Trop. Anim. Prod. Invest. 18 (1): 26-33 (2015)
ISSN: 1115-2540
http://animalsci.agric.ui.edu.ng/TAPI/index.php/tapijournal/index

ORIGINAL RESEARCH ARTICLE

Performance and blood parameters of ross broiler chicks fed graded levels of beniseed cake as substitute for full fat soya meal

***Olajide, R., Asaniyan, E.K. and Akintola, K.A.**

Department of Animal Science and Production, Joseph Ayo Babalola University, Ikeji-Arakeji, P.M.B. 5006, Ilesa, Osun State, Nigeria
**Corresponding author: rotbos97@yahoo.com; +2348035199681*

ABSTRACT

One hundred and fifty Ross broiler chicks were used to investigate the effect of replacing full fat soya bean meal (FFSM) with beniseed cake (BSC) on performance, serum and haematological parameters of the birds. Five diets were formulated with 0, 25, 50, 75 and 100% BSC replacing FFSM. Each of the diets represented a treatment and each treatment was replicated three times with 10 birds per replicate in a completely randomized design experiment. Fresh feed was provided ad libitum on daily basis and clean drinking water given free choice throughout the 28 days of the study. Data collected on weekly basis were used to calculate the average daily feed intake, weight gain and feed conversion ratio. Results obtained indicated that the average final body weight, average body weight gain, average daily feed intake, cost per kg feed and cost of feed per kg live weight gain were significantly (P<0.05) affected by the dietary treatments. Cost per kg feed and cost of feed per kg weight gain significantly (P<0.05) reduced with increasing levels of substitution of BSC for FFSM in the diets. All serological parameters were similar (P>0.05) across the dietary treatments and the haematological parameters are within the standards reported for healthy chicken. It was concluded that BSC could replace FFSM up to 100% in the diets of broiler chicks.

Key words: Beniseed cake, broilers, haematological parameters, serum, performance

INTRODUCTION

Feed accounts for 60-80% of the total cost of monogastric production (Nworgu *et al.,* 1998). More than two decades ago, Fanimo *et al.*, (1990) identified that the scarcity of feed and steep rise in prices of feed ingredients were the major problems confronting poultry production. Longe, (2006) reported that the cost of ingredients could be as high as 80% of the total cost of production of the finished feed. The conventional protein supplements such as soya bean meal, groundnut cake, meat meal and fish meal used in livestock feeds were reported to be characterized by high cost, scarcity and occasional adulteration by feeds ingredient suppliers (Adejimi *et al.*, 2000). Esonu (2000) observed that the high cost of feeds in various tropical countries was clear indication of grossly inadequate production of the cereal grains for livestock business. In order to sustain poultry production in Nigeria and other developing countries, alternative sources to these conventional protein supplements especially soya bean meal must be sought. Beniseed is one of the non-conventional ingredients which can be utilized in poultry diets. The plant sesame (*Sesame indicum* L.) also called *sesamum* is a member of the family *Pedaliaceae.* It is one of the cultivated oil seed crops widely grown in the Northern part of Nigeria. NAERLS (2010) described the crop as a major cash earner in many Northern states such as Benue, Gombe, Kogi, Jigawa, Kano, Nasarawa, Katsina, Plateau and Yobe. Beniseed is an excellent source of quality oils and rich in protein.Previous studies have shown that benniseed contained 18 – 25% crude protein (Borchani *et al.,* 2010). Yakubu and Alfred (2014) suggested supplementation of toasted white sesame seed meal at 18% of methionine in broiler finisher diets. Generally, there is paucity of information on the use of beniseed cake as protein feed ingredient. This study is therefore justified by the need to search for cheaper alternative unconventional plant protein supplements to soyabean meal.

This study was designed and carried out to evaluate the utilization of benny seed cake (BSC) as a substitute for full fat soya bean meal (FFSM) in broiler starter diets.

MATERIALS AND METHODS

Site of the experiment

The research was carried out at the Poultry section of the Teaching and Research Farm of Joseph Ayo Babalola University, Ikeji-Arakeji, Osun State, Nigeria.

