente, se llegó a la conclusión de que siempre y cuando la capacidad de agencia de las entidades sobrenaturales sea reconocida, considerar estas prácticas como ‘religiosas’ se justifica desde un punto de vista *etic*.

N'ayez pas peur du surnaturel!
L'importance de l'utilisation des plantes rituelles pour la
culture traditionnelle, la conservation de la nature, et la santé
humaine en Afrique occidentale

Résumé graphique



La pratique de la pharmacopée africaine implique souvent que pour diagnostiquer leurs patients, les tradipraticiens consultent des sprits et des ancêtres. Au même temps, ces traditions et les rites qui sont liés à leur pratique sont catégorisés comme “obscurés” et considérés peu scientifiques par le milieu académique. En collaboration avec des informateurs locaux au Bénin et au Gabon, ce travail s’est concentré sur une partie intégrale de la médecine traditionnelle africaine: les plantes rituelles.

En dehors de leur importance pour la satisfaction des besoins en santé primaire, la vente des plantes médicinales est une grande source de revenu pour des groupes vulnérables aux pays non industrialisés. Cependant, peu est connu sur les implications du commerce des plantes médicinales pour la durabilité.



Les marchés des plantes médicinales reflètent les préoccupations locales de santé. L'importance des pratiques rituelles au Bénin comme au Gabon n'est pas seulement limité aux plantes rituelles. Les animaux, comme les plants pour des fins rituels sont la plus grande catégorie d'utilisation pour laquelle les vendeurs approvisionnent les marchés de médecine traditionnelle.

Les interdits (telles que les tabous et les sacrifices) sont une indication de la rareté de plantes rituelles au Bénin et au Gabon. Grâce à ces pratiques, des espèces menacées (comme l'iroko) sont protégées et préservées.

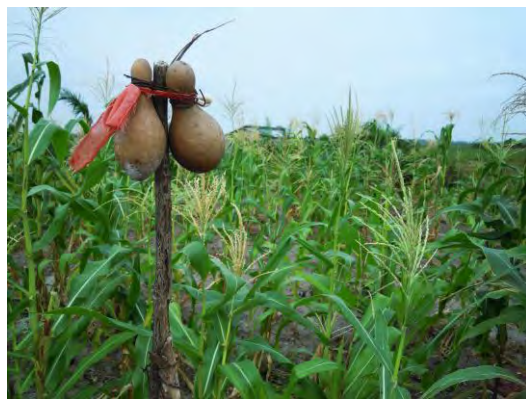


De même, les interdits sont reconnus par des adeptes du Vodoun et du Bwiti, comme des connaissances qui ont permis aux ancêtres de survivre en équilibre avec leur entourage naturel.

Communément, les pratiques liées au Vodoun et au Bwiti ont été décrites par des étrangers. Quelle que soit leur religion, aux Bénin et au Gabon, les gens considèrent les coquillages, le kaolin rouge, les plumes du perroquet, les fils, les pagnes, et les couleurs rouge, blanc, et noire comme des éléments importants des religions traditionnelles.



Les plantes cultivées pour des offrandes –comme les haricots rouges et le maïs-, et des autres plantes rituelles comme les noix de cola et les Calebasses, figuraient aussi entre les éléments que les gens considèrent partie du Vodoun et du Bwiti.



Les applications rituelles de plantes utilisées au Bénin et au Gabon suggèrent un effet pharmacologique sur leurs utilisateurs, contredisant l'hypothèse précédente selon laquelle leur efficacité ne fut qu'une question de croyance.



Dans le cadre des religions traditionnelles, plusieurs variétés du Goussi et des calebasses sont cultivées et au Bénin et au Gabon. Des variétés des oseilles (pas montrées ici) constituent aussi une part importante de la nourriture des humaines comme des ancêtres et des sprits.



