Performance and carcass characteristics of broiler fed raw and processed kenaf seed meal

*¹Odetola, O. M., ²Eruvbetine., D. ³Onagbesan. O. M., ²Oduguwa, O. O., ¹Owosibo, A.O.,
¹Ijadunola, T. I., Adetola, O.O., ²Sobayo, R. A. and O. A. Adeyemi⁴

¹Federal College of Animal Health and Production Technology, P.M.B 5029, Moor
Plantation, Ibadan, Nigeria.

²Department of Animal Nutrition, ³Department of Animal Physiology,

⁴Department of Animal Production and Health,

Federal University of Agriculture, P.M.B 2240, Abeokuta, Nigeria.

Abstract

*Corresponding E-mail: odetolabayo@yahoo.com

Two hundred and forty (240), unsexed day old Arbor Acre broiler chicks were used to evaluate the effects of replacing whole kenaf (*Hibiscus cannabinus* L.) seed meal (WKSM) with full fat soybean meal (FFSM) in the diets on the performance and carcass characteristics of broiler chicken in a 2 x 4 factorial arrangement, consisting two processing methods (raw kenaf seed meal RKM and roasted kenaf seed meal HKM) and 4 inclusion levels (0%, 10%, 20% and 30%). Both RKM and HKM were analysed for anti-nutritive factors, data were collected on performance, carcass characteristics and cost benefit. The results of anti-nutritive factors (ANF) in RKM and HKM revealed that HKM had lower values of 0.045%, 0.029mg/g and 0.013mg/g for tannin, oxalate and phytic acid respectively when compared to 0.078%, 0.124mg/g and 0.026mg/g obtained for RKM ($P < 0.05$). The performance of broiler chicken showed that birds on 10% RKM with an average weight gain and FCR of (2640.00g and 2.48) competed favourably with the control (2554.67g and 2.45). The results of carcass characteristics showed that birds on 10% and 20% inclusion levels had significantly ($P < 0.05$) higher values of 64.25% and 65.58% for dressed weight respectively. In terms of weight gain and FCR, birds fed RKM performed better than birds fed roasted kenaf meal HKM. About 5% feed cost savings was made when WKSM was included in the diets of broilers. It was concluded that RKM and RKM can replace FFSB in broiler diets up to 10% without any detrimental effect on performance and carcass quality.

Keywords: kenaf seed; broiler; performance; carcass

Introduction

Domestic animals continue to make important contributions to global food supply. Livestock products accounts for about 30 percent of the value of agriculture and 19 percent of the value of food production. Similarly, 34 percent of protein and 16 percent of the energy consumed in human diets are provided by livestock (Ominisi *et al.*, 2012). Meeting consumer's demand for more meat, milk, eggs and other livestock products is dependent to a major extent on the availability of regular supplies of appropriate, cost effective and safe animal feeds and as a result, animal feeds

have becomes an increasingly critical component of the integrated food chain (FAO, 2004).

Protein supplementation is often important to improve livestock performance, and this needs to be done with respect to the requirement of the animal in addition to the balance of other nutrient available. Soya bean meal and fish meal have been widely and successfully used as conventional protein sources for livestock (Oyebimpe *et al.*, 2006).

However, the prices of these protein sources have been increasing continuously in recent times, whilst availability is often scarce.

Performance and Carcass Characteristics of Broiler fed raw and Processed Kenaf Seed Meal

The shortage has been worsened due to the increasing competition between humans and livestock for these protein ingredients as food (Odetola and Eruvbetine, 2012). According to Odunsi, (2003) the rapid growth of human and livestock population, which is creating increased needs for food and feed in the less developed countries, demand that alternative feed resources must be identified and evaluated.

Hence, any similar high protein ingredient which could partially or completely be used as a substitute for soybean meal or fishmeal is desirable. This strategy could help to reduce cost of production and ensure cheaper meat production thereby making available the major crops for human consumption. One of such high protein ingredient crop is Kenaf (*Hibiscus cannabinus L.*).