Experimental birds and management

A total of one hundred and fifty (150) day old Ross broiler chicks purchased from Dynamic Farms, Ibadan, Oyo State were used for the 28-day feeding trial. The chicks were randomly allotted to 5 dietary treatments of 30 birds each. There were 3 replicates of 10 birds per replicate in each of the treatments. Routine management practices in poultry production were observed. Fresh feed was provided *ad libitum* on daily basis and clean drinking water given free choice. A known quantity of each of the diets was weighed into a container at the beginning of the week and the left over measured at the end of the corresponding week. This was used to calculate the weekly feed intake and thereafter the average daily feed intake. The birds were weighed at the beginning of the trial and thereafter on weekly basis from which the average daily weight gain were calculated. Feed conversion ratio was calculated as the quantity of feed consumed to produce a kilogramme live weight. Proper sanitation measures were observed throughout the period of the study. Vaccination and medication schedules designed by the University Teaching and Research farm Veterinarian were followed. Electricity was the source of heat for brooding.

Experimental diets

Five (5) diets were formulated with 0 (control), 25, 50, 75 and 100% of BSC as substitutes for FFSM. Each of the diets represented a treatment. The diets were formulated to meet the recommended nutrients requirements of broilers at the starter phase. The list of ingredients, gross composition and the determined nutrients composition of the experimental diets are presented in Table 1.

Haematological and serological characteristics of the experimental birds

Blood was collected into two vials from each of the three birds per treatment. The birds were bled by the wing vein using hypodermic needle with syringe. One vial contained ethylene diamine tetra acetic acid (EDTA) as an anti-coagulant while the other vial for serum collection had no anti-coagulant. Packed cell volume (PCV), red blood cells (RBC), white blood cells (WBC) and haemoglobin (Hb) was determined by Wintrobe's microhaematocrit, improved Neubauer haemocytometer and cyanomethemoglobin method (Kelly, 1979). Serum biochemical indices investigated include total protein, globulin, albumin, albumin:globulin ratio and glucose. The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were computed from the PCV, RBC and Hb values as described by Jain, (1986).

Chemical analysis

The proximate chemical compositions of the BSC and the five experimental diets were determined by methods of AOAC, (1995). Nitrogen free extract was determined by difference and metabolisable energy calculated according to the procedure of Pauzenga (1985) as: ME (kcal/kg DM) = 37 x % Protein + 81.8 x % fat + 35.5 x % NFE

Statistical analysis

Data collected on performance and blood indices of the broiler chicks were subjected to analysis of variance (ANOVA) using SAS statistical package, SAS (1999). The means were separated using Duncan multiple range test of the same software.

Table 1: Gross composition of experimental diets

Ingredients	Treatments				
	T1 (0% BSC)	T2 (25% BSC)	T3 (50% BSC)	T4 (75% BSC)	T5 (100%BSC)
Maize	53.5	53.5	53.5	53.5	53.5
Soy Bean Meal	16.0	12.0	8.0	4.0	0.0
Beniseed Cake	0.0	4.0	8.0	12.0	16.0
Fish Meal (72%)	5.0	5.0	5.0	5.0	5.0
Groundnut Cake	19.0	20.0	20.0	20.0	22.0
Wheat Bran	3.0	2.0	2.0	0.0	0.0
Palm Oil	0.5	0.5	0.5	0.5	0.5
Bone Meal	1.2	1.2	1.2	1.2	1.2
Limestone	1.0	1.0	1.0	1.0	1.0
Methionine	0.1	0.1	0.1	0.1	0.1
Lysine	0.1	0.1	0.1	0.1	0.1
Premix	0.3	0.3	0.3	0.3	0.3
Salt	0.3	0.3	0.3	0.3	0.3
Total	100.0	100.0	100.0	100.0	100.0
Determined nutrients composition (%)					
Dry Matter	92.25	92.36	92.47	92.26	92.10
Crude Protein	23.85	23.65	23.35	23.25	22.98
Ether Extract	6.77	6.39	5.99	5.64	5.24
Crude Fiber	3.51	3.83	4.46	4.86	5.15
Ash	4.35	4.56	4.63	4.90	5.25
*Nitrogen free extract	53.77	53.93	54.04	53.61	53.48
**ME (kcal/kgDM)	3345.08	3312.27	3272.35	3224.76	3177.43

