ISSN: 6109 – 5942
Volume 8, Number 2, 2023
International Journal of Agricultural Extension and Technology

PROXIMATE AND ANTI-NUTRITIONAL COMPOSITION OF COOKED KARAYA GUM TREE SEED *(STERCULIA SETIGERA)* AT DIFFERENT DURATIONS

[1]Guluwa, L.Y.,[1]Wumnokol, D. P., [2]Agbu, C. S., [1]Dikwahal, S.H.,[1]Gulukun, E. Z. and [1]Gyang, I. Y.
Department of Animal Production Technology, College of Agriculture, Garkawa, Plateau State, Nigeria, [2]Ministry of Agriculture, Nasarawa State P.M.B. 056, Lafia, Nigeria

[*]Corresponding author E-mail: lukayangka@gmail.com

ABSTRACT

This study was aimed at determine the outcome of cooking durations on proximate and anti-nutrients of karaya gum tree (Sterculia setigera) seeds meal. Sterculia setigera seeds were collected within Plateau State College of Agriculture, Garkawa and environs. National Veterinary Research Institute Vom Laboratory was used for the determination of proximate and anti-nutrients analysis. The experiment was conducted in a completely randomized design replicated three times. Sterculia setigera seeds were cooked for: 0, 30, 60, 90 and 120 minutes designated as $CKGTSM_O$, $CKGTSM_{30}$, $CKGTSM_{60}$, $CKGTSM_{90}$ and $CKGTSM_{120}$. The photochemical screening in revealed that tannins, saponins, anthraquinone and, flavonoides were negatives, and positive for steroids, cardiac glycoside, alkaloids and terpenes for both un-cooked and cooked Sterculia setigera for 120 minutes. Cooking durations had significant ($P<0.05$) impact on the crude protein content 24.09% which will aid in sustaining bacteria that are responsible for digestion and to supply more protein for growth and renewal of body tissues; while, oxalate and phytic acids had the same trend of significant reduction and no significant effect on tannins content as the cooking duration increased from 30 to 120 minutes.

Key words: Cooking, duration, proximate, anti-nutrient, karaya gum seeds

INTRODUCTION

Feed is an important input for milk and meat production from livestock and eggs and meat production from poultry (Reddy, 2012). EL-khalifa (2007) in his studies reported a crude protein value of 24.10%, fibre 25.65%, Ash 3.45%, Crude fat or oil 25.25% and carbohydrate 11.12%. Idu *et al*. (2008) reported the nutritional value of *Sterculia setigera*a seeds as: Crude protein 21.4%, crude lipid 11.0%, crude fiber 7.73%, carbohydrate 21.03%, and moisture content 16.42%. Idu *et al.* (2008) and Adelakun (2014) reported higher calcium in the seed of *Sterculia setigera* as important element for bone formation, others elements are iron, zinc, magnesium and corper useful in the prevention of anaemia and other related diseases.

Adelakun *et al*. (2014) reported the following anti nutritive factors in *Sterculia setigera* seeds as: alkaloid, cardiac glycoside, phytic, flavonoids, steroids and traces of oxalate but may not pose problem for processed *Sterculia setigera* seeds.

Idu *et al.* (2008) reported that *Sterculia setigera* seed is a good source of protein, carbohydrate, macro and trace elements and could be included in fish feed because of source of carbohydrate as reported by Adelakun *et al.* (2014) and the leaves has been be used as fodder for cattle and human being eat the seeds (Scande *et al.,* 2007). El-Khalifa 2007 and Idu *et al.* (2008) reported Karaya gum tree seed (*Sterculia setigera)* as a considerable protein source. The bark of *Sterculia setigera* is used for rope making and local medicine for the treatment of snakes bites, leprosy, syphilis, cough, insanity and the wood for fuel (Scande and Sanon, 2007).

Widely distribution of Karaya gum tree seed within the premises Plateau State College of Agriculture, Garkawa and environs is the sole reason for this study to reduce the burden on convectional feed ingredients. Therefore, Karaya gum tree (*Sterculia setigera*) seed is a wild plant seed widely spread

in the savanna area of tropical Africa, that can be use as feed resource to serve as one of the feed ingredient that can be use as input for milk, meat, skin, and eggs.

MATERIALS AND METHODS

Collections and Processing of *Sterculia Setigera* seed

Karaya gum tree *(Sterculia setigera)* seeds were collected from trees within Plateau State College of Agriculture, Garkawa and environs. The pods were plucked from the trees and cracked to remove the seeds, and thereafter cleaned to remove dirt and divided into five equal portions to serve as treatments and later cooked for 0, 30, 60, 90 and 120 minutes and coded as $CKGSM_O$, $CKGSM_{30}$, $CKGSM_{60}$, $CKGSM_{90}$ and $CKGSM_{120}$, correspondingly. The water was boiled at 100 ^{0}C before treatments 2 – 5 were poured into the heating pods. Thereafter, the boiled seeds were drained and dried by spreading on a concrete floor for 72 hours.

