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Growth performance of starter broiler starter chicks fed soaked and fermented baobab (*Adansonia digitata*) seed meal based diets

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Abstract

Means of cutting down cost of feed resources in order to bridge the wide gap between demand and supply of animal protein in livestock production is a great concern in the poultry industry. This study was conducted to investigate the effect of feeding diets containing soaked and fermented Baobab seed meal (BSM) on the growth performance of broiler starter chicks. A total of 150, one-day old chicks were randomly distributed into five treatment groups. Treatments were replicated three times with 10 chicks per replicate in a completely randomized design (CRD). The dietary groups were designated as T1 for control (0 % BSM), T2 (7.5 % SBSM), T3 (15.0% SBSM), T4 (22.5% FBSM) and T5 (30 % FBSM). Parameters monitored include final weight, weight gain, feed intake, feed conversion ratio, feed cost per kg gain (N) and mortality (%) The experiment lasted for 4 weeks. The results showed that the dietary treatments had significant (P<0.05) effect on all the parameters measured. Final weight and total weight gain were similar and significantly (P<0.05) higher in birds fed diets T2 and T4 when compared to other dietary treatments. However, birds in T5 group had the least significant (P<0.05) values 366.67 and 217.34 g/bird respectively. Daily weight gain (7.76 g/bird/day), total and daily feed intake (873.33 g and 31.19 g/bird/day) of birds followed similar trend and were significantly (P<0.05) lower in T5 group compared to other treatments. Feed conversion ratio of birds fed diet T5 had significantly (P<0.05) higher value (4.29) when compared to those in other treatment groups. Feed cost per kg gain (N) was significantly (P<0.05) lower and similar in birds fed T2, T3 and T4 when compared to values obtained in the control group (N253.27) and T5 (N 327.52). Mortality (%) only occurred in birds fed T5. It was therefore concluded that inclusion of 22.5% fermented baobab seed meal in broiler diets improved performance and had no negative effect on the health status of birds.

Keywords: Broiler, baobab seed meal, performance

La Performance de croissance des poussins de départ nourris avec des régimes à base de farine de baobab (*Adansoniadigitata*) trempés et fermentés

Résumé

Des moyens de réduire le coût des ressources alimentaires afin de combler le defi posé à cause de la demande et l'approvisionnement en protéines animales dans la production animale est une grande préoccupation dans l'industrie avicole. Cette étude a été menée pour étudier l'effet des regimes alimentaires contenant de la farine de graines de baobab trempée et fermentée (le 'BSM') sur les performances de croissance des poussins de départ. Un total

de 150 poussins âgés d'un jour ont été répartis au hasard en cinq groupes de traitement. Les traitements ont été répliqués trois fois avec 10 poussins par réplique dans une conception complètement randomisée (le 'CRD'). Les groupes diététiques ont été désignés comme T1 pour le contrôle (0% BSM), T2 (7,5% SBSM), T3 (15,0% SBSM), T4 (22,5% FBSM) et T5 (30% FBSM). Les paramètres surveillés comprennent le poids final, le gain de poids, la prise alimentaire, le taux de conversion alimentaire, le coût de l'alimentation par kg de gain (N) et la mortalité (%). L'expérience a duré 4 semaines. Les résultats ont montré que les traitements diététiques avaient un effet significatif (P <0,05) sur tous les paramètres mesurés. Le poids final et le gain de poids total étaient similaires et significativement (P <0,05) plus élevés chez les oiseaux nourris avec les régimes T2 et T4 par rapport aux autres traitements diététiques. Cependant, les oiseaux du groupe T5 avaient les valeurs les moins significatives (P <0,05) 366,67 et 217,34 g / oiseau respectivement. Le gain de poids quotidien (7,76 g / oiseau / jour), l'apport alimentaire total et quotidien (873,33 g et 31,19 g / oiseau / jour) des oiseaux ont suivi une tendance similaire et étaient significativement (P <0,05) inférieurs dans le groupe T5 par rapport aux autres traitements. Le rapport de conversion alimentaire des oiseaux nourris au régime alimentaire T5 avait une valeur significativement plus élevée (P <0,05) (4,29) par rapport à ceux des autres groupes de traitement. Le coût de l'alimentation par kg de gain (N) était significativement (P <0,05) plus faible et similaire chez les oiseaux nourris T2, T3 et T4 par rapport aux valeurs obtenues dans le groupe témoin (N253,27) et T5 (N 327,52). La mortalité (%) n'est survenue que chez les oiseaux nourris au T5. Il a donc été conclu que l'inclusion de farine de graines de baobab fermentée à 22,5% dans les régimes alimentaires des poulets de chair améliorait les performances et n'avait aucun effet négatif sur l'état de santé des oiseaux.

