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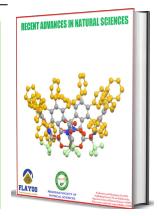

Proximate analysis of *Telfairia occidentalis* (fluted pumpkin) and T*elfairia pedata* (oyster nut) leaves consumed in Katsina Metropolis: a comparative study

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ABSTRACT

Telfairia occidentalis and *Telfairia pedata* are highly valued for their nutritious seeds and are consumed widely in sub-Saharan Africa. However, the potential application of their leaves was not thoroughly investigated and documented. Therefore, proximate analysis of their leaves for potential applications is sacrosanct. Samples of the leaves were obtained from the Katsina metropolis and analysed for their proximate compositions using standard analytical procedures. The result indicates that the percentage carbohydrate, crude *fibre*s, and moisture contents values for *Telfairia pedata* and *Telfairia occidentalis* leaves were 49.23±0.79, 19.50±0.31, 62.06±0.49 and 49.44±0.55,14.68±1.04, and 71.40±0.31, respectively. The crude protein, crude fat, and ash contents were 16.04±0.51, 2.00±0.50, 13.33±0.31 and 22.45±0.50, 4.80±0.34, and 8.60±0.21 for *Telfairia pedata* and *Telfairia occidentalis*, respectively. The crude *fibre* and ash content were higher in *Telfairia Pedata* than in *Telfairia Occidentalis* leaves. There was no significant difference in the carbohydrate content of the leaves. However, the crude protein, moisture content, and lipid were higher in the *Telfairia Occidentalis* leaf. The leaves could be a good carbohydrate, protein, and dietary fibre source. However, further study is recommended on the leaves' anti-nutrients, mineral and phytochemical analyses.

1. INTRODUCTION

Vegetables refer to the consumable components of herbaceous plants that can be consumed either in their entirety or in portions, raw or cooked. They are commonly incorporated into main courses or salads. These vegetables can possess various flavours, ranging from aromatic and bitter to relatively neutral taste. Sunmonu *et al.* [1] reported that these ingredients are commonly consumed in the dietary habits of the typical Nigerian population and offer significant quantities of essential minerals. Although leafy vegetables primarily consist of water, they serve as a rich source of minerals, vitamins, and phytochemicals, resembling a comprehensive natural repository. The Telfairia genus, classified under the Cucurbitaceae family, encompasses two distinct species found in Africa: *Telfairia occidentalis* Hooker and *Telfairia pedata*, originating from West Africa and East Africa, respectively [2]. Due to its significant value, *Telfairia Occidentalis*, a herbaceous perennial plant, is cultivated annually in some areas of West Africa [3]. *Telfairia occidentalis* is widely cultivated in the southern region of Nigeria, particularly by the Ig-

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bos. This vegetable crop has gained significant importance in its dietary practices and is now a prevalent component in regional households [2]. According to Kayode *et al.* [4], traditional medicine employs this substance to enhance blood circulation, bolster the immune system, and alleviate digestive issues and convulsions. Multiple authors have extensively documented the antioxidant property of *Telfairia Occidentalis* [5, 6]. From a nutritional standpoint, this particular leafy vegetable possesses a significant abundance of minerals, including iron, potassium, sodium, phosphorous, calcium, magnesium, and certain essential amino acids [7].

Additionally, it contains notable phytochemicals such as tannins, saponins, flavonoids, and phenolics [4]. *Telfairia pedata*, commonly known as oyster nut, is a perennial plant cultivated in Central and East Africa. According to Alegbejo [8], the plant in question yields seeds characterised by their significant size, elongated shape, and flat structure. Additionally, when subjected to roasting, these seeds exhibit a flavour reminiscent of almonds. *Telfairia pedata* is a native forest food plant in the Uluguru North and West Usambara Mountain regions, known for providing edible nuts and seeds [9]. The seeds of *Telfairia pedata* are utilised in tropical East Africa for oil production and are subjected to roasting and consumption.

Comparative analysis of the nutritional composition of Cucurbitaceae leaves within a specific region is crucial, as it is a key indicator of potential differences that may arise from climatic factors and soil composition. The nutritional value of *Telfairia occidentalis* leaves has been reported in the literature and is widely consumed throughout sub-Saharan Africa. However, the potential of *Telfairia pedata* leaves has not been comparatively investigated. To fill this knowledge gap, there is a need to evaluate the proximate composition of *Telfairia Occidentalis* and *Telfairia pedata* leaves. This will not only increase the understanding of the nutritional content of these leaves but also contribute to the proximate composition database of Cucurbitaceae leaves.

