Asian Journal of Agricultural Research 1 (3): 125-130, 2007
ISSN 1819-1894

Performance and Some Haematological Response of Finisher Broilers Fed Graded Levels of Fermented Locust Bean (*Parkia biglobosa*) Seeds Meal

C.O. Obun
Department of Animal Production Technology, Federal College of Wildlife Management, P.M.B. 268, New Bussa, Niger State, Nigeria

Abstract: One hundred day-old Anak broiler chicks were used to evaluate the performance and some haematological response of finisher broiler fed diets containing graded levels of Fermented *Parkia biglobosa* Seed Meal (FPSM) for 8 weeks using deep litter system in a Completely Randomized Design (CRD). Five dietary treatments containing 0 (control), 25, 50, 75 and 100% levels of FPSM were used and presented as diets 1, 2, 3, 4 and 5, respectively. Each treatment had 20 birds, replicated two times with 10 birds each. The results of the performance measured by Body Weight Gain (BWG) and feed intakes revealed that diet 5 was significantly ($p<0.05$) better in BWG when compared with others. There were significant ($p<0.05$) differences in BWG among the treatments except diet 1 and 2 which were not significantly ($p>0.05$) affected. There were no significant ($p>0.05$) differences in feed intake among the diets but high numerical value was recorded in diet 1 and least in diet 5. The feed conversion and protein efficiency ratios were superior in diet 5 when compared with the control and others. The haematological responses of the birds fed the control and FPSM based diets were not significantly ($p>0.05$) different and were not influenced by the FPSM inclusion levels in the diets. This study revealed that FPSM could replace GNC with no adverse effect on performance and haematological indices.

Key words: Performance, haematology, *Parkia biglobosa*, fermentation, broilers

INTRODUCTION

The need for additional protein supplies to promote sustainable monogastric livestock in most tropical area has increased the search for indigenous wild legume seeds for least cost formulation and production. One of such legume is *Parkia bglobosa*, commonly known as African locust bean, a tropical tree which is native to Africa and widely distributed in the savanna region (Adewusi, 1992). The tree is usually and carefully preserved by inhabitants of the areas where it grows because they are valuable source of reliable food, especially the seeds which serves as source of useful ingredients for consumption as Daddawa in Hausa and Iru in Yoruba (Campbell-Platt, 1980). *Parkia biglobosa* has high protein and better amino acid profile that recommends it for use as a protein substitute for human food and animal feed (Odunfa, 1983; Alabi, 1993; Alabi *et al*., 2004; Ekop, 2006). However, it has some Anti-Nutritional Factors (ANFs) such as tannins, oxalate and hydrogen cyanide (Alabi *et al*., 2005). Some of these ANFS are capable of inducing adverse effects especially in monogastric animals when consumed without adequate processing (Apata, 2003). ANFs had been reported (Alabi *et al*., 2005) eliminated/reduced by application of heat, sprouting and fermentation. Fermentation has been reported to destroy some natural toxins which may occur in beans, improve the nutritive value, increase digestibility and enhance growth (Bridget *et al*., 2004; Alabi *et al*., 2005; Ekop, 2006).

Blood is a very good medium of assessing the health status of animals (Taiwo and Anosa, 1995). Many worker (Mitruka and Rawsley, 1977; Aletor, 1989; Nottidge *et al*., 1999; Oyelola *et al*., 2004;

Annongu *et al*., 2004; Annongu and Olawuyi, 2005) have described the use of haematological parameters and indices of blood in assessing the differential resistance or otherwise of some animals to variation in diets composition and resultant health implications in our environment. This study was therefore designed to evaluate the effect of feeding graded levels of fermented *Parkia biglobosa* seed meal at various substitution levels on performance and some haematological response of finisher broiler chickens.

MATERIALS AND METHODS

The experiment was conducted in the poultry unit of Federal college of Wildlife Management, New Bussa, Niger State, Nigeria between the months of August-October, 2006.