Mots clés: Poulet de chair, farine de graines de baobab, performance.

Introduction

The population of developing countries has continued to increase resulting in increased demand for protein in human and animal origin (Sobayo *et al.*, 2007). Protein is a critical component of poultry rations, which is essential for life along with other major nutrient classes (Cheeke, 2005; Pond *et al.,* 1995)**.** Since protein from the animal source is rich in the essential amino acids, minerals and vitamins that the body requires, therefore there is need to increase the production of animal products so as to bridge the animal protein gap in Nigeria. In Nigeria, the high cost of conventional sources of protein and energy is largely responsible for the present high price of finished feeds. In addition, competition between man and animal for the conventional protein and energy feedstuffs leading to scarcity of feed ingredients also poses problem of proper feeding of livestock species (Iyayi and Davies, 2005). Hence, the urgent need to explore the available and less competitive non-conventional feed ingredients. One of such alternative is baobab (*Adansonia digitata*) seed. Baobab is locally called Kuka (Hausa). Luru (Yoruba) which is another non - conventional feedstuff that is readily available and underutilized but holds much agronomic potentials. The studies in baobab seed (*Adansonia digitata*) in Nigeria and elsewhere in the World have shown its potentials in supplying good quality food protein for human and livestock (Osman, 2004; Nkafamiya,*et al*., 2007). 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*., 2007). The seeds are rich in protein (18 – 36 % CP) therefore can be used as source of protein in poultry diets (Salami and Okezie, 1994).

The limited usage of baobab seed in Nigeria

made it a non-conventional feedstuffs of choice for poultry industry and other farm animals. Like most tropical legumes, the utilization of baobab seeds for good growth and performance of poultry species may be limited due to the presence of anti-nutritional factors such as protease inhibitors (trypsin, chymotrypsin inhibitors), lecithin, tannins and non - starch polysaccharides (NSP) (D'Mello, 1992; Amaefule and Nwagbara, 2004). Hence, the need for processing through various methods such as boiling, roasting, soaking and germination, fermentation, dehulling and chemical treatments which exerts beneficial effects by reducing or destroying the inherent anti-nutritional factors (Kaankuka *et al*., 2000). Effective reduction of levels of anti-nutritional factors present in formulated rations and the quality of the feed therefore will be determined by the effectiveness of the processing methods employed. The aim of this study therefore was to evaluate the effect of feeding graded levels of soaked and fermented baobab seed meal based diets on the growth performance of starter broiler chicks.

Materials and methods

Experimental site

The research was carried out at the Livestock Farm of the Teaching and Research Farm, Taraba State University, Jalingo. It lies between latitude $8^0$11' to 8^0 50'N and longitude 11^0 05' to $11^0$25'E. It is located within the Guinea Savannah Zone. The State is characterized by tropical climate marked by dry and rainy season. The rainy season usually commences in the Month of March and ends up in October. The dry season then starts in late October and ends in March. The annual rainfall is between 1000 - 1500 mm with an average minimum temperature of 30^0c and maximum temperature of 38^0c depending on the season (Taraba State Diary, 2008).

Source and processing of baobab (Adansonia digitata) seeds

Baobab seed was purchased from Zing Local Government Area Market of Taraba State. The two processing methods used were soaking and fermentation. For soaking, weighed quantities (7.5, 15, 22.5 and 30kg) of baobab seeds were poured into 100 litres of water at room temperature. Thereafter, the water was drained and the seeds were sun dried for 3 days on a concrete floor. The seeds were then milled and bagged. Fermentation of baobab seeds was also carried out by soaking weighed quantities (7.5, 15, 22.5 and 30kg) of seeds in a basin containing 100 liters of clean water. After 24 hours the baobab seeds were tied up into a clean sac for 72 hours and allowed the water to drain. Thereafter, the seeds were sun-dried for 3-4 days before milling and were incorporated into t*he diets.*

