NIGERIA SOCIETY FOR ANIMAL PRODUCTION

In Collaboration with

FEDERAL UNIVERSITY, DUTSIN-MA

PROGRAMME OF EVENT

for the

P. 14

46TH ANIMAL CONFERENCE

(DUTSIN-MA 2021)

Theme: **ANIMAL AGRICULTURE: A PANACEA FOR NIGERIA'S ECONOMIC GROWTH IN A POST PANDEMIC ERA**

DATE: 14th - 18th March, 2021

VENUE: Multi-Purpose Hall, Federal University, Dutsin-Ma, Katsina State.

NUTRITIONAL EVALUATION OF BOILED KARAYA GUM TREE (*sterculia setigera*) SEED MEAL ON GROWTH PERFORMANCE AND NUTRIENT DIGESTIBILITY OF RABBITS

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ABSTRACT
Nutritional evaluation of boiled Karaya gum tree (*Sterculia setigera*) (S.S) seed meal was studied using weaned rabbits in a twelve weeks experiment. Three diets were formulated with control diet (A) having 0% S.S. seed meal while diets B and C had 5% and 10% S.S seed meal respectively. Thirty-six mixed breed weaned rabbits with average initial weight of 525g were allocated to the three diets in complete randomized design with twelve rabbits per treatment. At the end of the twelve weeks, digestibility trial was conducted. Feed intake and weight gains were determined. Feed intake and weight gains were higher ($P< 0.05$) in diets containing S.S. seed meal. Intake, gain and feed conversion ratio were better ($P< 0.05$) in treatment containing 5% S.S. seed meal than control and 10% S.S. diet. Similarly, nutrient digestibility was also better in B than in A and C. The results had indicated that boiled S.S. seed meal had no negative effect on performance and nutrient digestibility of weaned rabbits and can therefore be included in the diet of rabbits up to 10% level.

Keywords: Boiled *Sterculia setigera*, Performance, Nutrient digestibility,

INTRODUCTION
The search for cheaper source of animal protein brings rabbits production into focus since it provides an inexpensive source of meat that is lower in cholesterol but higher in protein value than other meat types (Okonkwo, *et al.*, 2008). However, high cost and scarcity of compounded feed in one of the problems faced by livestock farmers in Nigeria. These are the major factors affecting the development of livestock industries and hence the supply of animal protein as a result of competition between man and monogastric animals for grain sources (Jiya *et al.*, 2008). This high cost and scarcity of conventional feed ingredients used in compounding feed had necessitated the search for cheap and available alternative sources that will reduce the cost of producing livestock.

Although grains and grain products are the main nutrient sources in diet of livestock (Durunma, *et al.*, 2000), many wild seeds are available that are less utilized in feeding livestock which could be incorporated in rabbits diet. Some of these wild seeds are reported to contain some anti-nutritional factors but could be removed or reduced by processing methods. Ayanwale (2004) had stated that different processing methods to detoxify anti-nutritional factors include roasting or toasting, soaking in water, fermentation, addition of alkaline salt, extruding and blancling.

Karaya gum tree (*sterculia setigera*) is a wild plant that wide spread in tropical Africa (Agishi, 2004). It produces seeds in pods which are less utilized by man and animals. Research on the seeds of this plant could help to reveal the potentials of the seeds as feed ingredient for incorporation in livestock feed. This research work therefore was carried out to determine the effect of boiling, as a processing method, of Karaya gum tree seeds on growth performance and nutrient digestibility of weaned rabbits.

MATERIALS AND METHODS
The experiment was conducted at the Rabbitry unit of Federal College of Wildlife Management, New Bussa, Niger State, Nigeria. Matured and ripped seeds of (*sterculia setigera)* (S.S) were collected within New Bussa. The seeds were cleaned to be free of unwanted particles and properly dried. The seeds were poured into boiling water (100^0C) in aluminium pot on fire without cover and boiled for thirty minutes. Thereafter, they were washed, air-dried and milled for inclusion in the diet. Three experimental diets were formulated in which diet A served control with 0% S.S. seeds meal while diets B and C contained 5% and 10% seed meal respectively (Table 1). Thirty-six mixed breed weaned rabbits with average initial weight

of 525g were used for the experiment groups. Each treatment had triplicates with four animals per replicate housed in wooden/wire hutches in a well-ventilated pen (4m by 5m). The animals were allotted to the three diets in a complete randomized design. Two weeks adjustment period was given for adaptation followed by twelve weeks experimental period, feed and water were served ad-lib. Feed intake (served feed – leftover feed) and weight gains were determined using weighing scale over the twelve weeks period followed by one week digestibility trial. Boiled *sterculia setigera* seed meal, feed and faecal samples were analyzed for nutrient composition according to Association of official Analytical chemists (AOAC, 1990) method. All data collected were subjected to analysis of variance (ANOVA) according to the procedure of Steel and Torrie (1980) while means were separated using Duncan's Multiple Range Test (Duncan, 1995).

