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Ethnobotanical uses of wild edible plants of Mucaba municipality, Angola

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ABSTRACT: The forests and savannahs of Mucaba municipality in northern Angola hold enormous potential for plant-based non-timber forest products (NTFPs), including wild food plants (WFPs). Mucaba communities have accumulated a wealth of traditional knowledge on the use of wild edible plants over their long history. However, few studies have highlighted this unique and globally attractive culture. The ethnobotanical survey was conducted in 9 villages in Mucaba Municipality in September and October 2020. A total of 65 local informants were interviewed (35 women and 30 men), and their traditional knowledge of wild edible plants was documented. A total of 46 wild edible plants, belonging to 25 families and 30 genera were documented. These plants are consumed as wild edible vegetables, seasonal fruits, spice substitutes for tea, and forest alcoholic drinks. The traditional knowledge of wild edible plants held by the villagers of Mucaba is rich but is in danger of being lost among the younger generation. Therefore, the diversified cultivation of these local plants would allow their sustainable use and conservation especially of the endangered species in this part of Angola.

1. INTRODUCTION

Plants (wild and cultivated) are the base of the terrestrial food chain and are consumed daily all over the world. According to Dupriez and De Leener (1993), plants are essential natural resources for human nutrition and care. The designation "wild plants" refers to non-cultivated plants gathered from wild and agricultural landscapes (Termote et al., 2012). WFPs have been part of diets and traditional food systems throughout human history, providing important nutrients and bioactive compounds. Ancestral and contemporary traditional diets are known to offer valuable health benefits (Crittenden & Schnorr, 2017). WFPs are traditional foods that tend to be richer in micronutrients than cultivated crops (Hunter et al., 2019; Mawunu et al., 2020; Zinöcker & Lindseth, 2018). WFPs are embedded in traditional food knowledge, which represents an integral part of local and sovereign the food systems (Abdul et al., 2020). Despite their potential benefits, WFPs have been overlooked and excluded from most formal education, policies and research or development programs. The barriers to a greater use of WFPs were reviewed by Heywood (1999), with the main ones being a lack of information, statistics, market infrastructure, research and policies. Moreover, food and agriculture sectors have neglected wild species in favor of cash crops and starchy staples (Bharucha & Pretty, 2010). In addition, their free availability in nature has resulted in low economic valuation, which further reduces their visibility and promotion despite their nutritional, health, social and ecological benefits (Ngome et al., 2017) and economical.

In traditional societies around the world, knowledge has always been or is still transmitted orally. Angola is no exception to this reality. The history of Angola is essentially marked by oral tradition, so ethnobotanical records are scarce. However, there are some more recent studies that clearly demonstrate that the practice of using native and exotic plants to cure diseases and for food is a very old practice among people. Even so, the high lack of written records can be understood since people pass on their teachings to younger people through orality (Heinze et al.,

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2017).

Several ethnobotanical investigations have been undertaken in northern Angola to document and thus perpetuate traditional knowledge such those linked to wild medicinal and food plants. The literature of these investigations include the works of Alexandre (2019); Jendras et al. (2020); Lautenschläger, Mandombe, et al. (2020); Lautenschläger et al. (2018); Lautenschläger, Neinhuis, et al. (2020); Mawunu et al. (2021, 2016, 2018); Mazekana and Carlos (2019); Monizi et al. (2018), and Göhre et al. (2016). In this context, the current study aims to document the traditional knowledge of wild food plants consumed by the villagers of Mucaba municipality.

2. MATERIAL AND METHODS

2.1. Location and characterization of the study area

Mucaba is one of the 16 municipalities of Uíge province located 60 km north of the provincial capital Uíge. It covers a land area of 964 km^2 and a population of 43,974 inhabitantsFigure 1 (NIS, 2014) .

