



NUTRIENT EVALUATION OF *Glossocalyx brevipes*
(Benth) LEAF AND BARK: UNDERUTILISED SPECIE
IN SOUTH WESTERN, NIGERIA.



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Abstract: This study examined the nutritional value of processed *Glossocalyx brevipes* (Benth) leaf and bark. They are as follows: shade dried bark, sun dried bark, shade dried leaf, and the locally processed bark. After drying, the samples were pulverized and labeled as shade dried, and sun dried. The samples were analyzed using standard assay methods. The result showed that shade dried leaf was higher in crude fibre (11.59%), protein (20.39%), moisture content (8.21%), and ash (7.84%) compared to shade dried bark which had 9.74%, 17.15%, 6.91%, and 6.59% of crude fibre, protein, moisture content, and ash respectively. The high content of pro-vitamin A in all samples was probably due to the processing method. All samples had comparable value for vitamins of interest. Shade dried bark had the highest value for calcium (2.09 mg), magnesium (0.68 mg), potassium (0.91mg), sodium (0.02 mg), manganese (0.69 mg), and iron (7.23 mg). However, both the leaf and bark of *Glossocalyx brevipes* (Benth) exhibited fairly good levels of proximate and micronutrients content and therefore good for consumption.

Keywords: Underutilized, nutritional value, micronutrient, vegetable, *Glossocalyx brevipes*.

Introduction

The use of underutilized vegetables is stemmed on their perceived nutritional and therapeutic properties (Padulosi *et al.*, 2002; Otitoju *et al.*, 2014). These underutilized plants also play a crucial role in the food security, nutrition, and income generation of the rural people (Arowosoge and Popoola, 2002; Magbagbeola, 2010). While these crops continue to be maintained by cultural preferences and traditional practices they remain inadequately characterized and underutilized by research and conservationist (Borokini *et al.*, 2010; Dansi *et al.*, 2012). It also places them in danger of continued genetic erosion and disappearance which would further restrict development options for the poor (Mal, 2007). Many underutilized crop species (NUCS) are nutritionally rich (Padulosi, 2014). Therefore, their extinction can have immediate consequences on the nutritional status and food security of the poor. In addition, their enhanced use can bring about better nutrition and a mean to fight hidden hunger. A lot of NUCS are recorded to be adapted to difficult environment unfit for other crops where they can provide sustainable productions (Mal, 2007). In this way, they contribute significantly to maintaining plant diversity and hence more stable ecosystems. Little is known about the ecology of most underutilized species or how to improve varieties, yield and quality and little has been done to identify the most effective commercialization, marketing, and policy frame works to promote their use and maximize their economic value (Ogunwusi and Ibrahim, 2016; Ahmad and Javed, 2007).

However, the world is precariously dependent on a limited number of plant species despite its wealth of traditional, locally-adapted underutilized species (Jacqueline, 2014). Many underutilized species may have much higher nutrient content than globally known species or varieties and with climate uncertainty, there is an urgent need to diversify our food base to a wider range of food crop species for greater system resilience. Promoting the use of underutilized species (vegetables, fruit, starchy crops and condiments) needs to be achieved by highlighting their importance in their current production areas as well as exploiting further opportunities to extend their production

and consumption. Promotion of these species, and the development of their value chains, must be based on rigorous scientific methods which will enable us to remove the stigma of "foodforthe poor" which often hinders their popularization and new demand creation (Jacqueline, 2014).

Plant foods are generally acceptable as good sources of nutrient and supplement for food in a world faced with scarcity. They are known to be excellent sources of nutrients such as minerals and vitamins (Otitoju *et al.*, 2014). It is estimated that up to 2.7 million lives could be potentially saved every year if vegetable and plant food utilization were increased (Maziya-Dixon, 2004). Hence, this would help reduce malnutrition which affects all age groups and different sectors of the population in many ways. Prolonged inadequate intake of food rich in micronutrients could result in their deficiencies (Maziya-Dixon, 2004). For instance, in Nigeria, low micronutrient levels among pregnant women is a leading contributor to infant low birth weight; not only stunting a child's ability to thrive in childhood and adulthood, but also leading to increased risks for adult chronic disease. World Health Organization, WHO (2002) reported that about 30% of the population in developing countries suffer currently from one or more of the multiple forms of nutritional deficiencies, especially that of micro nutrient. A review of national representation surveys from 1993 to 2005 shows that 30% non-pregnant women of child bearing age, 42% of pregnant women and 47% of pre-school children worldwide are anaemic (UNICEF, 2002). And estimated 1572 million of the world's population is at risk of iodine deficiency. In African, about 86 million people, that is, 13.1% of the world's population is affected by goiter as a result of iodine deficiency (FAO/WHO, 2006). Iron deficiency has a prevalence rate of approximately 69% for the under five children in Nigeria (UNICEF/FGN, 2000). *Glossocalyx brevipes* (Benth) is one of the traditional food crops whose value is underutilized. This plant belongs to the family of *monimiaceae*. It grows mainly in sub-tropical areas and in Nigeria, is found across Kogi, Ekiti and Ondo, states. The nutritional composition of *Glossocalyx brevipes* (Benth) has not being much documented, but traditionally,

