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Performance of Broiler Chicken Fed Diferently Processed Karanj Seed (Pongomia Pinnata) Meal in Semi Arid Zone of Borno State

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Abstract: *The study evaluated the performance of Broiler birds fed differently processed karanj seed (Pongamia pinnata) meal. Two hundred and forty (240) day old chicks were used for the experiment. The chicks were fed control diet and subsequently treatment diets containing the differently processed karanj seed meal designated T1, T2, T3, T4, T5 and T6 respectively. Completely Randomized Design (CRD) was used with four replication and ten (10) birds per replicates. The parameters evaluated include feed intake, daily weight gain, daily feed intake, Feed Conversion Ratio (FCR) and Protein Efficiency Ratio (PER). Results obtained showed that final weight, daily weight gain, daily feed intake, Feed Conversion Ratio (FCR) and protein efficiency ratio (PER) were significantly different between the treatment means. The results revealed that broiler chicken fed 0 % KSM, 5 % SKSM, 5% B. 30 M KSM and 5 % TKSM efficiently utilized the protein in their diets. These tallied with the better daily weight gain and FCR obtained from these treatments.*

Keywords: *Karanj Seeds Meal (KSM), Feed Conversion Ratio (FCR), Protein Efficiency Ratio (PER)*

INTRODUCTION

Background of the Study

Agriculture is an efficient and solid backbone for social, economic and industrial progress or development of any nation. For Nigeria to make giant strides in technological development, it needs to have optimum food security. Food supply has been a serious problem in the developing tropical countries. This has been aggravated by the increase in human population which according to Vandijk *et al*. (1982) has grown exponentially, almost doubling in less than a century, which has resulted into competition for food between human and animals. This emphasizes the need for alternative source of feed for livestock. Feed represents the major cost of poultry production, constituting up to 70 % of the total cost (Scott *et al.*, 2008; Olomu, 2011). Of the total feed cost, about 95 % is used to meet energy and protein requirements, about 3 to 4 % for major minerals, trace minerals and vitamins requirements and 1 to 2 % for various feed additives. Energy sources constitute the largest component of poultry diets, followed by plant protein sources and animal protein sources (Scott *et al.*, 2008; Olomu, 2011).
Pongamia pinnata popularly known as karanj, belongs to the family *Leguminosae*, and is a medium-sized glabrous tree capable of growing under wide range of agro-climatic conditions. The tree is abundantly found in Andhra Pradesh, Bihar, Karnataka, Maharastra, Tamil Nadu and West Bengal. It naturalized from India, Pakistan and Sri Lanka throughout south-east Asia to north-eastern Australia, Fiji and Japan. It is planted in the humid tropical lowlands around the world, and has been introduced into Egypt and the United States (Orwa *et al.*, 2009); It is also available in Nigeria as ornamental plant. The objective of the study was to assess the performance of broiler birds fed graded levels of karanj seed meal

MATERIALS AND METHODS

The study was conducted at the Livestock Unit of the Teaching and Research Farm, Department of Animal Production Technology, Ramat Polytechnic, Maiduguri. Maiduguri is located between latitude 11°5' and 12^0 North, longitude 13°09' and 14^0 East at an altitude of 354 m above sea level (DNMA, 2013).

The karanj seeds were obtained from pongamia plant (karanj) *(Pongomia pinnata)* across the University of Maiduguri Campus. The seeds were divided into five (5) batches. The first batch was left raw, while the other four (4) batches were classified according to the following processing methods;

1. Process 1: The second batch was soaked in tap water for 24 hours at room temperature in a plastic container. At the end of soaking, the water was decanted and the seeds later sun-dried for three days or more depending on the weather.
2. Process 2: The seeds was boiled for 60 minutes. Timing was commence few minutes after adding the karanj seeds in boiling water. The boiled seeds was drained and sun-dried.
3. Process 3: The seeds was boiled for 30 minutes. Timing was commence few minutes after adding the karanj seeds in boiling water. The boiled seeds was drained and sun-dried.
4. Process 4: The karanj seeds was toasted on open frying pan containing sand; it was stirred continuously until the seeds are crispy and acquired a characteristic aroma of roasted beans. The processed seeds was milled and stored in bags until needed for feed formulation.

A total of 240 day- old broiler chicks were purchased from Amo hatchery for the study. The chicks were brooded for two weeks during which they were fed commercial broiler starter diet and then fed the formulated/ experimental starter diet from three to four weeks and experimental finisher diet from 5^{th} to the 9^{th} weeks.

