Algerian Journal of Materials Chemistry

Alg. J Mat Chem ISSN 2661-7196 Vol.3 Issue 1, pp 23–29, (2020)

ELEMENTAL AND PROXIMATE ANALYSIS OF OHA (*Pterocarpus mildbraedii*) LEAF

Augustina A. Oyibo[1], S.B. King[1], Danlami A. Danzarami[2], Samuel Hassan[2], David E. Arthur[3,*]

[1]Ahmadu Bello University, Faculty of Physical Science, Department of Chemistry, Street Address, Zaria, Nigeria
[2]Nigerian Institute of Leather and Science Technology Samaru, Zaria
[3]Department of Chemistry, Baze University Abuja, Nigeria

Abstract. Leaves of *Pterocarpus mildbraedii* obtained from Samaru and sabo was analyzed for proximate constituents and elemental compositions. It content for samaru and sabo samples respectively: (10.94 ± 0.083, 10.81±0.070%) ash, (9.35 ± 0.031, 9.19±0.070%) moisture, (21.00±0.19, 21.27±0.030%) crude protein, (5.91 ± 0.110%, 6.00±0.020) crude lipid, (8.15±0.230, 8.11±0.130%) crude fibre and (44.65±0.655, 44.57±0.352%) carbohydrate. Minerals like zinc (30.70, 30.90mg/kg) and potassium (1049, 1050.50mg/kg) are predominantly abundant, manganese (3.27, 3.24mg/kg) is present in less appreciable amount while no level of Arsenic was detected in both samples and this values conform with the daily recommended dietary allowance for the minerals as being reported by FAO/WHO (2012). The study established that Pterocarpus mildbraedii (oha leaf) contains high amount of vital minerals and nutrients (e.g. potassium, carbohydrates, protein) needed for a healthy diet. Its high protein and carbohydrate content further eulogize the inestimable nutritional values of the plant. It can therefore be affirm that *P. mildbraedii* is a potential industrial raw material for food formulation and drug development.

Keywords: Elemental analysis, proximate composition, *Pterocarpus mildbraedii*.

1 Introduction

Pterocarpus mildbraedii Harms locally known as "Oha" in the Eastern Nigeria is one of the vegetables consumed widely in Nigeria [1-4]. Vegetables are the fresh and edible portions of herbaceous plants, which can be eaten raw, or cooked [5, 6]. Vegetables are valuable in maintaining alkaline reserve of the body; they are valued mainly for their high carbohydrate, vitamin and mineral contents [7-10]. Vegetables are rich sources of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron and phosphorus [11]. In addition, they contain phytochemicals or anti-nutrients such as phytic acid, tannic acid and oxalate which reduce their bioavailability [12]. According to Aletor and Adeogun [13], some anti-nutritional compounds exhibit protective effects, thus making them to serve a dual purpose of reducing some essential nutrients and protecting the body against a number of biochemical, physiological and metabolic disorders. Vegetables may be edible roots, stems, leaves, fruits or seed. Each group contributes to diet in its own way [14], however there are some inexpensive leafy vegetables whose nutritive and anti-nutritive potentials are yet to be adequately studied and utilized. Among these leafy vegetables are the leaves of Pterocarpus mildbraedii. The leaves which are used for soup preparation give good taste and palatability. Pterocarpus mildbraedii is found in Cameroon, Equatorial Guinea, Ghana, Liberia, Nigeria, Sierra Leone and Tanzania. Pterocarpus mildbreadii Harms is a green leafy vegetable

* Corresponding author. David E Arthur
E-mail address: eadavid@abu.edu.ng

which grows more like a big tree, it reaches a height of 2m (6.6ft) and its stem has a diameter of 20m (0.79 inch). Pterocarpus mildbraedii Harms has a smooth, gray or pale brown bark, exuding red gum when cut. Two species are recognized locally (Pterocarpus mildbraedii Harms (Oha)) and Ptercurpus santalinoides (uturukpa).

