Ethnobotany of priority food and medicinal plant species of the Anacardiaceae family in the subequatorial area of Benin

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Research

Abstract

Background: This study was conducted to assess the use value of priority food and medicinal plant species of the Anacardiaceae family in the sub-equatorial area of Benin.

Methods: Data were collected through a literature review and an ethnobotanical survey. Eight criteria and four prioritization methods were used. The ethnobotanical study was based on questionnaires administered to 194 respondents. Citation frequencies, Use diversity value (UDs), Use equitability value (UEs), Ethnobotanical Use Value (UV) were calculated.

Results: 14 species were identified. Among them, *Lannea nigritana* (Scott-Elliot) Keay, *Sorindeia grandifolia* Engl. and *Spondias mombin* L. were priority food and medicinal species for conservation in the area. The predominant forms of use were wood energy and fodder for *L. nigritana*, chewing stick for *S. grandifolia*, the direct consumption of fruit and fodder for *S. mombin*. The Use Diversity (UDs) and Use Equitability (UEs) values of plant species revealed that men and women share similar knowledge levels, younger individuals possess less understanding, and traditional practitioners demonstrate advanced knowledge of *S. mombin* and its uses. *S. mombin* had the highest ethnobotanical use value (UV = 5,33). Gender (*L. nigritana* ($p < 0.000$); *S. mombin* ($p = 0.0009$)) and the profession (*L. nigritana* ($p < 0.000$); *S. mombin* ($p = 0.002$)) had a significant effect on the ethnobotanical use value of *L. nigritana* and *S. mombin* .

Conclusions: For the conservation of these species, raising public awareness should be used to encourage sustainability practices.

Keywords: Anacardiaceae, species prioritization, food and medicinal species, conservation

Background

Traditional plant knowledge represents a vital biocultural heritage, with demonstrated significance across multiple domains. In human health, extensive documentation exists regarding the use of Anacardiaceae species and other medicinal plants in Ayurvedic systems (Shiddamallayya *et al.* 2019, Singh 2016), African pharmacopeias (Guédé *et al.* 2010, Van Wyk 2008), and various traditional medical practices (Tuasha *et al.* 2018, Çakılcıoğlu 2020). Ethnoveterinary applications have been similarly well-documented, ranging from Anatolian practices (Babacan *et al.* 2022) to sub-Saharan African traditions (Nalule *et al.* 2011, Mwale *et al.* 2005, Githiori *et al.* 2004). Regarding food security, numerous studies highlight the critical role of wild

edible plants in nutritional supplementation (Termote *et al.* 2012, Bharucha & Pretty 2010), particularly in vulnerable communities (Koukou *et al.* 2022, Achigan-Dako *et al.* 2010, Dansi *et al.* 2008).

Despite their ecological and cultural importance, many Anacardiaceae species – particularly in Benin where Anacardiaceae species contribute to agroforestry systems and traditional medicine – remain understudied, creating significant gaps in conservation strategies. As noted by Parotta and Trosper (2012), Medhi and Chakrabarti (2009), traditional knowledge systems are increasingly recognized as crucial for sustainable resource management. However, current policies frequently fail to integrate ethnobotanical data effectively, as highlighted by Bellefontaine *et al.* (2001). The lack of integration between traditional knowledge and policy frameworks undermines the sustainable management of multifunctional species that serve simultaneously as food sources, medicinal resources, and income generators (Heubach *et al.* 2011, Arbonnier 2005).

Effective conservation strategies for food and medicinal species of the Anacardiaceae family depend critically on the prior identification of priority species. Given the limited financial resources available for biodiversity conservation, establishing clear priorities is an essential step in developing targeted action plans (Wilson *et al.* 2006, Brehm *et al.* 2010, Regan *et al.* 2008). As noted by Idohou *et al.* (2013), species prioritization not only helps distinguish high-priority taxa from those requiring less immediate attention but also identifies critical knowledge gaps that must be addressed.

Various methodologies for species prioritization have been proposed (Coates & Atkins 2001), yet no single standardized approach exists. The selection of an appropriate method depends on both national-level data availability and the specific objectives of the conservation strategy. For Anacardiaceae species – which hold significant socio-economic and ecological value – priority setting must integrate multiple criteria, including ecological vulnerability, cultural importance, and economic utility (Brehm *et al.* 2010, Belcher & Schreckenberg 2007).

A particularly adaptable framework is the approach developed by Brehm *et al.* (2010), which allows for the integration of socio-economic and ecological criteria through customizable weighting systems. This flexibility has proven effective across diverse contexts in Benin, as demonstrated by its application in studies on species prioritization (Kafoutchoni *et al.* 2018, Assogbadjo *et al.* 2017, Akpona *et al.* 2017, Sèwadé *et al.* 2016, Yaoitcha *et al.* 2015, Idohou *et al.* 2013). By adopting such a method, conservation planners can ensure that strategies for Anacardiaceae species are both scientifically rigorous and responsive to local needs.

Building on previous work, this study addresses critical knowledge gaps through two primary objectives. First, we aim to systematically identify priority food and medicinal species within Benin's Anacardiaceae family using a multi-criteria assessment approach. Second, we analyze ethnobotanical use values across different demographic groups to understand knowledge distribution patterns.

This research develops an integrated species prioritization framework that synthesizes ecological vulnerability assessments with socio-economic utilization patterns. The methodology introduces the valuation metrics to quantify multifunctional importance across different use categories. A distinctive feature of our approach is the conservation urgency matrix, which evaluates how cumulative utilization pressures from multiple uses (food, medicine, firewood) compound species vulnerability.

Materials and Methods

Study area

For the collection of ethnobotanical data, a preliminary survey was carried out among a random sample of people living in areas where priority species are present. This phase made it possible to get preliminary statistics on the characteristics of the population of users of the species and to define the survey area. The municipalities in which the three species are used simultaneously are considered. Then, the study is carried out in these three municipalities (Bonou, Adjohoun and Dangbo) in the “Ouémé” department (Fig. 1). They are located between latitudes 6°51’ and 6°96’ N and longitudes 2°38’ and 2°60’ E. It covers 778.58 km² and is characterized by a sub-equatorial climate with a bimodal rainfall regime. Annual rainfall varies from 1100 to 1300 mm. Soils are hydromorphic. Plant formations are represented by semi-deciduous forests and swamps.

