BAJOPAS Volume 9 Number 2 December, 2016

http://dx.doi.org/10.4314/bajopas.v9i2.38

Bayero Journal of Pure and Applied Sciences, 9(2): 221 - 224
Received: December, 2015
Accepted: June, 2016
ISSN 2006 – 6996

PROXIMATE ANALYSIS OF THE FRUIT *Azanza garckeana* ("GORON TULA")

Jacob, C., Shehu, Z., Danbature, W.L. and Karu, E.*
Department of Chemistry Gombe State University, Nigeria
(* Corresponding author: elishakaru@yahoo.com)

ABSTRACT
The chemical composition and some selected metal ions of the fruit Azanza garckeana locally called "Goron Tula" obtained from different parts of Tula in Kaltungo Local Government Area of Gombe State were analysed. The chemical compositions determined showed a carbohydrate content in the range 49-56%; ascorbic acid 285.5-308.5mg/50g; fat content 0.0541-0.0543%; and starch while the selected metals Fe, Mg, Ca, and Mn were in the range 120-140µg/g, 1700-2300µg/g, 350-450µg/g, and 71-101µg/g respectively.
Key words: Azanza Garckeana fruit, proximate analysis, metal ions, carbohydrate content, ascorbic acid. Ascorbic acid, Azanza Garckeana fruit, carbohydrate content, proximate analysis, metal ions.

INTRODUCTION

The botanical name, *Azanza garckeana* (AG) is coined from two names, Garckeana (from August Garckeana, German botanist) and Azania (meaning "black and surviving in Zanzibar) (www.worldagroforestry.org). The plant's name by which it is known depends on where it is found. For example, the local names by which it is known in East and South Africa are; snot apple (Afrikans). muneko (Tongon), mkole (Nyanja), chinga and mukole (Bemba), morojwa (Tswana) ICRAF (1992). It has several English names such as tree hibiscus, snot apple, wild hibiscus, and African chewing gum. In Northern Nigeria, precisely Gombe State is called "Goron Tula".

Mbuya *et all..* (1994) and Mulofwa (1994) reported that the species is grown from Sudan to South Africa. The specific countries where the species are found are Botswana, Zambia, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania and Zimbabwe. So far in Nigeria, the authors found that the tree is native to Tula in Kaltungo Local Government Area of Gombe State.

The fruits are reported (Palgrave, 1988; Taylor and Kwerepe, 1995) to be spherical and woody in nature and about 2.5-4cm in diameter with short hairs and are divided into 4-5 sections, yellowish to brownish-green and hairy when mature. The fruits are eaten when ripe. They are chewed like a chewing gum producing a sweet glutinous taste. This is probably why it is given the name African chewing gum. Some people dry them and reconstitute them later (Taylor and Kwerepe, 1995). The fruits could be soaked in a small amount of water to make jelly (Palmer and Pitman, 1972) or they could also be boiled to make porridge (Storrs, 1979). These uses are very unfamiliar in Nigeria.

Djarova *et all.*. (1998) carried out the nutritional profile of some fruits including AG and legumes; and established that AG had 9.6% protein and 3.61mg/100g ascorbic acid. In another related study by Mojerewane and Tshwenyane (2004) in Bostwana, the ascorbic acid content was found to be 20.5mg/100g, fat 1.1%, total carbohydrate 35.2%, Ca 95µg/g, Mg 1453µg/g, Fe 84µg/g, K 26,190 µg/g and Na 202 µg/g . Edible portions of 16 indigenous wild fruits of Malawi were analyzed by Kalenga *et all..* (1994) for protein, fibre, carbohydrate and minerals (Ca, Mg, Fe, P, K and Na) and the highest mineral content was found for Adansonia digitata and the lowest energy content was found with AG (810kJ/100g).

The aim of the study was to determine the nutritional composition and some mineral elements of AG.