RESULTS AND DISCUSSION

Composition of the experimental diets is presented in Table 1, while nutrient composition of the diets, raw and boiled *sterculia setigera* (S.S) seed meal is presented in Table 2. The results had shown that boiling had effect on the nutrient composition of the seeds. Table 3 shows the performance of rabbits fed experimental diets. Higher daily feed intake and high total feed intake were recorded in diets containing the S.S. seed meal. This could be due to the aroma of the seeds which might have attracted the rabbits to consume more feed than those on diet without S.S. seed meal. Increase in boiled S.S. seed meal in the diet led in increased palatability and consequently feed intake, this is in line with the observation of Yusuf (2019). However, daily and total feed intakes were higher in diet with 5% S.S. than in 10% S.S. The values for feed intake were significantly ($P< 0.05$) different between the treatments. Similarly, average daily and total gains, and feed conversion ratio followed the same trend with feed intake. The daily feed intake as and daily weight gain were better than those recorded by Adeyina and Apata (2008), Carew *et al.* (2008) and Oninisi *et al.* (2008) on effects of dietary level of cocoa bean shell on nutrient digestibility, organ weight and serum metabolites of weaner rabbits, nutrient composition and feed value of *Tephrosia bructeolata* seed meal for rabbits. A preliminary study, growth performance, and carcass characteristics of young rabbits fed steamed castor bean-cake based diets.

Table 4 shows the nutrient digestibility of the rabbits. From the results, all the nutrients in the feeds were relatively (more than 50%) digested. Digestibility of nutrients was higher in diets containing S.S. seed meal. The values were significantly ($P< 0.05$) different between the treatments. This is an indication that inclusion of boiled S.S. seed meal has no negative effect on nutrient digestibility. Although feed intake, weight gain and digestibility were higher in diets containing S.S. seed meal, 5% level of inclusion was better than 10%.

CONCLUSION

From the results obtained in this study, it is evident that boiled *sterculia setigera* seed meal can be incorporated in the diets of weaned rabbits without any deleterious effect on performance and nutrient digestibility. This will reduce dependency and competition on conventional feed ingredients.

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Table 1. Composition of the Experimental Diets

Composition (%)	Diets		
	A (0% S.S.)	B (5% S.S.)	C (10% S.S.)
Maize	42.0	39.0	35.0
Boiled *Sterculia setigera*	0.0	5.0	10.0
Soya bean Cake	15.5	13.5	12.5
Full fat soya bean	14.5	14.0	14.5
Rice offal	24.0	24.0	24.0
Bone meal	3.5	3.5	3.5
Vitamin / premix	0.3	0.3	0.3
Lysine	0.2	0.2	0.2
Methionine	0.2	0.2	0.2
Salt	0.3	0.3	0.3
Total	**100**	**100**	**100**
Calculated composition:			
% Crude protein	16.78	16.73	17.03
% crude fiber	11.91	12.26	12.66
M.E. (Kcal/kg	2587.44	2651.63	2699.05

Table 2. Proximate composition of diets, raw and boiled *Sterculia setigera* (S.S.) seed meal

Parameters	Raw S.S. (%)	Boiled S.S. (%)	Diets		
			A (0% S.S.)	B (5% S.S.)	C (10% S.S.)
Dry matter	93.17	91.18	93.89	93.14	93.18
Crude fibre	6.76	5.86	11.96	12.06	12.19
Crude protein	18.72	18.02	16.75	16.72	16.99
Ash	2.56	5.68	11.77	11.32	11.47
Ether extract	18.90	16.35	6.56	7.19	7.40
Nitrogen Free Extract	46.23	45.27	46.85	45.85	45.13

Table 3. Performance of Rabbits fed diets containing boiled *Sterculia setigera* (S.S.) seed meal

Parameters	Diets			SEM	LOS
	A (0% S.S.)	B (5% S.S.)	C (10% S.S.)		
Initial body weight (g)	525.00	525.00	525.00	0.12	NS
Final body weight (g)	2065.00^{b}	2180.00^{a}	2100.00^{b}	13.67	*
Total weight gain (g)	1540.00^{b}	1654.83^{a}	1575.00^{b}	13.65	*
Average daily gain (g)	18.33^{b}	19.70^{a}	18.75^{ab}	0.16	*
Daily feed intake (g)	62.11^{b}	65.70^{a}	64.30^{a}	0.49	*
Total feed intake (g)	5401.20^{c}	5518.80^{a}	5401.20^{b}	232.83	*
Feed Conversion Ratio	3.39^{ab}	3.34^{a}	3.43^{b}	0.04	*

$^{A, b, c}$ means on the same row with different superscripts are significantly (P<0.05) different

NS = Not significant *= Significant S.S. = *Sterculia setigera*

Table 4. Nutrient Digestibility of Rabbits fed diets containing boiled *Sterculia setigera* (S.S.) seed meal

Parameters	Diets			SEM	LOS
	A (0% S.S.)	B (5% S.S.)	C (10% S.S.)		
Dry matter	60.41^{c}	64.02^{a}	63.81^{b}	0.48	*
Crude fibre	64.50^{b}	66.47^{a}	64.92^{b}	0.02	*
Crude protein	58.12	59.17	58.64	0.19	NS
Ash	52.67^{a}	51.37^{ab}	50.19^{b}	0.46	*
Ether extract	61.18	60.88	60.69	0.08	NS
Nitrogen Free Extract	57.78^{b}	60.13^{a}	59.27^{ab}	0.31	*

$^{A, b, c}$ means on the same row with different superscripts are significantly (p<0.05) different

NS = Not significant *= Significant S.S. = *Sterculia setigera*