Experimental diets at the starter and finisher phases were formulated using locally procured feed ingredients which include maize, wheat offals, full-fat soya bean, karanj seed meal, fish meal, bone meal, limestone, premix, methionine, common salt and lysine. Six starter and finisher diets were formulated with the same inclusion levels of 5% of karanj seed meal. The diet were designated as: T1 (control) (0% karanj seed meal), T2 (5% meal from raw karanj), T3 (5% meal from karanj seed soaked in water), T4 (5% meal from boiled karanj seed), T5 (5% meal from boiled karanj seed) and T6 (5% meal from roasted karanj seed) as shown in Tables1 and 2. The experimental birds were allocated to the experimental diets in groups of 40 birds each and each treatment group were replicated four times with 10 birds per replicate in a completely randomized design (CRD). The study lasted for 7 weeks.

Table 1: Ingredient Composition and Calculated Analysis of the Experimental Broiler Starter diets

Ingredient	Level of karanj seed meal included					
	T_1	T_2	T_3	T_4	T_5	T6
	(0% KSM)	(5% RKS)	(5% SSKM)	(5% BKSM A)	(5%BKSM)	(5% TKSM)
Maize	47.93	44.95	45.27	44.73	44.73	46.14
Full-fat Soya bean meal	28.37	25.85	25.53	26.07	26.07	24.66
GNC	05.00	05.00	05.00	05.00	05.00	05.00
KSM	00.00	05.00	05.00	05.00	05.00	05.00
Wheat offal	10.00	10.00	10.00	10.00	10.00	10.00

Fish meal	05.00	05.00	05.00	05.00	05.00	05.00
Limestone	01.00	01.00	01.00	01.00	01.00	01.00
Bone meal	02.00	02.50	02.50	02.50	02.50	02.50
Min-vit-premix*	00.25	00.25	00.25	00.25	00.25	00.25
Methionine	00.10	00.10	00.10	00.10	00.10	00.10
Lysine	00.10	00.10	00.10	00.10	00.10	00.10
Table salt (NaCl)	00.25	00.25	00.25	00.25	00.25	00.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis						
Crude protein (%)	23.88	23.35	22.59	23.69	23.69	22.96
Crude fibre (%)	04.00	04.06	04.10	04.07	04.07	04.10
Ether extract (%)	03.89	03.87	03.65	03.85	0385	03.77
Methionine (%)	00.48	00.47	00.46	00.44	00.44	00.44
Lysine (%)	01.49	01.48	01.46	01.44	01.44	01.39
Calcium (%)	01.00	01.00	01.00	01.00	01.00	01.00
Phosphorus (%)	00.65	00.65	00.65	00.65	00.65	00.65
ME (kcal/kg)	2848.15	2841.65	2854.49	2850.54	2850.54	2921.44

ME= Metabolizable energy; GNC= groundnut cake, KSM= karanj seed Meal, RKS= Raw karanj seed Meal, SSKM= Meal from seeds soaked in water for 24 hours, BKSM A= Boiled for 60 minute karanj seed Meal, BKSM= Boiled for 30 minute karanj seed Meal, RKSC= Roasted karanj seed Meal.

Table 2: Ingredients Composition and Calculated Analysis of the Experimental Broiler Finisher diets.

Ingredient	Level of karanj seed meal included					
	T_1 (0% KSM)	T_2 (5% RKSM)	T_3 (5% SSKM)	T_4 (5% BKSM A)	T_5 5% BKSM)	T_6 (5% TKSM)
Maize	49.64	46.66	46.98	46.44	46.44	47.86
Full fat Soya bean meal	21.16	19.14	18.82	19.36	19.36	17.94
GNC	05.00	05.00	05.00	05.00	05.00	05.00

KSM	00.00	05.00	05.00	05.00	05.00	05.00
Wheat offal	15.00	15.00	15.00	15.00	15.00	15.00
Fish meal	05.00	05.00	05.00	05.00	05.00	05.00
Limestone	01.00	01.00	01.00	01.00	01.00	01.00
Bone meal	02.50	02.50	02.50	02.50	02.50	02.50
Min-vit-premix*	00.25	00.25	00.25	00.25	00.25	00.25
Methionine	00.10	00.10	00.10	00.10	00.10	00.10
Lysine	00.10	00.10	00.10	00.10	00.10	00.10
Table salt (NaCl)	00.25	00.25	00.25	00.25	00.25	00.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis						
Crude protein (%)	21.00	21.00	21.00	21.00	21.00	21.00
ME (kcal/kg)	2854.16	2854.30	2940.93	2936.97	2936.97	2947.29

ME= Metabolizable energy; GNC= groundnut cake, KSM= karanj seed Meal, RKSM= Raw karanj seed Meal, SSKM= karanj Meal from seeds soaked in water for 24 hours, BKSM A= Boiled for 60 minute karanj seed Meal, BKSM= Boiled for 30 minute karanj seed Meal, RKSM= Roosted karanj seed Meal.

