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THE GROWTH PERFORMANCE, NUTRIENT DIGESTIBILITY AND CARCASS CHARACTERISTICS OF BROILERS FED COOKED FLAMBOYANT (*Delonix regia*) SEED MEAL

BY

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ABSTRACT

The experiment was designed to study the effect of replacing groundnut cake (GNC) in the diet of broilers with graded levels of cooked Flamboyant seed meal (CFSM) as a protein source. The experimental diets were designated as T_1, T_2, T_3 and T_4 having 0%, 10%, 15% and 20% level of inclusion of CFSM respectively. One hundred and twenty day-old Hubbard broiler chicks were used for the experiment. The chicks were divided into four treatment groups each with three replicates. Parameters measured included body weight, body weight gain, feed intake, feed conversion ratio (FCR) and nutrient digestibility. The effect of the replacement on carcass characteristics was also evaluated.

Results showed no significant ($P>0.05$) difference across the treatments at the starter phase for all the parameters evaluated except for feed intake, body weight and nutrient digestibility. At the finisher phase, there were significant ($P<0.05$) differences observed in feed consumption, body weight, body weight gain, feed efficiency and nutrient digestibility coefficients among the treatments. No significant ($P>0.05$) difference was observed amongst the carcass parameters except the thigh and breast. It was concluded that broilers can tolerate CFSM up to 20% level of inclusion without any adverse effect on their performance.

Keywords: Broilers, carcass characteristics, cooked flamboyant, digestibility, growth, nutrient.

INTRODUCTION

The increasing cost of livestock feeds with irregular increase in the cost of livestock products has necessitated the search for cheaper and readily available alternative feed ingredients for livestock feeding. Due to the high cost of feed ingredients, it was recently observed that commercial feed operators have compromised on standards (Kudu *et al.*, 2008) such that, the compositional labels on branded bags does not truly reflect the actual nutrient composition of the feed. When such feeds were used to feed Cockerels, performance in terms of growth rate was reduced (Kudu *et al* 2008). To meet the plant protein demand of livestock, nutritionists are seeking plant protein alternatives (usually referred to as non-conventional feedstuff) in order to ameliorate the high cost of feeding. Some of the recently conducted researches revealed that Pigeon pea (Karsin *et al* 2008) *Afzelia africana* (Obun and Ayanwale 2008), Flamboyant seeds (Egena *et al* 2007; Shiawoya *et al* 2008), Taro Cocoyam (Edache *et al* 2008), bitter Kola (Asiegwu *et al* 2008), and Bambara groundnut (Omoikhoje *et al* 2008) and a host of others have been successfully used as a protein sources in livestock nutrition particularly monogatrics.

Flamboyant seed have been shown to be a good source of protein particularly when processed (Egena *et al* 2007; Shiawoya *et al* 2008). Processing tends to impact or improve the nutritional value of protein seeds with particular reference to crude protein and anti-nutritional factors (trypsin inhibitors, tannins, phytic acid) which often limits the use of most legume

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seeds. The purpose of this research is to investigate the effect of cooking Flamboyant seed on the performance of broilers under intensive management.

MATERIALS AND METHODS

The study was conducted at the poultry unit of the Department of Animal Production, Federal University of Technology, Minna, Niger State between July and August, 2008. Maize bran, maize grain, fish meal, salt, premix, bone meal, limestone, Groundnut cake GNC, methionine and lysine were obtained within Minna. The test ingredient (Flamboyant seeds) was sourced from within Minna and its environment. The seeds were sun-dried, and boiled at temperature of 105-110^{0}C until the seeds became soft. The boiled seeds were sun-dried and milled using a hammer milled and stored until needed as cooked Flamboyant seed meal (CFSM). The meal was used to formulate four diets (Table 1).

Table 1:Starter and Finisher Diets

Ingredient	Starter phase				Finisher phase			
	T_1	T_2	T_3	T_4	T_1	T_2	T_3	T_4
Maize	56.17	56.17	56.17	56.17	57.79	57.79	57.79	57.79
GNC	32.82	29.54	27.9	26.26	25.96	23.26	22.07	20.17
CFSM	0.00	3.28	4.92	6.56	0.00	2.59	3.89	5.19
Fish meal	2.50	4.00	3.00	3.00	5.00	4.50	4.00	4.00
Maize bran	5.00	2.50	2.50	1.50	7.85	7.46	6.85	6.85
Bone meal	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
$CaCO_3$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Red oil	1.00	2.00	3.00	4.00	1.00	2.00	3.00	3.00
Salt	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
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
Premix	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Total	100	100	100	100	100	100	100	100
CP%	22.00	22.00	22.00	22.00	20.00	20.00	20.00	20.00
Energy (Kcal/Kg)	3016	3006	3017	3036	2936	2922	2904	2903

T_1-0% CFSM, T2 – 10% CFSM, T_3 - 15%CFSM, T_4 - 20% CFSM

CFSM – Cooked flamboyant seed meal

One hundred and twenty day-old Hubbard broiler birds were randomly allotted to four treatments each with three replicates of 10 birds in a completely randomized design. Warmth was provided using 200 watt electric bulbs. Feed and water was supplied *ad libitum* throughout the trial. Other routine management practices were observed and vaccine administered as of when due. A digestibility trial was carried out to assess the metabolic response of the birds to the experimental diets. Feed and faeces were analyzed using the method of AOAC (1990). A modified method of AOAC (1984) was used to analyze for tannin and trypsin inhibitor, while phytic acid level was analyzed using the method of Latta and Eskin (1984). All data collected were subjected to analysis of variance according to Snedecor and Cochran (1980) and means were separated using Duncan multiple range test as outlined by Steel and Torrie (1980).

