

PERFORMANCE AND CARCASS CHARACTERISTICS OF FINISHING BROILER CHICKEN FED LOCUST BEAN PULP BASED DIETS IN SUDAN SAVANNAH REGION OF NIGERIA

M. S. Tamburawa, A. M. Hassan and F. S. Wali

Animal Science Department, Faculty of Agriculture and Agricultural Technology
Kano University of Science and Technology Wudil, Kano state. P.B.M. 3244
*muaztambura@yahoo.com

ABSTRACT

*This study was conducted to determine the performance and carcass characteristics of broiler chicken fed diets containing Locust Bean (*Parkia biglobosa*) Pulp (LBP) replacing maize at different dietary levels of 0, 2.5, 5, 7.5, and 10 % designated as treatment 1, 2, 3, 4 and 5 respectively. A total of ninety (90) four weeks old broiler chickens (ANAK strain) were used for the experiment. Each treatment was allocated to 18 chicks in a completely randomized design (CRD) and replicated three times with 6 birds per replicate. The experiment lasted 5 weeks at finisher phase. The results of the performance showed there were significant differences ($P < 0.05$) in the feed intake (113.91-152.89g) and final body weight (2150.44- 3201.74g). However, the daily weight gain (70.21- 83.31g) and feed conversion ratio (1.44 - 1.94) were not significantly ($P > 0.05$) affected by the dietary treatments. The results of the carcass analysis showed that the carcass weight (1.38 -1.99 kg) and dressing percentage (56.01-68.10%) were significantly ($P < 0.05$) affected by the dietary treatments. While, most of the organs weights were not significantly ($P > 0.05$) affected by the dietary treatments, except the liver weight (38.28 - 60.63g) which was influenced significantly ($P < 0.05$) by the diets. The feed cost per weight gain was significantly ($P < 0.05$) reduced at treatment 4 (₦144.13) and slightly increased at treatment 5 (₦156.21g). It was concluded that Locust bean pulp can be included in the diets of broiler chicken as an alternative source of energy up to 7.5% without any adverse effect in the performance and carcass yield.*

Keywords: Maize, Locust Bean Pulp, Broiler Finisher, Performance, Carcass Characteristics

INTRODUCTION

Poultry has been found to be highly prolific and very efficient in converting feed nutrients into high quality animal protein (Smith, 2001). Broiler chicken remains the fastest sources of animal protein because of their rapid growth. This is due to their genetic makeup good nutrition and management. However, a major limitation to increase animal production in Nigeria is exorbitant cost of feed and feed ingredients. As the cost of major feedstuffs continues to increase there is still need to maximize productivity. Uzeagbu *et al.* (2007) stated that maximization of productivity in broilers in form of heavy body weight with economical feed intake is only achievable through good quality nutrition that is digested absorbed and utilized by birds. The energy component of poultry feed constitutes the largest proportion of poultry diets for efficient productivity (Masobaje *et al.*, 2007).

Maize is a conventional energy source in Africa and constitutes the major problem of poultry production (Tewe *et al.*, 2004). The competition between man and livestock for maize necessitate scientist to explore some alternative sources of feed ingredients especially energy concentrates for poultry production. This is due to its scarcity as a result of low production and higher demand in Nigeria (Durunna, 2001). Maize is costly resulting in high cost of livestock feed. Fajimi *et al.* (1993) reported that the use of unconventional feed sources would reduce the pressure on conventional feed ingredients in Nigeria and indeed sub-Saharan African countries. Effort to reduce the feed cost and feed

ingredient through the knowledge of nutrition will certainly improve profit margin of poultry farmers (Tewe *et al.*, 2004).

The Scarcity and high cost of conventional feedstuffs in Nigeria such as Soya bean, Groundnut and Maize has led to renew interest in the use of non-conventional cheap and easily available ingredients. The non conventional feed ingredients are available in different localities of the nation. Locust bean tree (*Parkia biglobosa*) is one of the readily available trees in Guinea and Sudan savannah regions of Nigeria. It produces fruit embedded with seeds in a yellow floury pulp. Alabi *et al.* (2005) reported that locust bean powder contains six simple sugars namely raffinose, lactose, glucose, galactose, fructose and maltose. It can be used to replace conventional cereal grains like maize. This research was aimed at investigating the effect of locust bean pulp replacing maize on the performance and carcass characteristics broiler chicken.