Kenaf (*Hibiscus cannabinus L.*) has been, primarily used as a fibre crop and secondarily as a livestock feed (Dempsey, 1975). Its leaves have an acidic flower and are used for the production of local soups. Kenaf is extensively cultivated in tropical Africa, Asia, Central America and the Caribbean for the jute-like fibre. Kenaf seed has a crude protein content of 30.88%, with an organic matter content of 95.15% and ether extract content of 18.55% on a dry matter basis. The fatty acid content include palmitic acid (33.21%), stearic acid (50.02%), oleic acid (31.26%), and linoleic (30.51%) (Rajashekher *et al.*, 1993). It has a high potential as feedstuff. Despite the rich nutritional composition of kenaf seed, there are reports of the presence of a number of anti-nutritional (toxic) factors. Hansawasdi and Kawabatta (2000) reported low levels of tannin, amylase inhibitors, protease inhibitors, phytic acid and gossypol in kenaf seed.

This study was designed to evaluate the performance, carcass and cost benefit of

broiler chicken fed processed kenaf seeds meal.

Materials and Methods

Collection and preparation of kenaf seed meal

The kenaf seeds were collected from the Institutes of Agriculture Research and Training, Ibadan, South West Nigeria. The seeds were thoroughly cleansed to remove all the foreign materials. After cleaning, half of the seeds was roasted for about 10 – 15 minutes in a flat pan over an open fire by a constant stirring, until a golden brownish colour was obtained. It was then allowed to cool. Both the roasted and raw kenaf seeds were ground and stored in an air tight container for about 2 weeks, before been incorporated into the experimental diets.

Experimental diet formulation

A total of eight diets were formulated such that full fat soya bean meal (FFSBM) was replaced by raw whole kenaf seed meal (RKM) and roasted whole kenaf seed (HKM) on a weight to weight basis. The replacement was of 0%, 10%, 20%, and 30% of both raw and roasted kenaf meal. The birds were kept on starter diet for 3 weeks and finisher diets for another 4 weeks. The gross compositions of the starter and finisher diets are as shown in (Tables 1 and 2).

Experimental animals and management

A total of two hundred and forty (240) unsexed day-old *Arbor Acre* broiler chicks were used for this study. The chicks were randomly assigned to 8 dietary groups of three replicates with 10 birds per replicate in a 2x4 factorial arrangement of two factors (raw and roasted kenaf meal) and four levels of inclusion (0, 20, 30 and 40%). The birds were brooded together for 7 days before the commencement of the experiment. They were housed in an open sided pen, which has been fitted with facilities for lighting,

feeding and watering. Feed and water were provided *ad libitum*; litter condition was properly monitored and managed to prevent caking which could lead to outbreak of coccidiosis by removing the wet and caked litter and replacing it with new one. Routine vaccinations and medications were carried out as and when due. Data were collected on daily feed intake, weekly body weight and feed conversion.

Performance characteristics

Known quantity of feed was supplied to the birds and the left over removed and weighed to determine the actual feed consumed on daily basis. The daily feed consumption was added together over a period of 7 days to obtain the feed consumption per week. The body weights were taken on weekly basis. The difference between mean weights for two successive weeks was taken in order to obtain the average weight gain of birds per week.

Feed conversion ratio was calculated as a ratio of feed consumption and body weight gain (Oluyemi and Robert, 2000)

Feed conversion ratio = $\frac{\text{Feed intake}}{\text{Weight gain}}$

Carcass analysis

Three birds were randomly selected from each of the replicates for carcass analysis. The selected birds were starved overnight and their live weights recorded. The birds were slaughtered by severing the jugular vein and were fully bled before scalding in hot water, de-feathered and their plucked weights were taken. They were eviscerated and the eviscerated weight recorded. The head, neck and shanks were respectively removed weighed and recorded. The plucked, eviscerated, dressed, drumstick, thigh and breast weights were expressed as percentage of live weight.

Chemical analysis

Proximate analysis of the test ingredient was carried out according to A.O.A.C

(1990) procedures. Tannin content of the test ingredient was carried out using vanillin- HCL method modified by Atanassova and Christova-Bagdassarian (2009) oxalate was analyzed as outlined by Ukpabi and Ejidon (1989), while the method of Reddy and Love (1999) was adopted for the estimation of phytates.