RESULTS AND DISCUSSION

4.1 Proximate Composition of Karanj (*Pongamia pinnata*) Seed Meal

The results of the proximate composition of karanj seed meal (KSM) are presented in Table 3. The raw karanj seed meal (RKSM) contained 89.70% dry matter (DM), 18.55% crude protein (CP), 5.26% crude fibre (CF), 7.61% ether extract (EE), 4.50% ash and 53.88% nitrogen-free extract (NFE). The dry matter (DM) content of the raw and processed karanj seed meal ranged from 88.14 to 90.25%. The toasted karanj seed meal has the highest DM content (90.25%) while lowest value (88.14 %) was obtained in karanj seed soaked for 24 hours. This may be attributed to the leaching of some of the karanj seed components in the soaking water. Igwebuike (2001) reported similar findings in soaked *Faidherbia albida* pods. Similarly, other workers (Udedibie and Carlini, 2000; Onu *et al*., 2001; Aguibe and Kehinde, 2019) associated this with solubilization and leaching of some nitrogenous compounds in the water used for soaking.

Table 3: Proximate Composition of Differently Processed Karanj (*Pongamia pinnata*) Seed Meal

Processing Methods	Raw	Soaked for 24 h.	Boiled 30 M	Boiled 60 M	Toasted
Dry matter (DM)	89.80	88.14	88.70	88.75	90.25
Crude protein (CP)	18.55	24.83	19.25	21.36	24.43
Crude fibre (CF)	5.26	4.85	5.22	5.00	7.13

Ether extract (EE)	7.61	8.00	7.87	7.50	5.73
Ash	4.50	5.23	4.63	4.72	7.21
NFE	53.88	42.23	50.73	50.17	45.75
ME (Kcal/kg)	3215.50	3065.88	3138.36	3186.14	2992.17

NFE = Nitrogen-Free Extract, ME = Metabolizable energy, Boiled 30 M = Boiled for 30 Minutes
Boiled 60 M = Boiled for 60 Minutes

Productive Performance of Broiler Chickens Fed Differently Processed Karanj *(Pongamia pinnata)* **Seed Meal**

The productive performance of broiler chicken fed differently processed karanj *(Pongamia pinnata)* seed meal are presented in Table 4. The parameters were final live weight, daily weight gain, feed conversion ratio and protein efficiency ratio. The result showed significant ($P<0.05$) differences in these parameters among the treatment groups.

The average daily feed intake of the birds which ranged from 144.82 to 165.53 g significantly ($p<0.05$) differed among the treatment groups. The birds in the control (0% KSM) consumed significantly ($P<0.05$) more feed than the other groups while RKSM group recorded the lowest feed intake (144.82 g/bird/day). This may be due to the presence of anti-nutritional factors such as tannins, trypsin inhibitor and karanjin in the meal which are known to depress feed intake (Kumar *et al*., 2017).

The average daily feed intake in TKSM diet group (149.19 g) is comparable to 148.84 and 146.75 g from B. 60 M. KSM and B.30 M. KSM treatment groups. Atteh (2004) reported 140 g/head/day which is comparable to the 144.82 – 152.12 g obtained from this study for the groups receiving KSM. Nwambe *et al*. (2008) and Kwari *et al*. (2008a) reported 128.07 g/head/day and 109.64 g/head/day, respectively which are lower than the range (144.82 – 165.53 g) obtained from this study. Musama *et al*. (2016) reported 124.97 – 156.65 g/head/day for broiler chicken fed karanj seed cake in finishing phases which is also lower than the values obtained from this study. This may be due to disparity of weather or different processing methods of the seeds.

Generally, the lower average daily feed intake in the KSM groups may be due to effect of some residual anti-nutritional factors such as tannins, trypsin inhibitor and karanjin which are known to depress feed intake as corroborated by some workers (Kumar *et al*., 2017).

