ISSN 0189-0514
J. Anim. Prod. Res. (2017) 29(1): 295-300

National Animal Production Research Institute
Ahmadu Bello University
P.M.B 1096, Shika-Zaria,
Kaduna State, Nigeria.
Email:japr@napri.gov.ng
Website: http://journals.napri.gov.ng

DIETARY EFFECT OF BITTER LEAF (*VERNONIA AMYGDALINA)* MEAL ON GROWTH PERFORMANCE, CARCASS AND INTERNAL ORGANS CHARACTERISTICS OF FINISHER BROILERS

***Ndelekwute, E. K., Ekere, P. C., Assam, E. D. and Okonkwo, A. C.**
Department of Animal Science, University of Uyo, Uyo, Nigeria.
**Correspondence author: E-mail: ndelekwute.ek@gmail.com*

ABSTRACT

An experiment was conducted to determine the effect of bitter leaf meal (BLM) on growth, carcass and internal organs of finisher broilers. 144 unsexed Anak strains of broilers were used. There were 4 treatments containing 36 birds each arranged in completely randomized design (CRD). Each treatment was replicated thrice with each having 12 birds. The birds were fed formulated starter feed containing no BLM for the first 4 weeks. At the beginning of the 5th week BLM was introduced at the rate of 0, 25, 50 and 75 g/kg diet representing T1, T2, T3 and T4 respectively for 4 weeks *ad libitum* including drinking water. At the end of the experiment, broilers on T4 (with 75 g/kg BLM) had the highest final live weight, total feed intake and better feed:gain ratio (P<0.05). There were no significant (P>0.05) differences in dressed percentage and cut-parts. All the levels of the BLM significantly (P<0.05) reduced the abdominal fat. Higher bile volume was produced by broilers fed diet T4. The weight of the small intestine and caecum were significantly (P<0.05) reduced in broilers on 75 g/kg BLM. Hence 75 g/kg BLM inclusion level is recommended in broiler diets in the finisher phase.

Keywords: bitter leaf meal, carcass, finisher broilers, internal organs, growth.

INTRODUCTION

Broiler chickens are important source of protein rich in essential amino acids that are required for human body growth, maintenance and repairs. The demand of animal protein is on the increase as the population of the world is increasing. Another factor that favours the demand for broiler meat is its low level of cholesterol content. This requires that efforts be intensified not only to increase the number of broilers but also to improve productivity. Antibiotics have been used for decades to achieve this, but the recent reports and fears about their residual effects cumulating to antibiotic resistance, has placed antibiotics at a disadvantaged position as growth promoters (Mohammed and Zakariya'u, 2012). Recently plant based feed additives also known as phytogenics have been advocated to be included in broiler feeds as growth promoting feed additives, because of their abundance in our natural environment and they do not have residual effect (Ndelekwute *et al*., 2015).Their non-residual effect is because according to Kohlert *et al.* (2000), the active principles of phytogenic feed additives are absorbed in the intestine by enterocytes and are quickly metabolized by the body. Phytogenics can improve the consumption and conversion of feed, and the digestibility and weight gain of broiler chickens (Cardoso *et al*., 2012)

Feed additives are ingredients added to poultry diets to enhance production efficiency, improve health and reduce morbidity (FAC, 1998). Hence, feed additives are added to diets for reasons other than supply of nutrients to the animals. According to FAC (1998) they are added in order to improve feed utilization. The economic benefit of plant based feed additives has been the lowering of production cost as a result of their availability in our natural ecosystem and their affordability. These plant materials with bioactive ingredients could be used in diverse forms. For instance, recently leaf meals made from succulent plant leaves have been advocated to be included in broiler feeds as sources of utilizable fibre, starch, vitamins, and minerals, and to reduce cost of production (Ndelekwute *et al.*, 2014).

