Asian Journal of Poultry Science

ISSN 1819-3609

Academic Journals Inc.

www.academicjournals.com

Asian Journal of Poultry Science 2 (1): 10-16, 2008
ISSN 1819-3609

Response of Shika Brown Cockerels to Graded Dietary Levels of *Lablab purpureus* Beans

[1]F.O. Abeke, [1]S.O. Ogundipe, [1]A.A. Sekoni, [2]I.I. Dafwang, [1]I.A. Adeyinka,
[1]O.O. Oni, [1]B.I. Nwagu and [1]A. Abeke
[1]National Animal Production Research Institute, ABU, Zaria, Nigeria
[2]National Agricultural Extension and Research Laison Services, ABU Zaria, Nigeria

Abstract: This study was conducted to determine the response of Shika Brown cockerels to graded levels of *Lablab purpureus* beans, processed by boiling in water for 30 min at 100°C. Six isonitrogenous diets with similar caloric levels were formulated to contain lablab seed meal at 0.0, 7.5, 15.0, 22.5, 30.0 and 37.5%, respectively. Diet 1, which had no lablab seeds and served, as the control, was a groundnut cake-maize based chick diet. Each diet served as a treatment and each treatment was replicated three times in a completely randomized design. There were 30 birds per replicate making a total of 540 birds for the study. Feed and water were provided *ad libitum*. The experiment lasted 8 weeks. The results obtained showed significant ($p<0.05$) negative responses of the cockerels to dietary levels of lablab. It was observed that there was a significant ($p<0.05$) decrease in final weight and weight gain as the level of lablab in the diet increased. Feed efficiency was observed to decrease significantly ($p>0.05$) as the level of lablab in the diet increased. Mortality was not however significantly ($p>0.05$) affected by feeding lablab in the diet of the cockerels. Feed cost (₦/bird) and total cost (₦/bird) were significantly reduced ($p<0.05$) as the dietary levels of lablab seed increased. Also organ weights and haematological parameters were not significantly ($p>0.05$) affected by feeding graded dietary levels of cooked *Lablab purpureus* beans in the diets of Shika brown cockerels.

Key words: Lablab beans, antinutritional factors, cockerels, diets, organ weights, weight gain

INTRODUCTION

In most developed countries of the world, cockerels are destroyed immediately at the hatchery after being hatched. This is because cockerels grow very slowly reaching appreciable market weight of about 2 kg at about eight months of age even under condition of adequate care and good feeding. Also at this age their meat would have become too tough for consumption. However, the situation is different in developing and third world countries like Nigeria where there is inadequate animal protein intake by the populace occasioned by high cost of poultry meat resulting from high cost of production input especially feed. (Kperegbeyi and Onwumere, 2007; Babatunde and Hamza, 2005). Mature cocks forms an integral part of the poultry meat supply of Nigerians and are of higher demand than broilers and spent layers. However the major problems associated with rearing of cockerels are their slow rate of growth, high feed intake, poor feed conversion efficiency and consequently high cost of production (Jegede *et al*., 2007). To overcome this problem of high production cost this study was conducted with the main objective of using *Lablab purpureus* beans, which is very cheap in Nigeria as a source of protein ingredient for compounding cheap diets for cockerels as well as to know the safe inclusion level of *Lablab purpureus* beans that can be fed in the diets of cockerels for optimum performance.

Corresponding Author: F.O. Abeke, National Animal Production Research Institute, ABU, Zaria, Nigeria

MATERIALS AND METHODS

This study was carried out at the poultry research unit of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika, Zaria, Nigeria, from March to May 2003. Shika is geographically located between latitude 11° 12'N and longitude 7° 33'E at an altitude of 640 M above sea level (Akpa *et al*., 2002). Shika is located about 20 km along the Zaria Sokoto road in Kaduna state, North Western Nigeria. It has three distinct climatic seasons. These are the cold dry season (November-February), the hot dry season (March-May) and the wet season (June-October). The total annual rainfall ranges from 617 to 1365 mm with a 50 year average of 1041 mm Most of the rains fall between July and September (Oni *et al*., 1991).