Source and Preparation of Test Ingredients

The seeds were sourced from the college-reserve estate. The *P. biglobosa* seeds were cooked over night (12 h) with large pots in open firewood to soften the seed coats. The seeds were lightly pounded with pestle and mortar to separate the seed coats from the seeds. The decorticated seeds were wrapped in a polyethylene bag, placed inside a basket and kept in a tight enclosure under roof for 5 days for microbial degradation. After 5 days, the fermented seeds were removed, sun-dried for 4 days and then ground to form Fermented *P. biglobosa* Seed Meal (FPSM).

Experimental Diets

Five experimental diets were formulated such that diet 1 (0% control) had no FPSM but 100% groundnut cake (GNC) while diets 2, 3, 4 and 5 contained 25, 50, 75 and 100% FPSM. The experimental diets were maintained from day-old to 56 days of termination (Table 1).

Management of the Birds

One hundred day-old Anak broiler chicks were randomly divided into five treatment groups of 20 birds each, replicated two times (10 birds each) in a completely randomized design (CRD of deep litter system of management. Each diet was offered *ad libitum* to the birds until termination of experiment at 56 days. All routine management operations applicable to broilers were strictly adhered to.

Parameters Measured

At the beginning of the experiment, the chicks were weighed as individual replicate groups. Weekly feed intake and weight gain were recorded from which Feed Conversion Ratio (FCR) and Protein Efficiency Ratio (PER) were calculated.

Blood Sample Collection

At the end of the experiment (8 weeks), two chickens were randomly selected whose body weights were closest to the mean for each replicate group, starved overnight and slaughtered by severing the jugular vein allowing free flow of blood into labeled sterile universal bottles containing Ethyldiamine tetra acetic acid (EDTA) powder as anti-coagulant The Percentage Packed Cell Volume (PCV) was determine by centrifugation of capillary tubes for 5 min at 1200 rpm, the haemoglobin content (HB) was determined by the methods of Jain (1986). The Red Blood Cells (RBC) was determine using the Hendricks fluid in an improved Neubaur ruling counting chamber.

Proximate Analysis

The experimental diets were analyzed for proximate composition using AOAC (1990) methods.

Data Analysis

Data generated from this study were subjected to analysis of variance (ANOVA) using graph pad instat 3.05 for window as outlined by SAS (1995) and Duncan's multiple range test (Duncan, 1955) for significant differences of means.

RESULTS AND DISCUSSION

The results of the proximate composition of the experimental diets are presented in Table 1. There was a decreased in Dry Matter (DM), Crude Protein (CP), Crude Fibre (CF) and ash contents in the diets with increasing levels of FPBM based diets which were not significantly (p>0.05) different among the diets. The Nitrogen free extract (Nfe) of diet 2 was slightly above the other diets but were within the same (p>0.05) range with others. The analyzed proximate values of the local processed FPSM is shown in Table 1. The dry matter, crude protein, crude fibre, ether extract, ash and NFE contents of FPSM were 90.41, 33.62, 4.00, 16.58, 4.43 and 31.78%, respectively.

The results of these study revealed that the growth performance in terms of Body Weight Gain (BWG) improve with increasing levels of FPBM in the diets. The best BWG was observed by birds on diet 5 (2320.41 g) which was significantly superior (p<0.05) to those of diets 1, 2, 3 and 4, respectively (Table 2). Diets 1 and 2 were similar (p>0.05) in BWG but were significantly (p<0.05) inferior among diets 3, 4 and 5. Daily body weight gain followed a similar trend as BWG. The feed intakes were not significantly (p>0.05) influence by the FPBM replacement levels in the diets. The highest value was recorded by birds on the control diet (3668.80 g) while the least intake was on birds fed diet 4 (3610.84 g) (Table 2). The feed conversion values were best at 100% levels (1.59) and poorest recorded in diet 1 birds while Protein Efficiency Ratio (PER) improved as FPSM inclusion level increases with best value from diet 5 (2.93) (Table 2).

