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Effect of Graded Levels of Baobab (*Adansonia digitata*) Seed Meal on the Growth Performance and Production Economic Analysis of Broiler Chickens

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Abstract: A feeding trial was conducted to determine the effect of graded levels of baobab seed meal on growth performance and cost benefit in broiler chicken production. A total of two hundred one-week old broiler chicks of the Anak breed were randomly distributed to five dietary treatments and replicated four times with 10 birds each for a period of 8 weeks. Baobab seed meal was included in the broiler chicken diets at 0, 10, 20, 30 and 40% levels designated as diets 1, 2, 3, 4 and 5, respectively for both the starter and finisher phases. At the starter phase, feed intake (65.18-71.73 g), daily weight gain (30.36-36.16 g) and feed conversion ratio (1.96-2.39) were not significantly ($p>0.05$) affected by the dietary treatments. However, at finisher phase, the daily feed intake (133.40-148.40 g) and weight gain (37.23-55.00 g) were significantly affected at ($p<0.001$) and ($p<0.05$) respectively. Feed conversion ratio was not significantly ($p>0.05$) different among all the treatments means. The overall performance showed significant difference at ($p<0.001$ and $p<0.01$) for daily feed intake and daily weight gain, respectively. The birds fed 20% diet had the highest daily weight gain (44.55 g) and lowest (33.80 g) was recorded for diet 5. The feed cost per gain (N/kg gain) was cheaper (N142.44) on diet 4 and most expensive (N163.69) on diet 1 during the starter phase, while at the finisher phase diet 5 was cheaper (N176.36) and diet 1 being the most expensive (N193.91). Similar trends were obtained at the overall phase. It was therefore concluded that baobab seed meal can be incorporated into broiler chicken diets up to 30% without any deleterious effect on performance with concomitant reduction in feed cost.

Key words: Baobab seed meal, broilers, feed intake, weight gain, feed conversion ratio, cost-benefit

INTRODUCTION

Nutrition and diseases are the major limiting factors in poultry production as the cost of feed alone accounts for about 70-80% of the total cost of producing commercial poultry in Nigeria (Aduku, 1993; Adegbola, 2004). Shortage of feed resources in developing countries and Nigeria in particular is worsened by its competition with humans and growing livestock production in the tropics (Robinson and Singh, 2001). This has resulted in increased prices of conventional sources of poultry feed, especially that of protein. One of the alternative ways of solving this problem is perhaps the use of non-conventional sources of protein to supplement the diets of poultry and reduce cost of production. Poultry production is generally accepted as the fastest way of increasing animal protein consumption in developing countries of the world (Ogundipe, 1999). In Nigeria, poultry meat is popular and well accepted across all religious adherents. Studies on baobab seeds in Nigeria and elsewhere in the world have shown its potentials in supplying good quality food proteins for humans and livestock (Osman, 2004; Nkafamiya *et al*., 2007a). The seeds are rich in protein (18-36% CP), therefore, can be used as source of protein in poultry diets (Salami and Okezie, 1994; Murray *et al*., 2001). Baobab trees are indigenous to Nigeria and the seeds are readily and cheaply available particularly around the middle-belt and some parts of the far north (Nkafamiya *et al*., 2007a). The limited usage of baobab seed in Nigeria made it a non-conventional feedstuff of choice for poultry industry and other farm animals. According to Mwale *et al*. (2008) baobab seed cake has been included in guinea fowl keets diets up to 5% without compromising growth performance. In Nigeria, little or no information is available on the use of baobab seed meal in broiler chicken diets. The purpose of this study was therefore, to determine the upper level of inclusion of baobab seed meal that will not exert any deleterious effect on the growth performance of broiler chickens.

MATERIALS AND METHODS

Study area: The experiment was conducted at the Faculty of Veterinary Medicine of Ahmadu Bello University Zaria, Kaduna state. Zaria is located between latitude 11°11' North and longitude 07°38' East, at an altitude of 686 metres above sea level. It lies within the Guinea Savannah zone with three distinct seasons namely, harmattan (November-February), hot (March-May) and

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Table 1: Ingredient composition (%) of experimental diets at starter phase (1-4 weeks)