BSC = Beniseed Cake
*Nitrogen free extract = Calculated values
**ME = Calculated Metabolisable energy

RESULTS AND DISCUSSION

The gross composition, determined nutrient composition, calculated Nitrogen free extract and metabolisable energy of the experimental diets are presented in Table 1. The highest crude protein, CP (23.85%), ether extract, EE (6.77%) and metabolisable energy, ME (3345.08 kcal/kg DM) obtained in treatment 1 (0% BSC) decreased with increasing level of substitution of beniseed cake for full fat soya bean in the diets to 22.98% CP, 5.24% EE and 3177.43 kcal/kg DM ME for treatment 5 (100% BSC). The crude fiber, CF (3.51%) and ash (4.35%) of the control (0% BSC) on the other hand increased with increasing contents of BSC for FFSM to CP (5.15%) and ash (5.25%) respectively in treatment 5 (100% BSC). The nutrient values reflected the differences in contents of these nutrients in BSC and FFSM. The diets were formulated to meet the CP (18.4 - 28%) and ME (2300 - 3500 kcal/kg DM) recommended by Olomu, (1995).

Table 2 shows the determined proximate composition and calculated nitrogen free extract and metabolisable energy values of beniseed cake. The dry matter, crude protein, crude fiber, ether extract, ash and NFE values are 90.02, 26.25, 21.42, 8.00, 14.00 and 20.35% respectively. The metabolisable energy value is 2348.08 kcal/ kg DM). The proximate composition of BSC compares favourably with 92.60% dry matter, 22.30% crude protein, 10.30% crude fiber and 5.30% ash reported for Sesame seed cake (Agbulu *et al.*, 2010). Alharthi and El-Deak (2009) reported dry matter of 91.60%, crude protein of 29.52%, crude fiber of 5.15% and 11.40% ether extract. Sources of seed, cultivar, method of processing, length of storage and storage condition have been identified as factors responsible for differences in proximate chemical composition of oil seed meal (Ojewole and Ewa, 2005).

Table 2: Proximate composition of beniseed cake (BSC)

Parameters	Percentage composition in benny seed cake
Dry Matter (%)	90.02
Crude Protein (%)	26.25
Crude Fiber (%)	21.42
Ether Extract (%)	8.00
Ash (%)	14.00
*Nitrogen Free Extract (%)	20.35
*Metabolisable energy (kcal/kg DM)	2348.08

* Calculated analyses

Table 3: Performance of broiler chicks fed graded levels of beniseed meal-based diets

Parameters	Treatments					SEM
	T1 (0% BSC)	T2 (25% BSC)	T3 (50% BSC)	T4 (75% BSC)	T5 (100% BSC)	
Average initial body weight (g/b)	38.96	38.96	38.27	38.33	38.75	0.19
Average final body weight (g/b)	462.83^{a}	462.50^{a}	465.63^{a}	440.14^{ab}	406.25^{b}	10.65
Average body weight gain (g/b)	423.87^{a}	423.54^{a}	427.36^{a}	401.81^{ab}	367.50^{b}	10.00
Average daily body weight gain (g/b/d)	15.14	15.13	15.26	14.35	13.13	0.36
Average daily feed intake(g/b/d)	37.40^{a}	37.44^{a}	37.24^{a}	36.25^{ab}	33.48^{b}	0.12
Feed conversion ratio (FCR)	2.47	2.47	2.44	2.53	2.55	0.03
Cost per kg feed (₦)	88.73^{a}	85.73^{b}	83.93^{c}	80.53^{d}	78.13^{e}	1.87
Cost of feed per kg live weight gain (₦)	219.19^{a}	212.14^{b}	204.82^{c}	203.43^{d}	199.23^{e}	3.39