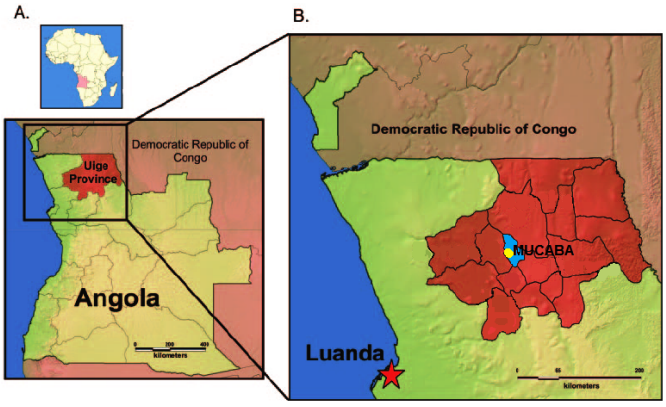

Figure 1. Mucaba municipality location

Mucaba is located almost in the center of Uíge province. It is bordered by Damba municipality to the north, Bungo municipality to the east, Bembe and Songo municipalities to the west and Uíge municipality to the south. The population of Mucaba municipality is originally Bantu from Bakongo ethnolinguistic group. The origin of the name Mucaba, derives from the river "Nkamba" (in kikongo language), which means safety belt (*Profile of Uíge province*, 2012). Mucaba is a municipality with an eminent agricultural profile. The traditional agricultural calendar is divided into three seasons. The first agricultural season, locally called as Ntema or Masanza runs from October to February of each year, while the second season, locally called Kintombo, runs from February to June. Finally, the third season, locally called Mulenga or Mbangala, runs from July to September. Subsistence agriculture is the main source of income, food diversification and social stabilization. The main agricultural products are cassava, bananas, groundnuts, sweet potatoes, coffee, beans, yams (Quissadi), maize and squash (Personal communication).

As for the climate aspects, Mucaba fits into a tropical hot and humid climate region with two well-defined seasons namely the dry season or Cacimbo from mid-May to August [Sivu ou Mbangala in Kikongo language] (Mawunu et al., 2016) and the rainy season corresponding to the remaining period of the year. The dry season is characterized by practically zero precipitation, but the dryness of the air and evaporation are mitigated by high relative humidity, cloudiness, and both persistent and frequent fogs. During Cacimbo season, night dew is almost a daily occurrence, with greater incidence in the early hours of the morning, and sometimes even small amounts of precipitation. Mucaba registers an average rainfall value of 900 mm in the western border and reaches up to 1500 mm in the interior. In the rain distribution there are two rainfall peaks in (November and April) separated by a short period without rain that takes place in January or February.

The average annual relative humidity at 9 o'clock is above 80%, while the coldest months are July and August, with average minimum values of 13^{o}C and 14^{o}C (Diniz, 2006).

2.2. Plant Materials

The plant material referred to in this research consists of the samples of wild food plants collected in Mucaba municipality. The field work was carried out over a period of approximately two months (September and October of 2020). The names of plant families were listed in alphabetic order. For the listing of taxa, we followed the APG (Group et al., 2009). We checked the spelling of the scientific names using the base according to the plant list. (http://www.theplantlist.org, accessed on 10/October/2021). Finally, both the teachers and the researchers of Kimpa Vita University have carried out the scientific identification of the species.

2.3. Study methodology

An ethnobotanical survey was conducted in nine villages of Mucaba Municipality, in northern Angola (Fig. 1). For data collection, a semi-structured questionnaire on the wild plants consumed by the villagers of Mucaba was prepared and submitted orally to the 65 informants, split into 35 women (47%) and 30 men (53%). The age of the informants varied between 18 and 53 years. We recorded data related to sociodemographic characteristics of the participants, local names of wild edible plants, consumed parts and consumption methods of the wild food plants were recorded, among other things. The exchange rate used in this study is equivalent to 1 US$ = 600.088 AOA [www.xe.com, accessed on 10/October/2021].

3. DATA ANALYSIS

We leveraged Microsoft Excel version 2016 and ORIGIN 8.5 softwares for data processing issues.

Table 1
List of wild edible plants usedby the local community in Mucaba.

Family and botanical name	Local names	Useful parts	Ethnobotanical uses	Other uses
Anacardiaceae				
Pseudospondias microcarpa (A. Rich.) Engl.	Mfiwa/Mviwa	Fruits	Fruit	Bioenergy
Annonaceae				
Annona stenophylla subsp.Cuneata(Oliv.) N.Robson	Malomboka/kilolo	Leaves, fruits	Fruit, tea substitute	-
Monodora myristica (Gaertn.) Dunal	Mpeve	Seeds	Spice	Medicinal
Xylopia aethiopica (Dunal) A.Rich	Nkua nkua	Fruits	Spice	Medicinal, Bioenergy, Construction Materials
Apocynaceae				
Landolphia owariensis P. Beauv.	Makongue	Fruits	Fruit	-
Mondia whitei (Hook.f.) Skeels	Nlondo londo	Leaves	Leaf vegetable, amuse-guele	Stimulent
Arecaceae				
Raphia sp.	Bordão, Matombe	Sap, fruits	Wine, fruit	Construction materials, Artisanat
Raphia sp.	Bordão, Matombe	Sap, fruits	Wine, fruit	Construction materials, Artisanat
Asteraceae				
Crassocephalum montuosum (S.Moore) Milne-Redh.	Bungudia	Leaves	Leaf vegetable	Medicinal
Crassocephalum rubens (Juss. Ex Jacq.) S. Moore	Bungudia	Leaves	Leaf vegetable	Medicinal
Burseraceae				
Canarium schweinfurtii Engl.	Mbidi	Fruits	Fruit	Medicinal, Artisanat
Costaceae				
Costus afer Ker Gawl.	Nsangalavua	Leaves, stems	Amuse-guele	Medicinal
Cucurbitaceae				
Raphidiocystis jeffreyaaa R.Fern. & A. Fern.	Mbankenkete	Leaves	Leaf vegetable	-
Dennstaedtiaceae				
Pteridium centrali-africanum (Hieron.) Alston	Mitekwa	Shoots	Leaf vegetable	Medicinal
Dioscoreaceae				
Dioscorea praehensilis Benth.	Kisadi Kia makaka	Tubers	Tubers	-
Gnetaceae				
Gnetum africanum Welw.	Mfumbwa	Leaves	Leaf vegetable	-
Lamiaceae				
Ocimum x africanum Lour.	Dinguanzi	Leaves	Spice	
Vitex ferruginea Schumach. & Thonn.	Mfilu a mfinda	Fruits	Fruit	Bioenergy, construction materials