MATERIAL AND METHODS

Experimental site

The experiment was conducted at the Teaching and research Farm of Department of Animal Science, Faculty of Agriculture, Kano University of Science and Technology, Wudil. It is located within Sudan savannah region of Nigeria. The farm is located on latitude 11° 37'N and longitude 8° 58'E at an altitude of 403m above the sea level. The annual rainfall ranges from 850mm-870mm, while minimum and maximum temperature ranges between 26° and 33° C. While the relative humidity of the region is always

low and ranges between, 40- 51.3% (Olofin *et al.*,

2008).

Experimental diets and birds

Five diets were formulated containing locust bean pulp replacing maize at dietary levels of 0, 2.5, 5.0, 7.5 and 10% designated as treatments 1, 2, 3, 4 and 5 respectively. A total of ninety (90) four weeks old broiler chicks (ANAK strain) were used for the experiment. Treatments were allotted to birds in a completely randomized design (CRD). Each treatment was fed to 18 birds in 3 replicates with 6 birds per pen.

Experimental animal management

The birds were reared on deep litter system with experimental units (pens) measuring 1.25 m wide, 1.50m length and 1m height. Fifteen experimental pens were constructed and designed to accommodate 6 birds as an experimental unit. The pens were fully constructed with wood and wire mesh to protect them against predators and serves as security. The feeding trough and water troughs were properly placed in the pens to avoid spillage and wastage. The chicks were immediately offered anti-stress in drinking (Vitalyte) and vaccinated with Newcastle Vaccine at 4 weeks against Newcastle disease. Routine management operations were conducted on daily and weekly basis, such as feed offering, cleaning removal of faeces to avoid contamination and ensure good healthy condition of the birds.

Data collection

The initial body weights of bird were recorded at beginning of the experiment. The feeds offered were measured daily and leftovers of feed offered were also recorded on daily basis. The feed consumption was determined by the difference between the daily feed offered and the daily leftover weighed. While the weight gain was measured on weekly basis using a 10kg weighing scale. The daily weight gain was determined by difference between the initial weight and the final body weight of bird within the interval of days in the week.

At the end of the experiment, carcass analysis was conducted with two birds per replicate. The final live weight of individual bird was taken and recorded before slaughtering. Birds then were slaughtered at the jugular vein and eviscerated. The carcass weight and organs weights were all recorded using a portable digital weighing scale for micro measurement of organs in grams. The gut weights (crop, proventriculus, gizzard, small and large intestines) were all weighed using a digital electric weighing scale. Additionally, the organs weight (Liver, Lung, Heart, Pancreas, and kidney) and abdominal fat were all weighed.

Data analysis

Data generated were subjected to Analysis of variance (ANOVA) as described by Steel and Torrie (1980). A statistical analysis system package was used for the analysis (SAS, 1998).

Duncan Multiple Range Test (D.M.R.T) was also used to separate the means, where significant difference exists between the treatments means (Duncan, 1955).

RESULTS AND DISCUSSION

The proximate composition of Locust bean Pulp and Maize used in the experiment is presented in Table 1. The composition of experimental diets is shown in Table 2. Diets are isocaloric and isonitrogenous and met the requirement of birds based on the nutrients composition and requirement of broiler chicken as shown by Aduku (1993) who reported that that the crude protein and energy content should be between 20 - 21 % and 3000-3100 Kcal/kg respectively, in the diet of finishing broiler chicken .

The results of the performance of the birds fed diets containing locust bean pulp is presented in Table 3. The results showed that the feed consumption (113.91-152.89g) was significantly ($P < 0.05$) affected by the dietary treatments. Higher feed intake was found in treatment 4 (152.89g) and lower feed consumption was realized in treatment 5 (113.91g). This revealed that there was gradual decrease in feed consumption at finisher phase as replacement is beyond 7.5%. This contradict the work of Kwari and Igwebuikwe (2001) who reported that there was no significant difference in the feed intake up to 20% in arid zone when locust bean pulp diets were fed to broiler chickens. The final body weight was significantly ($P < 0.05$) influenced by the dietary treatments. Treatment 4 had the higher final body weight (3201.74g) when compared with other treatments. However, lower final body weight was obtained on birds fed with treatment 5 (2150.44g). This agreed with the report of (Kwari and Igwebuikwe, 2001) who reported that might be due to low feed consumption.. Conversely, there was no significant difference ($P > 0.05$) in the daily weight gain (70.01-84.38g) among the treatments. However, treatment 4 had higher daily weight gain numerically compared to others. Similarly, treatment 5 had lower daily weight gain (70.01g). The feed conversion ratio was lower in treatment 4 (1.44) and higher in treatment 5 (1.94). This is also similar to the report of Kwari and Igwebuikwe (2001) who obtained an increase in value of feed conversion ratio as replacement of maize with locust bean pulp increases. This also agreed with Doma (1998) who reported that the lower the value of feed conversion ratio the better the diets in monogastric animals feeding. The feed cost per kilogram gain (₦144.13 - 156.76) was significantly ($P < 0.05$) affected by the treatments. Treatment 4 had lower feed cost per kilogram gain and treatment 1 had higher cost when compared to other treatments This indicated some reduction in cost per unit weight gain with an increased in the utilization of locust bean pulp

in the diets up to treatment 4 and beyond which

the cost/kg gain increased at treatment 5.