The *Lablab purpureus* beans used for this experiment is the Rongai variety. It is milky white in colour. They were obtained from the Sabon-gari market in Zaria, Nigeria. The optimum cooking duration to properly process lablab beans was 30 min as determined in an earlier experiment.

For each cooking time 50 L of water was first brought to boiling in a 200 L metal drum container. The batch (25 kg) of lablab beans was then poured into the boiling water. From this point, the beans were cooked for 30 min. At the end of the period of cooking, the remaining water was drained off and the cooked beans were sun dried for 3 days before milling. The average ambient temperature for the three days of sun drying was 32°C and relative humidity was 35%. After sun drying, chemical evaluation of the processed lablab beans was done according to AOAC (1990) procedure (Table 1).

Six isonitrogenous and iso-caloric rations were formulated containing lablab beans at 0.0, 7.5, 15.0, 22.5, 30.0 and 37.5%, respectively (Table 2). Each diet constituted a treatment and each treatment was replicated three times. There were 30 birds per replicate making a total of 540 birds for the study. The design was a complete randomized design. Feed and water were provided *ad libitum*. The experiment lasted 8 weeks. The average initial weights of the birds were taken before the commencement of the experiment. The birds were subsequently weighed every week to determine the weight gain. Feed weigh-back was also done weekly to determine weekly feed intake. The experiment-started when the chicks were one day old and they were exactly 8 weeks of age when the experiment was terminated. At the end of the 8th week of the feeding trial, six birds per replicate were bled for the evaluation of the blood parameters. Bleeding was done using a 5 mL syringe at the vein under the wings. About 3 mL was placed in a small bottle which already contained EDTA and taken to the laboratory for analysis. Also three birds representing the average weight of the replicate group were selected, starved of feed but given water overnight to empty the gut contents. The birds were then weighed and slaughtered. Data collected include weights of the liver, the heart, the spleen, the kidney and the pancreas. Blood samples were collected and analysed for Packed-Cell Volume (PCV), Total Protein (TP) and Haemoglobin (Hb).

Data collected were subjected to the analysis of variance using the SAS (1985), General Linear Model procedure. Differences between treatment means were separated using Duncans Multiple Range Test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The result of the chemical composition of the cooked *Lablab purpureus* beans used for the experiment (Table 1), the composition of the diets containing graded dietary levels of lablab beans (Table 2), the performance of the cockerels (Table 3) and the organs and haematological parameters of the cockerels (Table 4) are presented below, respectively.

The result obtained from the proximate analysis showed that *Lablab purpureus* beans contain 95.97% D.M, 23.29% C.P, 11.19% C.F 9.13% E.E, 3.85% Ash, 1.32% Ca and 0.11% P (Table 1). The crude protein content is fairly high and falls within the range of 20-30% crude protein often reported

Table 1: Chemical composition of cooked *Lablab purpureus* beans

Components (%)	Values
Dry matter	95.97
Crude protein	23.29
Crude fibre	11.19
Ether extract	9.13
Ash	3.85
Calcium	1.32
Total phosphorus	0.11

These are average values of 3 determinations of the cooked lablab beans

Table 2: Composition of lablab seed based diets fed to cockerels (0-8 weeks)

