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Original Article

Composition of some indigenous economic tree species in Yorro, Taraba State, Nigeria

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ABSTRACT

This study evaluated the composition of some indigenous economic tree species in Yorro Local Government Area (LGA) of Taraba State, Nigeria. The objectives were to identify indigenous edible tree species and evaluate the proximate composition of the most prevalent species. Data were obtained using a semi-structured questionnaire and laboratory analysis. A sample intensity of 40% was used to select four districts at random. A total of 398 respondents were sampled using Solvin's formula and the Snowball sampling method. Vitellaria paradoxa and Ziziphus mauritiana were purposively selected to elicit information on proximate composition. Matured fresh undamaged parts of these species were harvested, sun-dried, and ground into powder form for laboratory analysis. Data obtained were analyzed using proximate parameters (protein, moisture content, crude fiber, ash content, lipid, and carbohydrates) and statistical tools (frequencies, percentages, ANOVA, and LSD). The results indicated that most respondents were married (58.79%), middle-aged (48.99%), male (53.52%), and had a primary education (31.66%). They engaged in farming (49.25%) and the utilization of indigenous economic tree species for medicinal (21.36%) and trade purposes (15.08%). The respondents identified a total of 23 indigenous economic tree species, with Ziziphus mauritiana being the most prevalent (95.98%). The proximate findings showed the exceptional amount of carbohydrates (89.24±0.148% and 384.29±5.742%) in Vetellaria. paradoxa and Ziziphus mauritiana roots, respectively. Similarly, the protein (35.34±0.652%) and lipid (33.73±1.092%) contents were high in Ziziphus mauritiana and Vetellaria paradoxa seeds, respectively. These attributes indicate the potential significance of these species in the food and pharmaceutical industries. There is an urgent need to implement sustainable management solutions for these species.

KEYWORDS: *Carbohydrates, Protein, Proximate, Vetellaria paradoxa, Ziziphus mauritiana*

INTRODUCTION

Indigenous economic tree species have been a significant part of diets for various ecosystems over centuries, offering a diverse range of food and health benefits (Borelli *et al.*, 2020) as well as socio-economic and ecological considerations. Indigenous economic tree species are well known and consumed by the indigenous people because the species have formed their main source of nutrients and diets in their traditional food systems (Carvalho & Barata, 2016; Oduor *et al.*, 2023). These tree species are used for food and fodder (Talukdar e*t al.*, 2021) because they are often rich in proximate nutrients. Their significance extends beyond nutrition, as they play crucial roles in medicine, ecological balance, biodiversity conservation, and cultural heritage (Tahir *et al.*, 2023). The utilization of indigenous economic tree species for food and medicine

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represents a significant area of interest within food security, nutrition, and sustainable resource management (Oduor *et al*., 2023). The vegetation of Yorro, a Local Government Area (LGA) in Nigeria, is one of the main in-situ responsibilities of the germplasm of indigenous economic tree species.

Some indigenous economic tree species with different characteristics of proximate profiles include *Annona senegalensis* (Okhale *et al*., 2016) and *Vitellaria paradoxa* (Israel, 2014). The parts of these species are rich in protein, fat, and carbohydrates. Rural communities, in most cases, depend on indigenous economic tree species resources to meet their food needs in periods of food crisis. Utilization of indigenous economic tree species as a food source is an integral part of the culture of indigenous people who dwell around forest areas. In Northern Nigeria, leafy vegetables and parts of indigenous economic tree species were collected as daily supplements for relishes and soups (Shomkegh *et al*., 2013). Many indigenous economic tree species are nutritionally rich and can supplement nutritional requirements, especially protein and carbohydrates. Protein deficiency, for instance, is widespread and has been cited as the most common form of nutrition (Imran *et al*., 2007) in Nigeria. With a high proximate content along with important proteins, carbohydrates, and lipids, indigenous economic tree plant parts have been recognized for their nutritional importance (Imran *et al*., 2007). Proximate analysis of indigenous economic trees demonstrates that in many cases, the nutritional quality of these species is comparable, in some cases, even superior to domesticated varieties (Shomkegh *et al*., 2013).