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RESULTS AND DISCUSSION

The proximate composition of the test ingredient is shown in Table 2. It revealed that through cooking, the entire nutrients contained in uncooked Flamboyant seed meal (UFSM) were increased particularly crude protein (CP), crude fibre (CF), ether extract (EE) and ash. However, reduction in Nitrogen free extract (NFE) and moisture content was observed following cooking. Egena *et al* (2007), Shiawoya *et al* (2008), and Kudu *et al* (2009) all reported similar increase in CP, CF and EE when Flamboyant seeds were roasted and anaerobically fermented followed by lyle treatment. Therefore the relative increase observed in the said parameters is reflective of the influence of cooking on the test ingredient. The observed increase in EE reflects the fact that cooking has a positive effect on the crude fat of the seed. This is in agreement with Okigbo (1975). Omoikhoje *et al* (2008) noted a significant increase in CP and NFE has influenced by cooking of Bambara groundnut though they observed that when cooked for too long, solubilization some of nutrients tends to set in. Akinmutimi (2003) and Etuk and Udebibie (2006) noted that cooking improves the nutritional value of Pigeon pea.

Table 2: Proximate composition of test ingredients (%)

Parameter	UFSM	CFSM
DM	87.80	94.00
Moisture	12.20	6.00
CP	18.10	25.00
CF	7.50	12.50
EE	7.50	10.05
Ash	3.60	6.00
NFE	51.10	40.45

UFSM: Uncooked flamboyant seed meal
CFSM: Cooked flamboyant seed meal

Table 3 shows the effect of cooking on anti-nutritional factors. Trypsin inhibitor and tannin were greatly reduced as much as by 66.30 and 66.55% respectively. Egena *et al* (2007) noted reduction in anti-nutritional factors when Flamboyant seeds were anaerobically fermented and lyle treated. As similar observation was reported by Shiawoya *et al.* (2008). These findings are in agreement with Tuleum *et al* (2008) who reported a 20-25% reduction in the level of anti-nutritional factors in mucuna seeds as a result of cooking.

Table 3: Effect of cooking on anti-nutrients of Flamboyant Seed

Parameters	UFSM	CFSM	% reduction
Phytate (mg/100g)	2.13	1.01	52.58
Tannin (g/kg)	93.10	33.00	66.55
Trypsin inhibitor (Tui/mg)	73.00	92.00	66.30
Saponin (%)	12.23	6.31	48.01

UFSM: Uncooked flamboyant seed meal
CFSM: Cooked flamboyant seed meal

Table 4 shows the performance of broilers fed graded levels of cooked Flamboyant seed meal. At the starter phase, significant statistical difference ($P<0.05$) was observed in body weight and feed intake. The body weight of the birds fed UFSM was observed to be lower than those fed the test ingredient. Birds fed T_2 (10% CFSM) had the least body weight amongst those fed the test ingredient. At the finisher phase, body weight, body weight gain, feed intake

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and feed conversion ratio were all significantly (P<0.05) affected. Feed intake decreased progressively as the inclusion level of CFSM increased in the diet. This is at variance with the report of Egena *et al* (2007) and Shiawoya *et al* (2008) who all observed remarkable increase in feed intake with increasing level of Flamboyant seed meal inclusion in the diet of broilers. Although birds fed the control diet had higher consumption, this did not translate to the final body weight as birds fed the test ingredient had better (P<0.05) final body weight. Obun and Ayanwale (2008), Egena *et al* (2007) and Karsin *et al.* (2008) reported that processing of legumes tend to have a positive influence on broilers.

Table 4: Performance of broilers fed CFSM

	T1	T2	T3	T4	SEM
Starter phase					
Initial body weight (g)	61.20	61.70	61.50	61.50	
Body weight (g)	406.50^{a}	408.00^{a}	422.00^{b}	431.00^{c}	10.15*
Body weight gain (g/week)	31.57	30.71	31.00	30.43	0.42ns
Feed intake (g)	3226.66^{d}	3160.00^{c}	3081.67^{a}	3108.33^{b}	55.33*
FCR	14.66	14.7	14.34	14.53	0.14ns
Finisher phase					
Body weight	1523.18^{a}	1649.58^{d}	1559.50^{b}	1672.50^{c}	61.75*
Body weight gain (g/week)	56.25^{a}	56.52^{b}	63.42^{c}	69.39^{d}	5.44*
Feed intake (g)	6000.00^{c}	5955.00^{a}	5980.00^{b}	5955.04^{a}	18.87*
FCR	15.24^{c}	13.28^{a}	13.66^{b}	13.68^{b}	3.00*