	Diets					
Ingredients	1	2	3	4	5	6
Maize	53.95	49.65	45.15	40.65	36.15	31.85
Groundnut cake	31.00	27.80	24.80	21.80	18.80	15.60
Lablab	0.00	7.50	15.00	22.50	30.00	37.50
Wheat offal	10.00	10.00	10.00	10.00	10.00	10.00
Bonemeal	3.00	3.00	3.00	3.00	3.00	3.00
Limestone	1.50	1.50	1.50	1.50	1.50	1.50
Salt	0.30	0.30	0.30	0.30	0.30	0.30
Premix chicks	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis						
CP (%)	20.00	20.00	20.00	20.00	20.00	20.00
ME (kcal kg^{-1})	2761.46	2761.49	2759.70	2757.92	2756.14	2756.16
Crude fibre (%)	3.64	4.24	4.84	5.45	6.05	6.65
Calcium (%)	1.14	1.14	1.13	1.13	1.13	1.13
Avail. P (%)	0.97	0.94	0.92	0.90	0.88	0.85
Lysine (%)	0.86	0.83	0.80	0.77	0.74	0.70
Methionine (%)	0.37	0.35	0.34	0.33	0.31	0.30
Cystine (%)	0.34	0.32	0.30	0.28	0.26	0.23
Meth. + Cyst. (%)	0.71	0.67	0.64	0.61	0.57	0.53
Feed cost (₦/kg)	38.50	36.10	34.24	32.86	30.43	29.12

Optimix chick premix supplied the following per kg diet: Vit. A, 32000 i.u, Vit. D36,000 i.u, Vit. E, 28 mg, Niacin 600 mg, Vit. B1, 8 mg, Vit.B2, 10 mg, Vit. B6, 8 mg, Vit. B12, 0.04 mg, Vit. K, 6 mg, Pantothenic acid,22 mg, Folic acid,2 mg, Choline chloride, 700 mg, Cobalt 0.8 mg, Copper 12 mg, Iodine 4 mg, Iron 84 mg, Manganese 160 mg, Selenium 0.8 mg, Zinc 124 mg

Table 3: Effect of graded dietary levels of cooked *Lablab purpureus* beans on the performance of Shika Brown cockerels (0-8 weeks)

	Dietary levels of *Lablab purpureus* beans						
Parameters	0.00	7.50	15.00	22.50	30.00	37.50	SEM
Initial wt. (g/b)	31.47	30.80	31.07	31.33	31.47	31.20	1.87
Final wt. (g/b)	373.61^{a}	330.30^{b}	301.73^{c}	291.67^{c}	262.64^{d}	241.48^{e}	10.42
Weight gain (g/b)	342.14^{a}	299.50^{b}	270.66^{bc}	260.34^{c}	231.17^{d}	210.28^{d}	14.94
Feed intake (g/b)	1078.51^{a}	1069.23^{ab}	1043.92^{b}	1032.20^{bc}	1026.78^{bc}	1011.35^{c}	15.25
FE	0.32^{a}	0.28^{b}	0.26^{b}	0.25^{b}	0.22^{bc}	0.20^{c}	0.02
Feed cost (₦/bird)	35.27^{d}	33.64^{c}	33.36^{bc}	33.28^{bc}	32.57^{ab}	32.10^{a}	0.41
Total cost (₦/bird)	125.27^{d}	123.65^{c}	123.46^{bc}	123.29^{bc}	122.57^{ab}	122.10^{a}	0.45
Mortality (%)	0.00	2.78	0.00	0.00	0.00	0.00	1.87

Means within the same column with different letter(s) superscripts are significantly ($p<0.05$) different, SEM = Standard Error of the Means, FE = Feed Efficiency, g/b = Gramm per bird

for legume seeds in the tropics (Abeke *et al*., 2003). The ether extract is also fairly high which indicate that lablab seeds can contribute significantly to the energy content of the diets in which it is incorporated. Percent crude fibre of *Lablab purpureus* beans is close to results often reported for most tropical legumes used in poultry ration. The Calcium and Phosphorus levels are a bit low therefore supplementation will be needed when lablab seeds are incorporated into diets of poultry birds.