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it is generally believed to contain a host of nutrients and compounds called phytochemicals. Hence, the vegetable plant is used as anti-diarrhea and to eat yam during new yam festivals. It is also used as a laxative for women after delivery. *Glossocalyx brevipes* (Benth) in believed to provide people with a range of compounds, many of which have more than one role, being involved both with immediate good health and with protection against disease that can develop over or long period of time, such as cancer, heart conditions, stroke hypertension, birth defects, cataracts and diabetes (Donatien *et al.*, 2006; Mbahet *et al.*, 2004).

Glossocalyx brevipes (Benth) is mainly consumed for its medical values without much consideration for the nutritional importance. Furthermore, the plant is grown wildly and there has been little or no work on the nutrient composition. Hence, the present study was initiated to document the basic information of *Glossocalyx brevipes* for popularizing this valuable plant in future. This can compete with the best vegetables if proper research is initiated for yield and quality improvement. The purpose of this study therefore was to evaluate the nutrient composition of *Glossocalyx brevipes* (Benth).

Materials and Methods

Sample collection and pre-treatment

Sample of the leaf and bark of *Glossocalyx brevipes* (Benth) was collected from Omuo village in Ekiti State, Nigeria. Two kilogram each of *Glossocalyx brevipes* (Benth) leaf and bark was harvested and cleaned by hand picking to remove extraneous material. Each sample was washed with deionized water, drained, cutted and blended to a uniform pulp using laboratory mortar and packaged for analysis.

Chemical

All chemical that were used for this study was of analytical grade from Sigma and Alderich Germany.

Chemical analysis

Proximate analysis

The moisture content of the samples was determined using the hot air oven method of the Association of Official Analytical chemist (AOAC, 2005). Ash was determined using the method described by A.O.A.C. (2005). Fat content was determined using the Soxhlet extraction method described by AOAC, 1995. The crude protein content was determined using the Micro Kjeldahl method described by Pearson, 1976 while crude fibre was determined using acid and alkaline digestion method and carbohydrate was determined by difference method (AOAC, 2005).

Minerals analysis

Zinc content was determined using the dithizone method described by AOAC (1995). Iron determination. The Phenanthroline method described by AOAC 1995 was used to determine the iron content of the sample. The iodine content was determined using the method described by Pearson 1979. This was done using the spectrophotometer (model spectrum Lab 21A manufactured in China) as was described by Person (1976).

Analysis of vitamins

The vitamin C content of the samples was determined using the method described by the Institute of Public

Analyst of Nigeria, (2005). Pro-Vitamin A determination in the sample was determined using Harborne method as described by Pearson (1976). Vitamin B₁ (thiamin) determination was determined using the method described by Pearson (1976). The riboflavin and Vitamin B₃ (Niacin) content of the sample were determined using the method used as described by Onwuka (2005).

Statistical analysis

Data collected were analyzed using Statistical Package for Social Sciences for Mean and Standard deviation. Duncan multiple range tests used for separation of means.

Results and Discussion

Table 1 shows result of the proximate composition of *Glossocalyx brevipes* (B) samples. The locally processed bark was significantly ($p \leq 0.05$) higher in all proximate values except carbohydrate where it had the least value of 49.23%. Shade dried bark had a highest value of carbohydrate with 59.61%. Table 2 shows the vitamin contents in the processed *Glossocalyx brevipes* (B) samples. The locally processed bark was significantly ($p < 0.05$) higher than other samples in the vitamin content. However, the vitamin B₁ content of sundried bark and shade dried leaf were higher (0.03 mg). Shade dried leaf had highest value of vitamin C (0.54 mg) and pro-vitamin A (116.16 mg). Table 3 shows the mineral composition of *Glossocalyx brevipes* (B). Shade dried bark showed significant ($p < 0.05$) increase in nutrient composition over other processing methods. However, shade dried leaf had the highest value for phosphorus with 86.52 mg while the locally processed bark had the highest value for zinc with 2.80 mg.