Continued on next page

Table 1 continued

Vitex madiensis Oliv.	Mfilu a londe	Fruits, leaves, stem barks, root barks	Fruit, Tea substitute	Medicinal, bioenergy
Leguminosae/Fabaceae				
Albizia adianthifolha (Schum.) W.Wight	Mulu/Muanze	Leaves	Leaf vegetable	Bioenergy, construction materials
Erythrina abyssinica DC.	Mulungu lungu	Stem barks, leaves	Tea substitute	Medicinal, Firewood
Loganiaceae				
Strychnos cocculoides L.	Mabumi	Fruits	Fruit	Bioenergy, construction materials
Malvaceae				
Hibiscus cannabinus L.	Usse	Leaves	Leaf vegetable	Medicinal
Moraceae				
Trilepisium madagascariense DC.	Nsekena, ntombo a ngola	Leaves	Leaf vegetable	Construction materials
Myrtaceae				
*Syzygium guineens*e var. littorale Keay	Nkizu	Fruits	Fruit	Bioenergy
Passifloraceae				
Adenia lobata (Jacq.) Engl.	Nkenkete	Leaves	Leaf vegetable	-
Phyllanthaceae				
Hymenocardia acida Tul.	Mpete	Leaves	Leaf vegetable	Bioenergy, construction materials
Antidesma sp.	Kimfitia	Fruits	Fruit	-
Phytolacaceae				
Hilleria latifolia (Lam.) H.Walter	Ngudi a nkuekue	Leaves	Leaf vegetable	-
Piperaceae				
Piper guineense Schumach. & Thonn.	Kampidi	Seeds	Spice	-
Piper umbellatum L.	Muengeleka mfinda	Leaves	Leaf vegetable	Medicinal
Solanaceae				
Solanum americanum Mill.	Ndumbu	Leaves	Leaf vegetable	Medicinal
Urticaceae				
Myrianthus arboreus P. Beauv.	Mambonzua	Fruits	Fruit	Bioenergy, construction materials
Verbenaceae				
Lippia multiflora Moldenke	Bulukutu	Leaves, inflorescence	Tea substitute or tisane	Medicinal
Zingiberaceae				
Aframomum angustifolium (Sonn.) K.Schum.	Gingenga da floresta	Fruits	Fruit	-
Aframomum stanfieldii Hepper	Mampodia	Fruits	Fruit	-
Aframomum alboviolaceum (Ridl.) K.Schum.	Gingenga da savana	Fruits	Fruit	-

4. RESULTS AND DISCUSSION

4.1. Socio-demographic characterization of the informants

In total 65 informants were interviewed of which more than half (53%) are female and 47% are male. The relatively balanced proportion in gender of the interviewees sample shows that, men and women know and use wild food plants as part of their diet. We can compare the data in Mucaba to the 58% of the informants are women against 42% men, reported by Alexandre (2019) for Quitexe municipality. In contrast, Mawunu et al. (2016) reported an unbalanced proportion in Ambuila municipality, with man informants (67%) and only 23% of women.