	Diets (%)				
	1	2	3	4	5
Ingredient	0	10	20	30	40
Maize	55.00	48.30	40.00	34.20	28.00
Full fat soyabean	35.30	32.00	30.30	26.10	22.30
Baobab seed	0.00	10.00	20.00	30.00	40.00
Fishmeal	6.00	6.00	6.00	6.00	6.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Cost N/kg diet	78.32	74.33	70.82	66.56	62.42
Calculated analysis					
ME/Kcal/kg	3126	3144	3157	3180	3203
Crude protein (%)	22.00	22.11	22.67	22.53	22.49
Calcium (%)	1.32	1.32	1.31	1.30'	1.29
Phosphorus (%)	0.99	0.95	0.92	0.88	0.84
Lysine	1.44	1.34	1.33	1.25	1.19
Methionine	0.50	0.48	0.46	0.44	0.41
Proximate analysis					
Dry matter (%)	93.07	90.15	92.51	93.11	93.89
Crude protein (%)	23.08	22.45	22.87	22.51	22.46
Crude fiber (%)	5.45	4.77	5.28	6.77	6.81
NFE (%)	50.11	55.76	56.43	55.66	58.54
Ash (%)	6.81	5.88	7.01	6.66	6.97

NFE: Nitrogen free extract

rainy (June-October) (Ayo *et al*., 1998). Its annual rainfall, average temperature and mean relative humidity are 1055 millimeters, 24.55°C and 43.6%, respectively (Meteorological Unit I.A.R., 2009).

Source and processing of baobab seeds and soya bean: Baobab seeds were purchased from two local markets at Langtang and Pankshin in Plateau state and Billiri and Kaltungo in Gombe state. The seeds were soaked in water for 10-15 minutes, thoroughly washed with water, sun- dried for 3-4 hours and milled before incorporation into the experimental diets. The soya beans were processed by parboiling in 100°C boiling water for 40 minutes to remove any possible anti-nutritional factors and sun dried for 3-4 days.

Experimental birds and design: Two hundred day-old broiler chicks of the Anak strain were obtained from CHI Hatchery farm Ajanra, Ibadan, Nigeria for the experiments. The birds were randomly divided into 5 groups of 40 chicks per treatment. The 5 groups were assigned to five experimental diets with each treatment replicated four times with 10 birds per replicate in a Completely Randomized Design (CRD). The birds were weighed as replicate groups and recorded before been subjected to the experimental diets. Thereafter, daily feed intake, weekly weight gain and feed conversion ratio were determined. Feed and water were supplied *ad libitum* throughout the entire period of the experiment.

Table 2: Ingredient composition (%) of experimental diets at finishing phase (5-8 weeks)

	Diets (%)				
	1	2	3	4	5
Parameters	0	10	20	30	40
Maize	53.95	48.00	41.10	35.00	28.60
Full fat soya bean	30.35	26.30	23.20	19.30	15.60
Boabab seed	0.00	10.00	20.00	30.00	40.00
Fishmeal	4.00	4.00	4.00	4.00	4.00
Wheat offal	8.00	8.00	8.00	8.00	8.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Cost N/kg diet	71.03	66.82	62.89	58.72	54.6
Calculated analysis					
ME/Kcal/kg	3033	3057	3076	3098	3116
Crude protein (%)	20.18	20.07	20.24	20.18	20.17
Calcium (%)	1.26	1.25	1.24	1.23	1.26
Phosphorus (%)	0.97	0.93	0.89	0.85	0.83
Lysine	1.26	1.19	1.14	1.07	1.01
Methionine	0.46	0.43	0.41	0.39	0.37
Proximate analysis					
Dry matter (%)	93.89	93.89	93.82	93.62	93.73
Crude protein (%)	19.75	20.44	20.05	19.66	19.63
Crude fiber (%)	5.61	7.08	7.98	7.99	8.09
Nitrogen free extract	60.01	57.82	52.81	55.66	55.66
Ash (%)	5.98	6.04	6.54	4.81	4.63

Experimental diets: Five experimental diets containing graded levels (0, 10, 20, 30 and 40%) of baobab seed meal were formulated each for the starter and finisher phase. The ingredient composition, calculated analysis and proximate analysis of the broiler starter and finisher diets are as presented in Table 1 and 2.

Statistical analysis: The data collected on daily feed intake, daily weight gain and feed conversion ratio were subjected to Analysis of variance (ANOVA) and the means were separated using General Linear Model as contained in SPSS (1996) statistical package procedure.

RESULTS

The performance data of birds fed varying levels of Baobab Seed Meal (BSM) based diets are as presented in Table 3. The feed intake, weight gain and feed conversion ratio across the dietary treatments showed no significant difference at starter phase. The cheapest (142.44) feed cost per kg gain was recorded on diet 4 (30%) and most expensive (163.69) in diet 1 (0%) control group. The initial weights of the birds were similar except for the group on diet 2 (10%) with least numerical value of 133g. At the finisher phase, the feed intake (133.40-148.85 g) showed significant ($p<0.001$) difference amongst the treatment groups. Weight gain (37.23-55.00 g) for the birds was also significantly ($p<0.01$) different at this phase. The highest (193.93) feed cost per gain was observed on diet 1 (0%) and lowest in diet 5 (40%). The final weights of the birds