Many neglected and underutilized crop species are nutritionally rich and therefore their enhanced use can bring about better nutrition and fight hidden hunger (Padulosi, 2000). The result of the proximate content of the processed samples is shown in Table 1. The lower moisture content of the four samples is in agreement with existing fact that fresh vegetables are known to contain more water than either sun or shade dried vegetables. Oguntona (1998, 2007) reported that the amount of moisture in individual sample depends on several factors including agronomic practices prevailing during cultivation and freshness. The lower moisture for the shade dried bark (6.91%) and sundried bark (6.98%) meant that these samples would keep longer than the other shade or sun dried samples. The higher protein levels for the four samples could be attributed to loss of moisture. It is known that the lower the moisture content of foods the higher are their nutrient density of which protein is one, that is, drying increases nutrient density. The fat levels for all samples were statistically similar ($p > 0.05$). The low fat content of the four samples in (Table 1) are also in consonance with the findings of Enwere (1998) who reported that vegetable generally are low in fat. The lower fat content also means that they might have higher keeping quality because oxidative rancidity would be out of the question. The 9.74%, 9.61%, 11.59% and 12.25% fiber for shade dried bark, sun dried, shade dried leaf and locally processed bark showed they are a good source of fiber and could be used in diabetic diet. The ash values for the four samples were controlled by varying treatments. The higher ash content for the locally processed bark could be due to the processing technique employed. The varied increases in carbohydrate for the four samples were due to loss of moisture that precipitated the increases. However, the

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locally processed bark was significantly ($p < 0.05$) different from other samples with a lower value of 49.23% which could be attributed to fermentation.

The decreased vitamin contents in (Table 2) might be that the water soluble vitamins were lost along with the moisture. The higher values for pro- vitamin A in the four samples suggest that this vegetable vitamin A might be much more available in the sun and the shade dried samples. Also a comparable value of 1.13 mg, 1.05 mg, 1.00 mg and 1.16 mg for shade dried bark, sun dried bark, shade dried leaf and locally processed bark suggest that these processing methods could also increase the availability of vitamin D in the vegetable. On the other hand, the locally processed bark showed a significant

difference ($P < 0.05$) from other samples in vitamin B12 with a highest value of 0.24 mg. Both sun dried bark and shade dried leaf had a comparable value of (0.16mg and 0.15 mg) while shade dried bark had a least value of 0.12 mg. The result however, is in line with US Department of Agriculture (2011), which stated that vitamin B₁₂ is generally very little or not present in plants. The significant ($p < 0.05$) low values for vitamins B1, B2, B3, B6, vitamin E and C in all the samples could be attributed to changes due to oxidative destruction of the vitamins, losses during dewatering and domestic processing techniques applied.

Table 1: Proximate composition (leaf and bark) of processed *Glossocalyx brevipes* samples

Nutrient (100 g sample) %	SDB	SUDB	SDL	LPB
Moisture content	6.91±0.497 ^a	6.98±1.182 ^a	8.21±0.125 ^{ab}	8.68±0.791 ^b
Protein	17.15±1.24 ^a	16.91±3.15 ^a	20.39±0.30 ^{ab}	21.55±1.96 ^b
Fat	3.35±0.16 ^a	3.46±0.37 ^a	3.76±0.04 ^{ab}	3.91±0.25 ^b
Carbohydrate	56.10±2.92 ^b	56.07±7.06 ^b	48.47±0.71 ^{ab}	45.73±4.61 ^a
Crude Fibre	9.74±0.71 ^a	9.61±1.79 ^a	11.587±0.14 ^{ab}	12.25±1.11 ^a
Ash	6.59±0.47 ^a	6.93±1.12 ^{ab}	7.84±0.11 ^{ab}	8.29±0.76 ^b

Any mean value on the same row with different superscript is statistically significant $P < 0.05$; Mean ± SD of triplicate (n=3); SDB: Shade dried bark; SUDB: Sun dried bark; SDL: Shade dried leaf; LPB: Locally processed bark

Table 2: Vitamin composition (%) of processed leaf and bark of *Glossocalyx brevipes* samples