Statistical analysis

Data generated were subjected to analysis of variance using SAS statistical package SAS, (2003). The mean where significant, were separated using Duncan's procedures of the same software.

Results

The proximate composition of the test ingredients is as presented in Table 3, The dry matter content was higher in roasted kenaf meal (HKM). While the ether extract was lower in roasted kenaf meal (HKM) compared to the raw kenaf meal (RKM). The values obtained for ash and crude fibre was lower in RKM compared to HKM. Roasting of the kenaf seeds reduces the levels of anti-nutritional factors tested for. The values obtained for these parameters, viz, tannin, oxalate and phytic acid were lower in HKM than RKM.

The results of main effect of processing methods of kenaf seed meal and levels of inclusion on the performance characteristics is as presented in Table 4. While the interaction effect is as presented in Table 5. Processing methods significantly ($p < 0.05$) influenced all the parameters measured. Highest final weight, weight gain, feed consumption and cost of feed consumed per bird was recorded by birds on the control diet. All parameters measured were significantly influenced by the levels of inclusion. Birds on 10% inclusion levels of RKM has the highest final weight, weight gain, feed consumption, while those on 30% inclusion

Performance and Carcass Characteristics of Broiler fed raw and Processed Kenaf Seed Meal

Table 1; Composition of the experimental diets (starter phase)

Ingredients%	Levels of whole kenaf seed meal in the diet (%)							
	Raw Kenaf seed meal				Roasted Kenaf seed meal			
	00	10	20	30	00	10	20	30
Maize	49.00	49.00	49.00	49.00	49.00	49.00	49.00	49.00
Groundnut cake	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Full fat soya meal	30.00	20.00	10.00	-	30.00	20.00	10.00	-
Raw kenaf meal	-	10.00	20.00	30.00	-	-	-	-
Roasted kenaf meal	-	-	-	-	-	10.00	20.00	30.00
Fish meal (72% CP)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Wheat offals	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin /mineral premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis%								
Crude protein	23.14	22.38	21.68	21.54	23.14	22.38	21.68	21.54
Crude fibre	3.58	3.90	3.92	3.95	3.58	3.90	3.92	3.95
Ether extract	8.12	8.36	8.39	8.14	8.12	8.36	8.39	8.14
**M.E MJ/Kg	12.22	12.00	11.80	11.80	12.22	12.00	11.80	11.80
Lysine	1.30	1.30	1.29	1.27	1.30	1.30	1.29	1.27
Methionine	0.44	0.42	0.42	0.42	0.44	0.42	0.42	0.42

*Vitamin-mineral premix (2.5kg/1000kg); vitamin A (10,000,000IU), vitamin D3(3,000,000IU), vitamin E (30,000IU), vitamin K (2.3gm), vitamin B1 (2.0gm), Riboflavin (5.0gr), Pyridoxine (3.0gm), vitamin B12 (160mg), Biotin (60mg), Niacin (31gm), panthotenic acid (8gm), folic acid (1gm),manganese (85g m), zinc (50gm), iron (25gm), copper (6gm), iodine (1gm), selenium (120gm), cobalt (220mg),antioxidant (125gm), choline chloride (200gm). **M.E = Metabolizable energy.

levels had the lowest values for these parameters. General performance of the broiler reduces as the inclusion levels of kenaf meal increases.

There was significant ($P<0.05$) interaction effects on the parameters measured. Broilers fed 10% inclusion levels of raw kenaf meal (RKM) and 10%(HKM) compared favourably with the control in term of average final weight, average weight gain, FCR and PER, but they consumed more feed than those on the control diet. Birds fed 30% inclusion level of RKM and HKM had the lowest final weight (1831.67g and 1307.50g

respectively), weight gain (1738.33g and 1227.50g respectively), feed consumption (5181.50g and 4170.70g respectively), feed conversion ratio (2.98 and 3.40 respectively) and protein efficiency ratio (1.60 and 1.42 respectively). The cost of feed consumed/bird was reducing as the inclusion levels increases. However, the cost of feed consumed/weight gain was increasing as the inclusion levels increases. There were significant ($P<0.05$) interaction effects on the cost of final feed consumption, and cost of feed consumed / weight gain. Broilers on 10% RKM recorded highest (? 546.93) cost of feed