The final live weight (Table 3) showed a significant ($p<0.05$) difference between treatment means. There was a corresponding decrease in final live weight as the level of lablab in the diets increased. The

Table 4: Effect of graded dietary levels of cooked Lablab seeds on organ weights and blood parameters of cockerels (0-8 weeks)

	Levels of Lablab						
Parameters	0.0	7.5	15.0	22.5	30.0	37.5	SEM
Live weight	364.89a	320.43b	290.87c	281.76c	253.56d	230.54e	10.49
Liver (%LW)	2.62	2.83	2.88	3.09	3.16	3.49	0.88
Heart (%LW)	0.82	0.80	0.78	0.78	0.77	0.76	0.16
Pancreas (%LW)	0.36	0.38	0.39	0.45	0.49	0.50	0.14
Spleen (%LW)	0.22	0.20	0.19	0.19	0.18	0.18	0.08
Kidney (%LW)	0.75	0.74	0.71	0.71	0.68	0.66	0.12
PCV (%)	25.50	25.10	24.68	24.59	23.92	23.78	1.78
TP (g dL^{-1})	5.54	5.48	5.39	5.21	4.89	4.79	0.92
Hb (%)	8.50	8.36	8.23	8.16	7.97	7.93	1.78

SEM = Standard Error of the Means, LW = Live Weight, PCV = Packed Cell Volume, TP = Total Protein, Hb = Haemoglobin

same trend was observed for weight gain. There was also a significant ($p<0.05$) difference in total feed intake (g $bird^{-1}$). It was observed that as the level of lablab beans increased in the diets, there was a corresponding decrease in feed intake. The level of lablab in the diet had a significant ($p<0.05$) difference on feed efficiency. It was observed that as the level of lablab in the diet increased, there was a corresponding decrease in feed efficiency.

Feed cost (₦/bird) and total cost (₦/bird) decreased significantly ($p<0.05$) as the level of lablab beans in the diet increased. Mortality was not significantly ($p>0.05$) affected by levels of feeding cooked lablab beans in the diets of the cockerels.

For the organ weights the results showed an insignificant ($p>0.05$) increase in the weights of the liver and the pancreas as the level of lablab beans in the diets increased. The spleen, the heart and the kidney were observed to decrease as the level of lablab beans in the diets increased although the decreases were not significant ($p>0.05$). Haematological parameters such as the PCV, Hb and TP were found to decrease as the level of lablab beans in the diets increased. However these decreases were not significant ($p>0.05$).

The results of the final weight gain observed in this study compares favourably with the results reported by Ani and Omeje (2007) who fed raw Bambara nut (a legume seed similar to lablab seed) in the diets of broilers and observed that the final weight and weight gain decreased significantly ($p<0.05$) as the level of the nut increased in the diet. The authors reported that the birds fed soyabean cake-maize based control diet performed significantly ($p<0.05$) better than all the other diets containing the Bambara nut. Abeke (2005) reported a decrease in final weight and weight gain for broiler finishers as the level of cooked lablab in their diets increased. Reports by Emenalon *et al.* (2007) and Tuleun and Igba (2007) also support the result obtained in this study. The authors reported a decrease in average daily gain in broiler finisher as the level of velvet beans meal in their diets increased. Report by Akanji *et al.* (2003) indicated a higher weight gain in broiler chickens fed soyabean cake-maize based diet than for birds fed on diets containing differently processed sesame seeds. Amaefule and Obioha (2001), Etuk (2001) and Apata (2003) worked on the replacement value of unconventional grain legumes in poultry diets and reported that although birds performed well on diets containing well-processed grain legume seeds, their performance is nevertheless lower than those fed on the conventional soyabean and groundnut cakes based diets. The authors agreed that although *Prosopis africana*, sesame seed and pigeon pea and many other legume seeds which they worked on had great potential in replacing the conventional vegetable protein sources, more research is needed in the area of cultivation (by using cultivars with higher protein levels and less antinutritional factors) and better processing methods so as to convert them into cakes which can then be fortified with essential amino acids such as methionine and lysine in order for them to be efficiently utilized by chickens.