Table 1: Composition of experimental diets fed broilers

	Diets				
Ingredients	0 (15%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)
Maize	52.00	50.00	49.00	48.00	47.00
Wheat offal	10.00	11.00	10.00	10.00	9.00
GNC	23.00	17.25	11.50	5.75	-
FPSM	-	5.75	11.50	17.25	23.00
Palm kernel cake	3.00	4.00	5.00	5.00	5.00
Fish meal	4.00	4.00	4.00	4.00	4.00
Blood meal	4.00	4.00	5.00	6.00	8.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Vit/premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Determined chemical composition (% of DM)					
Dry matter	88.08	88.44	85.51	84.87	86.14
Crude protein	22.87	22.79	22.64	22.55	21.50
Crude fibre	6.26	5.12	5.35	5.41	5.48
Ether extract	7.60	7.00	6.98	7.00	6.95
Total ash	4.01	3.48	3.94	3.91	3.83
Nitrogen free extract	47.34	49.55	46.55	46.56	48.38
Metabolizable energy (kcal kg^{-1})	2870.00	2860.00	2867.00	2862.00	2863.00

Premix to provide the following additional micro-nutrients: Vit. A, 10,500,000 IU; Vit. D_3, 2,000 IU; Vit. E, 20 g; Vit. K_3, 3 mg; Vit. B_{12}, 0.05 g; Nicotinamide acid, 35 mg; Pantothenate, 15 mg; Cholinechloride, 500 mg; Folicacid 1 mg; riboflavin, 6 mg; Manganese, 55 mg; Iron, 55 mg; Zinc, 80 g; Copper, 12 mg; Iodine, 1.5 g; Cobalt, 0.3 g, Selenium, 0.15 g; Anti-oxidant, 70 mg

Table 2: Performance of broilers fed experimental diets

	Diets					
Parameters	1	2	3	4	5	SEM
Mean initial body weight (g)	36.00	36.00	36.02	36.00	36.00	0.00
Mean final body weight (g)	2108.10^{d}	2108.41^{d}	2195.00^{c}	2273.00^{b}	2320.41^{a}	47.88
Mean body weight gain (g)	2072.09^{d}	2072.41^{d}	2158.98^{c}	2237.00^{b}	2284.41^{a}	47.88
Mean daily body weight gain (g bird^{-1})	37.00	37.00	38.55	40.00	41.00	0.89
Mean total feed intake (g bird^{-1})	3668.80^{a}	3649.30^{a}	3634.00^{a}	3610.84^{a}	3642.00^{a}	10.61^{a}
Mean daily feed intake (g bird^{-1})	65.51	65.17	64.89	64.48	65.00	0.19
Feed Conversion Ratio (FCR)	I.77	1.76	1.68	1.61	1.59	0.04
Protein Efficiency Ratio (PER)	2.47	2.46	2.66	2.75	2.93	0.09

^{a,b,c,d}: Means on the same row with different superscripts are significantly different ($p<0.05$), Values without superscripts are not significantly difference ($p>0.05$), SEM: Standard Error of Meals

Table 3: Effect of experimental diets on some haematological indices of broiler chickens

	Diets					
Parameters	1	2	3	4	5	SEM
Pack cell volume (PCV, %)	31.81	30.64	29.88	30.00	31.34	2.00
Red blood cells ($\times 10^{6}$ mm^{-3} RBC)	2.73	2.65	2.83	2.71	2.74	0.03
Hemoglobin (Hb, g dL^{-1})	7.20	7.18	7.24	7.21	7.30	0.02
White blood cells (WBC, $\times 10^{6}$ mm^{-3})	26.15	25.81	26.43	26.71	25.12	0.25

Values without superscripts are not significantly difference ($p>0.05$), SEM: Standard Error of Meals

The haematological indices (packed cell volume, haemoglobin, red blood cell count and white blood cell count) shows no significant differences ($p>0.05$) among the diets (Table 3).