Vitamin	SDB	SUDB	SDL	LPB
Vitamin B ₁	0.02±0.013	0.03±0.00	0.03±0.01	0.02±0.01
Vitamin B ₂	0.05±0.01	0.07±0.01	0.08±0.05	0.13±0.06
Vitamin B ₃	0.17±0.24	0.16±0.02	0.18±0.1	0.20±0.02
Vitamin B ₆	0.008±0.002	0.010±0.00	0.012±0.01	0.02±0.01
Vitamin E	0.015±0.00	0.024±0.01	0.02±0.00	0.024±0.01
Vitamin C	0.48±0.13	0.50±0.08	0.54±0.08	0.36±0.09
Vitamin B ₁₂	0.12±0.01	0.15±0.01	0.16±0.02	0.24±0.01
Vitamin D	1.13 ±0.17	1.05±0.20	1.00±0.08	1.16±0.29
Vitamin A	37.06±1.39	100.87±78.10	116.16±65.11	61.37±2.89

Mean ± SD of triplicate (n=3); SDB: Shade dried bark; SUDB: Sun dried bark; SDL: Shade dried leaf; LPB: Locally processed bark

Table 3: Mineral composition (mg/100g sample) of leaf and bark of processed *Glossocalyx brevipes* samples

Nutrient	SDB	SUB	SDL	LPB
calcium	2.09±0.275 ^a	1.91±0.194 ^a	1.64±0.485 ^a	1.86±0.433 ^a
Magnesium	0.683±0.0359 ^c	0.487±0.159 ^b	0.363±0.070 ^{ab}	0.267±0.067 ^a
Potassium	0.91±0.192 ^a	0.67±0.0945 ^a	0.54±0.303 ^a	0.577±0.241 ^a
Sodium	0.0189±0.0024 ^b	0.0089±0.0024 ^a	0.0083±0.00076 ^a	0.0072±0.00036 ^a
Phosphorus	4.12±0.26 ^a	5.591±1.529 ^a	7.593±0.938 ^a	7.593±0.938 ^a
Manganese	0.686±0.076 ^b	0.32±0.192 ^a	0.204±0.035 ^a	0.204±0.035 ^a
Iron	7.225±0.429 ^c	5.95±0.888 ^{ab}	6.609±0.229 ^a	6.609±0.229 ^{bc}
Zinc	0.199±0.0386 ^a	0.248±0.112 ^a	0.279±0.0933 ^a	0.279±0.0933 ^a

Any two means not followed by the same superscript in the same row are statistically different at $P < 0.05$; Mean ± SD of triplicate (n=3); SDB: Shade dried bark; SUDB: Sun dried bark; SDL: Shade dried leaf; LPB: Locally Processed Bark

The high mineral contents of the samples in (Table 3) showed that these domestic food processing techniques could retain the levels of the nutrients in vegetable. Shade dried bark had a highest value of 2.09 mg for calcium. Sun dried bark, shade dried leaf and locally processed bark had a comparable value of (1.91 mg, 1.64 mg and 1.86 mg), respectively. It is found that calcium in dairy products is not as well absorbed as that in many leafy vegetables, and therefore the plant will be good in boosting calcium levels of the population. The magnesium content does not agree with Institute of Medicine (1997) which reported that foods containing higher dietary fibre provide more

magnesium. The locally processed bark which had a highest value of 12.25% for fibre had the lowest magnesium content of 0.27%. The low sodium and phosphorus content however agreed with (IOM, 2010), which stated that plant contain only small amounts of these minerals.

The higher value for iron in the four samples could be attributed to the processing technique. Sun-drying and shade drying are known to make this nutrient more available. Iron is a vital component of red blood cells and therefore, the plant will be useful to the pregnant women and in managing anaemic conditions. On the other hand,

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the decreases in zinc and potassium might be ascribed to nutrient specificity. Vegetables are known not to be good sources of zinc because the zinc in plant protein is not as available for use by the body as the zinc from animal protein. Therefore, vegetables tend to be low in zinc. Shade dried bark had a highest value of 0.91 mg for potassium while sun dried bark, shade dried leaf and locally processed bark had a comparable value of (0.67 mg, 0.56 mg and 0.58 mg).

Conclusion

The result of this study shows that preserving *Glossocalyx brevipes* (Benth), leaf and bark, either by sun drying or shade drying is very much encouraged. However, some vitamins showed a considerable decrease in content. Shade dried bark had lower moisture content and therefore may have longer shelf-life. The locally processed bark and the shade dried leaf had a comparable higher nutrient concentration than other samples.

The locally processed bark had high moisture content and therefore may have a poor shelf life. The local processing method is good for nutrient retention and therefore not discouraged. The leaf and bark of *Glossocalyx brevipes* (Benth) contain a good quantity of nutrients. Thus, the importance of the leaves and bark, as well as the appropriate preservation method like shade drying which can increase the nutrient density of this vegetable should be stressed through nutrition education.

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Conflict of Interest

There is no conflict of interest among the authors.

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