Design and management of experimental birds

A total number of 150, one day old chicks purchased from the National Veterinary Research Institute, Vom, and Jos Plateau State were used in the experiment. The chicks were weighed and allotted to five dietary treatment groups. Treatments were replicated three times with 10 chicks per replicate in a completely randomized design. The birds were reared on deep litter system. Kerosene stoves were used to provide additional heat while electricity bulb were installed in each pen to provide light and heat during the brooding period. Feed and water were provided *ad libitum.* Drugs and vaccines were administered as at when necessary and all other routine management practices duly observed. The experiment lasted for four weeks. The birds were weighed at the beginning of the experiment and their average initial weights were taken. The chicks were subsequently weighed every week to determine the weight gained. Feed supplied and the left over were also weighed daily to determine

the daily feed intake. Average final weight, daily weight gain, daily feed intake, feed to gain ratio, and percentage mortality (where it occurred) were computed. The cost /per kg of feed and cost of feed /kg (N) gains were computed for each dietary treatment.

Experimental diets

The experimental diets were formulated for starter chicks to meet NRC **(**1994) minimum nutrient requirement. There were nine dietary treatments in a completely randomized design. The soaked and fermented baobab seed meal was incorporated into the diets at the inclusion levels of 0 %, 7.5 %, 15.0 %, (SBSM), 22.5 % and 30 % (FBSM) designated as T1 (control), T2, T3 T4 and T5 respectively as presented in Table 1.

Chemical analysis

The proximate composition of the test ingredient (Baobab seeds) and experimental diets were determined using the procedures of the Association of Analytical Chemist (AOAC, 1990).

Statistical analysis

All data obtained in this study were subjected to analysis of variance using the general linear model procedure of Statistical Analytic System (SAS, 2008). Significant differences among treatment means were separated using Tukey's model.

Table 1: Composition of broiler starter diets containing graded levels of soaked and fermented baobab seed meal (0 – 4 weeks)

Ingredients	**Treatments**				
	0% Control	**7.5% SBSM**	**15% SBSM**	**22.5% FBSM**	**30% FBSM**
Maize	58.36	55.06	51.73	58.36	58.36
GNC	35.64	31.44	27.27	13.14	5.64
BSM	0.00	7.50	15.00	22.50	30.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.20	0.20	0.20	0.20	0.20
Vitamin premix	3.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
Metabolizable energy (kcal/kg)	3033.84	3041.98	3121.45	3290.75	3400.25
Crude protein (%)	23.00	23.00	23.00	23.00	23.00
Crude fibre (%)	2.94	3.19	3.45	3.50	3.81
EE (%)	5.74	7.70	9.65	11.11	12.89
Calcium (%)	0.14	0.22	0.30	0.36	0.44
Phosphorus (%)	0.41	1.09	1.79	2.43	3.11
Methionine (%)	0.31	0.37	0.44	0.49	0.56
Lysine (%)	0.84	1.04	1.24	1.29	1.44
Cysteine (%)	1.20	0.44	0.52	1.37	1.43
Feed cost/kg(₦)	93.67	91.17	91.30	90.00	86.03

*Biomix premix provided per kg of diet: Vit A. 13,340 i.u, Vit D3 2,680 i.u, Vit E 10 i.u; Vit K 2.68mg; Calcium Pantothenete, 10.68mg; Vit B1 20.022mg; Folic acid 0.668mg; Choline chloride, 400mg, Chlortetracycline, 26.68mg; Manganese 133.34 mg; Iron, 66.68mg; Zinc, 55.34mg, Copper 3.2mg; Iodine 1.86; Cobalt 0.268mg. Selenium 0.108mg. GNC= Groundnut cake,EE = Ether extract, BSM = Baobab Seed Meal, SBSM = Soaked Baobab Seed Meal, FBSM = Fermented Baobab Seed Meal