Feed intake was observed in this study to decrease as the level of lablab in the diets of the chickens increased. This result agree with the reports by Akanji *et al*. (2003) and Amaefule and Obioha (2001) who fed processed sesame seed meal and dehulled pigeon pea seed meal in diets of broiler chickens, respectively and observed reduction in feed intake as the level of the legumes in the diet increased. This the authors attributed to reduced palatability of the diets containing these grain legume seed meals. Similarly, Okeke (2000) and Apata (2003) reported reduced feed intake in broilers and layers fed diets containing unconventional grain legume seeds such as sesame, bambara and pigeon pea as replacement for groundnut cake. Etuk (2001) reported that the decrease in final weight and weight gain observed in broiler chickens fed pigeon pea seed was attributed to reduced feed intake. Poor palatability, aroma and other intrinsic anti nutritional factors have been identified as factors that affect intake of feeds that contain these unconventional grain legume seed meals (Kperegbeyi and Onwumere, 2007).

Feed efficiency was observed to decrease significantly ($p<0.05$) as the level of lablab seed meal increased in the diets. This means the diet were less efficiently utilized as the dietary levels of lablab increased. Akanji *et al*. (2003) reported reduced efficiency of feed conversion in broiler finishers fed diets containing, soaked and boiled sesame seeds meal as compared to birds fed diets containing soyabean cake based diets. The authors reasoned that this may be due to reduced acceptability of the feed by the birds occasioned by poor palatability of the feed as compared to that of soyabean cake based control diet as well as the effect of other anti-nutritional factors that may be present in the sesame seed, which the processing method might not have completely removed. The result obtained in this study also agree with that obtained by Bawa *et al*. (2003a) who fed boiled lablab seeds meal in the diets of young pigs and reported decreasing feed efficiency as the levels of lablab seed meal in their diets increased. It implies therefore that there may be some intrinsic factors such as some left over antinutritional factors and poor palatability that are limiting the efficient utilization of these diets.

Feed cost (₦/bird) as well as total cost (₦/bird) was found in this study to be significantly ($p<0.05$) reduced as the level of lablab in the diets increased. This result agrees with the findings of Najime (2003). Ani and Okorie (2003) and Bawa *et al*. (2003b), who reported significant ($p<0.05$) reduction in feed cost and total cost when unconventional legumes seed meal are utilized in poultry diets. This is because, these legumes are cheap and available without much competition from humans, as they are not cherished as human food. Reports by Okeke (2000) and Tuleun and Igba (2007) indicate significant ($p<0.05$) reduction in feed cost by using unconventional grain legume seeds such as sesame, pigeon pea and *Leucaena leucocephala*. According to the authors, the need to lower production costs through reduction of feed cost without compromising production targets and quality of edible meat and egg is the main thrust of recent advances in nutrition research. According to Abeke (2005) and Balogun *et al*. (2001), more than 70% of the cost of producing edible meat and egg is due to feed cost. The authors argued that efforts in nutrition research should be focused on reducing feed costs through the introduction of well processed, cheap and easily available grain legume seed meals into poultry diets.

There were very few birds that died during the course of the experiment. This could be attributed to good management and to the safety of the test ingredients. It shows that cooking the lablab seeds for 30 min, at 100°C effectively eliminated most of the anti nutritional factors, which would have resulted in the death of the chicks. Bawa *et al*. (2003a) reported that cooking legume seeds at 100°C for about 30 min renders them safe for incorporation into poultry diets. Akanji *et al*. (2003) did not also record much mortality when soaked and boiled sesame seed meal were fed as replacement for soya bean meal in broiler diets.

For the organ weights (Table 4), the results showed a gradual increase in the weights of the liver and the pancreas as the level of lablab beans in the diets increased. However these increases were not significant ($p>0.05$) which indicate that although a small amount of some of the antinutritional factors

may have remained in the seed despite the 30 min cooking time (Ogundipe *et al*., 2003) they were not enough to exert significant negative effect on these parameters. This further confirms the results of an earlier study (Abeke *et al*., 2003) which showed that lablab seeds cooked for 30 min is safe for incorporation into poultry diets. However, the gradual increase in these organs as the level of lablab seeds increased in the diets may have resulted from the increase in the residual content of antinutritional factors which the organs had to deal with resulting in their slight hypertrophy (Omeje, 1999).