Bitter leaf *(Vernonia amygdalina)* is a valuable medicinal plant with antimicrobial activity that is widespread in East and West Africa (Burkill, 1985). In Nigeria, it is a staple vegetable leaf used to prepare soup especially in the South Eastern part. Some principal chemical constituents found in bitter leaf are steroid glycoside, vernonioside B1, which possess a potent anti-parasitic, anti-tumor and bactericidal effect (Tadesse *et al*., 1993). Durunna *et al*. (2011) reported that it contained 15.67% crude protein, 11.53% crude fibre and 6.95% ether extract. It has been reported that bitter leaf meal used in poultry production was able to increase feed conversion efficiency of birds without affecting their heamatological profile (Olobatoke and Olonirula, 2009. According to Mohammed and Zakariya'u (2012) bitter leaf meal fed from starter phase at

300, 600, and 900 g/kg diet did not improve growth but reduced feed intake at higher level. Feeding of bitter leaf could increase the cost of production due to the quantity of the bitter leaf to be consumed. Also, prolong exposure of broilers to bitter leaf meal which has been reported to contain anti-nutritional factors such as tannins and saponins (Nwanjo, 2005) could impact on the broilers negatively. Therefore, the objective of this study was to determine the effect of bitter leaf meal fed during finisher phase only on growth performance, carcass and internal organs of broiler chickens

MATERIALS AND METHODS.

Site of the experiment

The experiment was conducted at the poultry unit of Teaching and Research Farm of the University of Uyo, Nigeria, located on latitude 5^0 32' N and longitude 7^0 54' E with average annual rainfall of 1500 mm. The average relative humidity during the experiment was 75% and average ambient temperature of 29^{o}C

Processing of bitter leaf meal

The bitter leaf leaves used were harvested from a farm, washed and sun-dried for 7 days. The average ambient temperature during the drying period was 32^{o}C. Thereafter, the dry leaves were ground into powdery form and stored in a corked plastic container.

Experimental design, diets and management of the experimental birds.

Four diets representing the treatments (T) were formulated such that T1 (control) contained no bitter leaf meal, T2 had 25 g/kg diet, T3 contained 50 g/kg and T4 = 75 g/kg (Table 2). One hundred and forty four (144) unsexed day old chicks of Anak strain were used. They were brooded for three weeks using kerosene stoves. The birds were fed together with a single formulated starter feed (Table 1) for four weeks. At the end of the fourth week, 36 birds whose average weight was noted were allotted to a treatment which was replicated thrice. Each replicate had 12 birds. All the treatments had similar weight. The experiment was arranged in completely randomized design (CRD). The experimental diets were introduced from the fifth week (finisher phase). Both the feed and water were offered to the birds *ad libitum* for four weeks which the finisher phase lasted. Vaccination against Gumboro and Newcastle diseases was carried out.

Table 1: Composition of Starter Diet

Ingredient	Proportion (%)
Maize	53.00
Soya bean meal	30.00
Palm kernel cake	10.20
Fish meal	3.00
Bone meal	3.00
BLM	0.00
Salt	0.25
Lysine	0.20
Methinine	0.10
Premix	0.25
Total	100.00
Nutrient composition (%):	
Crude protein	22.33
Energy (KcalME/kg)	2865
Ca	1.21
P	0.92

*premix supplied per kg diet: vitamin A 15,000 I.U, vitamin D_3 13000 iu, thiamine 2mg, Riboflavin 6mg, pyridoxine 4mg, Niacin 40mg, cobalamine 0.05g, Biotin 0.08mg, choline chloride 0.05g, Manganese 0.096g, Zinc 0.06g, Iron 0.024g, Copper 0.006g, Iodine 0.014g, Selenium 0.24mg, Cobalt 0.024mg and Antioxidant 0.125g, NFE = Nitrogen free extract.