BSC = Beniseed Cake

Growth performance of Ross broiler chicks fed graded levels of beniseed seed cake in place of full fat soya bean meal is presented in Table 3. The average final body weight, average body weight gain, average daily feed intake, cost per kg feed and cost of feed per kg live weight gain were significantly ($P<0.05$) affected by the dietary treatments. Average final body weight, average weight gain and average daily feed intake followed the same trend. The average final body weights (g/b) of birds in T_1 (462.83), T_2 (462.50) and T_3 (465.63) were similar but higher ($P<0.05$) than T_4 (440.14) and T_5 (406.25). The average body weight gain (g/b) was 423.87 (T_1), 423.54 (T_2), 427.36 (T_3), 401.81 (T_4) and 367.50 (T_5) respectively. The average daily feed intake (g/b/d) for birds in the first three treatments (37.40, 37.44 and 37.24) were similar (P>0.05), but these were significantly (P<0.05) higher than 36.25 and 33.48 obtained for birds in T_4 and T_5. The highest final weight and body weight gain obtained in birds fed 50% BSC beyond which there was a decline could be the level at which nutrients in BSC were optimally utilized. Subsequent reductions in the feed intake at 75 and 100% BSC could probably be due to contents of anti-nutrients in BSC. Reductions in weight gain due to anti-nutritional factors in diets have been reported (King *et al.*, 2000 and Tanveer *et al.*, 2000). Emenalom, *et al.*, (2011) found that inclusion of 10% each of raw and fermented *Alchornea cordifolia* seed meals depressed weight gains of broiler starter. Deyab *et al.*, (2009) also found that beyond 50% level of substitution the weight gain of stock decreased. Fiber level of the diets also increased with increasing BSC. It may be that the chicks were not able to utilize the nutrients effectively beyond this level. Zaczek *et al.*, (2003) reported that increasing concentration of fiber in diets have a negative linear effect on body weight. More so, the CP and EE also reduced. Cost per kg feed declined from ₦ 88.73 (T_1) to ₦ 78.13 (T_5) in a linear fashion. Cost of feed per kg live weight gain in the same order declined from ₦ 219.19 (T_1) to ₦ 199.23 (T_5). Consistent reductions in the cost per kg feed and cost of feed per kg live weight gain confirmed that it was cheaper to produce a kg of broiler chicks on BSC than on FFSM.

Table 4: Serum biochemistry of broiler chicks fed graded levels of beniseed meal-based diets

Parameters	Treatments					SEM
	T1 (0% BSC)	T2 (25% BSC)	T3 (50% BSC)	T4 (75% BSC)	T5 (100%BSC)	
Total Protein (g/dl)	22.47	22.27	22.63	22.59	22.48	1.89
Globulin (g/dl)	5.52	5.64	5.71	6.21	5.92	0.30
Albumin (g/dl)	16.95	16.63	16.92	16.38	16.56	1.02
Albumin/Globulin	3.07	2.95	2.96	2.64	2.80	0.10
Glucose (mg/dl)	2.83	2.43	2.67	2.22	2.25	0.18

BSC = Beniseed Cake

Serum biochemistry of experimental broiler chicks (Table 4) revealed that all parameters investigated were similar (P>0.05) for all dietary treatments. This may suggest adequacy of protein and energy contents of the diets for the experimental birds. Table 5 presents the result for haematological parameters of Ross broiler chicks fed experimental diets. The main haematological parameters such as RBC, PCV, Hb and MCV; including Eosinophils, Basophils and ESR were not significantly (P>0.05) affected by dietary treatments. However, Neutrophils, Lymphocytes and Monocytes differed significantly (P<0.05). The RBC (1.25-4.50 x 10^9/dl), WBC differential counts, neutrophils (15.60-43.90%) and lymphocytes (43.9-81.20%) reported for healthy chicken (Singh *et al.*, 2006) compares favourably with the ranges obtained in this study. The monocyte (0.5-5.0%) on the other hand is lower than the values obtained in this study. The PCV and Hb values obtained in this study are very close to a minimum of 24% and 7.40% recommended by these authors. Deviation from normal of these blood parameters were reported to be indications of physiological imbalance and disease conditions responsiveness to the external and internal environments including feed and feeding (Esonu *et al.*, 2002). Leucocytes, neutrophils, lymphocytes and monocytes were found to affect the immune status (Obun *et al.* 2008). The authors citing the works of Schalm *et al.*, 1975, Coles, 1986; Aster, 2003 and 2004) reported that monocytes develop into macrophages that function in the phagocytosis of large particles (fungi and protozoa) and production of antigens.