Acknowledgements

Completing this PhD thesis has not only required every single one of mine but also a great deal of other people's neurons. Oh yes, it has also required love and patience, and quite a few sacred plants, of course. In all honesty, the experience has been, one time too often, an awful dance. But it has also yielded delightful rewards. I hope that those of you who do not read French will forgive my switching to that language to thank my informants (as well as those people in Benin and Gabon with whom I am indebted), but I find it not only appropriate but a nice gesture towards them. In order to make it up to the non-francophones interested in my prose, I'll summarise up to the part where you can read again with the saying "tu peux quitter l'Afrique, mais l'Afrique va jamais te quitter" (you can leave Africa, but Africa will never leave you). If it wasn't already so, then it has definitely become true for me after Benin and Gabon.

J'ai beaucoup de reconnaissance et d'admiration à témoigner tout d'abord à nos informateurs, leurs familles et leurs communautés. Au Bénin je tiens à remercier: E. Degboe, M. Yeyumon, M. Winkissou, M. Wenoukpo, T. Salanon, S. Akinoumi, F. Tata, A. Tata, A. Togbe, B. Aboudou, C. Tata, K. Sumoni, F. Bienvenu, D. Guedengue, H. Akakpo, K. Adadhosi, M. Sofo, N. Klovi, M. Batafoye, M. Ayizon, C. Dogodossi, F. Massenon, D. Houffonssi, A. Kouso, E. Tchedji, H. Ademea, J. Saki, P. Yehoume, R. Amou, S. Bioni, Z. Hekpaso. M. Goudou, R. Tu, A. Masourou, J. Soglo, Maman Anono, P. Houndegla, B. Kagbano, M. Kebeh, M. Misarat, Maman Agbome, Maman Momono, J. Vioho, M. Teko, M. Rodrigues, et tous les participants anonymes de nos exercices de free-listing. Au Gabon, merci à: G. Ekomie-Obame, S.S. Obame, N. Minku-Miuna, Maman Scolastique, J. Bilange, J. Endambe, P. Nzua-Eyene, C. Eyang, I. Nzogue-Nyan, M. Nzam-Milan, E. Monangui, A. Musavu, B. Ritula, F. Ntachandi, L. Opuma, S. Mogangué, A. Massande, D. Kombi, J.P. Kombo, K. Papé, A. Kombé, D. Moanda, F. Mussavou, A. Nzamba- Mbomba, D.D.F. Azizet, J.H. Dukaga, F. Apassingui, G. Gadjama, J.P. Njuli, M. Angana, J. Lemami, R. Eminga, P. Ognama, J. Ofbu, A. Ekouma, Tata Mouney, Tatayo, Maman Amélie, Maman Brigitte, Maman Jeannette, Maman Annie, Maman Agate, Maman Véronique, Maman Germaine, Maman Aubierge, Maman Stéphanie, Maman Olga, Maman Rose, Maman Rosalie, Maman Éveline, M. Hugues, et Papa Gaby.

De même, il serait impossible d'aborder les personnes mentionnées ci-dessus sans l'aide de nos points d'entrée aux communautés. Au Bénin, je tiens à remercier Norbert Kougbila et Karin Ostertag, qui m'ont vu faire mes premiers pas dans le domaine de 'la tradition' dans une langue autant intimidant pour moi. Norbert, merci pour le bel esprit de jeunesse et d'amour envers la vie, et de compréhension et de solidarité envers les autres. Karin, ich danke Dir für deine freundliche Unterstützung und für all die Zeit, die du mit so viel Liebe zur Verfügung gestellt hast, um deine wertvollen Erfahrungen mit mir zu teilen. Au Gabon, les éco-guides des parcs nationaux, Eddy Mounanga Pango, Clement Moukoula, Basile Mintonghe-Eyene, Franç is Xavier Mba, Hurley Pambou Pambou, Jean-Omar Mondjo-Madouma, M. Brown et M. Ange, Ruben Yaga et Teddy Ombama-Obaka, dont connaissance indispensable des parcs et de leurs habitants, leur assistance

professionnelle et leur plaisante compagnie lors de nos missions ont beaucoup renforcé notre travail sur le terrain. Qu'ils en soient remerciés.