The importance of the active ingredients of indigenous economic tree species has stimulated significant scientific interest (Okhale *et al*., 2016) in their study. Additionally, the daily human needs for these species' resources to supplement the nutritional requirements of the body for proper functioning, coupled with both natural and human disturbances, are always the greatest threats to their existence (Sapkota *et al*., 2009; Neelo *et al.,* 2015; Kayombo *et al*., 2020). These factors affect their nutritional quantities and qualities.

Proximate analysis of indigenous economic tree species offers information on nutritional content, which is a crucial instrument to improve the nutritional profiles of these species. The information may be useful in identifying indigenous economic tree species that can improve nutrition and increase dietary diversity, thereby becoming an important strategy in tackling food insecurity. In most of the developing countries of the world, hunger and nutrition are increasing due to population explosion and high food prices (Imran *et al*., 2007). The effect of food shortage is spreading from developing countries to the developed ones, and millions of the World's most vulnerable (the rural poor) are facing starvation as food shortage bites hard and prices of food crops move upward every day (Smith and Edward, 2008; Akesa *et al*., 2018).

Indigenous economic tree species, especially those utilized for food and medicine, have suffered serious neglect and disregard, while some of them have not been properly identified (Meer *et al*., 2024). There is growing interest in investigating the nutritional profiles of the neglected indigenous economic tree species as food security becomes a pressing concern. Therefore, this study aimed to identify indigenous edible tree species and determine the proximate composition of the selected indigenous economic tree species. This will contribute to a better understanding of the potential of indigenous economic tree species as a valuable resource for sustainable food systems and the development of food security and nutrition.

MATERIALS AND METHODS

The Study Area

Yorro local government area (LGA) is located between latitudes 8^0 42' N and 9^0 12' N and longitudes 11^0 20' E and 11^0 45' E. It occupies a total land area of about 1,304 km^2 (Figure 1). The area is bounded to the north by Lau LGA, to the northeast and southeast by Mayo Belwa (Adamawa State), to the east by Zing LGA, to the west by Jalingo LGA, and to the south by Bali LGA (Oruonye Yorro Local Government Area (LGA) in Ahmed, 2017). Yorro LGA is made up of eleven (11) districts (council wards), which include Bikassa I, Bikassa II, Nyaja I, Nyaja II, Pantisawa I, Pantisawa II, Pupule, Pupule II, Pupule III, Sumbu I, and Sumbu II (Eduweb, 2022). The study area has two distinct seasons: the wet season and the dry season. The wet season typically lasts from April through October. The wettest months are August and September. November through March are the dry season months. December and January have the lowest relative humidity, falling to around 15%. The mean annual temperature is 290°C; the highest temperature is 350°C, and the lowest is 150°C. Rainfall averages 1541 mm annually (Serapta, 2020; Atlas Weather, 2024; Manpower, 2024; Weather Crave, 2024).

According to the National Population Census (2006), the population of Yorro LGA is put at 89,410 inhabitants (45,548 male and 43,862 female). Yorro LGA has a vibrant agricultural sector with the area known for the cultivation of a few numbers of crops such as maize, millet, salads, onions, yam, maize, groundnut, guinea corn, bambara nut, millet, tiger nut, cassava and vegetables, as well as rearing of domestic animals like cattle, sheep and goats (Oruonye Yorro Local Government Area (LGA) in Ahmed, 2017; Manpower, 2024). The study area is a hilly and mountainous area, surrounded by chains of mountains, with only about 25 percent of the cultivated land (Oruonye & Abbas, 2011). The mountains here are part of the Shebshi Mountain, which extends up to the Republic of Cameroon (Oruonye & Ahmed, 2017). The soil of the area consists of sandy loam soil, which developed on the basement complex rocks in the region. Yorro LGA is drained by the Malale River and many smaller streams that take their sources from the various mountains in the locality (Oruonye & Ahmed, 2017).