4.2. Ethnobotanical informations from informant reports

As for age, the average age of the informants is 34 years. This average age shows that the informants are young and that the future ethnobotanical knowledge linked to the food use of wild plants is quite to be ensured. The informants found by Alexandre (2019) in Quitexe municipality and Mawunu et al. (2016) in Ambuila municipality who were 47 and 55 years old respectively. Concerning marital status, the majority (73%) of the respondents are married. The remaining informants are single (16%) or separated (11%). The predominance of married people in this study can be explained by the fact that they are the ones in charge of feeding the household. Also, the majority (65%) of interviewees have completed secondary education; 19% have primary education and 16% have only attended adult literacy school. The fact that ethnobotanical knowledge is mainly held by scholars shows that there is a possibility of this knowledge being preserved in writing and passed on to future generations. Finally, the great majority (88%) of respondents live from agriculture as their main source of income and employment. 7% of the interviewees are civil servants and 5% of the informants depend on other activities such as: small trade and odd jobs. The municipality of Mucaba is one of the regions of agricultural tradition in Angola, the relationship with the land is based on subsistence agriculture and the sale of the surplus, basically using family labour, as in other villages of the Uíge Province. Mawunu et al. (2016) reported that in the municipality of Ambuila, agriculture constitutes the main source of income and employment (95%). According to the Angolan National Institute of Statistics (2014), agriculture is practiced by 46% of the Angolan population, being the main source of income and employment.

Table 1 represents information on the wild edible plants used by Mucaba communities.

The ethnobotanical survey allowed an inventory of 46 species of wild plants consumed in Mucaba, of which 38 species were identified and 9 still to be identified. The 38 identified species are distributed in 30 genera and 25 botanical families (Figure 2). Among the 25 families, 76% of which were dicots (19 families), 16% monocots (4 families), 4% pteridophytes (1 family), and 4% gymnosperms (1 family). Amongst the dicots, Annonaceae, Lamiaceae and Zingiberaceae were the most represented families with 3 species in each, followed by Apocynaceae, Asteraceae, Leguminosae, Phyllanthaceae and Piperaceae with 2 species. The remaining botanical families (Anacardiaceae, Burseraceae, Costaceae, Cucurbitaceae, Loganiaceae, Malvaceae, Moraceae, Myrtaceae, Passifloraceae, Phytolacaceae, Solanaceae, Urticaceae, and Verbenaceae) have only one species each. In addition, the Monocots were represented by the families Zingiberaceae (3 species), Arecaceae (2 species), and Dioscoreaceae (1 species). On the other hand, the Pteridophytes were represented by the family Dennstaedtiaceae (1 species). Finally, Gymnosperms were represented by a single Gnetaceae family (1 species). By cross-referencing these data to Mawunu et al. (2016) study in Ambuila municipality who enlisted 59 species of wild food plants distributed in 43 genera and 31 botanical families. The families with the highest representation were, Apocynaceae and Zingiberaceae with 5 species each and Arecaceae 4 species. Whereas, Alexandre (2019) in Quitexe, investigated 27 wild food plant species and 17 botanical families. The families with the highest number of species are: Arecaceae (4 species), Apocynaceae (3 species) and Zingiberaceae (3 species). Finally, Mazekana and Carlos (2019) who conducted the same type of study in the entire Uíge Province listed 62 species distributed in 28 botanical families. The richest families were, Apocynaceae (10 species), Fabaceae or Leguminosae (7 species), Asteraceae (4 species), Euphorbiaceae and Zingiberaceae (3 species each). And the other families were Acanthaceae, Chrisobalanaceae, Lamiaceae, Loganiaceae and Passifloraceae, with 2 species each.

The difference of the results of this study with the previous ones can be linked to the diversity of agroecological zones and habitats frequented, the duration in the study, of study season, the degree of influence of human activity in the different study zones among others.

4.2.1 Harvested plant habitats

The different ecological environments that host the edible wild plant species of Mucaba are presented in Figure 2.

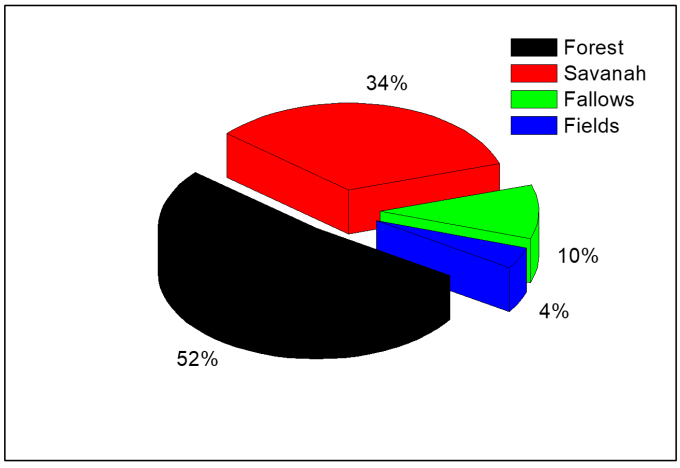

Figure 2. Distribution of wild food plants by habitat (%)

Table 2
Wild food plants sold in Mucaba.