MATERIALS AND METHODS

Reagents

$C_2H_5OC_2H_5$, 1N HNO_3, 1N HCl, 0.1N HCl, 5% C_6H_5OH, 96% sulphuric acid, $C_6H_{12}O_6$, 52% $CaCl_2$, 80% C_2H_5OH, I_2 solution, starch indicator, 3N H_2SO_4. 0.7M H_3PO_4, 1M H_2SO_4, Stock 0.1M $KMnO_4$, 0.1M $AgNO_3$, $K_2S_2O_8$, KIO_4.

All chemicals used were Analar grades except potassium $KMnO_4$, and $K_2S_2O_8$.

Samples collection and preparation:

The fruit samples were gathered from three locations of Tula namely: Yiri (Sample A), Baule (sample B), and Wange (sample C); each location being separated by a minimum of 2 kilometres. They were obtained randomly by plucking them from different trees. After removing the seeds, the samples were then dried in an oven at a temperature of 105-110^{0}C to remove the moisture content and were crushed into a fine powder using pestle and mortar(Reeb and Milota, n.d)

Fat Determination

The method described by Nielsen (1994) was adopted and used; 0.5g of crushed chips was placed in a test tube, 5ml of petroleum ether were added and stoppered. It was shaken and centrifuged for 5 minutes to allow the solid particles settle to the bottom.

The liquid was decanted into a pre-weighed flask. Another 5ml of the petroleum ether were added to the solid in the test tube and the procedure was repeated. The flask was then warmed to drive off the ether. The flask and the solid were then weighed. The percent fat in the sample was calculated using the formula:

$$\% \text{ Fat} = \frac{\text{wt of solid fat}}{\text{Wt of sample}} \times 100$$

Ascorbic acid determination

The procedure was first tested with standard vitamin C standard solution. This was done to be sure of the ascorbic acid to be used. The fruit (50g) was blended with distilled water (30ml) in a beaker and the mixture was strirred. A piece of cloth that served as the filter was washed with few milliliters of distilled water and the mixture filtered into a measuring cylinder and then transferred to a 50ml volumetric flask. The volume was finally made up to mark with distilled water.

Iodine solution was prepared by dissolving 5.0g KI and 0.268g KIO_3 in 200ml of distilled water, 4ml of 3M H_2SO_4 were added and the volume was made up to 500ml with it. A burette was rinsed with a small amount of the iodine solution. A volume of 25ml of the sample solution was measured into a conical flask and 10 drops of 1% starch solution was added before titrating, which left the solution unchanged.

The sample solution was titrated with the iodine solution from the burette until the endpoint was reached; that is the first sign of brownish-black color that persisted after swirling. The titration was repeated twice for each sample and the average titre taken (Lowor and Agyente–Badu (2009)). A positive control, Ascorbic acid was tested using the procedure.

Total carbohydrate determination

The sample (100mg) was weighed into a boiling tube and 5ml of 2.5ml HCl was added and kept in a boiling water bath for three hours. It was then removed and cooled to room temperature. The sample was neutralized with solid sodium carbonate until effervescence ceased.

0.2, 0.4, 0.6, 0.8, and 1ml of the working standards were pipetted into a series of test tubes, 0.1 and 0.2ml of the sample solution were also pipetted into two separate test tubes and the volume of each tube was made up to 1ml by adding various volumes of water using a graduated pipette.

A blank solution was set with 1ml of water, 1ml of phenol solution and 5ml of 96% H_2SO_4 were added to each tube and were shaken well. After 10 minutes the contents in the test tube were shaken and placed in a water bath at 25-30^{0}C for 20 minutes. The absorbance of each solution was measured at 490nm and the amount of the total carbohydrate was calculated (Hedge and Hofreiter 1962) as follows.