Les autorités béninoises, qui ont beaucoup facilité l'agréable traversée de nos mois dans leur pays, comme d'ailleurs les chers collègues aux différents départements à l'Université d'Abomey-Calavi avec qui j'ai tissé des liens plus que professionnels. Merci à tout le personnel de l'herbier national du Bénin, en spécial, Prof. Akpovi Akoègninou, Dr. Aristide Adomou, et Dr. Paul Yédomonhan. Du Laboratoire d'Ecologie Appliquée, je remercie Prof. Brice Sinsin et Dr. Bruno Djossa. Grand merci à Ingrid Legba, Innocent Essou, Ange Agbehounkpan, et Prisca Agognon de l'École Polytechnique d'Abomey-Calavi, à Nicaise Deguenonvo de la Faculté de Sciences Agronomiques, et à Mélain Anago de l'Université de Parakou, qui ont assisté la collecte des données ainsi que facilité notre entrée dans les communautés beninoises.

Je tiens aussi à remercier les autorités gabonaises, le Centre National de la Recherche Scientifique et Technologique et l'Agence National des Parcs Nationaux, en spécial leur employés Dr. A. Flore Koumba Pambo et Dr. Kathryn Jeffrey pour les autorisations de recherche sur le territoire du Gabon et dans les parcs nationaux. J'exprime aussi ma gratitude aux conservateurs des Parcs Nationaux pour leur excellente orientation et leur soutien logistique dans l'organisation de nos missions aux parcs. Prof. Paul-Henri Bourobou-Bourobou pour son conseil et soutien logistique, Constant Lié Mougoudi pour son assistance sur le terrain dans la région de l'Estuaire, Raoul Niangadouma pour son aide dans l'identification d'un nombre considérable de spécimens d'herbier, et tous les techniciens de l'herbier national du Gabon et de l'Institut de Pharmacopée et de Médecine Traditionnelle pour leur aimable assistance au cours de notre travail à l'herbier. Ruth Starkey, Heather Arrowood, Dr. Richard Parnell, je vous remercie pour votre aide et vos conseils logistiques. Piere-Didier Agamboué et Dr. Landri Ekomie-Obame, merci d'avoir facilité notre entrée dans les communautés de Libreville et de Cocobeach où nous avons eu le plaisir de travailler.

The colleagues at the National Herbarium of the Netherlands in Wageningen (that, very lamentably for most of us, went the way of the dodo half-way through my writing) have played an instrumental role in my instruction and have been a source of inspiration in these four years. I can hardly remember a day during my stay in Wageningen that I didn't wake up looking forward to another day at the office with you all. I've learnt a great deal from all of you, either by engaging in deeply insightful or idle and entertaining conversations during our breaks - or by being allowed to participate in the lives of many of you outside of the herbarium. My promotor, Prof. Marc Sosef, Hiltje and Paul Maas, Lubbert Westra, Frans Breteler, Hans de Wilde, Jos van der Maesen, Chris Bosch, Roel and Mirjam Lemmens, Kees-Jan Manschot, Koen van Setten, René Siep, Jan Janssen, Erik Simons, Hendrikjan van Os Breijer, Nico Patist, Bea Pracht-Mahabier, Jan Wieringa, André van Proosdij, Pulcherie Bissengou, Karel Jongkind, Hans de Vries, Folkert Aleva, Richard Pattiasina, and Bruce Hoffman. Thank you for helping me prepare my field stays and to identify, sort out, and mount the herbarium specimens I brought back after these periods, and to organize and discuss their corresponding data. To all of you I owe my botanical training.

And that last paragraph brought me, of course, to devoting another round of special thanks to the "Plant Use of the motherland..." research team. First of all, thanks to my thesis supervisor, Dr.