Figure 1. (a) showing Pterocarpus mildbreadii (Oha tree), (b) Oha leaf

Pterocarpus mildbreadii, a non-wood forest tree species and one of the largest genus in the Papilionoideae family occurring throughout the tropics with yellow bright flowers and usually alternate leaflets, is referred to as, "Oha" in Igbo, "Madobiyar Rafi" in Hausa, "Urube" in Edo, "Geneghar" in Ijaw and "Kakupupu" in Urhobo [15]. Pterocarpus mildbreadii is widely recognized as important indigenous multipurpose tree with very high commercial and nutritional values in most ecological zones of Nigeria used mainly as vegetable in soups and herbs. Previous reports on Pterocarpus mildbraedii leaf and seed alike indicate that it is a good source of energy, protein and fat [16]. However, this kind of work has not been carried out in Zaria metropolis. Therefore, this research work is aimed at carrying out proximate and elemental analysis of Pterocarpus mildbraedii leaf sourced from Samaru and Sabo locations in Zaria metropolis.

2. Materials and Method

2.1 Sample Collection and Preparation:

Pterocarpus mildbraedii (Oha leaf) were obtained from Sabo and Samaru market in Zaria metropolis, the leaves was screened to remove the bad ones and shelled manually after which they are being air dried for a month. The leaves were grounded separately into powdered form using Thomas-Wiley laboratory milling machine (model 4). The powder was sieved using a local mesh sieve (2mm) to remove any remaining ungrounded leave particle such as the leave stalk. The grounded and sieved powder was then stored in airtight, plastic containers labeled 'Samaru' and 'Sabo' respectively pending further analysis.

2.2 Methodology

Ash and lipid content were determined using the method of Association of Official Analytical Chemists (AOAC) [17]. Crude fiber, crude carbohydrate and moisture content were determined using the method of the Association of Official Analytical Chemists [18]. Determination of crude protein was carried out

using Kjeldahl (AOAC, 2011) method. Determination of mineral elements was carried out using Atomic absorption spectrum and Flame photometry (AOAC, 1990).

3. Result and Discussion

Table 1. Result for Proximate Analysis and Statistical Significance of Result

S/N^{o}	Results in %	Samaru sample %	Sabo sample %	Akinyeye (2010) %	DMRT (Proximate parameter)
1.	ASH CONTENT	10.94±0.083	10.81±0.070	20.63±0.030	**42.38±0.183^{b}**
2.	MOISTURE CONNTENT	9.35±0.031	9.19±0.070	13.33±0.010	**31.87±0.111^{b}**
3.	CRUDE LIPID	5.91±0.110	6.00±0.020	8.66±0.010	**20.57±0.140^{a}**
4.	CRUDE PROTEIN	21.00±0.190	21.27±0.030	26.45±0.0.030	**68.72±0.250^{c}**
5.	CRUDE FIBRE	8.15±0.230	8.11±0.130	12.33±0.020	**28.59±0.380^{b}**
6.	CAROHYDRATES	44.65±0.655	44.57±0.352	18.61 ± 0.440	**107.83±1.447^{d}**
	DMRT (Samples)	**16.667±0.2432^{a}**	**16.67±0.1204^{a}**	**16.67±1.447^{a}**	

Source	df	Mean Square	F	Sig
Model	8	1336.318	566.648	.000
Sample	2	9.386	3.980	.054
Proximate	5	996.222	422.435	.000
Error	10	2.358		
Total	18			

Values are Mean ± SD; Values with different superscript in the row by Proximate Parameter and column by Sample methods are significantly different (P<0.05)

Base on the above analysis carried out on table 1 it was revealed that model is significant since p-value (0.000) is less than α-value (0.05), however the table also depict that there is significance difference within the proximate parameters with p-value (0.000) less than α-value (0.05), Furthermore table one above was able to show that there is no significance difference between the samples as used in these study statistically, all at 95% confident limit. See chart below for more information.

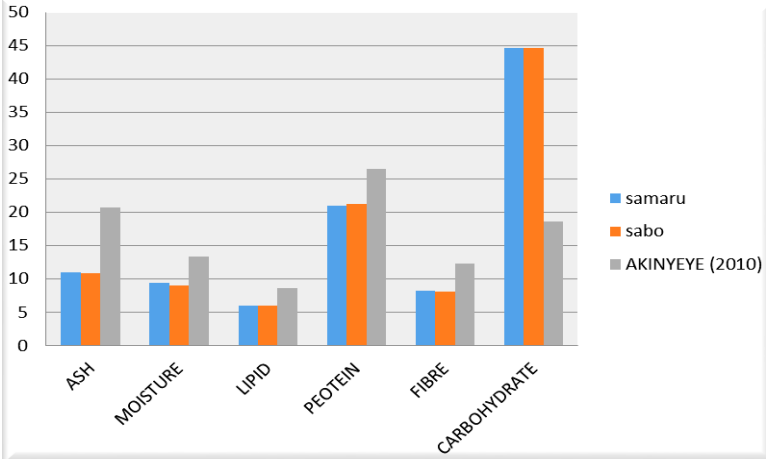

Figure 1: Distribution of Sample across Proximate Parameter

Table 2. Elemental Analysis on *Pterocapus Mildbraedii* (Oha Leaf)