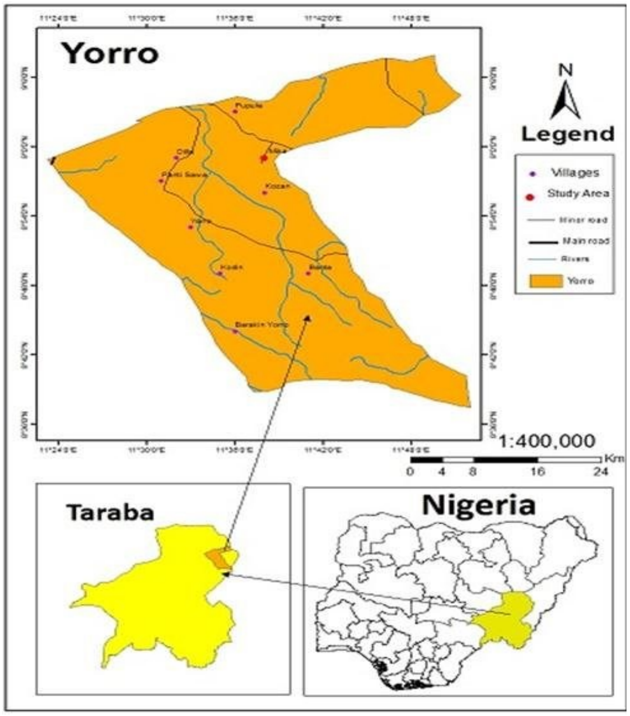

Fig. 1: Map of Nigeria showing Taraba state and the Study Area
Source: Oruonye & Ahmed (2017).

Data Collection

A sample intensity of 40% of the eleven (11) districts (council wards) of the LGA, which include Bikassa I, Bikassa II, Nyaja I, Nyaja II, Pantisawa I, Pantisawa II, Pupule, Pupule II, Pupule III, Sumbu I, and Sumbu II, was used to randomly select four (4) districts for the study. The randomly selected districts were Pantisawa II, Pupule III, Nyaja II, and Sumbu I.

A total of 398 respondents who use indigenous economic tree species for food and medicine, drawn from the target population of Yorro LGA (89,410), were purposively sampled in the study using Solvin's formula adopted by Yamane (1967) (equation 1).

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where: n = Required sample size, 1 = Constant, N= Total population of the study area, e = Error to tolerance (95% confidence level at a margin of error of 0.05)

An unstructured questionnaire was administered to the respondents sampled. The question required respondents to list a maximum of three most essential indigenous economic tree species used for food and medicine. The administration of the questionnaire was done using the Snowball sampling method as adopted by Agbelade *et al*. (2017) and Ifeanyi-obi *et al*. (2017).

Two indigenous economic tree species with the highest frequency out of the total species listed by the respondents were purposively selected to elicit information on proximate composition. Mature, fresh, and undamaged plant parts (leaves, stem barks, seeds, and roots) of the sampled indigenous economic tree species, each weighing approximately 1 kilogram, were harvested from standing trees. The samples were cut into small pieces, allowed to air dry at room temperature, and then ground with a mortar and pestle into a uniform powder as adopted by Dau *et al*. (2016 and Doe & Roe (2023). The powdered samples were then sieved, bottled, and labelled for laboratory analysis at the Biochemistry laboratory, Department of Biochemistry, Modibbo Adama University, Yola, Adamawa State, Nigeria.