This agreed with report of kwari and Igwebuiké (2001) who reported a decrease in the cost of production with an increase in the replacement of maize with locust bean pulp in arid zone. There was no significant difference ($P > 0.05$) in the mortality rate of the bird. However, treatment 4 had higher mortality rate than other treatments having 0.66% .

1(201.34g) and lower in treatment 3 (182.24g). However, the large intestine weight was higher in treatment 5(19.34g) and lower in treatment 4 (21.30). The length of small and large intestine were higher in treatments 1 and 3 having 201cm and 30.70cm respectively. The weight of abdominal fat was higher in treatment 1 and lower in treatment 5 having 60.41g and 44.70g respectively.

The results of carcass analysis are presented in Table 4 and 5. The carcass and gut characteristics showed there were significant differences ($P < 0.05$) in the final live weight, carcass weight and dressing percentages. Treatment 4 had higher final live weight (3.01Kg) than other treatments. Lower final body weight was found in treatment 5 (2.10kg). Similarly, higher carcass weight was found in birds fed on treatment 4 (1.99 Kg) and lower carcass weight was obtained in treatment 5 (1.38 Kg). The dressing percentage was higher in treatment 4 (68.10 %) and lower in treatment 5 (63.31%).The drum stick breast muscle and wings were not significantly ($P > 0.05$) affected by the dietary treatments. However, treatment 4 had higher weight of drum stick (287.22g) and treatment 3 had the lower weight of drum stick (245.56g). Treatment 4 had higher weight of breast muscle (498.23g) and lower weight was obtained in treatment 1 (345.78g). The wings weight was higher in treatment 4 (252.47g) and lower weight of wings in treatment 3 (194.34g). There were no significant differences ($P > 0.05$) in the gut weights (crop, proventriculus and gizzard, small and large intestines.). However, higher weight of gizzard was found in treatment 4(51.30g) and lower in treatments 3 and 5 each having 42.70g. The proventriculus was higher in treatment 4 (15.30g) and lower in treatment 3(8.70g). The small intestine weight was higher in treatment

The results of carcass analysis on the organs weights is presented in Table 5.The results showed that most of the organs weights (Heart, lung, kidney, pancreas, and spleen) were not significantly ($P > 0.05$) influenced by the dietary treatments. Higher weight of heart was found in treatment 3 (16.71g) and lower weights in treatments 1and 4 having 11.42g and 11.31g respectively. The Lung weight was higher in treatment 2 and lower in treatment 1 having 18.70g and 13.34g respectively. However, the liver weight was significantly ($P < 0.05$) affected by the dietary treatments. Treatment 2 (60.63g) had the higher liver weight, while treatment 5 had the lower liver weight (38.28g). The kidney and Pancreas weights were lower in treatments 2 and 1 having 3.20g and 4.62g respectively. The higher weights of kidney and pancreas were obtained in treatment 3 having 5.62g and 7.30g respectively. The organs weights numerically increased with an increase of LBP up to 7.5 % and slightly decreased beyond the level. This agreed with report of kwari and Igwebuiké (2001) who reported a decreased in organs weights with an increase of locust bean pulp replacing maize in the diets of broilers in arid zone of Nigeria.. It has been shown that as protein level of diet is slightly increase in feed consumed; it leads to better muscle deposition and production of leaner carcass (Hill and Dansky, 1954)

Table 1: Proximate compositions of Maize and Locust bean pulp

Nutrient components	Maize (%)	Locust bean Pulp (%)
Dry matter (%)	92.67	94.23
Crude Protein (%)	9.02	7.69
Ether extract (%)	4.05	1.28
Crude Fibre (%)	12.73	11.14
Ash (%)	3.36	3.04
Nitrogen free extract (%)	70.84	76.85

Table 2: Compositions of broiler finisher diets containing Locust bean Pulp.