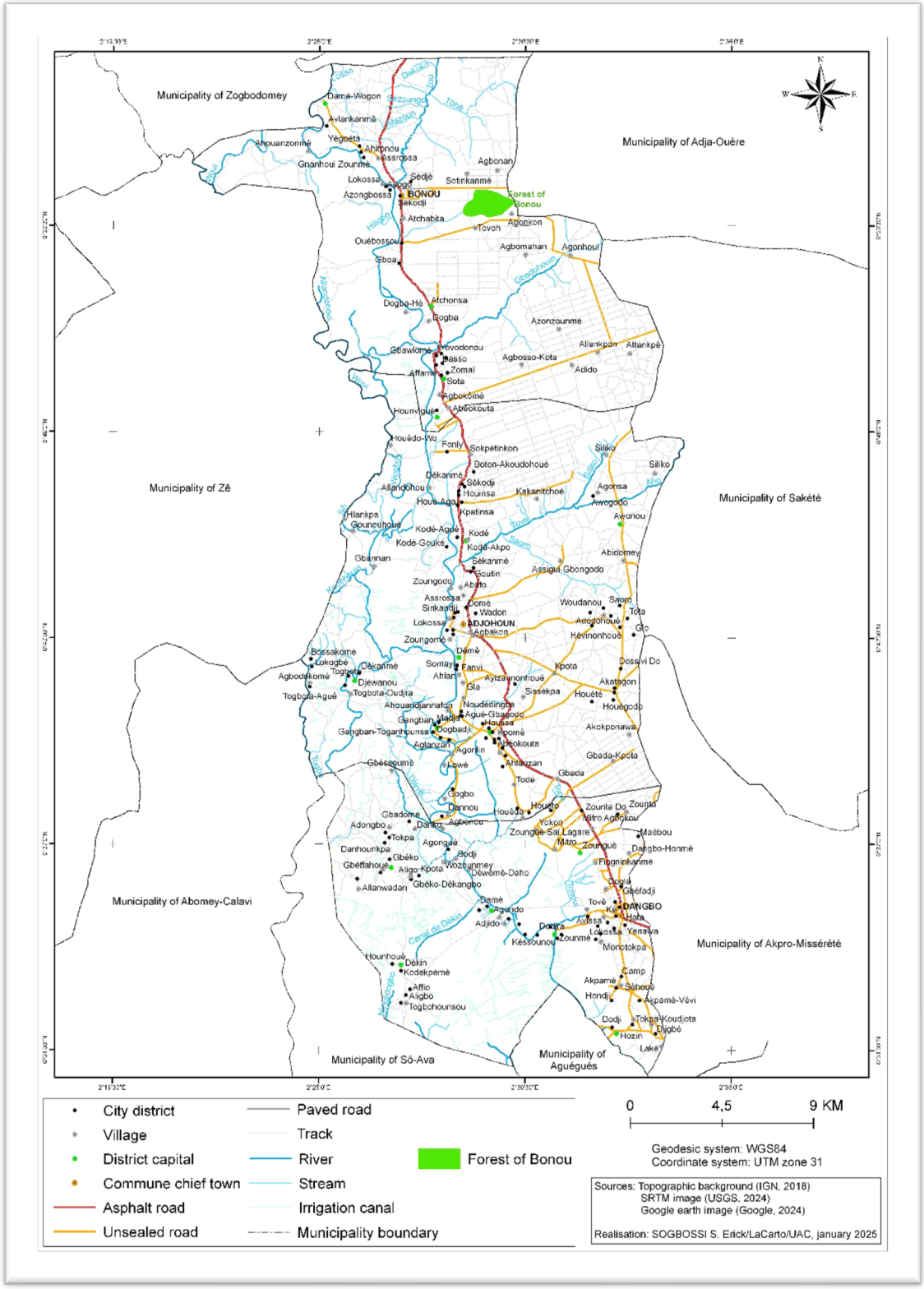

Figure 1. Location of study area showing surveyed localities

Data collection

Literature research for prioritization

To identify the priority food and medicinal species of the Anacardiaceae family in the Subequatorial area of Benin, the data collection method was essentially based on documentary research (Assogbadjo *et al.* 2017, Idohou *et al.* 2013, Chiara & Crespo 2012). It consisted of an exhaustive survey of all the species in the Anacardiaceae family in Benin's subequatorial area, using the Analytic Flora of Benin (Akoegninou *et al.* 2006), the Atlas of Biodiversity in West Africa (Poorter 2004), the

IUCN Red List for Benin (Neuenschwander *et al.* 2011), the Contribution of ethnobotanic and floristic studies in Benin République (Adjanohoun *et al.* 1989), the IUCN websites (www.iucn.org, www.iucnredlist.org), legal texts (national and international), dissertations, theses and scientific articles. The bibliographic search also included PubMed, Scorpus and Google Scholar digital databases. The databases of the main herbaria and genebanks accessible online via the Global Biodiversity Information Facility (GBIF, www.gbif.net) were also exploited. The data collected relate to the eight prioritization criteria listed in Table 1 (Brehm *et al.* 2010).

Table 1. Criteria used to identify priority food and/or medicinal species of the Anacardiaceae family for conservation in Benin and their different modalities (phd: phytodistrict)

N°	Criteria	Description	Modalities
1	**Origin**	The species may be native or introduced, or there may be doubts about its origin.	Four modalities were considered: (a) native, (b) introduced, (c) existence of doubt as to the origin of the species, (d) no data.
2	**Economic value**	Each species has been assigned an economic category based on its economic value and importance.	Three levels were considered: (a) international, (b) national, (c) local, (d) no data.
3	**Ethnobotanical value**	The food and/or medicinal uses of each species have been considered.	Modalities are: (a) Food and medicinal, (b) Food or medicinal, (c) Other uses
4	**Global distribution**	Global distribution data were considered, and the given taxa were divided according to their distribution.	The categories considered are: (a) World, (b) Africa, (c) East/West/North/South/Central Africa, (d) West Africa, (e) no data.
5	**National distribution**	National distribution data were considered, and taxa were divided according to their presence in the various departments and communes.	The flora of Benin was used. The following levels will be considered (a) 1 phd; (b) 2 phd; (c) 3 phd; (d) 4 phd; (e) no data.
6	**Conservation status**	Existing or ongoing conservation strategies were considered	The scales considered are conservation: (a) *in situ*, (b) *ex-situ*, (c) other, (d) no data.
7	**Legislation**	National and international legislation has been considered	The categories are: (a) local, (b) national, (c) international or (d) no data.
8	**Threat assessment**	The following categories of threats to species were considered (www.iucn.org, www.iucnredlist.org, Neuenschwander *et al.* 2011)	The IUCN Red List and the Benin Red List were consulted. The categories are CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient; NE: Not Evaluated.