Table 5: Haematological parameters of broiler chicks fed graded levels of beniseed meal-based diets

Parameters	Treatments					SEM
	T1 (0% BSC)	T2 (25% BSC)	T3 (50% BSC)	T4 (75% BSC)	T5 (100% BSC)	
Red Blood Cell (mm x 10^6)	127.69	137.33	133.69	125.00	131.67	14.19
Packed Cell Volume (%)	22.00	22.33	22.67	21.33	21.33	0.45
Haemoglobin (g/100 ml)	7.37	7.77	7.57	7.13	7.07	0.48
Neutrophils (%)	22.67^{ab}	23.33^{a}	19.67^{ab}	22.67^{ab}	18.67^{c}	0.63
Lymphocytes (%)	62.67^{ab}	61.67^{b}	61.33^{b}	59.67^{b}	65.33^{a}	2.61
Monocytes (%)	11.33^{b}	10.68^{b}	15.67^{a}	13.33^{ab}	12.34^{ab}	0.68
Eosinophils (%)	1.00	1.33	1.33	2.00	1.50	0.05
Basophils (%)	2.50	3.00	2.00	2.33	2.67	0.40
ESR (mm/hr)	8.33	8.67	8.67	8.00	8.10	0.19
Mean Cell Volume (μ^3)	1.72	1.63	1.70	1.71	1.62	0.08
Mean Corpuscular Haemoglobin (μ μg)	0.58	0.57	0.57	0.58	0.54	0.02
Mean Corpuscular Haemoglobin Concentration (%)	33.50	34.80	33.39	33.43	33.15	1.20

BSC = Beniseed Cake

CONCLUSION

Result obtained from this study suggests that beniseed cake can economically replace full fat soya bean meal up to 100% in the diets of broiler chicks with no adverse effect on serum and haematological parameters of the birds. It is recommended for broiler farmers as cheaper and safe alternative plant protein ingredient to full fat soya bean meal.

CONFLICT OF INTEREST

The authors declare that there is no known conflict of interest as regards the conduct of this study and the data reported in this work.

REFERENCES

Adejinmi, O.O., Adejinmi, J.O. and Adeleye, I.O.A. 2000. Replacement of fish meal with Soldier fly larvae meal in broiler diets. *Nig. Poult. Sci. J.* 1: 52-60.

Agbulu, O., Gyau, A.M. and Abakura, J.B. (2010). Effect of the replacement of Sesame seed for methionine in broiler production in Middle Belt Region. *Nigerian Journal of Emerging Trends in Educational Research and Policy Studies (JETERAPS)*, 1 (1): 16-21.

Alharthi, M.A. and El-Deak, A.A. (2009). Evaluation of Sesame Meal replacement in broiler diets with Phytase and probiotic supplementation. *Egypt Poult. Sci.*, 29 (1): 99-125.

Association of Official Analytical Chemist AOAC, 1995. Official methods of analysis. 17th edition. Washington D.C, pp. 69-89.

Borchani C., Besbes S., Blecker C.H. and Attia H. (2010). Chemical characteristics and oxidative stability of sesame seed, sesame paste and olive oils. *Journal of Agriculture, Science and Technology* 12: 585 – 596.

Deyab, D.S.M., El-Sidy, I., Samy, H. Mahmoud., Mostafa, A. El-Garhy and Hayam, D. Tonsy. 20009. Nutritional evaluation of sesame seed meal, *Sesamum indicum* (L.) as alternative protein source in diets of juvenile mono-sex Nile tilapia (*Oreochromis niloticus*). *Egypt. J. Aquat. Biol. & Fish,* 13(1): 93-106.