^{a,b,c}: means denoted by different superscript along the same row are significantly different (p<0.05)

Table 5 shows the nutrient digestibility by broilers fed graded levels of CFSM. Most of the nutrients seem to have been well digested at both phases of the experiment. Age seem not to have affected the birds ability to digest nutrients at the starter phase as reported in roasted Flamboyant seed meal (Shiawoya *et al* 2008), anaerobicaly fermented and lyle treated flamboyant seed meal (Egena *et al., 2009)* or cooked flamboyant seed meal (Kudu *et al., 2009).* Cooking therefore did not hamper the bird's ability to digest nutrients in the seed meal. This might be linked to the reduced level of anti-nutrients in the cooked Flamboyant seed meal (Table 3).

Table 5: Nutrient digestibility of broiler fed CFSM

	T_1	T_2	T_3	T_4	SEM
Starter phase					
DM	96.38^{d}	92.00^{a}	95.81^{c}	95.64^{b}	0.65*
CP	81.63^{b}	78.17^{a}	85.96^{d}	84.86^{c}	1.14*
CF	69.80^{c}	61.93^{a}	65.95^{b}	74.47^{d}	1.74*
EE	95.04^{c}	93.99^{b}	96.31^{d}	92.61^{a}	0.51*
Ash	79.88^{c}	78.41^{a}	91.68^{d}	79.32^{b}	2.05*
NFE	93.25^{a}	94.27^{b}	94.37^{c}	95.65^{d}	0.32*
Finisher phase					
DM	67.64^{a}	97.90^{d}	97.14^{c}	96.84^{b}	4.86*
CP	90.41^{d}	89.08^{c}	88.02^{b}	87.20^{a}	0.45*
CF	94.50^{c}	87.59^{a}	92.41^{b}	92.18^{b}	0.95*
EE	97.34^{c}	96.77^{b}	97.45^{c}	96.01^{a}	0.21*
Ash	84.09^{a}	84.24^{a}	89.44^{b}	90.02^{c}	0.97*
NFE	91.77^{d}	91.53^{c}	90.80^{a}	91.07^{b}	0.14*

a,b,c: means denoted by different superscript along the same row are significantly different.

Table 6 represents the cut-up parts of the carcass express as percentage of live weight at slaughter. The thigh and the breast are significant ($P<0.05$) among the treatments. This is in disagreement with Egena *et al* (2007) who observed non significance differences in most of the carcass parameters measured. The increase in the thigh and the breast revealed a better utilization of the feed than in the control (T_1). This therefore shows that the feed components particularly those that contain the test ingredient can be tolerated by broiler birds. The internal organs did not show any significant difference among all the treatments. This is at with the findings of Egena *et al.* (2007), who observed a significant difference in the intestine, crop and lungs among broilers fed an aerobically-fermented and Lyle treated flamboyant seed meal.

Table 6: Carcass characteristics of broilers fed cooked flamboyant seed meal

Parameters	T_1	T_2	T_3	T_4	TOTAL	x	SEM	REM
Live weight		1523[a]	1649[c]	1560[b]	1672[d]	6405	1601	1.75
	*							
Slaughter wt	94.93	91.15	92.62	92.04	370.74	92.69	1.39	Ns
Head	2.62	2.25	2.64	2.85	10.36	2.59	0.22	Ns
Neck	5.58	5.88	5.90	6.11	23.47	5.87	0.18	Ns
Thigh	10.08[a]	11.17[b]	11.36[c]	11.52[d]	44.13	11.03	0.56	*
Drumstick	9.63	9.68	9.65	9.67	38.63	9.66	0.02	Ns
Back	10.31	10.45	10.68	11.41	42.85	10.71	0.42	Ns
Breast	11.33[a]	14.32[c]	14.42[d]	13.62[b]	53.69	13.42	1.25	*
Wing	11.26	11.06	11.23	11.43	44.98	11.25	0.13	Ns
Internal organs								
Crop	2.03	2.25	2.35	3.03	9.66	2.42	0.37	Ns
Gizzard	4.01	3.98	4.07	3.51	15.57	3.89	0.22	Ns
Intestine	8.41	6.24	6.74	6.09	27.44	6.86	0.93	Ns
Heart	0.45	0.52	0.48	0.51	1.96	0.49	0.03	Ns
Lungs	0.48	0.58	0.59	0.51	2.16	0.54	0.05	Ns
Kidney	0.17	0.16	0.18	0.14	0.65	0.16	0.02	Ns
Liver	2.10	1.91	2.20	1.90	8.11	2.02	0.12	Ns
Spleen	0.13	0.13	0.14	0.13	0.53	0.13	0.04	Ns

a,b,c: means denoted by different superscript along the same row are significantly different.

CONCLUSION AND RECOMMENDATION

Cooked flamboyant seed meal is a potential feed ingredient particularly in the tropics. Since broiler birds can tolerate both the treated and untreated seeds as observed in the live weight of the birds and in some carcass parameters measured. Based on the results obtained in this study, it is recommended that CFSM could be included in the diets of broilers up to 20% without any negative effect on performance.

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