NSAP 47th Annual Conference (JOS 2022) CONFERENCE PROCEEDINGS
THEME: SECURING ANIMAL AGRICULTURE AMIDST GLOBAL CHALLENGES

EFFECT OF COOKING DURATIONS ON PROXIMATE AND ANTINUTRITIOINAL COMPOSITION OF FLAMBOYANT (*Delonix regia*) SEED MEAL

[1]GULUWA, L. Y.,*[2]ONAZI, B. O., [1]WUMNOKOL, D.P., [3]ABDULLAHI, H. R.[1]LATU, M. Y.
[1]Department of Animal Production Technology, College of Agriculture, Garkawa, Plateau State, Nigeria
[2]Department of Agricultural Education, Federal College of Education, Gusau, Zamfara State, Nigeria
[3]Department of Animal Science, Faculty of Agriculture, Federal University Lafia, PMB 146 Lafia, Nasarawa State, Nigeria
*Corresponding author. Email: lukayangka@gmail.com

ABSTRACT
Flamboyant seed (Delonix regia) was collected from the premises of Plateau State College of Agriculture, Garkawa to explore the effect of cooking interval on proximate composition and anti-nutritional factors. The seeds were divided into five equal parts and cooked for 0, 30, 60, 90 and 120 minutes each representing a treatment and coded as $CFSM_0$, $CFSM_{30}$, $CFSM_{60}$, $CFSM_{90}$, and $CFSM_{120}$ respectively. Each treatment was replicated three times in a completely randomized design. Cooked flamboyant seeds were sun dried, crushed using a hammer mill crusher and sieved for proximate analysis. The results showed that cooking as a processing method significantly ($P<0.05$) affected proximate and anti-nutritional compositionsof flamboyant seed meal (FSM) as cooking interval increase from 0 – 120 minutes. Observed higher crude fibrecontents of Delonix regia might serve asa challenge to its utilization in poultry nutrition if not properly handled during feed formulations. Cooking was demonstrated to be effective in reducing the levels of these anti nutrients:phytate, tannin and oxalate. Cooking for 120 minutes lower the level of phytic acid by 61.14% Tannins (29.82%) and oxalate (23.88%) respectively. Cooking of flamboyant seed for 60 minutes increased crude protein content to 27.98 %, and was effective in reducing its ant nutritional contents and is hereby recommended for use as a protein source in the diets of monogastric animals.

Key words: *Flamboyant seeds, nutrient compositions, anti-nutritional factors and cooking durations*

INTRODUCTION
Quantities of Flamboyant seeds (*Delonix regia*) wildlegumes remainunused and underutilized by neither human nor animals within the premises of Plateau State College Agriculture and environs. Oyedeji*et al.* (2017) reported *Delonix regia* seeds as good source of oil, energy-rich and good for consumption and can be used as protein a supplement but may pose cardiovascular risk due to its high sodium-to-potassium ratio.Guluwa*et al.* (2019) reported modification in the primary structures of protein in cooked flamboyant seedsat different intervals, but beyond 60 minutes, the protein content denatures.*Delonixregia* leaves and seeds have been reported to possess anti-inflammatory and anti-microbial properties (Rani *et al.,* 2011). Ologhobo*et al.*(1992) reported reduction in feed conversion, growth and sometimes dead when consumed raw.

MATERIAL AND METHODS
Preparation of Test ingredients
Flamboyant seeds (*Delonix regia*) wereplucked from the premises of Plateau State College of Agriculture Garkawa. The pods were crushed to get the seeds and thereafter, divided into five equal parts and processedby means of cooking at 0, 30, 60, 90 and 120 minutes durations, sun dried, milled and coded $CFSM_0$, $CFSM_{30}$, $CFSM_{60}$, $CFSM_{90}$, and $CFSM_{120}$ in that order to obtain cooked flamboyant seed meal at different cooking durations. The proximate compositions of Flamboyant seed meal were determined using the procedure of AOAC (2000). Moisture content was also determined by drying samples at 100 ^{0}C until a constant weight was

obtained. Dry sample was used for determination of crude protein, crude fat, and ash contents. Crude protein was calculated by using Nitrogen content obtained by kjeldahl method. A conversion factor of 6.25 was used for the calculation of protein content. Crude fat was measured by solvent extraction method in a soxhlet system, where n- hexane was used as a solvent (AOAC, 2000).

Tannin and phytate were determined using the standard procedure described by Markkar*et al* (1993) and oxalate using the procedure of Oke (1969). Anti-nutritional percentage destruction was calculated by subtracting durations of cooking treatments 2 – 5 from treatment 1thendivided the outcome by treatment 1 and finally multiply by 100%.

Experiential design and Statistical Analysis

The experiment was allotted to 5 treatments replicated three times in a completely randomized design.Data obtained were subjected to analysis of variance (ANOVA) using the SPSS (2012) statistical software. Where significance differences were observed, means were separated using Duncan Multiple Range Test (DMRT) as outlined by SPSS (2012).