Table 2: Composition of experimental diets (finisher phase)

Ingredients%	Levels of whole kenaf seed meal in the diets (%)							
	Raw Kenaf seed meal				Roasted Kenaf seed meal			
	00	10	20	30	00	10	20	30
Maize	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00
Groundnut cake	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00
Full fat soya meal	30.00	20.00	10.00	-	30.00	20.00	10.00	-
Raw kenaf meal	-	10.00	20.00	30.00	-	-	-	-
Roasted kenaf meal	-	-	-	-	-	10.00	20.00	30.00
Fish meal(72% CP)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Wheat offals	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Limestone	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin/mineral premix*	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis%								
Cude protein	21.96	21.27	20.57	20.50	21.96	21.27	20.57	20.50
Crude fibre	3.96	4.59	4.55	4.51	3.96	4.59	4.55	4.51
Ether extract	8.38	8.40	8.35	8.38	8.38	8.40	8.35	8.38
**M.E MJ/Kg	12.64	12.41	12.27	12.27	12.64	12.41	12.27	12.27
Lysine	1.24	1.22	1.23	1.20	1.24	1.22	1.23	1.20
Methionine	0.40	0.38	0.36	0.37	0.40	0.38	0.36	0.37

*Vitamin-mineral premix (2.5kg/1000kg); vitamin A (11,000,000IU), vitamin D3(3,000,000IU),vitamin E (30,000IU), vitamin K (2.3gm), vitamin B1 (1.7gm), Riboflavin (5.2gm), Pyridoxin(3.7gm),vitaminB12 (18mg), Biotin (76mg), Niacin (37gm), panthotenic acid (9.2gm), folic acid (0.9gm),manganese (85gm), zinc (50gm), iron (25gm), copper (6gm), iodine (1gm), selenium (120gm), cobalt (220mg),antioxidant (126gm), choline chloride (180gm). **M.E = Metabolizable energy.

consumed/bird, while those on 30% HKM recorded the lowest (? 362.80). However, broilers fed 30% HKM recorded the highest cost (? 277.16) of feed consumed/weight gain, while those fed 10% RKM recorded the lowest (? 207.36).

Table 6, shows the main effect of processing effect and levels of inclusion on the carcass characteristics of broiler chicken. While Table 7 shows the interaction effect of RKM, HKM and levels of inclusion on the carcass characteristics of broiler chicken. The processing methods significantly ($p<0.05$) influenced the live weight, eviscerated weight, breast weight, drumstick and abdominal fat. Birds on

control and RKM had similar live weight and eviscerated weight which was significantly higher what was recorded for HKM. Broilers fed diet containing RKM recorded the highest breast weight (20.74%), while those fed diet containing HKM had the lowest (17.14%).The levels of inclusion significant ($P<0.05$) influenced the mean values obtained for live weight, breast weight, drumstick and abdominal fat. Live weight and breast weight were similar for 0%, 10% and 20% levels of inclusion, which was significantly higher than what was obtained for 30% levels of inclusion. It was observed that the abdominal fat was increasing as the levels of inclusion

Performance and Carcass Characteristics of Broiler fed raw and Processed Kenaf Seed Meal

increased.

There was significant ($P<0.05$) interaction effect in the mean value obtained for live weight, breast weight, drum stick and abdominal fat. Broilers fed 10% RKM had

the highest live weight (26411.67g), while those on 30% RKM had the lowest (1781.67g). However, the abdominal fat increased as the inclusion levels of both RKM and HKM increases.