Laboratory Procedures

The proximate content of the dried pulverized samples was determined according to standard methods described by the Association of Official Analytical Chemists (AOAC) (2012) and Ajetunmobi (2014) to estimate the ash, crude protein, crude fat, crude fibre, carbohydrate, and moisture contents of the samples as shown below:

Crude protein

Crude protein was determined using the Kjeldahl digestion method (AOAC, 2012) adopted by Ajetunmobi (2014). Two grams (2g) of the pulverized samples were digested with 5cm^3 conc. HNO_3 and 5cm^3 conc. H_2SO_4 (1:1) in a Kjeldahl apparatus according to the Kjeldahl digestion method until a clear colorless solution was obtained. The solution was allowed to cool and then made up to the top mark with distilled water in a 100 cm^3 volumetric flask. The digested sample was transferred into the micro Kjeldahl distillation unit and made alkaline with 17 ml of 40% NaOH, and then distilled into a receiver containing 10ml of boric acid indicator. The distillate was collected and then titrated against 0.1 N H_2SO_4, and a blank was made. The formula used is:

$$\% \text{ Nitrogen} = \frac{A - B \times 0.1 \times 100 \times N}{100 \times 0.2 \text{ (g)}} \quad (2)$$

Where: A = Titre of sample, B = Titre of blank, 0.1 = Normality of acid, N = 14.01, which is equivalent to weighed nitrogen, 0.2g = Weight of the sample in g, 1000 x 0.2 = Conversion of grams to milligrams, % Crude protein = % Nitrogen x 6.25 (protein factor of plant-protein) Where 6.25 = Factor use to multiply nitrogen to get crude protein

Lipid determination

Ten grams (10g) of the digest was extracted with n-hexane in a Soxhlet apparatus at 60^{0}C and the extract was dried for 30 minutes at 100^{0}C and then cooled to obtain the total lipid content, and the percentage fat was calculated as adopted by Ajetunmobi (2014):

$$\% \text{ crude fat} = \frac{W_2 - W_1}{W} \times 100 \quad (3)$$

W_2 = Weight of the beaker with the extracted oil, W_1 = Weight of the empty beaker, W = Weight of sample.

Crude fibre

Crude fibre determination was carried out by the standard methods described by AOAC (2012) and Ajetunmobi (2014). Five grams (5g) of the residue from the heated digest in 150 ml of KOH solution was dried in an oven at 105°C for 12 hours and weighed. The amount of crude fiber in percentage was determined using the formula:

$$\text{Crude Fibre} = \frac{\text{Weight of crucible + Dry residue} - \text{Weight of crucible + Ash}}{100} \quad (4)$$

Ash content

The ash content was determined as adopted by Ajetunmobi (2014). Two grams (2g) of the samples were heated in a muffle furnace with a dry crucible for 8 hours at 550°C until all carbon was removed. The ash content was calculated as follows:

$$\text{Ash Content (\%)} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100 \quad (5)$$

Carbohydrate content

The total carbohydrate content of the sample was measured by difference. According to Greenfield and Southgate (2020), carbohydrate originally could be a substance in a plant that is not protein, lipid, moisture, ash, crude fibre, or alcohol (if present). The original definition of total carbohydrate, known as total carbohydrate by difference, was calculated in this study, as adopted by FAO (2003) and Greenfield and Southgate (2020): Total carbohydrates = 100% - [protein + fats + moisture content + ash + crude fibre + alcohol (if any)].

Data Analysis

Data collected from the respondents were analyzed using descriptive statistics like frequency and percentage. The proximate analysis data were expressed as mean ± standard error of mean and subjected to one-way analysis of variance (ANOVA) using SPSS version 20 software to test for the significant difference. Fisher's Least Significant Difference (LSD) was used to separate means found to differ significantly.