Tinde van Andel. Tinde, from you I've learnt not only that one can tell a Lecythidaceae flower because "the food is in the hood", but also a great deal of other things that are too many to name here but that I am sure have equipped me to carry on as an independent, yet collaboration-seeking researcher. Likewise, I'd like to thank fellow ethnobotanists Alexandra Towns and Sofie Ruyschaert, and thesis students Solène Brière, Jorik Swier, Britt Boogmans, Lieke Guinée, and Esther van Vliet. Your collaboration not only made this a successful experience for me, but also a richer one.

I would also like to show my gratitude to Dr. María de los Ángeles Villarreal-Reyna for assisting the statistical analysis of Chapter Two. Thanks to Bertie Joan van Heuven and Prof. Pieter Baas for performing the hardwood microscopic identification and to Dr. Barbara Gravendeel for the DNA analysis of our wood samples. The comments of Dr. Olivier Lachenaud, Dr. Gaby Schmelzer, Mathilde Grøndborg Helms, Dr. Monique Slegers, Susana Arias, Dr. Madeleine Florin, and Sébastien Gueydon on the different parts of this thesis, not only provided useful insights, but also helped to improve its quality. Likewise, I would like to thank Prof. John Rashford for pointing at some important sources of anthropological literature on religion. It was both an honour and a pleasure to engage with you in the most stimulating discussions (i.e. you explaining the act of the infinite in the finite and symbolic dualism while I tried not to look too stupid by constantly dropping my jaw) during our lunch and tea breaks at the meetings of the Society for Economic Botany. Also, thanks to Prof. Eric Schranz and Wilma Twigt of the Biosystematics group for their kind support in the last year of my work at Wageningen University.

Those who have lived abroad, regardless of the length of their stay, might know how tough the going can get sometimes, far away from one's point of reference to normality. There are situations that compare to a toe stubbed on a bedpost: seemingly stupid but terribly painful. At the absence of family members around one, friends are essential. I've been so lucky that after almost nine years of residence in Germany (previous to my stay in the Netherlands, that is), many of the precious people in my life are conveniently scattered in the neighboring countries. Having you "next door" and being able to talk to you on the phone or visit you (or having you over) for the weekend made the lack of parents or siblings to have over or visit for the weekend practically seamless. Thanks to the *meninas* (Brunhina, Beinha, and Lorinho). Thanks to Pao and Jensito. Cuervo Mayor, Changuita, and Darling-oh, thanks for taking the time, so many times, to listen, give invaluable feedback, or simply for having a laugh with me about the absurdities of the times we live in over the phone, or live, the many times I counted with the pleasure of your visits. Thanks to Frau Nickisch (and Birk) and Frau Körner for their concern and support, especially at a time when I was convinced life couldn't possibly be more challenging. Two Richards (R. Porker and R. Parker): although our ways have parted further as my PhD progressed, what you have given me, now a part of me, was very useful in the past years and I want to thank you for that. Thank goodness that there are Don Toño and Raúl, and thanks to them two for sharing the gentle path they walk.

Bart and Irene Paardenkooper are doubtlessly the best neighbors and landlords one could ever wish for. I cannot thank you enough for the countless times in these four years you have looked after me (and my medicinal cat and plants) when I've been ill, hungry, stressed, late to catch a train,

or simply in the need of warmth or a good laugh. Irene gets extra thanks for saving my butt, one time too many, from getting fines at the library due to, well, overdue items. Bart, thank you for indulging me in my bricolage and gardening projects at home. I hope that the often-disastrous outcomes of my ventures (like that ant issue, to name one of several examples) have spiced up your lives a little bit, rather than left you wishing you had taken a tenant with a profile less prone to chaos than mine.