The haematological parameters measured such as the PCV, Hb and TP showed a gradual but insignificant ($p>0.05$) decrease in values as the levels of lablab seed meal increased in the diets. This may be due to lower nutrient uptake resulting possibly from antinutritional factors or imbalance in the nutrient profile as the level of lablab seeds increased in the diets. It has been argued by Abeke *et al*. (2003), Onyimonyi and Onukwufor (2003) and Bawa *et al*. (2003a) that a limiting nutrient in any ingredient will be limiting in any diet in which such an ingredient is used in large quantity. This will also apply if such ingredients have antinutritional factors. This might have been the reason for the decrease in values of these parameters.

CONCLUSION

From the results obtained in this study, it can be concluded that although feeding cooked *Lablab purpureus* seed meal reduced performance in the Shika brown pullet cockerels; such reductions were not significant up to 22.5% inclusion level taking all parameters measured into consideration. Therefore *Lablab purpureus* beans cooked for 30 min can be included up to 22.5% in the diets of pullet chicks without any negative adverse effect on their performance. This will also result in reduced cost of production.

REFERENCES

Abeke, F.O., S.O. Ogundipe, A.A. Sekoni, I.I. Dafwang and S.B. Oladele, 2003. Effects of duration of cooking of lablab (*Lablab purpureus*) beans on organ weights and blood parameters of pullet chicks. Proc. 28th Ann. NSAP Conf. Ibadan, 28: 240-242.

Abeke, F.O., 2005. Evaluation of the nutritive value of *Lablab purpureus* beans in replacement for groundnut cake in poultry diets. Ph.D Thesis, Department of Anim. Science, Ahmadu Bello University, Zaria, Nigeria, pp: 1-128.

Akanji, A.M., A.D. Ologhobo, I.A. Emiola, T.A. Adedeji and O.S. Adedeji, 2003. The effects of processing on haemagglutinin and other anti-nutritional factors in Jackbeans (*Canavalia ensiformis*) (L) (DC). Proc. 28th Ann. Conf. NSAP, Ibadan, Nigeria, pp: 189-193.

Akpa, G.N., J.O. Ifut and F. Mohammed, 2002. Indegenous management of dystocia in ruminant livestock of Northern guinea savannah of Nigeria. J. Anim. Prod., 29: 264-270.

Amaefule, K.U. and F.C. Obioha, 2001. Performance and nutrient utilization of broilers starters fed diets containing raw, boiled or dehulled pigeon pea seeds (*Cajanus cajan*). Nigerian J. An. Prod., 28: 31-39.

Ani, A.O. and A.U. Okorie, 2003. The nutritive value of dehulled and cooked Castor oil bean (*Ricinus communis* L.) meal to broiler finishers. Proc. of 27th NSAP Conf., pp: 141-143.

Ani, A.O. and O.D. Omeje, 2007. Effect of supplementation with enzyme on growth performance of broiler chicks fed diets containing raw bambara nut (*Voandzeia subterranean* L.) waste. Proc. of the 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) held at the University of Calabar, Nigeria from 18th-21st March, pp: 278-281.

AOAC (Association of Official Analytical Chemist), 1990. Official Methods of Analysis. 13th Edn., Washington DC., USA.

Apata, D.F., 2003. Egg production and haematological profile of laying hens fed dietary raw or processed *Prosopis africana* seeds. Proc. 28th Ann. Conf. NSAP Ibadan, 28: 151-154.

Babatunde, B.B. and R.A. Hamza, 2005. Effects of feeding graded levels of kolanut husk meal on the performance of cockerels. Nig. J. Anim. Prod., 32: 61-66.