S/No	ELEMENT	SAMARU SAMPLE (mg/kg)	SABO SAMPLE (mg/kg)	MEAN±SD	WHO/FAO DAILY RECOMMENDATION FOR FOOD 2012 (mg/day)	**DMRT (ANALYTES)**
1.	ARSENIC	-ND	-ND	-ND	<0.001	**<0.001±0.00**
2.	MANGANESE	3.27	3.24	3.26±0.021	3.00±1.00	**6.26±1.021**
3.	POTASSIUM	1049.00	1050.50	1049.75±1.06	3000 ± 500	**4049.50±501.06**
4.	ZINC	30.90	30.70	30.80± 0.14	28.00 ± 3.00	**58.80±3.14**
	DMRT (Samples)	**1083±1.22[a]**	**1084±1.21[a]**	**1083±1.22[a]**	**3031±504.00[b]**	

	source	**df**	**Mean Square**	**F**	**Sig.**
Zn	Sample	2	8.130	2.698	0.146
	Analyte	6	3.013		
Mn	Sample	2	0.070	0 .211	0.816
	Analyte	6	0.334		
K	Sample	2	3805926.316	45.668	0.000
	Analyte	6	83339.568		
	Total	8			

Values are Mean ± SD; Values with different superscript in the row by Proximate Parameter and column by Sample methods are significantly different (P<0.05)

Base on the above analysis carried out on table 2 it was revealed that model is not significant since p-value (0.146) is greater than α-value (0.05), however the table also depict that there is significance difference within the analyte with p-value (0.000) less than α-value (0.05), Furthermore table two above was able to show that there is no significant difference between the samples as used in these study statistically, all at 95% confident limit. see chart below for more information