In spite of the lovely atmosphere at work and the coolest landlords on earth, getting emotionally settled in Wageningen (i.e. finding those of my kind to do the things those of my kind like to do) proved a painfully long process. The circumstances didn't help much: the herbarium was off of the campus, I wasn't taking any courses where I could meet other students, and the few people I met through doing theatre had finished their studies and left by the time I would return from my field stays. Fortunately, friendships evolved with some of my colleagues. Thanks to Gaby, who together with her husband François and son Theo opened not only home and hearts, but made it possible for me to have the best of starts in beautiful Benin. In Susa I found not only a friend and part-time neighbor, but also a colleague from whom I've learnt many of the little tricks that make of botany such an exciting trade. Theo, partner in crime and one of the most fascinating persons I have had the good fortune to meet, I thank you for your patience and help figuring out the mysterious ways of the BRAHMS database. And I thank all of you for sharing your perspectives in the topics of life that have been a bit of an unfathomable and recurrent issue in the past four years and you had the nerve to hear me speak of (or whine about, more like). The planet would be a greener and definitely funnier place if there would be more people like you walking its surface.

Without any doubt, some of the toughest moments in the past four years came once fieldwork stays were over and I had to sit and write down my thesis. The difficulty was not so much in writing (although I have to confess it was not that easy either), but in a crescendo of unfortunate incidents not uncommon of this venture of life. So, the weekends and evenings with De Keek op de Week, MovieW, and other friends certainly made the hardships of this period more bearable. Thanks to fellow keeksters Monique, Joost, Emma, Jorrit-Jan, Paul, Erik, Marcus, Bart, Suzanne, Ruud, Geertje, Geke, Tamar, and Ymkje. Dear keeksters, it's been a true pleasure to be exposed to the creative genius of each and every one of you, and to lose some precious neurons with you in our many keekings. Dear fellow MovieW volunteers, it's been a pleasure to escape the confinement of a computer screen to confine myself to the escape of the big screen with you all. Cheronsky and Rebecca, you two are incredible women and role models to me. I praise myself lucky that we befriended one another. There are four people whose kindness and loving care have filled me with hope and strength to go through the toughest moments of the past year. Marce and Laurensito, who have made of 'solita' one of the most beautiful words, in my count. Mads and Sébas, who always make me feel like I'm having a sundowner by the beach, no matter what time of the day it is I see them. I thank you four for the friendship and the little joys we share. These are the delightful rewards.

I mentioned above, how lucky I am to have friends that are like my family in Europe, but I still haven't said how grateful I am to have the family and friends I have in Mexico. Words fail to

describe what you are to me. *Mami* and Jorge; *papi* and Magali; my beloved brothers Santiago, Miguel, and Luis; my sisters-in-law Laura and Juliana; and my dear nieces Ángela and Abril and nephew Santi; Juanita, my second mom; Alma and Alberto, my second siblings; aunty Tere, uncle Jupi, cousins Patricio and Alejandra; my school friends Anabel, Lorena, and Whamps; and Chavita and Javier Ordoñez, whom I met at university and with whom I share a deep appreciation for Mexico's nature and culture. I thank you all for your generosity, your affection, your tolerance to the pursuing of my aspirations abroad and far away from you, and most of all, thank you for your friendship.

About the author

Diana Quiroz was born in northern Mexico at the break of a summer's day in 1981. Diana spent a reasonable part of her formative years visiting a peasant great-grand mother who lived on the fringes of the Chihuahua desert. She also frequented the mountain range between Zapalinamé and Huachichil, while camping with the scout group she and her family belonged to. Although many women of her generation claim that Disney thwarted them by indoctrinating a tiny-waisted ideal of gender and beauty, the effect that Disney had on Diana was a different one (in her case, The Princess Problem came from other sources). While flipping through the pages of a Disney's Small World Library she and her brothers shared, she often wondered if it was really true that people in other parts of the globe went about their business in a different manner her folks, in their contrastive denominations (i.e. peasants or urban creatures) did. She finally set out to look for answers after graduating from high school in 1998, when she spent a year as an exchange student in Flanders.