Results and discussion

The results of graded levels of soaked and fermented baobab seed meal (BSM) based diets on growth performance of broiler chicks are presented in Table 2. Results showed that dietary treatments significantly (P<0.05) influenced all the parameters measured. Final weight and total weight gain of birds followed similar trend while daily weight gain, total and daily feed intake also followed similar pattern across all the treatments. Significantly (P<0.05) higher and comparable values (746.67g and 796.67g) were obtained for final weight of birds fed diets T2 containing 7.5% soaked BSM and T4 containing 22.5% fermented BSM, respectively. Birds fed 30% FBSM (T5) recorded the least value of 366g. The better performance of the birds on diets T2 and T4 compared to those in T5 group may be attributed to better detoxification of anti-nutrients and hence availability of proteins and their constituent amino acids leading to improved weight gain by birds (Apata and Ologhobo, 1993). Similar trend was observed for total weight gain of birds across the treatments. Birds fed diets T2 (596.67g) and T4 (648.34g) were comparable and significantly (P<0.05) higher than those in other treatments. However, least (P<0.05) statistical values of 217.34g was recorded in birds fed diet T5. However, daily weight gain was similar across all the treatments except diet T5 which had the least (P<0.05) statistical value (7.76g/bird). Higher weight gain recorded in birds fed T2 and T4 may be attributed to good nutrient utilization which led to improved weight gain. Total and daily feed intake of birds fed diets T1 – T4 were significantly (P <0.05) higher than 873.33g and 31.19g/bird respectively, for those in T5. This could be due to the acceptability and palatability of the diet across all the treatments. This result agreed with the report of Nidahullah *et al.* (2010) that smell and taste were critical traits in food selection. The lower feed intake in T5 could be attributed to the presence of high anti-nutritional factors in the feed which could not be reduced to a tolerable level and thus culminated in the loss of appetite.

Table 2: Growth performance of broiler starter chicks fed soaked and fermented baobab seed meal based diets (0 – 4 weeks)

Parameters	T1 (Control	T2 7.5% SBSM	T3 15% SBSM	T4 22.5% FBSM	T5 30% FBSM	SEM
Initial Weight (g/bird)	150.00	150.00	150.00	148.33	149.33	1.73
Final Weight (g/bird)	656.67^{b}	746.67^{ab}	696.67^{b}	796.67^{a}	366.67^{c}	41.62
Total Weight Gain (g/bird)	506.67^{b}	596.67^{ab}	546.67^{b}	648.33^{a}	217.33^{c}	41.55
Daily Weight gain (g/bird/day)	18.09^{a}	21.31^{a}	19.52^{a}	23.16^{a}	7.76^{b}	2.13
Total Feed intake (g/bird)	1363.33^{a}	1276.67^{a}	1270.00^{a}	1456.67^{a}	873.33^{b}	61.05
Daily feed intake (g/bird/day)	48.69^{a}	45.59^{a}	45.36^{a}	52.02^{a}	31.19^{b}	2.93
Feed conversion ratio	2.69^{b}	2.14$^{b\ b}$	2.33^{b}	2.26^{b}	4.29^{a}	0.25
Feed cost per Kg gain (₦)	253.27^{ab}	195.38^{b}	205.70^{b}	185.08^{b}	327.52^{a}	18.37
Mortality (%)	0.00^{b}	0.00^{b}	0.00^{b}	0.00^{b}	7.78^{a}	0.96

a b c = means on the same row with different superscript differ significantly (P<0.05), SEM = Standard Error of Mean, SBSM = Soaked Baobab Seed Meal, FBSM = Fermented Baobab Seed Mea

Lower feed conversion ratio (FCR) was comparable among birds fed diets T1 – T4 and these were significantly (P<0.05) lower compared to those in T5 (4.29). The better feed conversion ratio observed in birds fed diets T1 – T4 may be attributed to the palatability of the diets and efficient utilization of the diets in converting the feed into meat by birds. This observation agrees with the findings of Gebhart and Kabanov (2001) who reported that better feed conversion ratio signified that more feed was retained in the animals and less waste to the environment. Feed cost per kg gain (N) was statistically (P<0.05) similar for those fed T2 - T4 but lower compared to those on diets T1 (N253.27) and T5 (N327.52). The lower feed cost per kg gain (N) obtained in

birds fed diets T2 – T4 may be the product of favourable weight gain and good feed conversion ratio which resulted from adequate nutrient utilization. No mortality was recorded in birds across the dietary treatments except those in T5 group (7.78%).

Conclusion

Based on the findings of this study it was revealed that inclusion of fermented baobab seed meal up to 22.5% in broiler diets improved performance of broiler starter chicks and had no negative effect on the health status of the birds. Feeding fermented baobab seed meal at 30 % inclusion level in broiler diets had a higher cost implication in broiler production

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