Balogun, T.F., F.G. Kaankuka and G.S. Bawa, 2001. Effect of boiling full-fat soya beans on its amino acid profile and on performance of pigs. NJAP., 28: 45-51.

Bawa, G.S., T.S.B. Tegbe and S.O. Ogundipe, 2003a. Effect of feeding graded dietary levels of lablab seeds as a replacement for soyabean on performance characteristics of young pigs. Proc. 28th NSAP Conf., Ibadan, Nigeria, 28: 230-232.

Bawa, G.S., T.S.B. Tegbe, S.O. Ogundipe, I.I. Dafwang and E.A. Abu, 2003b. The effect of duration of cooking of lablab seeds on the level of some antinutritional factors. Proc. 28th Ann. Conf. NSAP, Ibadan, Nigeria, 28: 213-215.

Emenalon, O.O., M.C. Chima, E.B. Etuk and B.O. Esonu, 2007. Comparative evaluation of processed velvet bean (*Mucuna pruriens*), Soyabean and groundnut meals on the performance and internal organ characteristics of broilers. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) Held at the University of Calabar, Nigeria from 18th-21st March, pp: 220-222.

Etuk, E.B., 2001. Determination of the optimal replacement level (s) of soyabean meal and maize with toasted and cooked pigeon pea (*Cajanus cajan*) seed meal for broilers. M.Sc. Thesis, Fed. Uni. Tech. Owerri, Nigeria.

Jegede, A.V., O.O. Oduguwa, A.O. Fafiolu, O.M.O. Idowu, R.A. Olorunsola and O.O. Ibitoye, 2007. Performance characteristics of cockerel chickens fed organic and inorganic copper sources. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) Held at the University of Calabar, Nigeria from 18th-21st March, pp: 201-203.

Kperegbeyi, J.I. and O.S. Onwumere, 2007. Effects of raw and toasted bambara groundnut (*Vigna subterranean* (L.) *verdcourt*) on performance of growing cockerels. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) Held at the University of Calabar, Nigeria from 18th-21st March, pp: 188-191.

Najime, D., 2003. Effect of processing on the utilization of soyabeans by broiler chickens. Unpublished M.Sc. Thesis, A.T.B.U. Bauchi, Nigeria.

Ogundipe, S.O., F.O. Abeke, A.A. Sekoni, I.I. Dafwang and I.A. Adeyinka, 2003. Effects of duration of cooking on the utilization of *Lablab purpureus* beans by pullet chicks. Proc. 28th Ann. Conf. NSAP. Ibadan, Nigeria, 28: 233-235.

Okeke, D.P., 2000. Replacement of soyabean meal with Bambara waste in broiler diets. M.Sc. Thesis, (Unpublished).

Omeje, S.I., 1999. Issues in Animal Science. Raykennedy Scientific Pub. Enugu, Nigeria.

Oni, O.O., B.Y. Abubakar and S.O. Ogundipe, 1991. Genetic and phenotypic associations of juvenile body weights and egg production traits in 2 strains of Rhode Island chickens. Nig. J. Anim. Prod., 18: 66-69.

Onyimonyi, A.E. and A. Onukwufor, 2003. Effect of Toasted Bambara (*Voandzeia subterrenea*) waste on performance of growing pullets. Proc. 28th NSAP Conference, pp: 237-239.

SAS, 1985. Statistical Analysis System Institute Inc., Users Guide. Statistic Version 6th Edn., Carry, North Carolina, USA.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Practice of Statistics. A Biometric Approach. 2nd Edn., McGraw-Hill Book Co. Inc., New York.

Tuleun, C.D. and F. Igba, 2007. Growth and Carcass characteristics of broiler chickens fed water soaked and cooked velvet bean (*Mucuna utilis*) meal. Proc. 32nd Ann. Conf. Nig. Soc. Anim. Prod. (NSAP) Held at the University of Calabar, Nigeria from 18th-21st March, pp: 240-243.