RESULTS AND DISCUSSION

The end product of cooking duration on flamboyant seeds on proximate and mineral composition is shown in Table 1. The results generally showed significant difference (P<0.05) changes between un-cooked and cooked flamboyant seeds for all the factors measured. The moisture content increase as cooking duration increased when the flamboyant seeds were dried at the same ambient temperature and pressure. Higher increase in moisture content as duration of cooking increased might affect the product shelf-life, freshness and quality.

Cooking for 60 minutes resulted in higher crude protein value (27.98%) when compared to un-cooked flamboyant seeds (16.32%). However, cooking beyond 60 minutes reduced the crude protein content, even though it is considerably (P<0.05) higher than that of 0 and 30 minutes cooking durations. Overheating of *Delonix regia* beyond 60 minutes was considered as the explanation for reduction in crude protein quality since it denatures proteins (Guluwa*et al*., 2019). The crude fibre content decreased significantly (P<0.05) across treatments group as cooking duration increased from 30-120minutes. High crude fibre content of 21.80 - 25.07% for cooked flamboyant seed meal due hard seed coat may reduce its feeding value of monogastric animals. This may suggest low level of digestible energy that may reduce carbohydrate utilization. Higher ash content of 4.94% 60mins cooking duration may not be related to higher crude fibre of 23.31% 60 minutes cooking time. The ether extract content decrease as duration of cooking increase, but 30mins compared favourably with 90mins. The conclusion of Alemede*et al.* (2010) reported higher ether extract values of 7.5 – 9.00% when compared to 2.03 – 3.95 observed in this study.

Table 1: Proximate and mineral composition of flamboyant seed cooked at different minutes interval

Parameters (%)	Cooking durations of FSM (minutes)					
	0	30	60	90	120	SEM
Moisture content	5.53^{e}	5.93^{d}	6.22^{c}	7.07^{b}	7.77^{a}	0.22*
Crude Protein	16.32^{e}	18.80^{d}	27.98^{a}	21.16^{c}	25.16^{b}	1.13*
Crude fibre	27.72^{a}	25.07^{b}	23.31^{c}	21.80^{e}	22.17^{d}	0.59*
Ash	3.78^{b}	2.83^{c}	4.94^{a}	4.07^{b}	3.73^{b}	0.19*
Ether Extract	3.95^{a}	2.03^{d}	2.50^{b}	2.08^{d}	3.31^{c}	0.20*
Nitrogen Free Extract	42.69^{c}	45.41^{a}	35.04^{d}	43.82^{b}	27.86^{e}	1.76*
Calcium	0.48^{a}	0.20^{c}	0.36^{b}	0.48^{ab}	0.33^{b}	0.03*
Phosphorus	0.12^{b}	0.11^{bc}	0.15^{a}	0.09^{c}	0.13^{ab}	0.01*

$^{*a, b, c, d, e}$ Means on the same row with different superscripts are significantly different both at (P< 0.05) and (P<0.01), SEM = Standard Error of Mean, FSM = Flamboyant seed meal.

The portions of digestible carbohydrate (i.e NFE) were significantly high in seeds cooked for 30 minutes followed by 90 minutes duration. Roasted flamboyant seeds reported higher NFE value of 57.70% (Alemede*et*

al., 2010) compared to 27.86 - 45.41% obtained in this study. Increase in cooking duration beyond 30 minutes caused significant (P<0.05) reduction in NFE values of flamboyant seeds. Significant variations were noticed among treatment means for both Calcium and Phosphorus contents. However, 60 minutes cooking durations revealed higher phosphorus content.

Presented in Table 2 is Anti-nutritional concentration of cooked flamboyant seed meal. Cooking technique significantly (P<0.05) reduced the level of phytic acid. Un-cooked flamboyant seed had 73.99 mg/100g which was reduced to 50.06, 49.46, 41.42 and 28.75 mg/100% as the seed were cooked for 30, 60, 90, and 120 minutes respectively. Un-cooked and 30 minutes cooking duration were statistically similar for tannins content. They had1.71 mg/100g, and thereafter reduced to 1.44, 1.40 and 1.20mg/100% as flamboyant seeds were cooked for 60, 90 and 1.20 minutes in that order. The findings in this study agreed with the findings of Omeje (1999) that reported reduction in anti nutritional factors of legumes seeds cooked for 30 minutes.