Photochemical screening, Proximate, Anti-nutrient Determination and Experimental Design

The milled samples of cooked karaya gum tree seeds were sent to National Veterinary Research Institute Laboratory Vom, Plateau State, Nigeria for photochemical screening and proximate analysis determination as reported by AOAC (2002) and nitrogen free extract was determined by difference. Tannin and phytic acids were carried out as reported by Earp *et al*. (1982) and oxalate by AOAC (2005). The experiment was laid in a completely randomized design (CRD) replicated three times. Data obtained were statistically analyzed using One Way Analysis of Variance (ANOVA), and where differences exist, means were separated using the Duncan Multiple Range Test (DMRT) of SPSS (2010) statistical software.

RESULTS AND DISCUSSION

Table 1: Phytochemical screening of uncooked and cooked *Sterculia setigera* seeds at 120 mins.

Parameters	Unprocessed	CKGSM 120
Tannins	-ve	-ve
Saponins	-ve	-ve
Steroides	+ve	+ve
Cardiac Glycoside	+ve	+ve
Anthraquinone	-ve	-ve
Flavonoides	-ve	-ve
Alkaloids	+ve	+ve
Terpenes	+ve	+ve

NB: -ve denotes negative +ve denotes positive, CKGTSM = cooked karaya gum tree seed meal at 120 mins

Photochemical screening of un-cooked and cooked *Sterculia setigera* at 120 minutes is presented in Table 1. It was observed that *Sterculia setigera* seeds were positive for steroids, cardiac glycoside, alkaloids and terpenes for both unprocessed and cooked at 120 mins. This is in agreement with Adelakun *et al.* (2014) that reported the presence of some anti-nutritive factors like alkaloids, cardiac glycosides, phytate, flavonoids, steroids and trace of oxalate. Feeding *Sterculia setigera* to monogastric and ruminant animals may not affects proteolytic enzymes, action of glycoprotein in the saliva and depression of celullase activity digestion of crude fibre because of tannins absence in *sterculia setigera*. Absence of tannins in this study will make the diet prepared with *Sterculia setigera* palatable as reported by Reddy (2012). The absence of saponin in this study will aid intestinal, ruminal ammonia production and benefits animal welfare as efficiency of microbial protein synsthesis and protein flow to the duodenum will increase as reported by Patra and Saxena (2009) in their study.

Table 2: Effect of cooking duration on anti-nutritional factors of *Sterculia setigera* seed

Parameters	Cooking Duration of Karaya Gum Seeds Meal (mins)				
	RKGTSM 0	CKGTSM 30	CKGTSM 60	CKGTSM 90	CKGTSM 120
Tannins	1.19[a]	1.00[b]	0.78[b]	0.92[b]	0.97[b]
Oxalate	62[a]	45[b]	30[c]	20[e]	25[d]
Phytic acid	5.48[a]	4.57[b]	3.65[c]	0.19[e]	1.60[d]

[a, b, c, d, e] Means on the same row with different superscripts are significantly different (P< 0.05), Lsd = least significant different, RKGTSM = raw karaya gum tree seed meal, CKGTSM = cooked karaya gum tree seed meal, cooking durations were: 0, 30, 60, 90 and 120 mins

Presented in Table 2 is effect of cooking durations on ant nutrient of *Sterculia setigera* seed meal. Cooking duration did not affect the tannin content of S*terculia setigera* seed cooked for 30 to 120 minutes. Oxalate and phytic acids had the same trend of significant reduction as the cooking duration increased from 30 to 120 minutes. However, 90 mins cooking time had the lowest mean values for oxalate and phytic acids. Therefore, 90 mins cooking duration is recommended for the reduction of oxalate and phytic acids.

Table 3: Effect of cooking duration on proximate nutrients and minerals of *Stercularia setigera*

Parameters	Cooking Duration of Karaya Gum Seeds Meal (mins)				
	RKGTSM 0	CKGTSM 30	CKGTSM 60	CKGTSM 90	CKGTSM 120
Moisture content	6.80[c]	6.05[d]	7.35[b]	5.85[e]	9.70[a]
Crude protein	22.78[b]	20.80[c]	24.09[a]	20.23[d]	22.42[b]
Crude fibre	13.00[d]	17.13[b]	12.20[e]	15.20[c]	17.90[a]
Ether extract	20.93[e]	21.80[d]	22.65[c]	27.00[a]	23.50[b]
Nitrogen free extract	32.32[a]	29.67[b]	30.16[b]	28.32[c]	26.63[d]
Ash	4.15[a]	4.20[a]	3.55[b]	3.40[b]	2.85[c]
Calcium	0.32[a]	0.32[a]	0.30[ab]	0.25[b]	0.30[ab]
Phosphorus	0.14[a]	0.09[c]	0.09[c]	0.12[ab]	0.11[bc]