In 2000, she started a major in Biology at the Autonomous University of Nuevo León, but interrupted her studies a year later to respond to the insistent call of wanderlust. In 2002, she enrolled at the Brandenburg University of Technology in Germany. It was during this period that her interest in nature and people took a new, well, take. Apart from taking courses in the natural sciences, Diana explored the place of humans in nature and her own *Weltanschauung* while writing assignments on the phenomenology of the material culture for her sociology class. Four years and a semester spent monitoring birds in Thailand's Khao Luang National Park later; Diana obtained a B.Sc. degree in Environmental and Resource Management. In 2007, she started her M.Sc. degree in Ecological Agriculture at the University of Kassel, in Witzenhausen. Then, she landed an opportunity to carry out the research for her thesis in one of Arabia's last forests: the Hawf protected area in Southeast Yemen. Her work on Hawf's agro-pastoral land-use systems resulted in a set of recommendations for the Environmental Protection Authority of Yemen on the feasibility of a management plan not yet set into practice that limited the use of plant resources to the area's inhabitants. Subsequently, she remained in the country for the best part of 2008 as an intern of the UNDP-funded Socotra Conservation and Development Programme, where she was in charge of implementing a project on grazing targeted at the participatory protection of threatened plant species on Socotra Island. In 2009, Diana worked in Liberia for medica mondiale – a German NGO working with female survivors of sexualised gender-based violence. There, she provided technical advice in the implementation of activities aimed at the economic emancipation of women, which included home gardening, up cycling non-organic home waste for the elaboration of toys, and exploring the potential of Non-Timber Forest Products for income generation.

In September 2010, Diana joined Naturalis Biodiversity Center and the Wageningen University branch of the National Herbarium of the Netherlands. As a scientific officer (AIO), she conducted the research described in this thesis, taught tropical botany, and supervised M.Sc. students in their thesis projects. After all these years, she still cannot decide if and how people really differ across cultures.

Publication list

- Quiroz, D.**, Sosef, M.S.M., van Anandel, T.R. (submitted). "Gullibility of the credulous" or ignorance of the sceptic? Why ritual plant use has pharmacological relevance.
- Quiroz, D.**, van Anandel, T.R. (in review). Plants of the gods and their importance among the mortals: an analysis of cultural domain.
- Van Anandel, T.R., Croft, S., van Loon, E.E., **Quiroz, D.**, Towns, A.M., Raes, N. 2015. Prioritizing West African medicinal plants for conservation and sustainable extraction based on species distribution models and market surveys. *Biological Conservation*, 181: 173-181
- Quiroz, D.**, van Anandel, T.R. 2015. Evidence of a link between taboos and sacrifices and resource scarcity of ritual plants. *Journal of Ethnobiology and Ethnomedicine*, 11: 5.
- Van Anandel, T.R., Van 't Klooster, C., **Quiroz, D.**, Towns, A.M., Ruyschaert, S., van den Berg, M. 2014. Local plant names reveal that enslaved Africans recognized substantial parts of the New World flora. *Proceedings of the National Academy of Science*, 111: E5346-E5353.
- Vossen, T.E., Towns, A.M., Ruyschaert, S., **Quiroz, D.**, van Anandel, T.R. 2014. Consequences of the trans-Atlantic slave trade on medicinal plant selection: Plant use for cultural bound syndromes affecting children in Suriname and Western Africa. *PLoS ONE*, 9: e112345.
- Towns, A.M., **Quiroz, D.**, Guinée, L., de Boer, H., van Anandel, T.R. 2014. Volume, value and floristic diversity of Gabon's medicinal plant markets. *Journal of Ethnopharmacology*, 155: 1184-1193.
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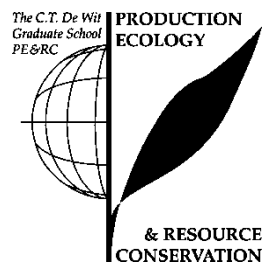
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Porter, R.F., **Quiroz, D.** 2010. Social behaviour of the Egyptian Vulture (*Neophron percnopterus*). British Birds, 131: 61-64.