N°	Botanical name	Useful parts	Average price (US$)	Selling methods
1	*Lippia multiflora*	Leaves	0.25	Piles, bundle
2	*Mondia whitei*	Leaves, Root	0.17	Piles
3	*Landolphia owariensis*	Fruit	0.50	Piles
4	*Raphia sp.*	Wine, fruit	0.08	Litre
5	*Raphia sp.*	Wine, Fruit	0.08	Piles, litre
6	*Monodora myristica*	Seeds	0.17	Piles
7	*Piper guineense*	Fruit	0.17	Piles, bucket
8	*Aframomum angustifolium*	Fruit	0.08	Piles
9	*Aframomum stanfieldii*	Fruit	0.08	Piles, tigelas
10	*Aframomum alboviolaceum*	Fruit	0.17	Piles, tigelas
11	*Canarium schweinfurtii*	Fruit	0.17	Piles, metal box
12	*Gnetum africanum*	Leaves	0.75	Bundle
13	*Pteridium centrali-africanum*	Shoots	0.17	Piles
14	*Xylopia aethiopica*	Fruit, Seeds	0.17	Piles

The results in Figure 2 show that forest (52%) and savannah (34%) are the habitats par excellence of wild food plants in Mucaba. The remaining plants were found in the fallows (10%) and ploughs (2%). Mawunu et al. (2016), pointed out that in Ambuila Municipality 72 % of wild food plants are from forest, 25 % from savannah and 3 % of species are ubiquitous (belong in both habitats). In contrast, Mazekana and Carlos (2019) reported that the majority (37%) of wild food plants in Uíge Province are from savannah, 34 % are from forest and more than a quarter (29%) are ubiquitous (forest and savannah). Several reasons may be behind these observations, since Uíge province is made up of several agro-ecological zones and different microclimates and ecosystems. The study by Mazekana and Carlos (2019) covered almost all the agroecological zones of Uíge province and covered the two main seasons of the region (dry and rainy) which is why more species were found as compared to Mawunu et al. (2016) and Alexandre (2019).

4.2.2 *Morphological form*

Figure 3 shows the morphological form of the different wild food plants surveyed from the Mucaba.

The wild food flora of Mucaba Municipality is richly dominated by herbaceous (38%) and trees (24%). This is followed by shrubs (22%) and climbers (16%). The results of this research corroborate with Mazekana and Carlos (2019), who reported that herbaceous predominate (37%) the wild food species in the entire Uíge province. This is followed by shrubs (23%), climbers (21%) and trees (19%). Mawunu et al. (2016) in Ambuila Municipality also reported predominance of herbaceous (34 %) and trees (32 %). Climbers and shrubs occupy 25 % and 9 % respectively.

The differences observed in this item with previous studies by Mawunu et al. (2016) and Mazekana and Carlos (2019) would be linked to the availability of guide-informants, accessibility of the sampling areas and the state of degradation of ecosystems due to anthropic activities.

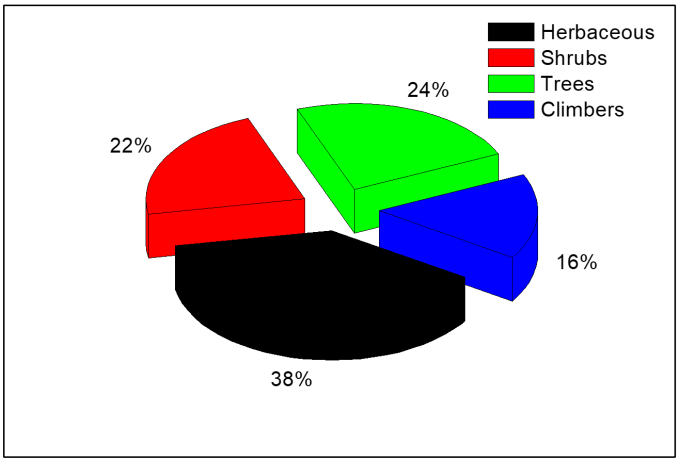

Figure 3. Morphological type of edible wild plants (%).

4.2.3 *Edible parts*

Figure 4 shows the food parts of the wild plants investigated at Mucaba.