The slight reduction in Dm, Cf, Cp and ash contents with increased FPBM in diets may be a reflection of the nutrients composition of FPBM which had earlier been reported lower compared with GNC (Eyo, 2001; Bridget *et al*., 2004). Cooking and fermentation increased moisture, reduced Dm contents and lower Cf and ash contents probably due to dehulling of the seed coats. In addition, fermentation was carried out in a most solid state, involving contact with appropriate inoculate of assorted micro-organisms which causes break down of fibre for their metabolic activities. The superior growth performance of diet 5 (100% replacement) might be due to better amino acids in diets with increased FPSM inclusion level. GNC has been reported to contained lower lysine (4.18 mg) and methionine (0.18 mg) (Eyo, 2001) compared with FPSM with 6.79 mg of lysine and 7.42 mg of methionine (Ekop, 2006). This is evident as higher levels of FPSM replacement gave superior growth performance, FCR and PER than at lower inclusion levels of FPSM and control diet. Enrichment of amino acids has been reported in fermented soybean than the raw seeds (Omafuvbe *et al*., 1999, 2000). It could also be that unidentified growth factors are enriched during fermentation capable of influencing growth performance, more so that the diets were iso-nitrogenous and iso-caloric.

The non significant differences ($p>0.05$) observed for all haematological indices are indications of the good quality of FPSM as a substitute for GNC. Since haematocrit, erythrocytes and haemoglobin are known to correlate positively with protein quality and protein level (Ross *et al*., 1978). Oyelola *et al*. (2004) reported that decrease red blood cell counts are usually associated with low quality feed and protein deficiency. These results is similar to reports of Oyelola *et al*. (2004) and Apata (2003) who fed broiler chicks with cooked and fermented melon seeds and *Proposis africana* seed meal. The values obtained for all hematological parameters are almost uniform and within the normal ranged as established by Mitruka and Rawsley (1977) and Ross *et al*. (1978). A significant discrepancy in their quality would have been easily reflected in the haematological indices of chickens fed FPSM diets. Haematological constituents reflect the physiological responsiveness of the animals to its internal and external environment which include feeds and feeding (Esonu *et al*., 2001). Therefore, FPSM had no adverse effect on haematological indices measured in this study in broiler chickens.

CONCLUSION

This study suggested that when *Parkia biglobosa* is subjected to adequate cooking and fermentation, it could replace GNC completely (100% levels of FPSM) with improved performance and no adverse effect on haematological indices of chicks. The lack of disparity in the haematological indices measured in this trial revealed its suitability as source of protein in broiler diet.

REFERENCES

Adewusi, S.R.A., B.A. Orisadare and O.L. Oke, 1992. Studies on weaning diets in Nigeria. Two protein sources. Plant Food Hum. Nutr., 42: 183-192.

Alabi, D.A., 1993. *Parkia biglobosa* and endanger species. International Conference Proceeding on Lost Crops and Trees in Africa, 3: 265-285.

Alabi, D.A., O.R. Akinsulire and M.A. Sanyaolu, 2004. Nutritive and industrial utility values of African locust bean seeds (*Parkia biglobosa* Jacq Benth). Proceedings of Science Association of Nigeria, 25: 105-110.

Alabi, D.A., O.R. Akinsulire and M.A. Sanyaolu, 2005. Qualitative determination of chemical and nutritive composition of chemical and nutritional composition of *Parkia biglobosa*. Afr. J. Biotechnol., 4: 812-815.

Aletor, V.A., 1989. Effect of varying levels of fishmeal substitution with soybean meal on certain serum metabolites and haematological indices in chicken. Nig. J. Technol. Resour., 1: 111-114.

Annongu, A.A., J.K. Joseph and F. Liebert, 2004. Effects of anaerobic fermentation and Lyle treated *Proposis africana* seed meal on the nutritional and haematological responses of Harco chicks. J. Raw Mat. Res. (JORMAR), 1: 33-41.