Ethnobotanical Survey

The ethnobotanical data collection method was based on the administration of questionnaires following a simple random scheme. To constitute the sample, a preliminary survey was carried out on a sample of people chosen at random from the populations around the areas where the priority species were present. This phase provided preliminary statistics on the

characteristics of the population of species users and enabled the survey area to be defined. The sample size of those surveyed (n) was calculated using the normal approximation of the binomial distribution (Dagnelie 1998):

$$n = \frac{U^2_{1-\alpha/2} \times P(1-P)}{d^2}$$

$U^2_{1-\alpha/2} = 1.96^2$(for α = 0.05), P = 0.44 was the proportion of people surveyed at the end of the exploratory survey who know or use the priority species of Benin's subequatorial area; d: marginal error set at 0.05. The estimated value of (n) was 194.04 and had been rounded off to 194.

The ethnobotanical survey approach enabled us to get information on the socio-demographic characteristics of the respondents, their knowledge on the use of priority food and medicinal species in the *Anacardiaceae* family in the subequatorial area of Benin.

Data analysis

Species prioritization

The prioritization of food and medicinal species of the *Anacardiaceae* family in the subequatorial area of Benin was carried out using four different methods combining the eight above-mentioned criteria (Table 1) adapted from Brehm *et al.* (2010). This was the *Point Scoring Procedure* (PSP); the *Point Scoring Procedure with Weighting* (PSPW); the *Compound Ranking System* (CRS) and the *Binomial Ranking System* (BRS). Using these different methods (Fig. 2), the top 6 species were identified for each approach. The different prioritization results were then cross-referenced to produce a definitive list of priority food and medicinal species for the study area. The number of times each of these species appeared in the different methods was noted, enabling the top 3 species to be identified (Fig. 2).

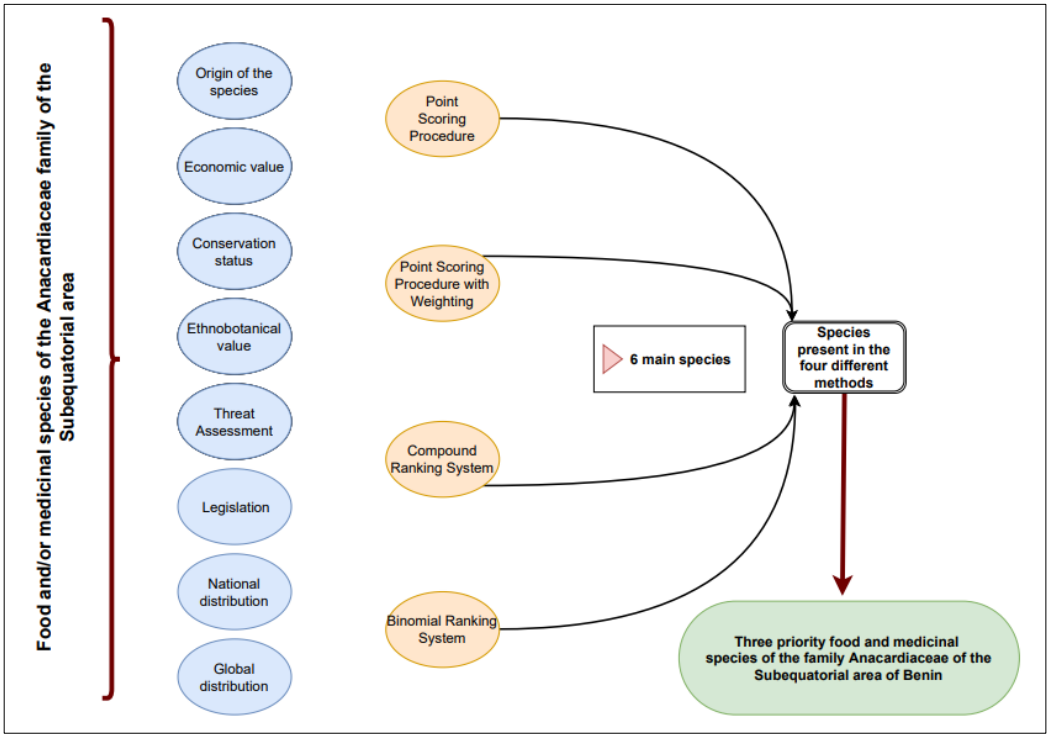

Figure 2. Methodology used to establish conservation priorities for food and medicinal species of Anacardiaceae in the Subequatorial area of Benin, adapted from (Brehm *et al.* 2010)

Use of priority species

The ethnobotanical and sociodemographic data collected enabled analyses to be carried out on the profile of respondents, the value and forms of use, and an assessment of the human-induced pressure on food and medicinal plant species in the Anacardiaceae family. To categorize respondents, age classes were adapted from Assogbadjo *et al.* (2008) and Houmenou *et al.* (2017). They were as follows: young people (≤ 29 years old), adults (30 to 59 years old) and the elderly (≥ 60 years old).

The relative frequency of citation (FRC) was calculated as follows:

$$FRC = 100\frac{S}{N}$$

(*S*: number of people who responded positively to a given variable, *N*: total number of people interviewed).

The various ethnobotanical indexes calculated are shown in table 2.

The Kruskal-Wallis's test was used to compare Use diversity value (UDs) and Use equitability value (UEs) according to socio-demographic groups. The Ethnobotanical Use Values was log-transformed (ln[x+1]) and subjected to an Analysis of Variance (ANOVA) with three factors (age, gender and profession) to assess respondents' knowledge on the uses of the three species. In this way, the groups with the best knowledge of these species were identified. The groups with the highest UV were those with the greatest overall knowledge for the uses of the plant in question.