Table 2: Composition of Experimental Finisher Diets Containing BLM (g/kg diet)

Ingredients (%)	T1(0.00)	T2 (25)	T3 (50)	T4(75)
Maize	53.00	53.00	53.00	53.00
Soya bean meal	26.00	26.00	26.00	26.00
Palm kernel cake	15.30	12.80	14.80	14.55
Fish meal	2.00	2.00	2.00	2.00
Bone meal	3.00	3.00	3.00	3.00
BLM	0.00	2.5	5.00	7.5
Salt	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
*Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Nutrient composition (%):				
Crude protein	20.03	20.03	20.02	20.01
Energy (Kcal ME/kg)	2850	2847	2844	2842
Ca	1.11	1.11	1.11	1.10
P	0.92	0.92	0.92	0.92

*premix supplied per kg diet: vitamin A 15,000 I.U, vitamin D_3 13000 iu, thiamin 2mg, Riboflavin 6mg, pyridoxine 4mg, Niancin 40mg, cobalamine 0.05g, Biotin 0.08mg, chooline chloride 0.05g, Manganese 0.096g, Zinc 0.06g, Iron 0.024g, Copper 0.006g, Iodine 0.014g, Selenium 0.24mg, Cobalt 0.024mg and Antioxidant 0.125g, NFE = Nitrogen free extract.BLM = bitter leaf meal.

Data collection and statistical analysis

Live weight was measured weekly and feed intake daily. The live weight and feed intake were used to calculate the feed: gain ratio. Carcass analysis was carried out according to the method outlined by Scott *et al*. (1969). The dressed weight, cut-parts (breast, thigh, drumstick and wing) were expressed as percentage live weight and dressed weight respectively. The weights of the internal organs were taken and converted to percentage of the live weight. The percentages were transformed using Arcsine. Analysis of variance was carried out and significant means were separated using New Duncan multiple range test (NDMRT) according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

The effects of bitter leaf meal on growth performance of finisher broiler chickens are shown in Table 3. Except the daily feed intake, all the growth indices were significantly ($P<0.05$) influenced. It was observed that the effect of the biter leaf meal on the indices took similar trend with the highest level (75g/kg) giving the best results. Final live weight, daily gain and total feed intake were higher ($P<0.05$) in group of birds that consumed diet containing 75g bitter leaf meal per kg diet. Feed gain ratio was lowest ($P<0.05$) and the best at the highest level of bitter leaf meal.

Table 3: Effect of bitter leaf meal (g/kg Diet) on growth performance of finisher broilers

Parameter	T1(0.0)	T2(25)	T3(50)	T4(75)	SEM
Initial live weight (g/bird)	800	814	829	838	112.02
Final live weight (g/bird)	1883^{b}	1870^{b}	1873^{b}	2152^{a}	155.21
Daily weight gain (g/bird)	38.17^{b}	38.21^{b}	37.26^{b}	46.93^{a}	5.03
Total feed intake (g/bird)	3752^{b}	3808^{b}	3759^{b}	4009^{a}	188.05
Daily feed intake (g/bird)	134.00	135.82	134.25	143.18	25.67
Feed: gain ratio	3.51^{a}	3.55^{a}	3.69^{a}	3.05^{b}	0.26

[ab] Means along the same row with different superscripts are significantly ($P<0.05$) different. SEM= Standard Error of the Means.

The present result indicates that bitter leaf meal is a good leaf material to be included in the diets of finisher broiler chickens. Lowest feed: gain ratio observed in birds that consumed 75g/kg level of bitter leaf meal shows that intake of bitter leaf meal led to better feed utilization. The best final live weight produced by 75 g/kg could be attributed to the highest total feed intake of the group. The importance of bitter leaf meal as potential ingredient in poultry feeds have been stressed (Durunna *et al.,* 2011). The result agreed with Tangka (2003). On the contrary, Mohammed and Zakariya'u (2012) using 300 g, 600 g and 900 g from starter phase reported no significant difference in live weight and the bitter leaf significantly reduced feed intake. This could be attributed to the high level of the bitter leaf which would have made the feed unpalatable.