Absorbance of 0.1ml of the test sample = xmg of glucose 100ml of the sample solution contain $= \frac{x}{0.1} \; x \; 100mg$ of glucose

Starch Determination

The amount of starch was determined using a method by Dubois *et all..* (1956). A 0.5g of the sample was homogenized in hot 80% ethanol to remove the sugars, it was centrifuged and the residue retained. The residue was washed repeatedly with hot 80% ethanol until it was colorless. It was then dried in a desiccator.

To the residue, 5ml of water and 6.5ml of 52% $CaCl_2$ solution were added in a boiling tube and placed in a water bath containing ice blocks. The starch was then extracted at 0^{0}C for 20 minutes, centrifuged and then the supernatant was collected: The extraction was repeated using fresh $CaCl_2$ solution. The supernatant was transferred to a 100ml volumetric flask.

A 0.1ml and 0.2ml of the supernatant and 0.2, 0.4, 0.6, 0.8 and 1ml of the working standard were pipetted into separate test tubes and were made up to 1ml each with water. 1ml of water, 1ml of phenol solution and 5ml of 96% sulphuric acid were added to each tube and were then shaken well. After 10 minutes the content in the test tube were shaken and placed in a water bath at 25-30^{0}C for 20 minutes. A blank solution was prepared in like manner. The colour of the final solution was pale green. The absorbance of each solution was measured at 490nm and a calibration curve was then plotted.

The absorbance of the sample was obtained and the corresponding concentration read from the standard curve.

Determination of some selected metals; Fe, Mg, Ca and Mn

Fe, Mg and Ca were determined by atomic absorption spectroscopy using Buck Scientific Instrument Model 210 VGP at the Department of Soil Science Faculty of Agricultural Sciences Bayero University, Kano, Nigeria. While Mn was determined spectrophotometrically (Mendham *et all.*, 2000).

Solutions used:-

Sulphuric acid (1M H_2SO_4):

Orthophosphoric acid, (0.7M H_3PO_4),:

Stock Potassium permanganate solution (0.1M):

Silver nitrate (0.1M $AgNO_3$)

Blank solution: ((1M H_2SO_4, 0.7M H_3PO_4 and distilled water.)

RESULTS AND DISCUSSION

Analyses of the fruit samples of the fruit AG obtained from different locations of Tula (Yiri, Wange and Baule) are presented in Table 1.

The fat content was found to be in the range 0.541-0.543% which is much lower than that reported for the Botswana samples of 1.1 %.(Mojerewane and Tshwenyane, 2004). The ascorbic acid content was found to be in the range 28.5-30.8mg/100g. This varies significantly with those reported by Djarova *et al..* (1998) that was found to be 20.5mg/100g and 3.61mg/100g. This could be attributed to differences in geographical locations. The samples of this study fall within both the British (30mg/day) and American (50mg/day) dietary requirement (Wikipedia).

The carbohydrate content was in the range of 49-56%. This finding varies with that reported for Botswana samples of 35.2% (Saka *et al,* 1994). Thus the Nigerian sample contains more carbohydrate than those found in South Africa. The difference could be as a result of differences in weather or probably the soil environment in which it is grown. The recommended dietary allowance for carbohydrate is 130g/day (Lydia *et al..,* 1941). The fruit is thus a good source of carbohydrate that is required by an individual to keep the body healthy.

Results for the starch content are presented in Table 1 and were found to be in the range 6.8-7.5%.

The AG fruits found in Nigeria have higher mineral content and higher nutritional values than those found in South Africa, except for the fat content where the percentage is less.

The Fe content was found to be in the range 120-140µg/g; Ca 35.0-45.0µg/g; Mg 1700-2300µg/g. The minerals reported for Botswana samples (Saka *et al.*; 1994) were Fe 84µg/g; Ca 95µg/g and Mg 1453µg/g respectively.

It can be concluded that the *Azanza garckeana* (Goron Tula) obtained from Nigeria has a high mineral content as well as proximate chemical composition except the fat content that is lower than that of Botswana and South Africa.