Table 3: Performance of bridler chickens fed varying levels of baobab seed meal (BSM) based diets

	Dietary level of incubations (%)						
	1	2	3	4	5		Level of
Phase/parameter	0	10	20	30	40	SEM	Significance
Starter phase (1-4 weeks)							
Initial weight/bird (g)	140	133	143	143	140	3.47	NS
Daily feed intake/bird (g)	65.18^{a}	68.41^{a}	69.29^{a}	71.73^{a}	69.73^{a}	1.71	NS
Daily weight intake/bird (g)	32.23^{a}	36.16^{a}	34.11^{a}	34.20^{a}	30.36^{a}	1.08	NS
Feed conversion ratio	2.09^{a}	1.96^{a}	2.09^{a}	2.14^{a}	2.39^{a}	0.03	NS
Cost per gain	163.69	145.69	148.01	142.44	149.18		
Finisher phase (5-8 weeks)							
Final weight/bird (g)	2538	2528	2638	2605	2033	70.21	***
Daily feed intake/bird (g)	128.46^{c}	139.99^{ab}	148.40^{a}	145.26^{a}	133.40^{bc}	1.3	***
Daily weight intake/bird (g)	53.39^{a}	49.38^{ab}	55.00^{a}	53.75^{a}	37.23^{b}	1.89	**
Feed conversion ratio	2.73^{a}	2.83^{a}	3.15^{a}	3.21^{a}	3.23^{a}	0.7	NS
Cost per gain	193.91	189.1	188.1	178.49	176.36		
Overall (1-8 weeks)							
Daily feed intake/bird (g)	96.82^{a}	104.2^{ab}	108.85^{a}	108.49^{a}	101.57^{ab}	1.09	***
Daily weight intake/bird (g)	42.81^{a}	42.77^{a}	44.55^{a}	43.97^{a}	33.80^{b}	1.1	**
Feed conversion ratio	2.41^{a}	1.23^{a}	2.62^{a}	2.68^{a}	1.81^{a}	0.38	NS
Cost per gain	178.8	167.4	168.1	160.5	162.8		

^{a,b,c}Means in rows with similar superscripts are not statistically significantly different ($p>0.05$) and those with dissimilar superscripts are significantly different ($p<0.01$). ***: $p<0.001$, **: $p<0.01$, NS: Not significant

ranged from 2033-2638 g. The overall performance in terms of daily feed intake (96.82-108.85 g) and daily weight gain (33.80-44.55 g) among the dietary treatments showed significant differences at $p<0.001$ and $p<0.01$, respectively. The feed cost per gain ranged from (160.5-178.8). The lowest feed cost in naira per kilogram gain was obtained on diet 4 (30%) and highest value was from control group (0%) level of inclusion. However, the feed conversion ratio (1.23-2.68) showed no significant difference among the treatment groups.

DISCUSSION

Feeding of graded levels of baobab seed meal based diets up to 30% to broiler starter had no significant ($p>0.05$) effect on both the feed intake, weight gain and the feed conversion ratio. MacIsaac *et al.* (2005) reported a similar trend in terms of feed consumption, weight gains and feed conversion ratio in broiler turkeys fed roasted full-fat soya beans. Also the feed cost per gain at this phase tended to decrease with increasing levels of baobab seed meal. However, at the finisher phase, the feed intake was significantly ($p<0.001$) different as the dietary levels of inclusion increased. The weight gain was also significantly ($p<0.01$) different for birds fed diets 2 (10%) and 5 (40%) compared with those of 0, 20 and 30% levels of inclusion which are similar. Therefore, the dietary inclusion of BSM up to 20% at the finisher phase of this study was most appropriate which is contrary to what was observed by Mwale *et al.* (2008) in Guinea fowl keets fed Baobab Seed Cake (BSC) diets. Mwale *et al.* (2008) observed lower feed intake in keets fed up to 10 and 15% BSC but higher in those fed control and 5% inclusion levels of BSC based diets. The final weight in the overall performance of broiler chickens in this study was observed to increase proportionately as the feed intake increased. Similar findings of higher values of feed intake were reported by Ezeagu (2005) in young albino rats fed raw baobab seed meal. This finding was also in agreement with the findings of Adeyemo and Alonge (2007) who observed increased feed intake with increase in age of broilers fed graded levels of cotton seed cake. Akinmutimi *et al.* (2008) observed contrary; as the level of test diets increased there was lower feed intake which resulted in poor weight gain in broiler birds fed quantitative replacement of soyabean meal with cooked and toasted lima bean meal. The lower feed intake was attributed to increase in the level of residual anti nutritional factors such as oxalate, phytate, saponins and tannins. Apata and Ologhobo (1990), Emiola *et al.* (2003) and Akanji (2002) reported improved utilization of protein of oil seed cakes as a result of good processing techniques that prevented formation of protein-iron complexes that could inhibit protein digestion. Baobab seed has also been established to contain anti nutritional factors, their levels however, are generally below established toxic levels for most poultry species (Nkafamiya *et al.*, 2007a). The increased in feed intake in this study could be attributed to the probable palatability of baobab seed meal included in the diets (Ezeagu, 2005). The cost per gain was also observed to decrease as the inclusion level of BSM based diets increased. This implied that it is cheaper to use BSM as source of protein in broiler diets as compared to the use of conventional feed ingredient such as soya bean which is very expensive and highly competitive for human consumption.