Table 2: Effects of cooking durations on the concentrations of some anti-nutrients in Flamboyant seed meal

	Durations of cooking (minutes)					
Anti-nutrients	0	30	60	90	120	SEM
Phytic acid (mg/100g)	73.99^{a}	50.06^{b}	49.46^{b}	41.42^{c}	28.25^{d}	3.97*
Tannin (mg/100g)	1.71^{a}	1.71^{a}	1.44^{b}	1.40^{c}	1 .20^{c}	0.05*
Oxalate (mg/100g)	335.00^{a}	290.00^{c}	295.00^{bc}	300.00^{b}	255.00^{d}	6.80*

*a, b, c, d Means on the same row with different superscripts are significantly different (P< 0.05), SEM = Standard Error of Mean, FSM = Flamboyant seed meal.

Table 3: Percentage Destruction of Anti-nutrients in cooked Flamboyant seed meal

CD (mins)	Phytic acid	Percentage destruction	Tannin	Percentage destruction	Oxalate	Percentage destruction
$CFSM_0$	73.99	-	1.71	-	335.00	-
$CFSM_{30}$	50.06	32.34	1.71	-	290.00	13.43
$CFSM_{60}$	49.46	33.15	1.44	15.79	295.00	11.94
$CFSM_{90}$	41.42	44.02	1.40	18.13	300.00	10.45
$CFSM_{120}$	28.75	61.14	1.20	29.82	255.00	23.88

CD (mins) = Cooking Duration (minutes), $CFSM_0$= un-cooked flamboyant seed meal, $CFSM_{30}$ = cooked flamboyant seed meal for 30 minutes, $CFSM_{60}$ = cooked flamboyant seed meal for 60 minutes, $CFSM_{90}$ = cooked flamboyant seed meal for 90 minutes, $CFSM_{120}$ = cooked flamboyant seed meal for 120 minutes, FSM = Flamboyant seed meal.

Presented in Table 3 is percentage destruction of some anti-nutrients in cooked flamboyant seed meal. The destruction of phytic acid increase as cooking duration also increases. However, 30 and 60 minutes were statistically similar and destruction continues beyond 60 minutes. The loss of tannin could be due to it solubility in water. Percentage reduction for oxalate was observed beyond 30 minutes (13. 43%) and later drop to 11.94 and 10.45% for 60 and 90 minutes cooking duration and rose to 23.88% 120 minutes cooking durations.

CONCLUSION AND RECOMMENDATIONS

The proximate assessment revealed nutritional prospect of flamboyant seed (*Delonix regia)* meal as a good dietary protein resource. Cooked flamboyant seed meal can serve as a surrogate for protein source in diets since it contains appreciable quantity of crude protein. High crude fibre values and presence of anti-nutritional factors observed is a challenge to its utilization in poultry nutrition. The utilization of cooking durations as a processing technique was well known for reducing the level of these anti nutrients: phytic acid (61.14%), tannins (29.82%) and oxalate (23.88%). Flamboyant seeds cooked for 60 minutes could be used in monogastric nutrition because it had the highest crude protein, ash, NFE, Calcium and phosphorus contents.

REFERENCES

Alemede, I. C., Adama, J. Y., Ogunbayo, S. A. and Abdulahi, J. (2010). Haematological parameters of Savannah brown does fed varying dietary level of flamboyant tree seed meal. *Pakistan Journal of Nutrition* 9(2):167-170.

AOAC (2000). Official Methods of Analysis. Association of Official Analytical Chemists. Washington D.C.

Guluwa, L. Y., Damter, S. A., Onazi, B. O., Damar, I. J. and Dalokom, Y. D. (2019). Effect of cooking durations on amino acids profile of flamboyant seed meal (*Delonix regia*) for animals feeding. *Journal of Animal Science and Veterinary Medicine Volume* 4(2): 48-51

Markkar, H. P. S.., Blummer, M. Browy, N. K. and Becker, K. (1993). Gravimetric of tannin and their correlation with chemical and protein precipitation methods. *Journal of Science, Foodand Agriculture* 61: 161 – 165.

Oke, O. L. (1969). Chemical studies on some Nigerian foodstuffs. Latum *West African Journal of Biology and Applied Chemistry*8:53-56.

Ologhobo, A. D., Apata, D. E., Oyejidiz, A. and Akinpelu, R. O (1992).Toxicity of raw lima beans (*Phaseolus lunatus*) and lima beans for growing chicks. *British Poultry Science*, 34:505 -533

Oyedeji, O. A., Azeez, L.A. and Osifade, B.G. (2017). Chemical and Nutritional Compositions of Flame of Forest (*Delonix regia*) Seeds and Seed Oil. *S. Afr. J. Chem*. 70: 16-20

Omeje, S. K. (1999). Issues in Animal Science. Raykennedy Scientific Publication, Enugu, Nigeria.

Rani, P.M.J., Kannan, P.S.M. and Kumaravel, S. (2011). Screening of antioxidant activity, total phenolics and gas chromatograph and mass spectrometer (GC-MS) study of *Delonix regia*. *African Journal of Biochemistry Research*, 5: 341–347.

SPSS (2012). Statistical Package for Social Sciences. Release 21.0. User Manual. Microsoft Corp. U. S. A