Emenalom, O.O., Etuk, E.B., Esonu, B.O. and Nwaiwu, L.C. 2011. Phytochemical and nutritional evaluation of raw and fermented Alchornea cordifolia seed meals on the performance of broiler chicks. *Nig. J. Anim. Prod.* 38 (1): 79-85.

Esonu B.O. 2000. Comparative evaluation of urea toasted velvet beans (*Mucuna puriens*) for broiler chicks. *Nig. J. Anim. Prod.* 16: 170-177.

Esonu, B.O., Iheukwumere, F.C., Emenelom, O.O., Uchegu, M.C. and Etuk, E.B. 2002. Performance, nutrient utilization and organ characteristics of broiler finishers fed *Microdermis puberula* leaf meal. LRRD 14 (6): 15. htt://www.cipav.org/lrrd/lrrd14/6/eson.14 htm.

Fanimo, A.O., Aina, A.B.J. and Oguntona, E.B. 1990. Effect of different levels of *Tridax procumbens* on the performance characteristics and carcass quality of rabbits. *Nig. J. Anim. Prod.*

Jain, W.C. 1986. Scham's Veterinary Haematology. 4th edition. Lea and Febiger. Philadelphia, pp: 149-162.

Kelly, W.R. 1979. Veterinary Clinical Diagnosis. 2nd edition, Bailliere Tindall, London.

King, D., Fan, M.Z., Ejeta, G., Asem, E.K. and Adeola, O. 2000. The effects of tannins on nutrient utilization in the white pekin duck. *British Poultry Science*, 41 (5): 630-639.

Longe, O.G. 2006. Poultry: Treasure in a chest. Inaugural Lecture, University of Ibadan, Nigeria, pp. 1-42.

Mitruka, B.M. and Rawnsley, H.M. 1977. Clinical biochemical and haematological reference values in normal experimental animals. Masson Publishing, USA, Inc, NY.

NAERLS (2010). Benniseed production and utilization in Nigeria. Extension Bulletin No. 154. Horticulture Series No. 5.

Nworgu, F.C., Adebowale, E.A., Oredein, A.O. and Oni, A. 1998. Prospects and economics of broiler production using two plant protein sources. *Anim. Sci.* 2 (10): 159-166.

Obun, C.O., Yahaya, M.S., Olafadehan, O.A., Kehide, A.S., Allison, D.S., Yusuf, A.M. and Farouk, I.U. 2008. Dietary value of honey and its effects on abdominal fat deposit, blood and serum profile of finisher broiler chicks. *J. Agric. Fores. and Soc. Sci.* 6 (2): 173-181.

Ojewole, G.S. and Ewa, U.E. 2005. Response of growing broiler to varying dietary plant protein. *Int. J. Poult. Sci*. 4(10): 765-771.

Olomu, J.M. 1995. Monogastric Animal Nutrition: Principle and Practice. Jachem Publ., Benin, Nigeria. pp. 68-69.

Pauzenga, U. 1995. Feeding Parent Stock. *Zootecnica International*, December 1985, pp. 22-24.

SAS Institute, 1999. SAS START R Users Guide: Statistics. Version 9 edition. SAS Institute, Inc., Cary, North Carolina, USA.

Tanveer, A., Shahid, R., Muhammed, S., Ahsan-ul, H. and Zia-ul, H. 2000. Effect of Microbial Phytase produced from a fungus *Aspergillus niger* on bioavailability of phosphorus and calcium in broiler chickens. *Animal Feed Science and Technology*, 83 (2): 103-114.

Yakubu, B. and B. Alfred (2014). Nutritional evaluation of toasted white sesame seed meal *Sesame indicum* as a source of methionine on growth performance, carcass characteristics, haematological and biochemical indices of finisher broiler chickens. *IOSR Journal of Agriculture and Veterinary Science* 7 (1): 46 – 52.

Zaczek, V., Jones, E.K.M., Makloed, M.G. and Hocking, P.M. 2003. Dietary fiber improves the welfare of female broiler breeders. *British Poultry Science*, 44: 530.