Acknowledgement: The authors are grateful to the authorities of Gombe State University for providing the laboratory space and the reagents used, and to Bayero University Kano for allowing us to use their AAS for the mineral analysis.

Table 1: Results for the Analyses of Fat content, Ascorbic acid, and some selected metal ions in *Azanza garckeana* fruit.

Samples	A	B	C	Literature values Djarova *et all..* (1998)	Saka *et all..* (1994)
Fat(%)	0.543±0.025	0.543±0.042	0.541±0.020		
Ascorbic acid (mg/100g)	28.5±4.5	32.1±1.0	30.8±0.5	20.5mg/100g and 3.61mg/100	
Total Carbohydrate (%)	49	56	52		35.1
Starch (%)	7.5	7.5	6.8		
Fe (µg/g)	140	100	120		84
Mg (µg/g)	2300	1500	1700		1453
Ca (µg/g)	35.0	40.0	45.0		95
Mn (µg/g)	85	94	74		

REFERENCES

Djarova, T., Kudanga T and Chirimba, F. (1998). Quantitative determination of protein, lipids and ascorbic acid in indigenous legumes and fruits of Zimbabwe. *Transaction of the Zimbabwe Scientific Association*, **72**:7-10.

http//en.m.wikipedia,org.

ICRAF, (1992). A selection of useful trees and shrubs for Kenya. International Centre for Research in Agroforestry. Nairobi.

Mbuya, L.P., Msaga, C.K., Ruffo, C.K., A. Birnie C.K. and Tengas, B. (1994). Useful trees and shrubs of Tanzania. *Regional Soil Conservation unit/SIDA,* **2**:23-27

Mendham, J., Denny, R. C., Barnes, J. D. and Thomas, M. J. K (2000). Vogel´s Textbook of Chemical Analysis 6th Edition, Pearson Education Limited, Edinburgh Gate Harlow Essex.

Mojeremane, W. and Tshwenyane, S. O (2004). Azanza Garckeana A Valuable Edible Indigenous Fruit Tree of Botswana. *Pakistan Journal of Nutrition,* **3(**5) 264-267.

Mulofwa, J., Simute, S. and Tengas, B. (1994). Agroforestry manual for extension workers in the Southern Province , Zambia. Technical Hand Book No 4. Regional Soil Conservation Unit/SIDA.

Nielsen, S. S. (1994**)** Food Analysis Laboratory Manual. Second Edition, Springer.

Palgrave, K.C.(1988). Trees of Southern Africa . Struik Publishers Cape Town.

Palmer, E. and P. Pitman (1972). Trees for Southern Africa Covering all Known indigenous species in RSA, South West Africa, Bostwana, Lesotho and Swaziland Volume 2 A. A. Balkema . Cape Town.

Reeb, J and Milota, M Oregon State University, USA.

Saka, J. D., Msonthi, J. D and Maghembe, J. A. (1994): Nutritional value of edible fruits of indigenous wild trees in Malawi. Forest Ecology and Management, **64** (2-3)245-248.

Storrs, A. E.G., (1979). Know your trees. Some of the most common trees found in Zambia the forest department Ndola, Zambia.

Taylor , F. and B. Kwerepe, (1995). Towards domestication of some indigenous fruit trees in Bostwana: **In** J.A Maghembe ,Y. Ntupanyama and P.W. Chirwa (eds): Improvement of indigenous trees of Miombo woodlands of Southern Africa . ICRAF. Nairobi, Kenya.

www.worldagroforestry.org

Fig.1 *Azanza garckeana* Tree of less than ten (10) years. Photograph during raining season (2010)

Fig. 2 Matured *Azanza garckeana* tree aged above seventy (70) years photograph during dry season (2010).

Fig. 3 Fruits of a matured *Azanza garckeana*

Fig. 4: Seeds of a matured *Azanza garckeana* fruits tree

Fig. 5 Pilled fruits of a matured *Azanza garckeana*