Table 4 shows the effect of bitter leaf meal on carcass quality. There were no significant (P>0.05) differences in all the parameters measured. All the levels of bitter leaf meal significantly (P<0.05) reduced abdominal fat, thus supporting the report of Nwanjo (2005) that bitter leaf could be used to reduce body fat.

Table 4: Effect of bitter leaf meal on carcass characteristics of broiler chickens

Parameters	T1(0.0)	T2(25)	T3(50)	T4(75)	SEM
Dressed weight (%)	65.31	66.68	68.00	67.50	10.30
Breast (%)	31.10	29.43	30.40	29.45	6.34
Thing (%)	12.75	12.45	11.49	14.51	4.34
Wing (%)	12.31	12.26	11.71	12.10	3.44
Back cut (%)	21.08	18.49	20.23	20.69	5.14
Abdominal fat	1.44^{a}	0.20^{b}	0.10^{b}	0.05^{b}	0.56

[ab]Means along the same row with different superscripts are significantly (P<0.05) different SEM = Standard Error of the Means.

The effect of bitter leaf meal on internal organs of finisher broiler chickens is shown on Table 5. There were no significant (P>0.05) differences in the size of proventriculus, gizzard, lungs, pancreas, kidney and heart. This indicates that the bitter leaf meal had no detrimental effect on such important organs as the pancreas, kidney and heart. However, significant differences (P<0.05) were noticed in liver, intestine, caecum and bile volume. The liver size was smallest in birds that were fed 75 g/kg indicating that bitter leaf could be used as liver purifier. The result of kidney and liver could be an indication that the bitter leaf was not detrimental to the organs. Both the intestine and *caecum* were significantly (P<0.05) reduced at 75 g/kg level. This could be related to reported antimicrobial action of bitter leaf (Mahady, 2002). Antimicrobial agents used as feed additives have been reported to reduce the size of intestine (Ndelekwute *et al*., 2014). Reduced caecal size shows that the bitter leaf meal could have exerted its reported antimicrobial effect in that region of gastrointestinal tract, thereby reducing the activities of bacteria which occur highest in the ceacum. Hence it has been reported that bacterial mass could increase the weight of ceacum (Choct, 2009). At 75 g/kg inclusion level of bitter leaf meal increased bile volume. This is an indication that bitter leaf meal could be used to improve digestibility of fat because bile is important in fat digestion according to Maynard *et al*. (1984).

Table 5: Effect of bitter leaf meal on internal organs of broiler chickens

Parameter	T_1 (0.0)	T_2(25)	T_3(50)	T_4(75)	SEM
Proventriculus (%)	0.58	0.56	0.64	0.62	0.20
Gizzard (%)	3.05	3.25	2.91	2.84	0.45
Pancreas (%)	0.24	0.25	0.21	0.18	0.10
Kidney (%)	0.57	0.55	0.59	0.49	0.20
Liver (%)	2.04^{a}	2.05^{a}	1.89^{a}	1.16^{b}	0.05
Lungs (%)	0.45	0.51	0.50	0.48	0.28
Heart (%)	0.42	0.46	0.41	0.45	0.27
Bile volume (%)	0.15^{b}	0.19^{b}	0.22^{b}	0.37^{a}	0.09
Intestine (%)	5.24^{a}	4.84^{ab}	4.12^{ab}	3.64^{b}	0.71
Caecum (%)	0.57^{a}	0.59^{a}	0.61^{a}	0.40^{b}	0.07

[ab]Means along the same row with different superscripts are significantly (P<0.05) different SEM =Standard Error of the Means.

CONCLUSION

Addition of 75 g/kg bitter leaf meal to diets of broilers at the finisher phase positively ($P<0.05$) influenced growth and feed intake, reduced abdominal fat and increased bile secretion. Bitter leaf meal in this work has shown that it is a good material to improve productivity in broiler chickens. It is therefore recommended that 75 g/kg bitter leaf meal could be added to finisher broiler chickens for optimum productivity.