Table 3: Chemical composition (g/100gDM) of test ingredients

Nutrients	Raw kenaf seed	Roasted kenaf seed
Dry matter	89.66	90.48
Crude Protein	31.28	31.80
Crude fibre	11.65	13.23
Ether extract	18.73	18.33
Ash	7.23	10.22
Nitrogen- free extract	31.11	36.64
Tannin (%)	0.078	0.045
Oxalate (mg/g)	0.124	0.029
Phytic acid (mg/g)	0.026	0.013

Table 4: Interaction effect of raw kenaf meal, roasted kenaf meal and level of inclusion on performance characteristics of broiler chicken

Parameter	Control		RKM		HKM		SEM	
	00%	10%	20%	30%	10%	20%		30%
Initial weight (g)	88.33	88.33	90.00	90.00	80.00	78.33	85.00	0.16
Final weight (g)	2643.00 ^a	2783.33 ^a	2463.33 ^b	1831.67 ^c	2366.67 ^a	2003.33 ^b	1307.50 ^c	40.52
Weight gain (g)	2554.67 ^a	2640.00 ^a	2371.67 ^b	1738.33 ^c	2286.67 ^a	1925.00 ^b	1227.50 ^c	72.30
Feed consumed (g)	6254.40 ^{ab}	6550.00 ^a	6064.60 ^b	5181.33 ^c	6365.90 ^a	5813.50 ^b	4170.70 ^c	133.29
Feed conversion ratio	2.45 ^c	2.48 ^c	2.56 ^b	2.98 ^a	2.79 ^{bc}	2.79 ^b	3.40 ^a	0.06
Protein efficiency ratio	1.85 ^a	1.92 ^a	1.87 ^a	1.60 ^a	1.71 ^a	1.59 ^a	1.42 ^b	0.05
Price per kg feed	85.00	83.00	82.50	82.00	83.50	83.00	82.50	0.00
Cost of feed consumed/bird(?)	531.62 ^a	546.93 ^a	503.36 ^b	425.51 ^c	534.74 ^a	485.43 ^b	362.80 ^c	12.81
Cost of feed consumed /wgt gain (?)	208.53 ^b	207.36 ^b	212.48 ^b	245.85 ^a	234.03 ^b	232.69 ^b	277.16 ^a	5.50
Mortality (%)	3.33	3.33	3.33	3.33	3.33	3.33	3.33	0.00

abc: Means on the same row with difference superscripts differ significantly ($P<0.05$).

Table 5: Main effect of processing methods of kenaf meal and levels of inclusion on performance characteristics of broiler chicken

Parameters	Processing Methods			Levels of Kenaf Meal				
	Control	RKM	HKM	SEM	0%	10%	20%	30%
Initial weight (g)	88.33 ^a	89.44 ^a	80.63 ^b	1.24	88.33	84.17	84.17	88.00
Final weight (g)	2643.00 ^a	2639.44 ^b	1966.88 ^c	41.32	2643.00 ^a	2547.50 ^a	2232.50 ^b	1622.00 ^c
Weight gain/bird (g)	2554.67 ^a	2250.00 ^b	1886.25 ^c	108.50	2554.67 ^a	2463.33 ^a	2148.33 ^b	1534.00 ^c
Feed consumed/bird (g)	6254.00 ^a	5932.14 ^{ab}	5609.95 ^b	104.21	6254.00 ^{ab}	6457.95 ^a	5939.05 ^b	4777.38 ^c
Feed conversion ratio	2.45 ^c	2.67 ^b	2.94 ^a	0.08	2.45 ^c	2.64 ^{bc}	2.67 ^b	3.15 ^a
Protein efficiency ratio	1.85 ^a	1.80 ^a	1.62 ^b	0.04	1.85 ^a	1.82 ^a	1.73 ^a	1.56 ^b
Price per kg feed (?)	85.00	83.00	83.50	0.00	85.00	83.25	83.50	83.75
Cost of feed consumed/bird(?)	531.62 ^a	492.60 ^b	473.26 ^b	16.76	531.62 ^a	540.83 ^a	494.39 ^b	401.63 ^c
Cost of feed consumed/wgt gain (?)	208.53 ^b	221.90 ^b	244.31 ^a	6.33	208.53 ^b	220.69 ^b	222.58 ^b	258.37 ^a
Mortality %	3.33	3.33	3.33	0.00	3.33	3.33	3.33	3.33

abc: Means on the same row with difference superscripts differ significantly ($P<0.05$). RKM = Raw kenaf meal, HKM = Roasted kenaf meal.