[a, b, c, d, e] Means on the same row with different superscripts are significantly different (P< 0.05), RKGSM = raw karaya gum tree seed meal, CKGTSM = cooked karaya gum tree seed meal, cooking duration were: 0, 30, 60, 90 and 120 mins

Table 3 shows the proximate constituents of raw and cooked karaya gum (*Stercuria setigera*) seed meal. Duration of cooking had significant (P <0.05) effect on the proximate nutrients. 120 mins cooking time increase the moisture content even though it was dried for 72 hours. Therefore, this suggested that drying time should be increase by future researchers. 60 and 120 mins cooking duration significantly increase the crude protein and crude fibre in that order by 24.09% and 17.90%. Improvement in 60 mins duration of cooking in this study agrees with the reports of Guluwa *et al.* (2015) that reported an outstanding crude protein content for flamboyant seed cooked for 60 minutes. Also, the crude protein content of 24.09% is in agreement with the value of 24.10% reported by El-khalifa (2007). Higher crude fibre at 120 mins durations of cooking was an indication that soluble fibre dissolved in water and decanted. The ether extract observe in this study improve by 90 mins duration of cooking. This revealed that 90 mins duration of cooking improve karaya gum tree seed fat content. No significant improvement was notice as durations of cooking increased from 30 – 120 mins for nitrogen free extract and beyond 60 mins decreased the ash content significantly. Statistical similarity were seen in 0 and 30 mins duration of cooking significantly higher than 60 and 120 mins that are also similar. Significant reduction was noticed in the phosphorus content as durations of cooking increased from 30 – 120 mins.

CONCLUSION AND RECOMMENDATION

Photochemical screening of un-cooked and cooked *Sterculia setigera* at 120 mins revealed the presence of steroids, cardiac glycoside, alkaloids and terpenes, but absence of tannins, saponins, Anthraquinone and Flavonoides were also noted. Cooking durations did not affect tannins content for 30 – 120 mins. Significant reductions for oxalate and phytic acids were noticed at 90 mins cooking duration. Also, 60 and 120 mins cooking duration significantly increase the crude protein and crude fibre in that order by 24.09% and 17.90%. Therefore, 60 mins cooking duration is recommended because of improvement in crude protein of 24.09% which will aid in sustaining bacteria that are responsible for digestion and to supply more protein for growth and regeneration of body tissues when included in livestock formulations. Higher crude may make *Sterculia setigera* a good source of energy for rabbits.

REFERENCES

Adelakun K.M., Mustapha, M.k., Damilare Ibukun Ogundiwin, D.I., Ambrose A Ihidero, A.A. (2014). Nutritional and anti-nutrient composition of Karaya gum tree (*Sterculia setigera*) seed: a potential fish feed ingredient. Journal of Fisheries Volume 2 Issue 3 Pp: 151-156.

Patra, A. K and Saxena, J. (2009). The effect and mode of action of saponins on the microbial population and fermentation in the rumen and rumiant production. *Nutr. Res. Rev. 204 – 219I.* doi. 10.1017/S0954422409990163. PMD. 20003539

AOAC (2002). Official Methods of Analytical Chemist (W. Horwt ed) 17th Association of Analytical Chemists, Washington, DC.

Earp, C.F. Akinbola, J.O., King, S.H. and Rooney, L.W. (1981). Evaluation of the several methods to determine tannin in sorghum with varying kernel characteristics. Cereal Chemistry, 58:234-238.

El Khalifa, A.A. (2007). Domestication of *Sterclia setigera* (L) in Sudan. Ph.D. Thesis, University of Khartoum.

Guluwa, L.Y., Ashom, S.A., Dalokom, Y.D. and Damar, I. (2015). Influence of cooking duration on nutrient and anti-nutrient of flamboyant (*Delonix regia)* seed for non ruminant feeding. 20th Annual International conference of Institute of Professional Agriculturist of Nigeria. Book of conference proceeding Awka, 2015.

Idu, M. Uzoekwe S. and Onyi, H.I. (2008). Nutritional evaluation or *Sterculia setigera* seed and pod. Paskista Journal of biological science 11 (1):139-149 do1:10-3923/pjbs. 2008.139-141

Reddy, D.V. (2012). Principles of animal nutrition and feed technology.2nd ed. oxford and IBH publishing. Pp. 20, 45-46, 265-389, 379-387.

Scande, M., Sanon, M. and Schmidt, l. (ED) (2007). *Sterculia setigera* detile seed leaflet(134).

SPSS (2010). Statistical Package for Social Science. Release 19.0.User Manual. Microsoft Corp. U. S.