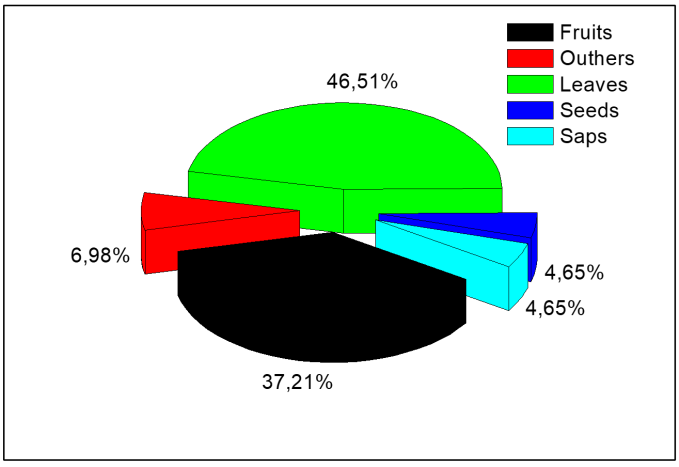

Figure 4. Parts of wild food plants used (%).

The data in Figure 4 show that leaves (47%) and fruits (37%) are the most abundant edible wild plant organs in the Mucaba. In addition, saps and seeds each have 5%. The other organs (7%) of plants consumed are root bark, stem bark (*Mondia whitei*) and tubers (*Dioscorea praehensilis*). Consumption of inflorescences was observed in only one species, *Lippia multiflora* (Bulukutu). The inflorescences of *L. multiflora* are boiled and consumed as tisane (Tea substitute). The other species consumed in this municipality presenting also one or two organs are *Raphia sp.* (the sap and fruits), *Pteridium centrali-africanum* (the shoot), *Vitex mandiensis* (fruits and bark), *Costus afer* (the stem) and *Dioscorea praehensilis* (the tuber). According to Mawunu et al. (2016) fruits and seeds (45%) and leaves (33 %) are the most abundant edible plant organs of wild plants in Ambuila. Mazekana and Carlos (2019) , also reported that fruits (57%) and leaves (31%) are the main edible organs of wild plants in Uíge province. On the other hand, the fact that fruits are more representative than other edible plant organs this shows a conservation character of the plant resource, because it does not prevent the development and reproduction of the plant (Martin, 1995), as well as the consumption of seeds and leaves if the removal of the aerial part is not excessive (Pilla et al., 2009) .

4.2.4 Modes of preparation and consumption

Harvested plant organs are consumed in various ways. This also explains the different ways or modes of preparation. The leaves are all used in the preparation of sauces, except for *L. multiflora*, whose leaves are used in the preparation of herbal tea. All these leaves are therefore cooked before consumption. As for the fruits, some can be eaten directly without any form of treatment, such as *Aframomum alboviolaceum*, *Aframomum stanfieldii*, *Aframomum angustifolium*, *V. madiensis*, *V. ferruginea* and *Syzygium guineense* var. littorale. In addition, other seasonal fruits undergo thermal treatments, such as boiling, as in the case of *Canarium schweinfurtii*. In some species, the mucilage or pulp around the seeds can be consumed directly, as in the case of *Adansonia digitata* (Nkondo or Imbodeiro in the local languages), where mealy pulp is eaten raw or made into juice after boiling or soaking in water at room temperature. Note that the seeds are used to enhance the flavour of food (spices). They are also used whole or crushed to give a seasoning used in the preparation of sauces or sprinkled on meat, chicken or fish before they are butchered, *Monodora myristica* (Mpeve in the local Kikongo language), *Piper guineense* (Kumpi or Kampidi in the local Kikongo language) and *Xylopia aethiopica* (Nkuwa nkuwa in the local Kikongo language). For *Raphia* species, the sap is used as a popular local drink (Raphia wine, commonly called Matombe or Maruvo) because of its cultural value, while the *Raphia* fruit (Nkulu in the local Kikongo language) can be eaten raw to ease stomach pains or cooked to extract. Finally, the barks of two species, *V. madiensis* (stem and root bark) and *M. whitei* (root bark) are used as tea and stimulant (aphrodisiac) respectively. As for the frequency of consumption of wild food plants, the study revealed that on average, 51% of the interviewed households consume them once a month, 27% consume them annually and 22% consume them once a week. On the other hand, wild food plants are consumed by children, youth, adults and elders. Some plants such as *A. alboviolaceum*, *A. stanfieldii*, *A. angustifolium* and *Landolphia owariensis*, which are a little acidic are preferred by one or two categories of people, children and women, especially pregnant ones. *G. africanum* leaves are much appreciated by adults, men and women because of their cultural value as local products. Finally, *M. whitei* roots are much consumed by men for their alleged aphrodisiac virtue.

4.2.5 Ways of acquiring food edible wild plants

Figure 5 shows the ways in which wild food plants are acquired in the Mucaba.