Ingredients	Treatments				
	1 (0%)	2 (2.5%)	3 (5.0%)	4 (7.5%)	5 (10.0%)
Maize	64.50	62.89	61.28	59.66	58.05
Locust bean pulp	0.00	1.61	3.22	4.84	6.45
Soya bean meal F/fat	9.50	9.50	9.50	9.50	9.50
Groundnut cake	15.00	15.00	15.00	15.00	15.00
Fish meal	3.00	3.00	3.00	3.00	3.00
Wheat offal	4.00	4.00	4.00	4.00	4.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.25	0.25	0.25	0.25	0.25
Vitamin-premix	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100
Calculated Analysis					
Crude protein (%)	20.00	20.00	20.00	20.00	20.00
M .Energy Kcal/kg	3041	3032	3016	3002	3001
Ether extract (%)	5.53	5.53	5.49	5.20	5.21
Ash (%)	3.94	3.94	3.41	3.33	3.22
Ca (%)	1.34	1.34	1.34	1.34	1.33
P (%)	0.91	0.91	0.90	0.93	0.95
Lysine (%)	1.18	1.18	1.19	1.17	1.19
Methionine (%)	0.50	0.50	0.59	0.51	0.56

M.E. = Metabolizable Energy, *Vitamin-mineral Premix---- Composition of vitamin premix 1 Kg is as follows:- vitamin A 8000 iu; Vitamin D₃ 1600iu; Vitamin E 5 iu, Vitamin K 0.200 mg; B vitamins, Thiamine B₁ 0.5mg; Riboflavin B₂ 4mg; pyridoxine B₆ 0.015 mg; Niacin 0.015mg; B₁₂ 0.01mg; Pantothenic acid 0.5 mg; folic acid 0.5mg and Biotin 0.020 mg; Choline chloride 0.02 mg; Anti-oxidant 0.125g and Minerals (Mn, zn, Fe, cu, I, Si, Co) 0.156g.

Table 3: Performance of broiler chickens fed locust bean pulp diets at finisher phase (4 - 9weeks).

Parameter	Treatments					SEM
	1	2	3	4	5	
Initial body weight (g)	421.01	420.14	420.14	421.14	421.21	10.34 ^{ns}
Daily feed intake (g)	132.25 ^b	122.22 ^c	133.67 ^b	152.89 ^a	113.91 ^c	7.31 [*]
Final body weight (g)	2461.57 ^b	2752.26 ^a	2551.72 ^b	3201.74 ^a	2150.44 ^a	0.05 [*]
Daily weight gain (g)	79.67	81.98	83.31	84.38	70.01	12.96 ^{ns}
Feed cost ₦/kg gain	156.76 ^a	147.49 ^b	148.05 ^b	144.13 ^b	156.21 ^a	4.45 [*]
Feed conversion ratio	1.48	1.80	1.49	1.44	1.94	1.03 ^{ns}
Mortality rate (%)	0.33	0.00	0.33	0.66	0.00	0.91 ^{ns}

* ^{abc}= means with different superscript on the same row are significantly different (P > 0.05)

ns = not significant (P>0.05), SEM = Standard error of means

Table 4: Carcass and gut Characteristics of broiler chicken fed diet containing Locust bean pulp.

Parameter	Treatments					SEM
	1	2	3	4	5	
Final body weight (Kg)	2.44 ^b	2.73 ^a	2.53 ^b	3.01 ^a	2.10 ^c	2.65 ^{ns}
Carcass weight (Kg)	1.79 ^b	1.80 ^b	1.61 ^c	1.99 ^a	1.38 ^c	0.56 [*]
Dressing percentage (%)	56.01 ^b	45.9 ^c	66.71 ^{ab}	68.10 ^a	63.31 ^b	4.76 [*]
Drum stick (g)	247.45	256.13	245.56	287.22	272.98	11.67 ^{ns}
Breast muscle (g)	345.78	456.23	465.27	498.23	395.36	5.20 ^{ns}
Wings (g)	210.09	216.12	194.34	252.47	198.43	20.12 ^{ns}
Crop (g)	10.88	11.34	8.70	13.00	12.03	7.04 ^{ns}
Proventriculus (g)	14.56	13.34	14.79	15.30	12.10	4.21 ^{ns}
Gizzard (g)	45.05	48.04	42.70	51.30	42.70	18.32 ^{ns}
Small intestine weight (g)	56.02	50.01	54.70	50.03	42.70	7.21 ^{ns}
Large intestine weight (g)	16.73	18.03	18.74	21.30	19.34	33.57 ^{ns}
Small intestine length (Cm)	201.34	169.34	182.24	195.34	185.56	4.18 ^{ns}
Large intestine length (Cm)	27.34	26.21	30.70	30.35	27.20	4.87 ^{ns}
Head (g)	99.67	74.70	93.30	61.30	61.45	10.50 ^{ns}
Feet (g)	101.23 ^a	85.67 ^b	71.87 ^c	94.70 ^a	87.30 ^b	3.10 [*]
Abdominal fat (g)	60.41	56.97	44.70	42.70	44.70	27.69 ^{ns}