REFERENCES

Burkill, H.M. (1985). The Useful Plants of West Tropical Africa. 2nd ed. Royal Botanic Gardens, London, 124-150.

Cardoso,V.D., Lima,C.A.R., Lima, M.E.F., Dorneles, L.E.G. and Danelli, M.G.M. (2012). Piperine as a phytogenic additive in broiler diets. Pesq. Agropec. Bras. Brasilia, 47 (4): 489-496.

Durunna, C.S., Chiaka, I.., Ebenebe, O.E., Udedibie, A.B.I., Uchegbu, M.C. and Durunna, O.N. (2011). Value of bitter leaf (*vernonia amygdalina*) meal as feed ingredient in the diet of finisher broiler chicken. International Journal of Agriculture and Rural Development. 14(2): 722-726.

FAC. (1998). Feed Additive Compendium. Miler Publishing Co., USA, 56p.

Kohlert, C., Van Rensen, I., März, R., Schindler, G., Graefe , E.U., Veit, M. (2000). Bioavailability and pharmacokinetics of natural volatile terpenes in animals and humans. Planta Médica. 66:495-505.

Maynard IA, Looshi JK, Hintz HF, Warner RC (1981). Animal nutrition. 7th ed.Tata MeGraw – Hill Pub. New Delhi, India, P 356-370

Mohammed, A.A. and Zakariya'u, A.S. (2012). Bitter leaf (*Vernonia amygdalina)* as a feed additive in broiler diets. Research Journal of Animal Science. 6(3):38-41

Ndelekwute, E.K., Assam, E.D. and Okonkwo, A.C. (2014). Growth performance and carcass yield of finisher broilers fed *Gmelina arborea* leaf meal in partial replacement for palm kernel cake. Journal of South Pacific Agriculture. 17(1&2): 91-98.

Ndelekwute, E.K., Uzegbu, H.O., Amaefule, K.u., Okereke, C.O. and Umoh, B.I. (2014). Effect of organic acids fed through drinking water on carcass and internal organs of broiler chickens. Nigeria Journal of Animal Production. 41(1): 60-67.

Ndelekwute, E.K., Enyenihi, G.E., Assam, E.D., Ufot, U. and Out, O. (2015). Lime (*Citrus aurantifolia*) juice a a natural source of organic acids can improve the growth of broiler chickens. Avances in Animal Biosciences, Science with Impact. Proc. of the British Society of Animal Science, 14-15 April, 2015, Chester, U.K. 220p.

Nwanjo H. U. (2005). Efficacy of aqueous leaf extract of *vernonia amygdalina* on plasma lipoprotein and oxidative status in diabetic rat models. Nigeria Journal of Physiological Science. 20 (1-2): 30 – 42.

Olobatoke, R.Y and Oloniruha, J.A. (2009). Haematological assessment of bitter leaf (*Vernonia amygdalina)* efficiency in reducing infections in cockerels. Proceeding of World Congress on Medicinal and Aromatic Plants. Cape Town, South Africa, 66-70pp.

Scott, M.L., Hili, N.F., Parson, E.H. (Jr.) and Buckner, J.H. 1969. Studies on duck nutrition. 7: Effect of dietary energy protein relationships upon growth, feed utilization and carcass composition in market ducking. Poultry Science. 38: 497 - 507.

Steel, R.G.D. and Torrie, J.H. 1980. Principles and Procedures of statistics. McGraw Hill Int. Books Co. Sydney. 155p.

Tadesse, A., Gebie-Hiwot, A., Asres, K., Djote, M. and Frommel, D. (1993). The in-vitro activity of *Vernonia amygdalina* on *Leishmania aethiopica.* Ethiopian Medical Journal. 31: 183-189.

Tangka, J.K. (2003). Analysis of the thermal energy requirements for extraction of leaf protein concentrate fro some green plants. Biosystem Engineering. 86: 473-479.