Table 2. Ethnobotanical parameters

Index	Formula	Comment	Description	Reference
Use diversity value (UD_s)	$UD_s = 1\Big/\sum_{c=1}^{k} P_c^2$	Pc = contribution of use category c to the total utility of a species s *(=number of times species s was mentioned within each use category, divided by the total number of reports of use of species s across all use categories k)*	Measures for how many use categories a species is used and how evenly these contribute to its total use. Values range between 0 and number of use categories for which it is used	Byg and Baslev (2001)
Use equitability value (UE_s)	$UE_s = \frac{UD_s}{UD_{s\max}}$	$UD_{s\,max}$ = maximum possible use diversity value for a species s with uses occurring in each number of categories	Measures how evenly the different uses contribute to the total use of a species independent of the number of use categories. values range between 0 and 1	Byg and Baslev (2001)
Ethnobotanical Use Value (UV)	$UV = \sum_{i=1}^{n} \frac{U_i}{N}$	U_i: Number of uses mentioned by respondent i for species s; *N:* Total number of respondents interviewed for species	Enables us to identify species with a high use value.	Philips and Gentry (1993)

Results

Prioritization of food and medicinal species in the Anacardiaceae family

Fourteen species belonging to ten genera were generated from literature research. The most represented genus was *Lannea* A. Rich. (28.57 %) with four species. It was followed by the genus *Spondias* L. represented by two species. Eighteen percent of genera were represented by one species (*Anacardium* L., *Antrocaryon* Pierre, *Mangifera* L., *Ozoroa* Delile Kuntze, *Pseudospondias* Engl., *Schinus* Raddi, *Sorindeia* Engl., *Trichoscypha* Hook.f.).

Each of the four methods used to draw up the list of priority food and medicinal species in Benin's Subequatorial area provided a list of species ranked according to scores. The Point Scoring Procedure (PSP) generated a list of 5 priority species belonging to the genera *Antrocaryon* Pierre, *Lannea* (Scott-Elliot) Keay, *Pseudospondias* Engl., *Sorindeia* Engl. et *Spondias* L. The two species with the highest scores were *S. mombin* and *L. nigritana*. The Point Scoring Procedure with Weighting (PSPW) and the Compound Ranking System (CRS) had generated the same list of priority species. There were 5 species belonging to the genera *Lannea* (Scott-Elliot) Keay, Pseudospondias Engl., *Sorindeia* Engl. and *Spondias* L. The two species with the highest scores were *S. mombin* and *L. nigritana*. The Binomial Ranking System (BRS) generated 5 priority species belonging to the genera *Antrocaryon*, *Lannea*, *Sorindeia*, and *Spondias*. The best scores were observed in *S. mombin*, *S. grandifolia* and *L. nigritana*.

The number of times each species appeared in the various results of the above-mentioned methods made it possible to identify the three-priority food and medicinal species of the Anacardiaceae family for the Subequatorial area of Benin. These were *L. nigritana*, *S. grandifolia* and *S. mombin* (Table 3). Whatever the method, *S. mombin* always came out on top. It could be considered the highest priority species of the Anacardiaceae family for active conservation.

Table 3. List of 6 food and medicinal species of the Anacardiaceae family from the Subequatorial area of Benin

Species	Prioritization methods				Total
	PSP	PSPW	CRS	BRS	
Spondias mombin L.	1	1	1	1	4
Lannea nigritana (Scott-Elliot) Keay	1	1	1	1	4
Sorindeia grandifolia Engl.	1	1	1	1	4
Pseudospondias microcarpa (A. Rich.)	1	1	1	0	3
Lannea acida A. Rich. s.l.	0	1	1	1	3
Antrocaryon micraster A.Chev. & Guillaumin	1	0	0	1	2

Table 4 presents the three-priority food and medicinal species identified by cross-referencing of the four methods used with their national distribution, legislation and threat status at national and international level. At national level, decree n° 96-271 of July 2, 1996 (law 93.009) relating to the forestry regime in the Republic of Benin targets the *S. mombin* as a protected species. Considering the target area, the three-priority food and medicinal species for active conservation are spread across the 4 phytodistricts making up this area.

According to Benin's Red List for Nature Conservation, none of the priority food and medicinal species of the Anacardiaceae family in the Subequatorial area had been assessed. According to the IUCN Red List, all three species (*S. mombin*, *L. nigritana* et *S. grandifolia*) are Least Concern (Table 4).

Table 4. National distribution, legislation and threats to priority food and medicinal species of the Anacardiaceae family (phd: phytodistrict)

Species	National distribution	Legislation	Threats IUCN	Threats Benin
S. mombin	4 phd	Decree n° 96-271 of July 2, 1996	LC	NE
L. nigritana	4 phd	No data	LC	NE
S. grandifolia	4 phd	No data	LC	NE

Diversity and equitability uses of priority plant species

Use diversity and equitability of plant species

Overall, respondents have varying levels of knowledge regarding the use of the three species (Table 5). Men and women share similar knowledge of the three species. Generally, young people know less about the species 'uses compared to older people. Civil servants, in particular, are unfamiliar with the use of *L. nigritana*. In contrast, artisans have relatively deeper knowledge of *S. grandifolia*. Lastly, traditional practitioners and farmers have particularly well-developed knowledge of *S. mombin* and its uses.

Table 5. Use diversity and equitability of species

Socio-demographic characteristic	Modality	*L. nigritana*		*S. grandifolia*		*S. mombin*	
		UD_s	UE_s	UD_s	UE_s	UD_s	UE_s
Gender	Male	2,999	1,000	2,163	0,541	4,000	0,800
	Female	2,998	0,999	2,223	0,556	3,990	0,798
Age	≥60 years old (Elders)	3,000	1,000	2,072	0,518	4,552	0,910
	30 - 59 years old (Adults)	2,999	1,000	2,268	0,567	4,581	0,916
	≤29 years old (Youngs)	2,909	0,970	1,882	0,471	4,263	0,853
Professional	Traditherapists	3,000	1,000	1,996	0,499	4,414	0,883
	Retailor	3,000	1,000	2,036	0,509	3,963	0,793
	Farmer	2,993	0,998	1,991	0,498	4,547	0,909
	Craftsman	3,000	1,000	2,469	0,617	4,147	0,829
	Civil servant	0,000	0,000	2,000	0,500	3,988	0,798

Use diversity and equitability variation in socio-demographic characteristic of respondents

Knowledge of the uses of *L. nigritana* was common among all respondents, regardless of their socio-demographic characteristics (Fig. 3). However, knowledge of *S. grandifolia* differs between men and women. Meanwhile, the use of *S. mombin* varies based on professional category and age group.