REFERENCES

Adegbola, T.A., 2004. Utilizing proven alternative feed ingredients in the livestock industry. Proceedings of the 27th Annual Conference of the Nigerian Society for Animal Production held at Sokoto, pp: 431-436.

Adeyemo, G.O. and O.G. Longe, 2007. Effects of graded levels of cottonseed cake on performance, haematological and carcass characteristics of broilers fed from day old to 8 weeks of age. Afr. J. Biotechnol., 6: 1064-1071.

Aduku, A.O., 1993. Tropical Feedstuffs Analysis Table, A.B.U Zaria, Pages: 4.

Akanji, A.M., 2002. Enhancing the utilization of some tropical legume seeds in diets of exotic meat-type and egg-type chickens. Ph.D thesis. University of Ibadan, Pages: 312.

Akinmutimi, A.H., A.O. Aligwara and S.F. Abasiekong, 2008. The effect of quantitative replacement of Soya bean meal with cooked and toasted lime bean meal on growth performance and carcass quality values of Broiler finisher birds. Int. J. Poult. Sci., 7: 487-490.

Apata, D.F. and A.D. Ologhobo, 1990. Some aspects of the biochemistry and nutritive value of African yam bean seed (Spenostylis stenocarpa). Food Chem., 36: 271-280.

Ayo, J.O., S.B. Oladele, S. Ngam, A. Fayomi and S.B. Afolayan, 1998. Diurnal flunctuations in rectal temperature of the Red Sokoto goat during the harmattan season. Res. Vet. Sci., 66: 7-9.

Emiola, I.A., A.D. Ologhobo, J. Akinlade, O.S. Adedeji and O.M. Bamigbade, 2003. Effect of inclusion of differently processed mucuna seed meal on performance characteristics of broilers. Trop. Anim. Prod. Invest., 6: 13-21.

Ezeagu, I.E., 2005. Baobab (*Adansonia digitata* L.) Seed protein utilization in young Albino Rats. II. Haematocrit, Plasma and hepatic biochemical metabolites. Anim. Res. Int., 2: 301-305.

MacIsaac, J.L., K.L. Burgoyne, D.M. Anderson and B.R. Rathgeber, 2005. Roasted Full-fat Soyabeans in Starter, Grower and Finisher diets for female broiler Turkeys. J. Applied Poult. Res., 14: 116-121.

Meteorological Unit, 2009. Institute of Agricultural Research, A.B.U. Samaru-Zaria.

Mwale, M., J.F. Mupangwa, C. Mapiye, H. Saina and J. Chimvuramahwe, 2008. Growth Performance of Guinea Fowl keets fed graded levels of baobab seed cake diets. Int. J. Poult. Sci., 7: 429-432.

Murray, S.S., M.J. Schoeninger, H.T. Bunn, T.R. Pickering and J.A. Marlett, 2001. Nutritional composition of some wild plant foods and Honey used by Hadza Foragers of Tanzania. J. Food Comp. Anal., 13: 1-11.

Nkafamiya, I.I., S.A. Osemeahou, D. Dahiru and H.A. Umar, 2007a. Studies on the chemical composition and physico-chemical properties of the seeds of baobab (*Adansonia digitata*). Afr. J. Biotechnol., 6: 756-759.

Ogundipe, S.O., 1999. Foreword, In: Poultry Care; A complete guide to chicken production Gonab and Associates.

Osman, M., 2004. Chemical and Nutrient Analysis of Baobab (*Adansonia digitata*) fruit and seed protein solubility. Plant Foods Hum. Nutr., 59: 29-33. © 2004 Springer Science + Business Media, Inc.

Robinson, D. and D.N. Singh, 2001. Alternative protein sources for laying hens. A report for the Rural Industries Research and Development CorporationPublication, 144: 1.

Salami, L.I. and U.N. Okezie, 1994. The nutritional composition and storage stability of millet (*Pennisetum americanum*) supplemented with varying levels of baobab (*Adansonia digitata*) flours. Ecol. Food Nutr., 31: 211-218.

SPSS, 1996. Statistical Package Procedure.