Table 6: Main effect of processing methods of kenaf meal and levels of inclusion of kenaf meal on carcass characteristics of broiler Chicken (% of live weight)

Parameters	Processin g		Methods		Levels of		Kenaf		meal	
	Control	RKM	HKM	SEM	0%	10%	20%	30%	SEM	
Live weight (g)	2475.00 ^a	2349.44 ^a	2103.13 ^b	81.34	2475.00 ^a	2466.67 ^a	2362.50 ^a	1799.00 ^b	103.29	
Pluck weight (%)	93.65	93.66	92.09	0.68	93.65	93.05	93.54	92.02	0.74	
Eviscerated weight (%)	79.19 ^a	81.09 ^a	73.53 ^b	0.61	79.19	75.93	78.90	77.80	1.65	
Dress (%)	64.14	64.21	63.27	1.39	64.14	64.25	65.58	61.03	1.30	
Breast weight (%)	18.92 ^{ab}	20.74 ^a	17.14 ^b	1.03	18.92 ^a	19.96 ^a	20.97 ^a	15.64 ^b	1.12	
Thigh (%)	9.69	11.01	10.02	0.95	9.69	10.02	10.73	10.96	0.89	
Drumstick (%)	12.04 ^a	10.68 ^b	10.44 ^b	0.41	12.04 ^a	10.34 ^b	11.11 ^{ab}	10.18 ^b	0.39	
Abdominal fat (%)	2.07 ^c	2.75 ^a	2.57 ^b	0.20	2.08 ^c	2.26 ^c	2.54 ^b	3.31 ^a	0.18	

abc: Means on the same row with difference superscripts differ significantly(P<0.05).

Table 7: Interaction effect of RKM, HKM and levels of inclusion on carcass characteristic of broiler chicken

Parameter	Control		RKM		HKM			SEM
	00%	10%	20%	30%	10%	20%	30%	
Live weight (g)	2475.00 ^a	2641.67 ^a	2575.00 ^a	1781.67 ^b	2241.67 ^{ab}	2150.00 ^{ab}	1825.00 ^b	96.51
Pluck weight (%)	93.65	94.31	94.09	92.58	91.78	93.00	91.19	0.65
Eviscerated weight (%)	79.19	80.06	81.64	81.57	71.80	76.17	72.16	1.29
Dress (%)	64.14	66.09	65.59	60.96	62.41	65.57	61.12	1.47
Breast weight (%)	9.69	10.50	11.59	10.94	9.54	9.86	10.99	0.79
Thigh (%)	12.04 ^a	10.41 ^b	11.11 ^{ab}	10.52 ^b	10.28 ^b	11.11 ^{ab}	9.67 ^b	0.46
Drumstick (%)	18.92 ^a	22.45 ^a	23.09 ^a	16.69 ^b	17.47 ^a	18.85 ^a	14.06 ^b	0.92
Abdominal fat (%)	2.07 ^b	2.27 ^b	2.64 ^b	3.35 ^a	2.25 ^b	2.44 ^b	3.24 ^a	0.24

abc: Means on the same row with difference superscripts differ significantly(P<0.05).

Discussions

The processing methods (raw and roasted) have significant (P<0.05) effect on the performance characteristics of the broiler. For all the parameters measured, the control had the highest, while the roasted had the least, this is contrary to Udedibe *et al.* (2002) who reported that roasting improve the nutritive value of jack bean. But agreed with the work of Esonu *et al.* (1998) who demonstrated that toasting alone as a method of processing jack bean seeds did not appreciably reduce the level of toxic factors in jack beans. However, the reduced performance of the broiler fed HKM might be due to the denaturation of the amino acid profile of the test ingredient.