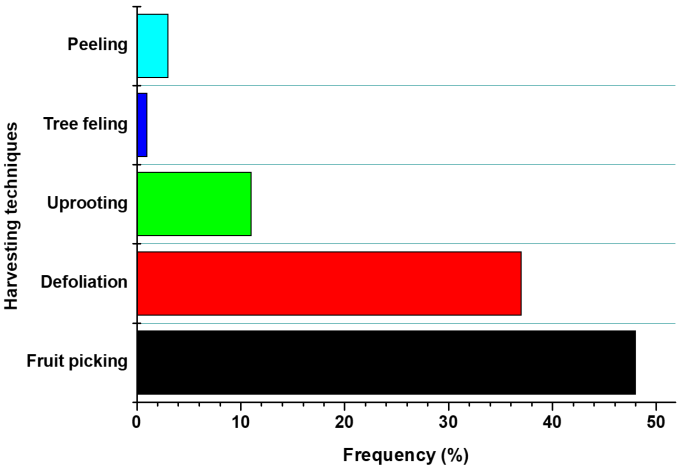

Figure 5. Forms of harvesting the wild food plants.

The results in Figure 5 show that fruit picking (48%) and defoliation (37%) are the main techniques used by Mucaba villagers in obtaining wild food plant organs. Other techniques used were: uprooting (11%), peeling (3%) and tree felling (1%). These last three techniques are not sustainable because they can cause a genetic erosion of the edible wild flora. Mawunu et al. (2016) revealed that harvesting (58%) were the most commonly used techniques in the acquisition of wild food plants in Ambuila. The other techniques reported were felling (11%) and shelling with 4%. Monizi et al. (2019), reported that in the gathering of *Dracaena camerooniana* leaves, the hunter-gatherers pick the leaves and sometimes cut the whole plant.

4.2.6 Other uses of the wild food plants investigated

Figure 6 shows the other uses of wild food plants in Mucaba.

The results in Figure 6 show the non-food uses of inventoried plants. Mostly, wild food plants are used as traditional medicine (32%), bioenergy (firewood, 24%; charcoal, 12%) and construction material (22%). In addition, 12% of the food plants are used in charcoal making. Finally, other wild food plants are used by Mucaba villagers in handicrafts (7%) and as stimulants or aphrodisiacs (2%).

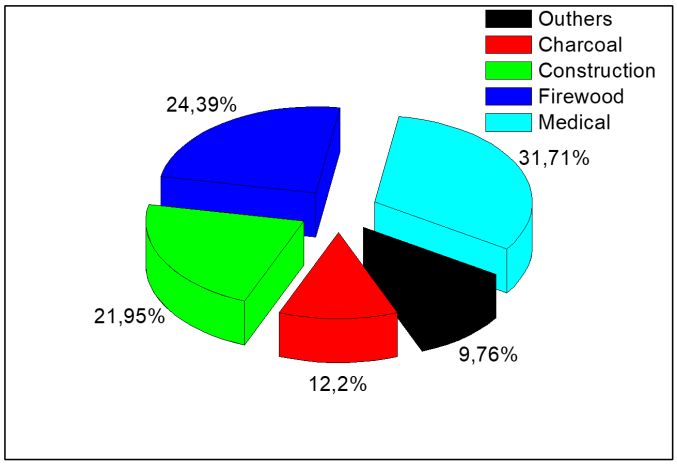

Figure 6. Other uses of wild food plants in Mucaba (%).

4.2.7 Acquisition and transmission of knowledge

The results of this study show that traditional knowledge comes from relatives or older people in the community. As for its transmission it is done according to the oral tradition of the region, a millennial means of preserving the know-how. Authors such as Monizi et al. (2018), Mawunu et al. (2018) and Heinze et al. (2017) reported similar results regarding the transmission of traditional knowledge in northern Angola.

4.2.8 Socio-economic value of some wild food species

Some wild food species inventoried in Mucaba are usually traded locally by women and children. Among these species are those whose seasonal fruits, leaves, sap, shoots, seeds or grains are sold in local markets in their entirety: *A. alboviolaceum*, *A. angustifolium*, *A. stanfieldii*, *S. cocculoides*, *P. guineense*, *X. aethiopica*, *C. schweinfurtii*, *M. myristica*, *L. owariensis*, *Raphia spp, P. Centrali-africanum*, *G. africanum* and *M. whitei*.

Concerning the organs of wild food plants sold in Mucaba, the leaves of G. africanum in bundles are the most expensive (0.75 US$) while the fruits of Aframomum are the most affordable costing on average 0.17 US$, a bunch.