RESULTS AND DISCUSSION

The result of the demographic characteristics of respondents in Table 1 is slightly male-dominated, with 53.52% male and 46.48% female. The largest age group (48.99%) was middle-aged respondents of 31-50 years, followed closely by those below 30 years (43.22%). The oldest age group (above 50 years) represents a small minority (7.79%). Many of the respondents were married (58.79%), while 41.21% were single. The highest proportion of respondents has only a primary education (31.66%), followed by those with secondary education (27.39%). Only 16.33% have a tertiary education. The dominant occupation is farming (49.25%), followed by herbalism (21.36%) and trading (15.08%). Artisans and civil servants represent smaller proportions. According to the study area's demographic profile, Yorro LGA is mostly made up of married men between the ages of 31 and 50 who engage in agriculture and depend on natural resources, such as indigenous economic tree species, for their livelihood. Meer (2018) reported similar demographic characteristics in Taraba State, Nigeria.

Table 1: Demographic Characteristics of the Respondents

Variable	Frequency	Percentage (%)
Gender		
Male	213	53.52
Female	185	46.48
Total	398	100
Age group		
Below 30 years	172	43.22
31 -50 years	195	48.99
Above 50 years	31	7.79
Total	398	100
Marital Status		
Married	234	58.79
Single	164	41.21
Total	398	100
Educational level		
Primary	126	31.66
Secondary	109	27.39
Tertiary	65	16.33
Illiteracy (no formal education)	98	24.62
Total	398	100
Occupation		
Farming	196	49.25
Trading	60	15.08
Artisan	42	10.55
Civil Servant	15	3.76
Herbalist	85	21.36
Total	398	100

Identification of Indigenous Economic Tree Species in the Study Area

The respondents listed a total of 23 prevalent indigenous economic tree species from 17 families (Table 2). Annonaceae, Fabaceae, Leguminosae, Malvaceae, Mimosoideae, and Rhamnaceae families had two species, while other families had only one species each. This implies that these species can supplement diets with essential nutrients and minerals, as reported by Duguma (2020). The majority of respondents (95.98%) perceived that the most common indigenous economic tree species utilized for food and medicine was *Ziziphus mauritiana*, followed by *Vitellaria paradoxa* (94.22%) and *Adansonia digitata* (93.97%), while *Hexalobus monopetalus* had the least (2.76%) (Table 2). The higher proportion of *Vitellaria paradoxa* and *Ziziphus mauritiana* could be linked to their food and medicinal values.

Table 2: Indigenous Economic Tree Species used for Food and Medicine in Yorro LGA

S/No	Local Name	Scientific Name	Family	Frequency	Percentage (%)	Rank
1	Bàgààrúúwáá	*Acacia nilotica*	*Leguminosae*	19	4.77	21st
2	Bàmbúú	*Adansonia digitata*	Malvaceae	374	93.97	3rd
3	Gubduu	*Annona senegalensis*	Annonaceae	191	47.99	10th
4	Kuryaa	*Bombax costatum*	Bombacaceae	234	58.79	9th
5	Giginya	*Borassus aethiopum*	Arecaceae	246	61.81	8th
6	Rimi	*Ceiba pentandra*	Malvaceae	44	10.05	16th
7	Taura	*Detarium microcarpum*	Fabaceae	15	3.77	22nd
8	Girca	*Ficus sur*	Moraceae	89	22.36	12th
9	Gaunde kura	*Gardenia erubescens*	Rubiaceae	61	15.33	14th
10	Dargajii	*Grewia mollis*	Tiliaceae	23	5.78	19th
11	Kelli	*Hexalobus monopetalus*	Annonaceae	11	2.76	23th
12	Namiji	*Khaya senegalensis*	Meliaceae	93	23.37	11th
13	Gawasa	*Parinari curatellifolia*	Chrysobalanacea	37	9.30	17th
14	Dabano	*Parkia biglobosa*	Mimosoideae	360	90.45	5th
15	Kirya	*Prosopis africana*	Mimosoideae	357	89.70	6th
16	Saada	*Spondias mombin*	Anacardiaceae	45	11.31	15th
17	Girgita	*Strychnos spinosa*	Loganiaceae	21	5.28	20th
18	Tsamiya	*Tamarindus indica*	Fabaceae	369	92.71	4th
19	Kadanyar	*Vitellaria paradoxa*	Sapotaceae	375	94.22	2nd
20	Dinyaa	*Vitex donniana*	Verbenaceae	318	79.90	7th
21	Tsada	*Ximenia americana*	Olacaceae	78	19.60	13th
22	Kurna	*Ziziphus spina*	Rhamnaceae	32	8.04	18th
23	Margaya	*Ziziphus mauritiana*	Rhamnaceae	382	95.98	1st