2. METHODOLOGY

Two different types of freshly harvested Telfairia Hooker F. leaves were collected from Katsina City, Nigeria, namely *Telfairia occidentalis* and *Telfairia pedata*. The leaves were carefully placed in a clean polyethene bag for packaging. The leaf samples underwent authentication and identification at the Herbarium Unit of the Department of Biology, *Umaru Musa Yar'adua University*, located in Katsina, Nigeria. Before commencing the study, the leaves were subjected to a comprehensive purification procedure, which entailed using water to eradicate any residual soil particles. The leaves were thoroughly washed using distilled water and subsequently allowed to undergo a natural drying process for three days within a sheltered environment. Subsequently, the leaves were ground into a fine powder using a mortar and pestle, and the resulting powder was then filtered through a mesh with a pore size of 20 μm. The acquired powder was afterward placed in a plastic container in anticipation of the proximate analysis. In order to ascertain the moisture content, the investigation utilised leaf samples that were freshly gathered. The proximate analysis was performed in accordance with the protocol specified by the Association of Official Analytical Chemists (AOAC) [10].

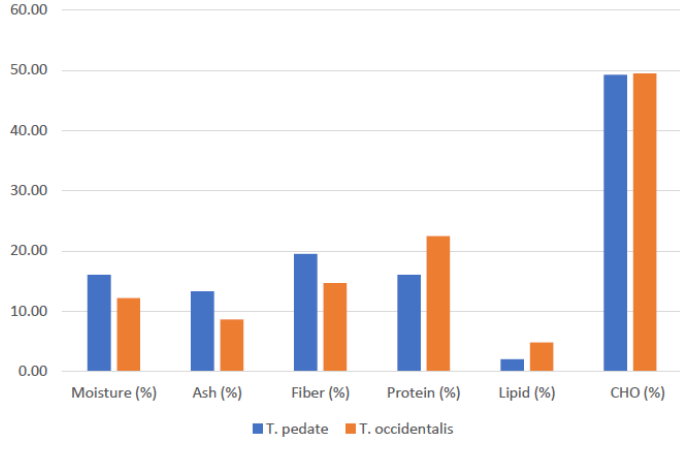

Figure 1. Comparative proximate values of *Telfairia peadata* and *Occidentalis* leaves

3. RESULTS AND DISCUSSION

The proximate composition of the two leaves is presented in Table 3. In terms of moisture content, the result shows a high percentage of mean moisture content in both leaves, with *Telfairia pedata* slightly higher than *Telfairia occidentalis.* The relatively higher moisture content in the leaves suggests that the vegetables may not be stored for long due to higher water activity. Higher moisture content helps maintain the cell's protoplasmic content [11]. Additionally, it facilitates enhanced functionality of hydrophilic enzymes and coenzymes essential for the metabolic processes of leafy green vegetables [12]. Nevertheless, the elevated moisture content could give rise to a quality issue, as the samples may exhibit increased vulnerability to bacterial spoilage throughout the storage period [13].

Comparatively, from the present analysis, *Telfairia occidentalis* leaf is more susceptible to deterioration by bacteria on storage and easily digestible on consumption than the *Telfairia Pedata* leaf because it contains higher moisture content (Figure 1). Omimakinde *et al.* [14] reported 8.75% of moisture content in fluted pumpkins, similar to but slightly less than in this study. This may be attributable to the plant's geographical location and the research's analytical accuracy. However, the 3.09±0.93 percentage moisture content of *Telfairia pedata* (Oyster Nut) seeds obtained by Mwakasege *et al.* [15] is about five-fold less than what was obtained in this study. The result shows that the leaves significantly differ in percentage moisture content at ($P < 0.05$).

Similarly, relatively high ash content values of 13.30 ± 0.31 and 8.60 ±0.20 for *Telfairia pedata* and *Telfairia Occidentalis* leaves, respectively, were recorded. Higher ash content is an indication of abundant mineral elements in the leaves. Comparatively (Figure 1), from the present study, *Telfairia peadata* leaf contained higher ash content than *Telfairia Occidentalis* leaf, indicating that the former may likely have more abundant mineral elements than the latter. The result of the ash content of *Telfairia Occidentalis* leaf obtained in this study agreed with the 8.3% ash content of Fluted pumpkin leaf reported [16]. Additionally, the seeds of *Telfairia pedata* have relatively high ash content compared with 2.57± 0.04% obtained by Kim *et al.* [17]. The mean ash content of the two leaves shows a statistically significant dif-