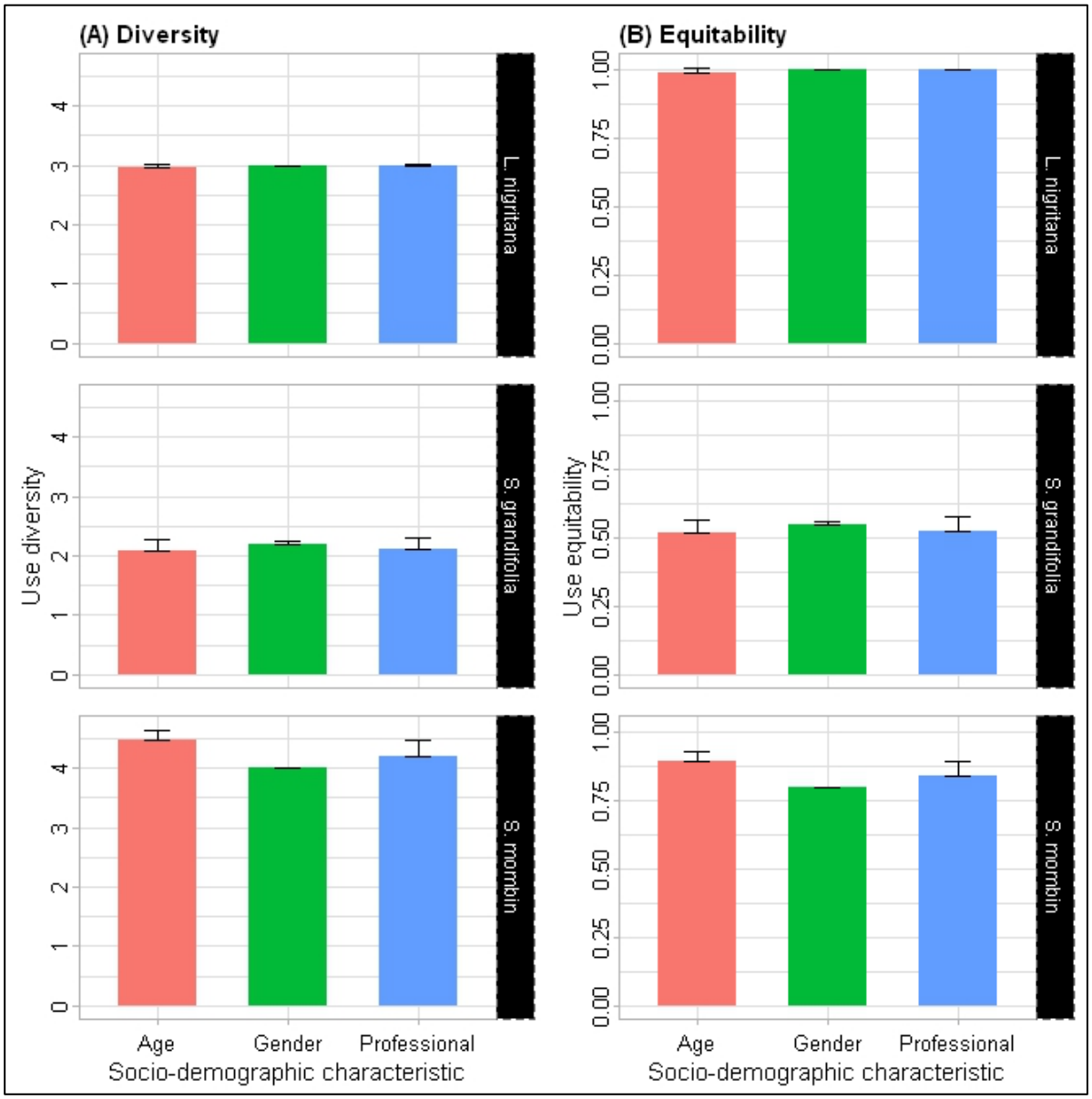

Figure 3. Use diversity and equitability of species by Socio-demographic characteristic of respondents

Use of priority plant species

Use categories

Respondents identified five main categories of use for the three species (Fig. 4). Among them, *S. grandifolia* is specifically associated with oral hygiene. *L. nigritana* is primarily used for medicinal, food, and firewood purposes, with a relative frequency exceeding 62%. For *S. grandifolia*, medicinal and oral hygiene applications are the most frequently reported, accounting for 86–98% of cases. Meanwhile, *S. mombin* is mainly valued for medicinal, food, and construction purposes, with usage rates ranging from 28% to 99%. Additionally, its use as firewood is also remarkable in the area.

Type of alimentary use

Based on the respondents' feedback, *L. nigritana* and *S. mombin* are commonly used as feed for domestic animals (Fig. 5). Moreover, a small percentage of respondents (3.95%) reported that *S. grandifolia* is also consumed by humans. However, all respondents unanimously agreed that *S. mombin* is widely consumed by humans.