Except for broiler on 10% inclusion level, the weight gain reduces as the inclusion levels of RKM and HKM increases, the same trend was recorded for the feed consumption, this may point to the inability

of the broilers to utilize or handle anti-nutritional factors in the kenaf based diets. The reduced feed intake could be due to reduced acceptability and also due to increased fibre level as kenaf seed has a high fibre level. The feed intake values however conformed to the recommendation for broilers (Oluyemi and Robert, 2000). The higher (P<0.05) average weight gain of the birds on control diets than those on kenaf based diets except those on 10% RKM could be explained by the relatively low crude fibre of the control compared with the kenaf based diets. Increasing the content of fibre in diets has a negative linear effect on body weight (Zaczek *et al.*, 2003).

The profit obtained from broilers depends on the carcass quality and feed conversion or feed efficiency ratio. A lower value of feed conversion ratio (FCR) is an indication of better performance and feed conversion into flesh. The non- significant variation

Performance and Carcass Characteristics of Broiler fed raw and Processed Kenaf Seed Meal

observed in FCR of birds fed 10% RKM compared with the control which was better than those levels of kenaf based diets was an indication of better utilization of the 10% RKM. The lowest FCR value was obtained for birds fed 10% RKM while the highest value was obtained from birds on 30% HKM. The FCR of the broilers on control diet (2.45) and those on forms of kenaf based diets were lower than the range 3.27-4.03 (Oyewola *et al.*, 2002) and 3.67- 5.97 (Adetunji and Ologhobo, 1999). The values however, compared favourably with 2.84-5.97 (Adetunji *et al.*, 1997) and 3.34- 3.65 (Akpodiete *et al.*, 1997). Apparent differences in the values recorded by these authors to the present study could be caused by differences in the ingredients used in ration formulation, breed or species of birds, site of experimentation.

Significant differences exist, in the live weight of birds fed variously processed kenaf based diets. Hunton (1972) identified nutrition, age, sex, environment, stage of development, efficiency of feed as determinants of carcass quality. In all parameters measured, there was no significant difference in values obtained for birds on control, 10% and 20% RKM and HKM respectively, though the highest values was obtained for birds on 10% RKM. Reports by (Bartov and Bornstein, 1976) depicted multifactor's influencing carcass yield which dietary quality and composition as prominent in influencing carcass yield as observed in this study. The dressing-out percentage values ranged from 60.69 - 66.08%. The highest dressed percentage was obtained from birds on 10% RKM (66.08%) while the least was obtained from 30% RKM (60.96%). The value was lower than the range 77.33- 83.00% (Akpodiete *et al.*, 1997) but fall within the range 60.30-74.65% recommended for broiler chickens (Bamgbose and Niba, 1998) and 69.23 -

71.01% (Matthew *et al.*, 2010).

Conclusion

From this study it was revealed that broilers on 10% inclusion levels of raw kenaf meal based diet recorded a higher final live weight and weight gain than those fed with control diet. The protein efficiency ratio (PER) of broilers on 10% inclusion of RKM based diet was higher than those fed with control diet. Broilers on control diet recorded a higher cost of feed consumed per bird than broilers fed the various kenaf based diets, and the cost of feed consumed per weight gain is also lower in birds fed 10% HKM compared to those on control diets, also the inclusion of 10% RKM resulted in better cuts parts compared with the control.

Therefore kenaf seed (raw and roasted) is a good resource for broilers and can be included in broiler diets up to 10% without adverse effect on performance and carcass quality.

References

- A.O.A.C. 1990.** The official method of Analysis. Association of official Analytical chemist 13th edition Washington D.C.
- Adetunji, C. A. and Ologhobo, A. D. 1999.** Utilization of full-fat sunflower seed in the diets of brown chicken. *Tropical Journal of Animal Science*. 2(2) 61- 66.
- Akpodiete, O. J., Ologhobo, A. P. and Ayoade, O. G. 1997.** Replacement value of maggot meal for fish meal in broiler chicken diets. Proceedings of 2nd Ann. Conf. of Anim. Sci. Association of Nigeria (ASAN), Ikeja Lagos Sept. 16- 17. 1997.
- Atanassova, M. and Christova-Bagdassarian, V. 2009.** Determination of tannins content by