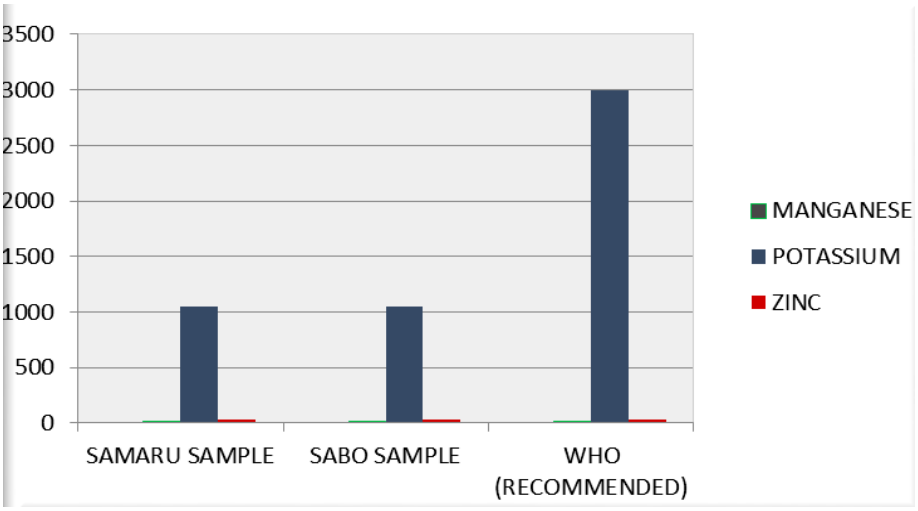

Figure 2. Distribution of Sample across analyte

3.1. Discussion

The result obtained from the proximate analysis of Pterocarpus mildbraedii in table 1. shows that there is no significant difference between samples of *Pterocarpus mildbraedii* (Oha leaf) obtained from Samaru and Sabo sample, however a significant difference was observed with that of Osun Ore as published by Akinyeye, et. al, 2010[16]. This difference could be as a result of the difference in the method of preparation of the sample or the weather condition between the studylocation and that of Osun-Ore. For Samaru and Sabo samples respectively the Ash content (10.94±0.083, 10.81±0.070%) shows that it could have a reasonable quantity of mineral elements for building healthy body and proper functioning of body tissues. Moisture content is low (9.35±0.023, 9.17±0.070%), which is higher than those reported for gourd seed (3.46%) [19, 20] and calabash seed (5.27%) [21].It is however comparable with that reported for unripe pulp of C*arica papaya* (10.65%) by Oloyede, 2005. The low moisture content suggests that the dry leaf would have a long shelf life [22], since the low moisture content could prevent microbial spoilage and pest attack during storage. Crude protein (21.10±0.190, 21.20±0.030%) value is high compared to that reported for Amaranthus *cruentus* (4.0 – 6.0) % [16]. However, the concentration is relatively lower compared to the 35.9% as reported by Ekuagbere, 2007 for calabash seed, 43.1% for luffa cylindrical kernel (Olaofe, et. al, 2008*)* and the 23.7 – 30.8% for gourd seed [20]. All these reported works suggest that *Pterocarpus mildbraedii* (Oha leaf) is one of the good and cheapest source of protein compared to some animal based source of protein such as fish, meat etc. which is (protein) an important building block of muscles, cartilage, skin and blood [23]. The crude lipid (5.91±0.110, 6.00±0.020%) is within the range for most legumes; which range between 2.10% in groundnuts to 7.60% in kidney beans and was found to be much lower than *Parkia biglobosa* seeds [24]. The low crude lipid of the leaf could show that it is of little or no effect on those who wish to lose weight. The amount of crude fiber in Oha leave is (8.15±0.230, 8.11±0.130%) is higher compared to the 2.8% in gourd seed [19], 4.28% soybean [25, 26] and 2.53% calabash seed [21]. These shows that it is a source of dietary fiber, which is essential for good bowel movement and could help in preventing obesity, diabetes, cancer of the colon and other ailments of the gastrointestinal tract of human [27]. The carbohydrate content of the leaf is considerably high (44.65±0.655, 44.57±0.352%) for samaru and sabo samples respectively, this shows that it is a good source of energy and hence a useful supplement in human diet.

3.2. Elemental composition

Result of the elemental content of *Pterocarpus mildbraedii* presented in Table 2.0 also shows that there is no significant difference between the elemental composition in Oha leaf obtained from Samaru and Sabo regions in Zaria. The values shows high amounts of potassium with the highest value as (1049±, 1050.50)mg/kg, while manganese (3.27, 3.24mg/kg) and zinc (30.70, 30.90mg/kg) values for Samaru and sabo Samples were also given respectively. All these values fall within the daily recommended amounts of minerals for consumption jointly reported by FAO/WHO (2012). The high amount of potassium in the leaf suggest that it is a good source of potassium which helps in developing the brain function as well as keeps alertness. Zinc present in the leaf is of considerable amount needed in the body's defense (immune) system to properly work, since it plays a vital role in cell division, cell growth, wound healing, and the breakdown of carbohydrates. The adequate amount of manganese in the leaf play a role in fat and carbohydrate metabolism, calcium absorption and blood sugar regulation.

References

[1]. Usunomena, U. and I.V. Chinwe, *Phytochemical screening, mineral composition and in vitro antioxidant activities of Pterocarpus mildbraedii leaves.* Magnesium, 2016. **778**: p. 2.21.

[2]. Uzodimma, D., *Medico-Ethnobotanical inventory of Ogii, Okigwe Imo State, South Eastern Nigeria-I.* Glob Adv Res J Med Plants, 2013. **2**: p. 030-044.

[3]. Aba, P.E. and I.R. Udechukwu, *Comparative hypoglycemic potentials and phytochemical profiles of 12 common leafy culinary vegetables consumed in Nsukka, Southeastern Nigeria.* Journal of basic and clinical physiology and pharmacology, 2018. **29**(4): p. 313-320.

[4]. Chic, O.I. and T.-A.T. Amom, *Phytochemical and antimicrobial evaluation of leaf-extracts of Pterocarpus santalinoides.* European Journal of Medicinal Plants, 2014: p. 105-115.

[5]. Adeniyi, S., J. Ehiagbonare, and S. Nwangwu, *Nutritional evaluation of some staple leafy vegetables in Southern Nigeria.* International Journal of Agricultural and Food Science, 2012. **2**(2): p. 37-43.

[6]. Konsam, S., B. Thongam, and A.K. Handique, *Assessment of wild leafy vegetables traditionally consumed by the ethnic communities of Manipur, northeast India.* Journal of ethnobiology and ethnomedicine, 2016. **12**(1): p. 9.