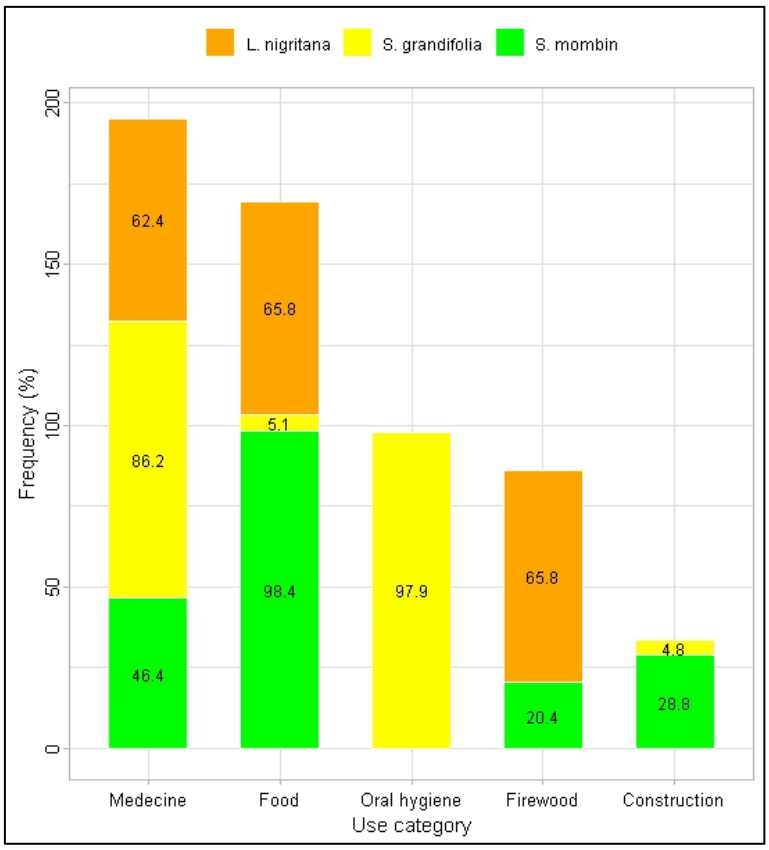

Figure 4. Use category of species by respondents

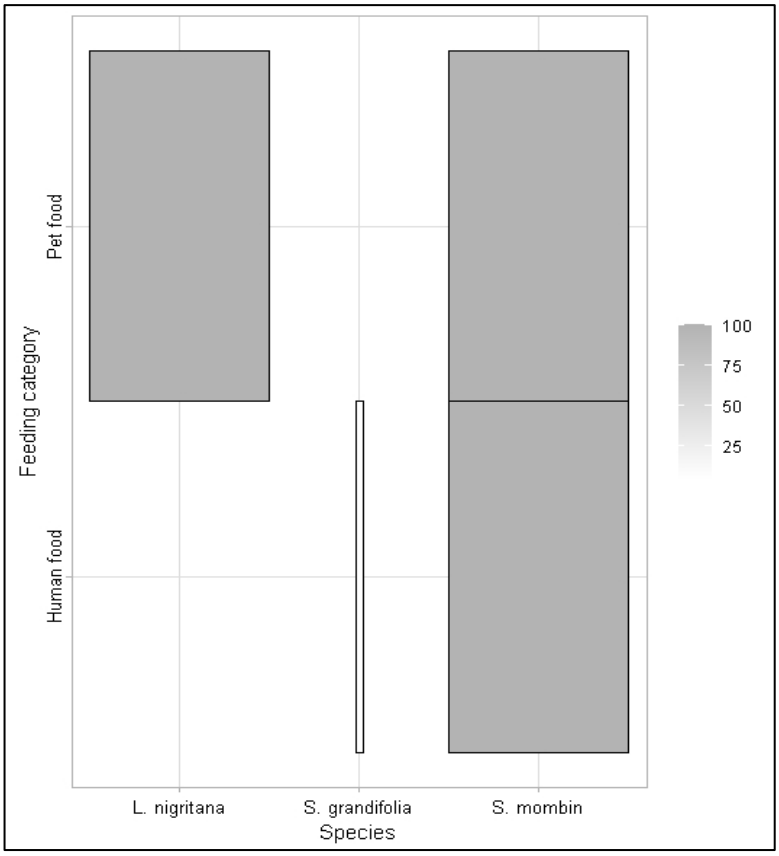

Figure. 5. Type of alimentary use by respondents

Mode of preparation for medical use

Five distinct preparation methods were identified for the medicinal use of the species (Fig. 6). All these methods are employed by respondents for the medicinal application of *S. mombin*. Among them, decoction is the most frequently utilized technique, adopted in 31–70% of cases, regardless of the species. The medicinal use of *L. nigritana* primarily relies on decoction and grinding, applied in 22–70% of cases. Similarly, *S. grandifolia* is predominantly prepared through decoction and infusion, used in 29–55% of cases. For *S. mombin*, decoction, fumigation, and maceration are the principal preparation methods for medicinal purposes.

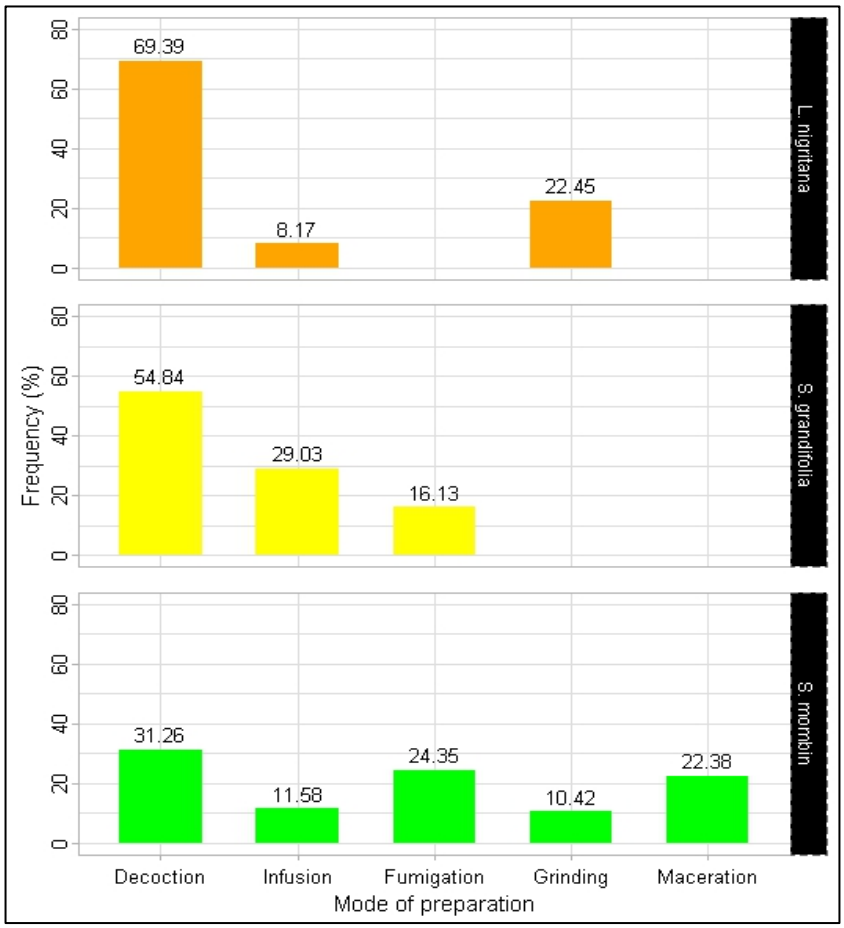

Figure 6. Mode of preparation for medical use by respondents

Ethnobotanical use values of priority species

Estimation of ethnobotanical use value (UV)

The ethnobotanical use value was 1.58 for *S. grandifolia*, 2.63 for *L. nigritana* and 5.33 for *S. mombin*. The highest value was for *S. mombin* (Table 6). The people interviewed had a greater knowledge of the uses of this species.