Proximate Composition of Vitellaria paradoxa and Ziziphus mauritiana Indigenous Economic Tree Species in Yorro LGA

Proximate analysis is conventionally used to assess the food value of plant substances (Ushie *et al*., 2022). The proximate characterization of the *Vitellaria paradoxa* and *Ziziphus mauritiana* species in Yorro LGA is shown in Table 3. The plant parts analyzed include leaves, bark, root, and seed, with measurements of various proximate parameters including protein, moisture content, crude fiber, ash content, lipid, and carbohydrates. The values were given as mean percentages with standard error of mean, and an asterisk (*) indicates a significant mean difference at the 0.05 level.

According to Table 3, carbohydrates were high in all the plant parts of *Vetellaria paradoxa,* i.e., leaves (88.16±0.147%), bark (82.85±0.332%), and seeds (42.03±1.917%), but slightly lower than in the roots (89.24±0.148 %). All the sampled *Vetellaria paradoxa* parts were characterized by moderate crude fibre content of 4.61±1.968% to 13.39±0.268%. Lower protein, moisture content, ash, and lipid content were seen in all the plant parts except seeds, which have higher values of proteins (6.06±0.070%), moisture content (5.62±2.180%), ash (4.29±0.305%), and lipids (33.73±1.092%). The *Vetellaria paradoxa* plant parts examined in this study have moderate crude fibre and a high carbohydrate content, but comparatively low protein, moisture, ash, and lipid levels. This finding is in line with the earlier report of Kolo *et al*. (2022), who found high carbohydrate content (70.24±0.52%), moderate moisture content (4.29±0.09%), and crude fibre (10.93±0.90%) in *Vetellaria paradoxa* seeds. In contrast to the present finding, the protein content of *Vetellaria paradoxa* seeds was higher than the protein concentration (3.68±0.02%) reported by Kolo *et al*. (2022) in Lapai metropolis of the Niger State, Nigeria, while the ash content in this study is greatly lower than the ash content (10.18±0.13 %) reported by Kolo *et al*. (2022).

All the plant parts of *Ziziphus mauritiana* except seeds have high carbohydrates, with roots (84.29±5.742%) being the highest, followed by bark (73.20±0.358%). The seeds of *Ziziphus mauritiana* were nutrient-dense with a balanced nutritional profile of high lipids (26.46±0.302%) and protein (35.34±0.652%) values. These values are marginally lesser or greater than those reported from Bauchi State, Nigeria, by Yerima and Adamu (2011). They reported 36.10±57%, 4.21±0.030%, 2.79±0.27%, 11.04±0.88%, 27.40±0.11%, and 21.26±0.63% for protein, moisture, ash, crude fiber, lipids, and carbohydrates, respectively. According to Keta's (2017) observations of proximate analysis of *Ziziphus mauritiana* fruits from Kebbi State, the moisture content, ash content, fat, crude fibre, protein, and carbohydrates were 5.16±0.29, 6.16±0.29, 62.00±0.50, 1.67±0.29, 6.18±0.13, and 83.98±0.46, respectively, measured in mg/100g. *Ziziphus mauritiana* seeds have the potential to be useful for nutrition due to their balanced nutritional profile, which includes high levels of proteins, lipids, and carbohydrates. To confirm this, Farha *et al*. (2020) reported that *Ziziphus mauritiana* seeds are rich in protein and are often eaten in times of famine. The least concentration of proximate analysis was observed in leaves for lipids (4.16±0.109%), stem bark for crude fibre content (1.53±0.088%), roots for protein (6.19±0.314%), and seeds for moisture content (3.83±0.098%), ash content (2.85±0.029%), and carbohydrates (20.39±0.751%). This corroborates Chen and Tsim (2020), who reported that *Ziziphus mauritiana* holds significant nutritional importance.