[7]. Mensah, J., et al., *Phytochemical, nutritional and medical properties of some leafy vegetables consumed by Edo people of Nigeria.* African journal of Biotechnology, 2008. **7**(14).

[8]. Nnamani, C., H. Oselebe, and A. Agbatutu, *Assessment of nutritional values of three underutilized indigenous leafy vegetables of Ebonyi State, Nigeria.* African Journal of Biotechnology, 2009. **8**(10).

[9]. Onwordi, C.T., A.M. Ogungbade, and A.D. Wusu, *The proximate and mineral composition of three leafy vegetables commonly consumed in Lagos, Nigeria.* African Journal of Pure and Applied Chemistry, 2009. **3**(6): p. 102-107.

[10]. Awol, A., *Nutrient, mineral and bioactive constituent evaluation of bamboo shoots grown in Masha area, south-west of Ethiopia.* American Scientific Research Journal for Engineering, Technology, and Sciences (ASRJETS), 2014. **7**(1): p. 15-25.

[11]. Fasuyi, A.O., *Bio-nutritional evaluations of three tropical leaf vegetables (Telfairia occidentalis, Amaranthus cruentus and Talinum triangulare) as sole dietary protein sources in rat assay.* Food chemistry, 2007. **103**(3): p. 757-765.

[12]. Akindahunsi, A. and S. Salawu, *Phytochemical screening and nutrient-antinutrient composition of selected tropical green leafy vegetables.* African Journal of Biotechnology, 2005. **4**(6).

[13]. Aletor, V. and O. Adeogun, *Nutrient and anti-nutrient components of some tropical leafy vegetables.* Food chemistry, 1995. **53**(4): p. 375-379.

[14]. Chinma, C. and M. Igyor, *Micronutrients and anti-nutritional contents of selected tropical vegetables grown in South East, Nigeria.* Nigerian Food Journal, 2007. **25**(1): p. 111-116.

[15]. Akpanyung, E., A. Udoh, and E. Akpan, *Chemical composition of the edible leaves ofPterocarpus mildbraedii.* Plant Foods for Human Nutrition, 1995. **48**(3): p. 209-215.

[16]. Akinyeye, R.O., A. Oluwadunsin, and A. Omoyeni, *Proximate, mineral, anti-nutrients, phyto-chemical screening and amino acid compositions of the leaves of Pterocarpus mildbraedi harms.* Electronic Journal of Environmental, Agricultural & Food Chemistry, 2010. **9**(8).

[17]. Williams, S., *Official methods of analysis*. 1984, Association of Official Analytical Chemists.

[18]. Taiga, A., et al., *Proximate analysis of some dry season vegetables in Anyigba, Kogi State, Nigeria.* African Journal of Biotechnology, 2008. **7**(10).

[19]. Ogungbenle, H.N. and E.F. Arekemase, *Nutritional evaluation of nigerian dried okra (Abelmoschus esculentus) seeds.* Biological Sciences-PJSIR, 2014. **57**(3): p. 129-135.

[20]. Olaofe, O., F. Adeyemi, and G.O. Adediran, *Amino acid and mineral compositions and functional properties of some oilseeds.* Journal of Agricultural and Food Chemistry, 1994. **42**(4): p. 878-881.

[21]. Ekuagbere, A., *Chemical, mineral and amino acid composition and functional properties of calabash seed.* International Journal of Natural and Applied Sciences, 2007. **2**(1): p. 24-36.

[22]. Oyenuga, V.A., *Nigeria's food and feeding-stuffs.* 1968.

[23]. Osterweil, N. and C.E.G. Mathis, *The Benefits of Protein.* Fitness Exercise Guide, 2004.

[24]. Ihekoronye, A.I. and P.O. Ngoddy, *Integrated food science and technology for the tropics*. 1985: Macmillan.

[25]. Akintayo, E., E. Adebayo, and L. Arogundade, *Chemical composition, physicochemical and functional properties of akee (Bilphia sapida) pulp and seed flours.* Food chemistry, 2002. **77**(3): p. 333-336.

[26]. Akintayo, E. and E. Bayer, *Characterisation and some possible uses of Plukenetia conophora and Adenopus breviflorus seeds and seed oils.* Bioresource technology, 2002. **85**(1): p. 95-97.

[27]. Shankar, S. and E. Lanza, *Dietary fiber and cancer prevention.* Hematology/Oncology Clinics, 1991. **5**(1): p. 25-41.