Table 6. Ethnobotanical use values (UV) of priority food and medicinal species

Species	UV
L. nigritana	2.63
S. grandifolia	1.58
S. mombin	5.33

Variation of the species use value according to socio-demographic characteristics

Gender, age and professional category had no influence on the ethnobotanical use value of *S. grandifolia* (Table 7). On the other hand, gender and professional category had a significant effect on the variation of ethnobotanical use value of *L. nigritana* and *S. mombin* (Table 7).

Table 7. Variation in ethnobotanical use value of species according to socio-demographic characteristics

Socio-demographic characteristics	*L. nigritana*		*S. grandifolia*		*S. mombin*	
	F	*Pr (>F)*	*F*	*Pr (>F)*	*F*	*Pr (>F)*
Gender	36.100	**< 0.000*** **	1.646	0.205	11.804	**0.0009 *** **
Age	2.061	0.146	0.155	0.856	0.114	0.892
Profession	18.343	**< 0.000*** **	1.243	0.3027	4.669	**0.002** **
Gender: Age	0.833	0.369	2.458	0.094	3.084	0.051
Gender: Profession	0.446	0.510	1.336	0.271	1.432	0.244
Age: Profession	0.445	0.646	0.244	0.912	0.965	0.443
Gender: Age: Profession	0.160	0.692	2.580	0.114	0.119	0.731

*F: Fisher statistics; Pr: Probability; **: p < 0.01; ***: p < 0.001*

Use value of species according to socio-demographic characteristics

Analysis of table 8 shows that women (UV= 1.34) and farmers (UV= 1.10) are the main socio-demographic groups with the most usage knowledge of *L. nigritana*. It also reveals that men (UV= 3.30) and farmers (UV= 2.88) are the main socio-demographic groups with the most knowledge of uses for *S. mombin*.

Table 8. Ethnobotanical use value (UV) of species according to socio-demographic characteristics of respondents

Socio-demographic characteristics	*L. nigritana*	*S. mombin*	*S. grandifolia*
Gender			
Female	1.34	2.03	0.85
Male	1.29	3.30	0.73
Professional categories			
Farmer	1.10	2.88	0.73
Traditherapists	0.93	0.72	0.30
Retailor	0.51	0.75	0.33
Civil servant	-	0.36	0.17
Craftsman	0.10	0.62	0.14

Discussion

Prioritization of food and medicinal species in the Anacardiaceae family

Prioritization in the development of conservation strategies is a dynamic process, and the multi-criteria approach seems to be more relevant for a judicious choice of species to be conserved (Brehm *et al.* 2010). This approach has enabled us to identify *L. nigritana*, *S. grandifolia* and *S. mombin* as priority food and medicinal species in the Anacardiaceae family. Kafoutchoni *et al.* (2018), Assogbadjo *et al.* (2017), Akpona *et al.* (2017), Sèwadé *et al.* (2016), Yaoitcha *et al.* (2015), Idohou *et al.* (2013) successfully used multicriteria analysis to identify priority species. However, prioritization methods are evolving. But priority species lists will need to be updated in the future, as the conservation status and threats of species may vary locally and internationally over the time.

Of these three species, *S. mombin*, is protected under Beninese law 93.009 relating to the forestry regime of the Republic of Benin. To date, a detailed threat assessment using IUCN Red List criteria has not been carried out in Benin for any of these species. The active conservation of food and medicinal species of the Anacardiaceae family should be a priority, as not only are the country's forest resources limited, but the socio-economic benefits of these species could compromise their long-term availability.

Targeted awareness-raising of the populations around the habitats where the species occur is necessary to ensure species conservation. Benin's flora shares the species identified with other African countries (Erhabor *et al.* 2013, Ngumah *et al.* 2013, Adedokun *et al.* 2010). As a result, the implementation of cross-border conservation policies and the creation of agroforestry development programs should facilitate better conservation of these species.

Knowledge of the uses of priority species

The results indicate that ethnobotanical knowledge distribution is shaped by respondents' age and profession, while gender does not appear to be a determining factor. These findings align with those of Ouachinou *et al.* (2017), who demonstrated

that ethnobotanical knowledge and practices vary significantly based on age and professional background. Older individuals, particularly traditherapists and farmers, possess a more comprehensive understanding of medicinal plant applications, especially in traditional veterinary and human medicine. Traditherapists are traditional medicine practitioners who use ancestral knowledge and natural remedies derived from plants to treat various illnesses. They capitalize on a great deal of information about plants and rely on knowledge passed down orally through generations within their communities and are regarded as healers in their societies (Kouchadé *et al.* 2016). They are in contact with suppliers (i.e., wholesalers or harvesters of medicinal plants), patients and other users with whom knowledge is regularly exchanged. In contrast, younger generations exhibit a lower level of knowledge in this domain, likely due to the weakening of intergenerational transmission and a growing shift away from traditional practices in favor of modern alternatives. In contrast, younger generations exhibit a lower level of knowledge in this domain, likely due to the weakening of intergenerational transmission and a growing shift away from traditional practices in favor of modern alternatives.

Furthermore, artisans exhibit specialized expertise in the utilization of specific plant species, reflecting a knowledge system closely tied to their craft. This pattern aligns with broader ethnobotanical research indicating that plant-based knowledge is often distributed according to professional roles within communities. For instance, Fagbohoun *et al.* (2014) identified 26 plant species from 14 botanical families used by artisans in Ifangni, Benin, particularly for dyeing and resin extraction. Such findings highlight the strong link between artisanal expertise and the practical application of ethnobotanical knowledge.

Conversely, civil servants exhibit a marked lack of familiarity with the uses of *L. nigritana*. This knowledge gap could be attributed to their professional detachment from traditional practices and reduced interaction with the natural environment. Their occupational roles typically do not require engagement with plant-based resources, limiting their exposure to ethnobotanical knowledge. This trend is consistent with broader ethnobotanical studies, which emphasize that knowledge of plant use is deeply rooted in daily practices and direct interactions with nature (Akouehou *et al.* 2014, Gbekley *et al*. 2015, Wédjangnon *et al.* 2016, Ouachinou *et al.* 2017, Yédomonhan *et al.* 2017, Olou *et al.* 2019).