* ^{abc}= means with different superscript on the same row are significantly different (P>0.05)

*=P<0.05, ns = not significant (P>0.05), SEM = Standard error of means

Table 5: Organs weights of broiler chicken fed locust bean pulp diets at finisher phase (4-9weeks)

Parameter	Treatments					SEM
	1	2	3	4	5	
Heart (g)	11.42	12.70	16.71	11.31	12.70	10.20 ^{ns}
Liver (g)	56.78 ^a	60.63 ^a	55.30 ^b	42.34 ^c	38.28 ^c	4.39 [*]
Lung (g)	13.34	18.70	16.89	14.71	14.52	11.40 ^{ns}
Spleen (g)	6.23	6.70	5.30	2.70	3.30	3.92 ^{ns}
Kidney (g)	3.21	3.20	5.62	4.78	3.67	5.09 ^{ns}
Pancreas (g)	4.62	5.30	7.30	4.67	5.67	3.12 ^{ns}

^{abc}= means with different superscript on the same row are significantly different (P>0.05)

*=P<0.05, ns = not significant (P>0.05), SEM = Standard error of means

CONCLUSION

On the basis of this study, It was concluded that Locust bean pulp can replace maize in the diet of

broiler chickens up to 7.5 % without any adverse effect on the performance and carcass yield.

REFERENCES

- Aduku, A. O. (1993). Tropical feedstuffs Analysis Table, Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria.
- Alabi, D.O. Akinsulire, O.R. and Sanyaolu, M.A.(2005).Quantitative determination of chemical and nutritional composition of *Parkia biglobosa* (Jacq) Benth. *African Journal of Biotechnology* 4(8) Pp. 812-815
- Doma,U.D. (1998). Utilization of Cowpea shell and Maize cobs as sources of dietary fibre for Rabbits.M.Sc. Thesis report Submitted to ATBU Bauchi, Nigeria. Pp 57-60.
- Duncan ,D.B..(1955). Multiple Range and Multiple F Test . 5th edition test Biometrics 1:1-42
- Durunna,C.S.(2001) .The performance of Broiler chicken on Palm kernel diets, In: Proceeding of 25th annual conference Nigerian Society for Animal Production (NSAP) March 2001. pp169-173.
- Fajimi.A.O. Babatunde,A.M. Ogunlana, F. F. and Oyejide, A. (1993). Comparative utilization of Rubber seed oil and Palm oil by broilers in humid tropical environment. *Animal Feed Science Technology Journal* 43: 177-188 .
- Hill, F.W. and Dansky, K.W.(1954). Studies on the energy requirement chickens. *World Poultry Science Journal*, 11:132-138
- Kwari, I. D. and Igwebuike J.U (2001) Broiler chicken fed graded levels of African locust bean (*Parkia biglobosa*) pup. In proceeding of the Annual Conference of the Animal Science Association of Nigeria. Unimaid 2006, University of Maiduguri. Borno state.pp 65-69
- Masobaje, M.A, Tewe, O.O. Adebayo, B.F. Adedoyin, A.A and Lawan, T.E. (2007). Performance and economy of production of layers fed whole cassava mash and pellet as replacement for maize. *Tropical Journal of Animal Science*. 1:2 pp56
- Olofin, E. A., Nabegu,A.B. and Dambazau, A.M. (2008).Wudil within Kano region ; A geographical synthesis, 1st edition, Adamu joji publishers. Kano State, Nigeria, 134-138.
- SAS. (1998). User's Guide Statistics version 6th edition, SAS statistical package Inc, Cary, North Carilina,U.S.A.
- Smith, A.J.(2001) Poultry; Tropical Agriculturalist , 2nd edition. .Macmillan education ltd. Uk Pp1-11.
- Steel, R.G.O and Torrie, J. H. (1980). Principles and Procedure of statistics. Mc gram-Hill book company Inc. New York, Toronto and london
- Tewe, O.O. Job, T.A. Looli, J.K. and Oyenuga, V.A.(2004).Composition of two Local cassava varieties and effect of processing on their hydrocynic content and nutrient utilization by the rat. *Nigerian Journal of Animal production*,3(2) 60-66.
- Uzeagbu, H.O. Ndelekwute.E.K. and Abdu, L.S. (2007).Effect of inclusion of Bambara groundnut (*Voandzea subtanemea*) waste meal on the metabolizable energy and protein of broiler chicken. In: proceeding of 41st Annual Conference of agricultural Society of Nigeria Pp 348-352.