Quiroz, D. 2008. Assessing the constraints and potentials to environmental protection in South-East Yemen. M.Sc. Thesis. University of Kassel, Germany.

PE&RC Training and Education Statement

With the training and education activities listed below the PhD candidate has complied with the requirements set by the C.T. de Wit Graduate School for Production Ecology and Resource Conservation (PE&RC) which comprises of a minimum total of 32 ECTS (= 22 weeks of activities)



Review of literature (4.5 ECTS)

- Sacred and ritual plants of Benin and Gabon (2011)

Writing of project proposal (4.5 ECTS)

- Plant use, traditional religious beliefs, and ecological knowledge of the ancestral ethnic groups of enslaved Africans; studies of Benin and Gabon (2010)

Post-graduate courses (7.5 ECTS)

- Biocultural diversity: concepts and interdisciplinary methods; Autonomous University of Barcelona (2011)
- Interpretive methods and methodologies: an introduction; WASS (2013)

Laboratory training and working visits (4.5 ECTS)

- Sacred plants of Benin; National Herbarium of Benin and University of Abomey-Calavi, Benin (2011)
- Sacred plants of Gabon; National Herbarium of Gabon and Institute of Pharmacopoeia and Traditional Medicine, Gabon (2012)

Deficiency, refresh, brush-up courses (3 ECTS)

- Plant families of the tropics; Naturalis, UL (2011)

Competence strengthening / skills courses (4.5 ECTS)

- Teaching and supervising thesis students; Wageningen Graduate Schools (2010)
- French language; Wageningen In'to Languages (2010-2011)
- Presentation skills; Wageningen Graduate schools (2013)
- Scientific writing; Wageningen Graduate Schools (2013)
- Writing grant proposals; Wageningen Graduate Schools (2014)

PE&RC Annual meetings, seminars and the PE&RC weekend (2.1 ECTS)

- PhD Day Research School Biodiversity (2010)
- PE&RC PhD Introduction weekend (2011)
- PE&RC PhD Weekend final year (2013)

Discussion groups / local seminars / other scientific meetings (6.5 ECTS)

- Ethnobotany Research at Naturalis (2010-2014)
- Biosystematics Group Colloquia (2010-2014)

International symposia, workshops and conferences (7.6 ECTS)

- Troisième Colloque des Sciences, Cultures et Technologies de l'Université d'Abomey-Calavi; Akassato, Benin (2011)
- Annual meeting of the Society for Economic Botany; Plymouth, UK (2013)
- Joint meeting of the Society of Ethnobiology and the Society for Economic Botany; Cherokee, USA (2014)
- Meeting of the African Society for the Study of Religion and Nature; Cape Town, South Africa (2014)

Lecturing / supervision of practicals / tutorials (3 ECTS)

- Plant families of the tropics (2011-2014)

Supervision of 3 MSc students

- Sustainability of commercial medicinal plant harvest in Benin
- Cultivation and conservation of medicinal plants in Benin
- Sustainability of commercial harvest of non-woody plant parts for medicinal purposes in Gabon

The research described in this thesis was executed as part of the project “Plant Use of the Motherland: Linking West-African and Afro-Caribbean Ethnobotany”, which was financially supported by the Netherlands Organization for Scientific Research (NWO-ALW Vidi grant nr. 864.09.007). The Alberta Mennega Foundation provided additional funding to complete a second field stay in Benin.

Diana Quiroz 2015

Cover illustrations: Hans de Vries (front) and Maman Vekinu (back).

Photographs: All by Diana Quiroz except Beninese market (page 232, top, by Sofie Ruyschaert).