Table 1. Proximate composition of *Telfairia pedata* and *Occidentalis* leaves

Leaves	Moisture (%)	Ash (%)	*Fibre* (%)	Protein (%)	Lipid (%)	CHO (%)
Telfairia pedata	16.06±0.10	13.30±0.31	19.50±0.031	16.04±0.51	2.00±0.50	49.23±0.79
Telfairia occidentalis	12.20 ±0.20	8.60±0.21	14.68±1.04	22.45±0.5	4.80±0.34	49.44±0.55

ference at (P < 0.05). The mean crude protein content of the leaves (Table 3) was significantly different at ($P < 0.05$) and generally higher, probably due to favourable soil fertility and environmental condition. The higher percentage crude protein content of *Telfairia Occidentalis* leaf (22.45 ± 0.50) is in line with (21.14 %) and (22.97 %) reported by Refs. [19] and [14], respectively. Also, the seed of *Telfairia pedata* was found to have contained significantly higher crude protein (29.08±1.43%) obtained by Kim *et al.* [17] compared with (16.04±0.03%) obtained in this study. Based on findings by Pearson [20], plants that derive more than 12% of their calorific value from protein are classified as viable protein sources. Therefore, the utilisation of curcubitaceae leaves in this study suggests that they could be an easily accessible and cost-effective protein source for maintaining regular bodily functions. The result indicates that the *Telfairia Occidentalis* leaf had more protein than the *Telfairia pedata* leaf, probably due to favourable soil fertility and environmental condition.

The lipid content of the leaves was generally low in the studied leaves but higher in the *Telfairia occidentalis* leaf. Adeyeye & Omaloyo [16] reported a similar result (3.46%) of the lipid content of the *Telfairia occidentalis* leaf. However, the lipid content (61.20±1.20 %) of the *Telfairia Pedata* seeds obtained by Kim *et al.* [17] is excessively higher than the leaf compared to the present research. The findings suggest that the examined leaves possess health benefits, as their consumption does not appear to contribute to obesity. The mean crude *fibre* content in (Table 3) of the leaves was significantly different at ($P < 0.05$) and relatively higher. The mean crude fibre of the leaves studied were 19.50±0.51 and 14.51±0.34 for *Telfairia pedata* and *Telfairia occidentalis* leaves, respectively. The crude *fibre* value of the *Telfairia Occidentalis* leaf agrees with the result (15.40±0.37) obtained [14]. The crude *fibre* of *Telfairia Pedata* leaf obtained in this research is excessively higher compared with (1.00±0.13%) obtained by Kim *et al.* [17] in seeds of *Telfairia pedata* (Oyster Nut). This shows that the seeds are generally a poor source of crude *fibre*. The consumption of dietary fibres has been associated with a reduction in serum cholesterol levels as well as a decreased risk of various health conditions such as coronary heart disease, hypertension, diabetes, colon cancer, and breast cancer [21–23]. From the present analysis, the *Telfairia Pedata* leaf contained a higher percentage of fibre content than the *Telfairia Occidentalis* leaf. However, both the leaves analysed could be a good source of dietary *fibre*, which could be responsible for the higher carbohydrate content of the leaves.

Carbohydrate content (Table 3) is generally high in all the leaves, and the mean results were not significantly different ($P < 0.05$). The percentage carbohydrate content (49.44±0.55) of *Telfairia Occidentalis* leaf obtained in the present study can be compared favourably with the (51.40 %) carbohydrate contents of *Telfairia Occidentalis* (fluted pumpkin) leaf reported by Omimakinde [14]. However, the seeds of *Telfairia pedata* (Oyster Nut) contained low carbohydrate content (3.06 %), according to the findings of Kim *et al.* [17]. In retrospect, from this research, the leaf of *Telfairia Pedata* contained an appreciable percentage of carbohydrates (49.23±0.79). The elevated levels of carbohydrates found in the leaves indicate that they contribute substantially to the overall energy content of the food materials. The primary role of carbohydrates is to serve as a source of fuel and energy for the human body, supporting its daily activities and physical exertion.

4. CONCLUSION

In this comparative research, the proximate composition of *Telfairia occidentalis* and *Telfairia pedata* leaves obtained from Katsina metropolis, Nigeria, was carried out, and the results revealed interesting findings. Both leaves portrayed high moisture content, indicating they may not be suitable for prolonged storage because of high water activity. *Telfairia Occidentalis* leaves with higher moisture content will be more susceptible to bacterial spoilage during storage than *Telfairia pedata* leaves. Contrarily, *Telfairia pedata* leaves show higher ash content, indicating a potentially greater abundance of minerals than *Telfairia Occidentalis* leaves. Regarding protein content, *Telfairia Occidentalis* leaves showed significantly higher levels, thus a valuable source of protein suitable for body functions. Although the lipid content of the leaves was relatively low, *Telfairia Occidentalis* leaves contained higher amounts. This suggests that the leaves healthwise are not likely to contribute to obesity when consumed. Furthermore, the crude *fibre* was significantly higher in *Telfairia Pedata* leaves than in *Telfairia Occidentalis* leaves. The leaves are therefore considered good sources of dietary *fibre*, which may be linked to their higher carbohydrate content. The carbohydrate content of the leaves was generally high, indicating a significant energy source. The research findings provide valuable insights for understanding these leaves' nutritional value and potential applications, thereby contributing to the broader knowledge of these valuable Cucurbitaceae resources. Further research is recommended to determine the anti-nutrients, minerals and amino acids, and phytochemicals of the leaves for potential nutritive and therapeutic applications.

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