The average final live weight and daily weight gain of broiler chickens fed KSM revealed that the chickens fed 0% KSM and 5 % TKSM diets recorded significantly ($P<0.05$) superior final live weight compared to the chickens fed other treatment diets. However, broiler chickens fed 0 % KSM and 5 % TKSM recorded similar final live weight and daily weight gain which are significantly ($P<0.05$) better than chickens fed 5 % RKSM and 5 % B. 60 Min. KSM. Similarly average daily weight gain showed significant ($P<0.05$) differences among all the treatment groups, showing a trend similar to the final mean weight. The reduced body weight gain observed, especially in RKSM diet group, could be associated with the reduced feed intake and possibly poor utilization of the feed due to residual effect of tannins, trypsin inhibitor and karanjin in the diet (Doss *et al*., 2011).

Table 4: Growth Performance of Broiler Chicken Fed Differently Processed Karanj (*Pongamia pinnata***) Seed Meal**

Experimental Diets

Parameters	TI(0% KSM)	T2(5% RKSM)	T3(5% SKSM)	T4 (5%B.30 M. KSM)	T5(5%B.60 M. KSM)	T6(5% TKSM)	SEM
Initial weight(g)	336.23	316.30	322.70	314.47	323.72	326.28	9.79^{NS}
Final weight(g)	2284.80^{a}	1788.80^{d}	2141.80^{bc}	2083.00^{c}	1870.80^{d}	2241.20^{ab}	38.43^{*}
Daily Weight Gain (g/bird)	46.39^{a}	35.061^{d}	$43.31b^{c}$	42.11^{c}	36.84^{d}	45.59^{ab}	1.01^{*}
Daily feed intake (g/bird)	165.53^{a}	144.82^{c}	152.12^{b}	146.75^{bc}	148.84^{bc}	149.19^{bc}	2.06^{*}
FCR	3.57^{b}	4.14^{a}	3.52^{bc}	3.49^{bc}	4.05^{a}	3.28^{c}	0.10^{*}

PER	1.42[a]	1.24[b]	1.38[a]	1.42[a]	1.19[b]	1.45[a]	0.03[*]
Mortality (%)	0.8	0.4	0.4	0.8	-	-	00[NAS]

* = Significant (P < 0.05): SEM = Standard Error of Mean; NS = Not Significant (P>0.05)
a, b, c, d = Means within the same row bearing different superscripts differ significantly (P < 0.05)
RKSM = Raw karanj seed meal
SKSM = Karanj seed meal Soaked for 24 h.
B.30 M. KSM = Karanj seed meal boiled for 30 minutes
B.60 M. KSM = Karanj seed meal boiled for 60 minutes
TKSM = Toasted karanj seed meal
FCR =Feed Conversion Ratio
PER = Protein Efficiency Ratio
NAS = Not analysed statistically

The results of feed conversion ratio (FCR) revealed similar trend to that of feed intake and weightgain. This is because FCR is directly related to other productive performance parameters (feed intake and weight gain). The depression in feed intake and growth rate also reflects the poor FCR among broiler chicken fed RKSM and B.60 M. KSM. From the results, the birds fed RKSM diet group had poorer feed FCR than those on control, SKSM, B. 30 M. KSM and TKSM diets. Some workers (Asafa *et al*., 2012, Halilu *et al*., 2016; Omojola and Adesehinwa, 2007) reported FCR of 2.40 - 2.68; 2.51 - 2.99 and 2.57 - 2.67, respectively. Although the values of 3.28 – 3.57 obtained here are inferior to these values but similar to the 3.48-3.58 reported by Onu *et al*. (2011) for broiler chickens at the finishing phase.

The protein efficiency ratio (PER) of broiler chicken fed KSM showed significant (P<0.05) differences among the treatment groups. Broiler chickens fed 0 % KSM, SKSM, boiled for 30 M. KSM and TKSM recorded higher values of 1.42, 1.38, 1.42 and 1.45, respectively. Broiler chickens fed 5 % RKSM recorded the lowest values (1.24). The results revealed that broiler chicken fed 0 % KSM, 5 % SKSM, 5% B. 30 M KSM and 5 % TKSM efficiently utilized the protein in their diets. These tallied with the better daily weight gain and FCR obtained from these treatments.

The mortality rate did not follow any particular pattern. However, the low mortality rate recorded suggest that inclusion of KSM in the diet of broiler chicken did not cause death beyond the normal mortality rate (5%) for broiler chicken reported by Ganiyu (2005).

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