The proximate values for carbohydrates were statistically significant in all the plant parts of the sampled species. The moisture content of *Ziziphus mauritiana* plant parts also showed a significant difference (Table 3). This suggests that different parts of *Vetellaria paradoxa* and *Ziziphus mauritiana* in Yorro LGA can serve as varying sources of essential nutrients, depending on nutritional needs. The significant differences between the mean values of proximate in some parts of the sampled economic tree species indicate that the distribution of proximate varies greatly, with some parts being particularly enriched in specific nutrients. In line with this, significant differences were reported for some edible forest trees by Dau *et al*. (2016) and Evuen *et al*. (2022). Alabi and Napoleon (2024), however, found no significant difference in their report.

Table 3: Proximate Analysis of Vitellaria paradoxa and *Ziziphus mauritiana* in the Study Area

Plant part	Protein (%)	Moisture content (%)	Crude Fibre (%)	Ash (%)	Lipids (%)	Carbon hydrates (%)
Vitellaria paradoxa						
Leaves	3.38±0.209*	0.17±0.024	7.93±0.042*	0.14±0.019	0.23±0.009*	88.16±0.147*
Bark	3.28±0.088	0.31±0.009*	13.39±0.268*	0.08±0.007*	0.10±0.006*	82.85±0.332*
Roots	2.70±0.096*	0.31±0.012*	4.61±1.968	0.84±0.037*	0.30±0.006*	89.24±0.148*
Seeds	6.06±0.070*	5.62±2.180	8.27±0.161*	4.29±0.305	33.73±1.092	42.03±1.917*
Ziziphus mauritiana						
Leaves	8.10±0.087	7.22±0.169*	12.12±0.592*	7.96±0.045*	4.16±0.109*	60.59±0.178*
Bark	8.30±0.162	5.58±0.166*	1.53±0.088*	6.05±0.050	5.35±0.053*	73.20±0.358*
Roots	6.19±0.314*	4.72±0.149*	1.59±0.339	6.08±0.089	3.62±0.306	84.29±5.742*
Seeds	35.34±0.652*	3.83±0.098*	11.13±0.123*	2.85±0.029*	26.46±0.302*	20.39±0.751*

* *Indicate the mean difference is significant at the 0.05 level.*

CONCLUSION AND RECOMMENDATIONS

This study identified a total of 23 indigenous economic trees in 17 families, with *Ziziphus mauritiana* and *Vitellaria paradoxa* being the most common indigenous economic tree species. These species are socially and economically beneficial to man, animals, and many food, cosmetic, and pharmaceutical industries. Different parts of *Vitellaria paradoxa* and *Ziziphus mauritiana* species have proximate properties to varying degrees, with the seeds of *Ziziphus mauritiana* notably exhibiting the highest protein content (35.34±0.652%) and the seeds of *Vitellaria paradoxa* being exceptionally rich in lipids (33.73±1.092%), while carbohydrates generally constitute the highest values (between 20.39±0.751% and 89.24±0.148%) in all the plant parts of the sampled species. Indigenous economic trees make a substantial contribution to the long-term creation of innovative food solutions. This calls for actions to improve the sustainability of these species for the benefit of human populations and the entire forest ecosystem. A comprehensive study is required to investigate the ecological, social, and economic implications of these tree species, with a focus on their potential contributions to sustainable development and rural well-being.

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Authors' Contributions

B.B.M.: Conceptualization, Methodology, Formal Analysis, Investigation, Writing - Original Draft, Review, and Editing. G.D.D.: Methodology, Data Collection, and Investigation. All authors: Reviewed and approved the final manuscript.

Ethical Statement

Not applicable.

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