- Titrimetric method for comparison of different plant species. *Journal of the University of Chemical Technology and Metallurgy*. 44 (4): 413-415
- Bamgbose, A. M. and Niba, A. T. 1998.** The Nigerian livestock industry in the 21st Century. 3rd Annual conference of Animal Science Association of Nigeria (ASAN). Pp 84- 87.
- Bartov, I. S. and Borstein, S. 1976.** Effect of Degree of Fatness in Broiler on Other Carcass Characteristics. Relationship between Fatness and Composition. *British Journal of Poultry Science* 17:17-27
- Dempsey, J. M. 1975.** Fiber crops, pages 203-304. The University press of Florida. Gainesville, Florida, 457 Pp.
- Esonu, B. O., Udedibie, A. B. I and Carlini, C. R. 1998.** The effect of toasting, dry urea treatment and sprouting on some thermostable toxic factors in the jackbean seed. *Nigeria Journal of Animal Production* 25: 36-39.
- FAO. 2004.** Protein sources for the Animal feed Industry. Food and Agricultural Organization. Export Consultation Workshop Report, F.A.D. Rome Italy. <http://www.fao.org/dorcrep/To395E/TO395EOO.html>. Accessed Feb. 2009.
- Hunton, P. 1972.** Nutrition and Carcass quality of Broilers and Turkeys. Recent Advances in Animal Nutrition.
- Matthew, U. D., Tegbe, T. S. B., Omage, J. J. and Adeyinka, I. A. 2010.** The effect of duration of cooking pigeon pea on the performance of broiler chicks. *Nigerian Journal of Animal Production* 37(1): 13-24.
- Odetola, O. M. and Eruvbetine, D. 2012.** Nutritional Evaluation of Whole Kenaf (*Hibiscus cannabinus* L.) Seed Meal in Rats. *Journal. Advance. Laboratory. Research in. Biology*. 3(3): 214-220.
- Odunsi, A. A. 2003.** The effect of Animal and Plant Protein-Based Diets on the Crude Protein of Cockerel Starters. *African Journals Online*. 6(1): 29-35.
- Ominisi, P. A., Omage, J. J., Dafwang and Bawa, G. S. 2012.** Evaluation of Quality Maize (*Obatanpa*) Diets with or without Synthetic Lysine Supplementation on the Performance and Egg Quality Characteristics of Laying Hens. *Nigerian Journal of Animal Production* (1): 86-95.
- Oyebimpe, K. A., Fanimu, O., Oduguwa, O. O. and Biobaku, W. O. 2006.** Response of broiler chicken to cassava peel and maize offals in cashew nut meal-based diets. *Archivos De Zootecnia*. 55 (211): 301-304.
- Oyewola, G. S., Amaefule, K. U., Abasiokong, S. F., Akinmutimi, A. H., Lawal, A. S. and Anyanwu, K. 2002.** Response of Broiler Finisher to Dietary Methionine and or Lysine Supplementation. *Tropical Journal of Animal Science*. 5(1): 189- 196.
- Oluyemi, J. A. and Roberts, F. A. 2000.** Poultry production in warm wet climate: Rev. Ed . Spectrum Books Ltd. Pg 2, 60, 143-155.
- Rajashekher, A. R., Rao, P. V. and Reddy, V. R. 1993.** Chemical composition and nutritive value of ambadi (*Hibiscus cannabinus*) meal for layers. *Animal Feed Sciences and Technol.* 44: 151-166.
- Reddy, M. B. and Love, M. 1999.** The impact of food Processing on the Nutritional Quality of Vitamins and

Performance and Carcass Characteristics of Broiler fed raw and Processed Kenaf Seed Meal

- Minerals, *Advanced Experimental Biology*. 15: 459-601.
- SAS, 2003.** SAS/STAT Users Guide: Version 8 for Windows. SAS Institute Inc., Cary, NC., USA.
- Udedibe, A.B.I., Lynn, R. And James, C.R.** 1988. Pharmacognosis 9th Ed. Lea and Fibiger Philadelphia. Pp 248.
- Zaczek, V., Jones, E. K. M., Macleod, M. G. and Hocking, P. M.** 2003. Dietary Fibre Improves the Welfare of Female Broiler Breeders. *British Journal of Poultry Science* 44: 530.

Received: 24th September, 2016

Accepted: 4th March, 2017