Annongu, A.A. and E.I.O. Olawuyi, 2005. Performance, blood chemistry and certain biochemical properties in pullet chicks fed chemically treated *Terminalia catappa* fruit waste. J. Raw Mat. Resour., 2: 61-68.

AOAC, 1990. Official Mehtods of Analysis. 15th Edn., Association of Analitical Chemist. Washington DC., 11: 80.

Apata, D.F., 2003. Egg production and hsematological profile of laying hens fed dietary raw or processed *Proposis africana* seeds. In: Proceeding of the 28th Annual Conference of the Nigeria Society for Animal Production. 16-20th March, Moore Plantation, Ibadan, 28: 151-154.

Bridget, O.O., S.F. Olumuyiwa, O.A. Bolanie and S.A.A. Adewusi, 2004. Biochemical changes in Africa locust beans (*Parkia biglobasa*) and Melon (*Citrullus vulgaris*) seeds during fermentation to condiment. Pak. J. Nutr., 3: 140-145.

Campbell-Platt, G., 1980. African locust bean (*Parkia* spp.) West African fermented-food products, daddawa. Ecol. Food Nutr., 9:123-132.

Duncan, D.R., 1955. Multiple ranges and multiple test. Biometrics, 11: 42.

Ekop, A.S., 2006. Changes in amino acid composition of Africana locust beans (*Parkia biglobosa*) on cooking. Pak. J. Nutr., 5: 245-256.

Esonu, B.O., O.O. Emenalom, A.B.L. Udedibie, U. Herbert, C.F. Ekpor, E.C. Okoli and F.C. Iheukwumere, 2001. Performance and blood chemistry of weaner pigs fed raw mucuna beans (*Velvet* beans) meal. Trop. Anim. Prod. Invest., 4: 49-56.

Eyo, A.A., 2001. Chemical composition and amino acid contents of the commonly available feed stuffs used in fish feed in Nigeria. Fish Nutrition Fish Feed Technology, FISON, Lagos, pp: 14-25.

Jain, N.C., 1986. Scham Veterinary Haematology. 4th Edn., Lea and Fabinger, Philadelhia, USA., pp: 1221.

Mitruka, B.M. and H.M. Rawsley, 1977. Clinical Biochemical and Experimental Animal. Masson, New York.

Nottidge, H.O., V.O. Taiwo and A.O. Ogunsatimi, 1999. Haematological and serum biochemical studies of cakes in Nigeria. Trop. Vet. J., 17: 8-15.

Odunfa, V.S.A., 1983. Carbohydrate changes in fermented locust bean (*Parkia biglobosa*) during preparation. Plant Nutr., 32: 45-52.

Omafuvbe, B.O., S.H. Abiose and O.O. Adeloye, 1999. The production of Kpaye a fermented condiment from *Proposis africana* Taub seeds. Int. J. Food Microbiol., 51: 183-186.

Omafuvbe, B.O., O. Oshonukan and S.H. Abiose, 2000. Microbilogical and biochemical changes in fermentation of soy bean for soy daddawa, Nigerian food condiment. Food Microbiol., 17: 469-474.

Oyelola, B.O., G.A. Otunola and D.F. Apata, 2004. Assessment of protein quality of processed melon seed as a component of poultry feed. Nig. Soc. Exp. Biol., 16: 80-87.

Ross, J.G., G. Christie, W.G. Halliday and R.M. Jones, 1978. Haematological and chemistry comparison values for chemical pathology in poultry. Vet. Res., 102: 29-31.

SAS., 1995. Statistical Analysis system. Users Guide. Version 6, 12 SAS Institute, Cary, North Carolina, USA.

Taiwo, V.O. and V.O. Anosa, 1995. Fibrinogen. Leucocyte and haematocrit values of cattle with various disease conditions. Trop. Vet. J., 13: 51-57.