Use of priority species

Direct consumption of fruit and fodder from *S. mombin* are the most cited uses. The high consumption of wild fruits to meet the food needs of rural African populations has been extensively noted in the literature (Abdou Habou *et al.* 2020, Kouadio *et al.* 2020, Betti *et al.* 2016, Makalao *et al.* 2015). The fruits of this species are especially prized for their tasty, vitamin-rich pulp. They contribute to balanced diets in rural areas (Makalao *et al.* 2015). Ambé (2001) reported that *S. mombin* fruits are mainly consumed by rural populations, even where they are picked in the pre-forest Guinean savannahs of Côte d'Ivoire. The species' dietary importance is also recognized by local populations in the "Forêt Classée de l'Ouémé Supérieur" and "N'Dali" (Djagoun *et al.* 2010) and in the "Agonvè" swamp forest and related terroirs in Benin (Dossou *et al.* 2012). According to Ogan *et al.* (2022), the fruit pulp of *S. mombin* has good potential for Vitamin C, phenolic compounds and flavonoids, which are essential for a balanced diet.

The use of *S. mombin* and *L. nigritana* species as woody fodder is explained by the fact that pastures are reduced to the leaf state in the dry season (Houinato 2001, Sinsin & Saîdou 1998). These forages are rich in digestible protein, vitamins and minerals (Kambashi *et al.* 2014). *S. mombin* leaves are highly prized by animals, to the point of being eaten to satiation in the economic community of the Great Lakes countries (Burundi, Rwanda, Democratic Republic of Congo) (Kanzila 1994). The species is cited as a fodder for rangelands in the Guineo-Congolian transition zone of Benin (Sewadé *et al.* 2016). Ohouko *et al.* (2020) report that *S. mombin* leaves are used in pig feed management in southern Benin. Another reason for interest in forage plants is that some of these species are said to have medicinal properties (Agbokounou 2001). For example, the leaves of *S. mombin* are used to combat Epistaxis, a known disease in pigs, and insufficient milk secretion (Ohouko *et al.* 2020).

The stem of *S. grandifolia* is mainly used as a chewing stick. The use of *S. grandifolia* as a chewing stick has also been mentioned by Akodewou *et al.* (2014) in Togo, Ogunshe and Odumesi (2010) in Nigeria, Akpona *et al.* (2009) in Benin. Chewing stick is a secondary forest product with a health, medicinal and pharmaceutical dimension, and one of the most exploited resources in rural Benin. It has antibacterial properties, notably against *Staphylococcus aureus* Rosenbach and *Bacillus cereus* Frankland & Frankland (Kassu *et al.* 1999). The use of these chewing sticks, usually for oral cleansing, remains a low-cost solution that is essential given the precarious purchasing power of rural populations (Akpona *et al.* 2009).

Ethnobotanical use values of priority species

The species exploited by local populations hold varying socio-economic values, as noted by Adomou *et al.* (2017). Among these, *S. mombin* stands out, with surveyed communities demonstrating extensive knowledge about its applications. This

disparity in ethnobotanical knowledge, particularly concerning *L. nigritana* and *S. mombin*, varies across different genders and professions.

This uneven distribution of indigenous knowledge has been observed in studies of other plant species. For instance, Yédomonhan *et al.* (2017) reported similar patterns with *Nesogordonia kabingaensis* (K.Schum.) Capuron, while Gbesso (2014) highlighted comparable findings for *Chrysophyllum albidum* G. Don. Gouwakinnou (2011) and Ekué *et al.* (2010) also documented such disparities in knowledge distribution for *Sclerocarya birrea* (A. Rich.) Hochst. and *Blighia sapida* K.D.Koenig, respectively.

Further supporting this, Ayantunde *et al.* (2008) found that botanical knowledge in southwestern Niger is influenced by factors such as age, gender, and ethnicity, leading to uneven knowledge distribution within communities.

Conclusion

A multi-criteria approach was used to identify priority food and medicinal species of the Anacardiaceae family in the sub-equatorial area of Benin. The three priority species are *L. nigritana*, *S. grandifolia* and *S. mombin*. The predominant forms of use are wood energy and fodder for *L. nigritana*, chewing stick for *S. grandifolia* and direct consumption of fruit and fodder for *S. mombin*. Ethnobotanical use-value analysis showed that *S. mombin* is the most widely used species. The sustained consumption of *S. mombin*, the use of *L. nigritana* and *S. mombin* stems as firewood and *S. grandifolia* stems as chewing stick may have an impact on sustainable conservation of these species. However, no protection and restoration strategy exist for these species. Therefore, it is urgent to draw up a sustainable management protocol for *L. nigritana*, *S. grandifolia* and *S. mombin* in subequatorial area of Benin to ensure their conservation. A communication strategy must be put in place to encourage people to adapt, get involved and change their behavior. An effective communication strategy should focus on organizing awareness campaigns in schools, universities, and local communities to emphasize the significance and benefits of these plants. It should promote reforestation and the establishment of community botanical gardens to actively engage local populations. Additionally, training sessions for farmers and foresters should raise awareness about sustainable practices and the advantages of preserving these plant species. Collaborating with NGOs and local governments will help expand conservation efforts on a larger scale.

Declarations

List of abbreviations: IUCN: International Union for Conservation of Nature; GBIF: Global Biodiversity Information Facility; phd: phytodistrict; CR: Critically Endangered; EN: Endangered; VU: Vulnerable; NT: Near Threatened; LC: Least Concern; DD: Data Deficient; NE: Not Evaluated; PSP: Point Scoring Procedure; PSPW: Point Scoring Procedure with Weighting; CRS: Compound Ranking System; BRS: Binomial Ranking System; DI: Diversity Index; EI: Equitability Index; UV: Ethnobotanical Use Value; ANOVA: Analysis of Variance

Ethics approval and consent to participate: All interviewees were totally consenting and gave their agreement to participate in investigations.

Consent for publication: Not applicable

Availability of data and materials: The data collected and processed are available from the authors and could bring them if required by the review.

Competing interests: The authors declare no conflict of interest.

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