The research conducted by Mawunu et al. (2016) in Ambuila municipality, inventoried 10 wild food plants sold in Ambuila Municipality. Among them, *P. guinneense* (Kumpidi in the local Kikongo language), *G. africanum* (Mfumbwa in the local Kikongo language), *C. acuminata* (Makazu in the local Kikongo language), *L. multiflora* (Bulukutu in the local Kikongo language) and *Raphia spp*. (Matombe or maruvu). Mawunu et al. (2020) also made an inventory of 35 wild food plant species sold at the markets of Uíge province. These are: *A. digitata*, *A. alboviolaceum*, *A. angustifolium*, *A. stanfieldii, Anisophyllea quangensis*, *C. schweinfurtii*, *C. acuminata*, *Cucumis metuliferus*, *Crassocephalum montuosum*, *C. rubens*, *Cymbopogon densiflorus*, *Dacryodes edulis*, *Dracaena camerooniana*, *Erythrina abyssinica*, *G. africanum*, *L. multiflora*, *Landolphia lecomtei*, *L. lanceolata*, *L. owariensis*, *M. whitei*, *Monodora angolensis*, *Ochna afzelii* subsp. mechowiana, *P. guieneense*, *Plukenetia conophora*, *Pteridium aquilinum* subsp. Africanum, *Pterocarpus angolensis*, *Raphia* spp, *Salacia pynaertii*, *Scrodophloeus zenkeri*, *S. cocculoides*, *S. guineense* subsp. Macrocarpum, *Treculia africana* and *X. aethiopica*.

The results of this study show that the majority (62%) of wild food plants in Mucaba are sold at the markets. In addition, the other places of sale are the homes of the harvesters (25 %) and roadside (13 %). Mawunu et al. (2020) and Monizi et al. (2019, 2018) found similar results.

We point out that vendors use various non-standardized selling instruments and modes. The instruments and modes of sale depend on the physical state of the products, solid or liquid. Sale in heap is the main mode (69%), followed by sales in liter, bowl and tin (locally called kilogram) which occupy 13%, 12% and 6% respectively. According to Mawunu et al. (2020), for example, Mucua (*A. digitata*) pulp is sold in bunch, bucket or 50-150 kg bags. Likewise, fruits and bark are sold in bunch, tub, bucket and tin. Liquid edible non-wood forest products (maruvo, palm oil, etc.) are sold in liters. Finally, leafy vegetables like Mfumbwa (*G. africanum*), Mbonde (*S. pynaertii*), Nlondo londo (*M. whitei*), and tisane (Tea substitute): Buluku (*L. multiflora*), Kikaya or Kimbele tea (*Uvariodendron molundense*), etc., are sold in bundles.

4.2.9 Destination of income

The results of this study show that most (78 %) of the money earned from the sale of wild food plants in Mucaba is used to buy basic necessities. Only 19 % of the money is used to buy school materials. Finally, 3% of the money is used for other purposes such as health, agricultural materials, food and clothes. The results of this study partially corroborate the studies of Monizi et al. (2019, 2018), which reported that income from the sale of non-mandated forest products (food and non-food) contributes to the strengthening of food security and acquisition of both goods and services (purchase of school supplies, health care, basic necessities, contributions in deaths and marriages, church).

4.3. Constraints and Importance of Sustainable Resource Management

The abundance of wild food plants in Uíge province, specifically in Mucaba municipality is constantly threatened by anthropic activities. These threats may contribute to the genetic erosion of plant biodiversity in particular and biological biodiversity in general. The main anthropic activities observed are: subsistence agriculture and the use of non-ecologically unsustainable harvesting methods by some gatherers, such as felling, uprooting and peeling. Finally, except for *C. acuminata*, the harvesting of other wild food plants is done freely without prior authorization from the government bodies.

5. CONCLUSION AND SUGGESTIONS

An ethnobotanical study on wild edible plants was conducted in Mucaba municipality, northern Angola. A total of 46 wild edible plants and their traditional uses were documented in this study. Our results show that Mucaba people have plentiful

traditional knowledge on the utilization of wild edible plants with diversified eating parts, consumption methods, and use purposes. By building on the traditional knowledge of Mucaba villagers and encouraging them to diversify the cultivation of wild edible plants on the fields, as well as in their home gardens, a new bridge could be built for wild plants to become more profitable cash crops, contributing to their sustainable use and preserving the endangered species in this region. A policy of sustainable natural resources management can be created to integrate social, cultural and economic values of local communities.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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MM, TL- Research concept and design, MM, MHGP-Collection and/or assembly of data, MM, AT, KNN–Data analysis and interpretation, MM, KNN- Writing the article, MM, LN, LL, KNN–Critical revision of the article. All authors have read and approved the manuscript.

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