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Research Article

EFFECTS OF DIFFERENT LEVELS OF BOVINE BLOOD / RUMEN CONTENT MIXTURE ON PRODUCTIVE PERFORMANCE, CARCASS CHARACTERISTICS AND ECONOMICS OF PRODUCTION OF FINISHER BROILERS

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ABSTRACT
The effects of different levels of bovine blood/rumen content mixture (BBRCM) on productive performance, carcass characteristics and economics of production of finisher broilers were evaluated. Four experimental diets were formulated such that diet 1 which served as the control contained 0% BBRCM. Diets 2, 3 and 4 contained 20%, 40% and 60% BBRCM as replacements for soyabean meal. One hundred and ninety two 5-weeks old Anak 2000 broiler chicks were randomly assigned to the four diets in a completely randomized design (CRD). Each treatment was replicated four times with 12 birds per replicate. The experimental diets and portable water were supplied *ad libitum* throughout the experimental period of 35 days. At the end of the feeding trial, 4 birds per replicate were selected for carcass evaluation. Results showed significant ($P<0.05$) differences among the treatment groups in all the measurements recorded. Birds fed diet 4 (T4) had the highest weight gain and the best feed conversion ratio. There was a significant ($P < 0.05$) increase in weight gain as the inclusion level increased. The feed intake of birds fed diet 1 ($T_{1)}$ was significantly ($P< 0.05$) higher than those fed diet 2 ($T_{2)}$, diet 3 ($T_{3)}$ and diet 4 ($T_{4)}$. The result of the experiment showed that Bovine blood / rumen content mixture can replace soyabean meal up to 60% level without any deleterious effect on the carcass yield and organ weight of the birds. Economics of production showed that BBRCM diets were more profitable in terms of t cost of feed per kg weight gain and thus cost saving.

Key Words: *Bovine Blood Rumen Content Mixture, Broilers, Carcass Characteristics, Economics Of Production, Performance*

INTRODUCTION
A major problem facing the developing countries especially Nigeria is the galloping population without a corresponding increase in animal protein production. Animal products contribute only 15 – 20% of the total protein intake of an average Nigerian contrary to 33% recommended by FAO and WHO (Taiwo *et al*., 2004). This wide margin between the recommended protein intake and the average consumption rate has resulted in an ever-increasing demand for animal protein by the Nigerian populace. To increase protein intake in Nigeria, there is urgent need to increase the production of animals with short generation interval at household and commercial holdings.

Broiler production represents one of the most economic and easiest means of bridging the supply demand gap of animal protein, due to their rapid growth rate and superior feed conversion ratio. More so, compared to other livestock species, broilers enjoy a relative advantage of easy management, quick returns to capital investments and wide acceptance of its meat for human consumption. However, in spite of these enormous potentials, broiler production in many tropical and sub-tropical countries is affected by scarcity and high cost of conventional protein feed ingredients (Onu and Okongwu, 2006; Atawodi *et al*., 2008; EL-Deek *et al*., 2008). High cost of conventional protein feedstuffs has contributed to the poor performance or productivity of many poultry farms in Nigeria and this has led to a shortage in the availability of animal protein to the citizenry (Adeniji and Jimoh, 2007).

Efforts to reduce the high cost of feeds and therefore the cost of poultry products have concentrated on the use of cheaper and locally available alternative agro-by products especially those that have no nutritional value to mankind (Onu, 2007, Onu and Otuma, 2008, Okonkwo *et al*., 2008, Oladunjoye and Ojebiyi, 2010). Furthermore, the need to maximize the economic and environmental benefits in disposal of slaughterhouse by-products (NAVN, 1994, Aniebo et al 2009) also stimulated a renewed interest in the investigation of slaughterhouse by-products for possible use as protein feedstuffs in livestock feeds. Incorporation of such products in poultry feed would help in alleviating the problem of the scarcity of feed supply that is having a negative effect on livestock industry most especially monogastric animal production. Its usage will also reduce pollution problems.

Bovine blood /rumen content mixture (BBRCM) is an abattoir by product that offers a tremendous potential as a cheap and locally available alternative feedstuffs for livestock. It has been used in Nigeria to feed poultry (Adeniyi and Balogun., 2001, 2002; Odunsi, 2003; Adeniji and Jimoh, 2007) rabbits (Dairo *et al*., 2005; Togun *et al*., 2009) and ruminants (Salinas-Charina *et al*., 2003; Rios Rincon *et al*., 2010) as a cheap untraditional feedstuff to reduce feeding costs and alleviate pollution problems without any reported deleterious clinical effect on animal health and performance. However, there is limited information on the feeding value of BBRCM for broiler finisher in Nigeria. This study was therefore conducted to evaluate the effects of different levels of bovine blood / rumen content mixture (BBRCM) on productive performance, carcass characteristic and economics of production of finisher broilers.

MATERIALS AND METHODS

The experiment was carried out at the Poultry Research Unit of the Department of Animal Science, Ebonyi State University, Abakaliki, Nigeria with the approval of the Committee for Animal Experiments of the Institution.

Collection and Processing of BBRCM

Fresh blood and rumen content obtained from freshly eviscerated cattle were collected into separate clean containers respectively from the abattoir in Abakaliki. Bovine blood and rumen content were weighed in the ratio of 1:1 into a drum. The drum containing the mixture was placed on burning firewood and allowed to boil for 120 minutes and was constantly stirred to prevent burning. After boiling the mixture was oven dried at 60^{o}c for 48 hours. A hammer mill of 10mm mesh-size was used to reduce the material to a uniform particle size. A sample of the processed BBRCM was analyzed to determine its crude protein, crude fibre, ether extract, dry matter, ash contents according to the methods of AOAC (1995). The metabolizable energy (Kcal/kg) of BBRCM was estimated using Pauzenga (1985) formula: ME ~ 35xCP% + 81.8 x EE% + 35.5 x NFE

Experimental Diets

The BBRCM was used to formulate four experimental diets such that diet 1 (T_1) which served as the control contained O% BBRCM, while it replaced the soyabean portion of diets 2 (T_2), 3 (T_3) and 4 (T_4) at 20%, 40% and 60% respectively.

Experimental Birds and Management

One hundred and eighty (180) Day –old Anak 2000 broiler chicks procured from a commercial hatchery were used for the study. The chicks were electrically brooded for 4 weeks during which time they were fed commercial broiler starter diets and water provided *ad libitum* in a deep litter system. At the end of the five (5) weeks brooding period, a total of one hundred and sixty (160) birds were randomly selected and divided into four (4) treatment groups of 40 birds each. Each group was randomly assigned to an experimental diet in a completely randomized design. Each group was further subdivided into four replicate groups of (10) birds. Fresh water and corresponding diet were provided *ad libitum* throughout the experimental period. Prior to the commencement of the experiment, the birds were weighed to obtain their initial body weights and subsequently weekly.

Feed intake was recorded daily as the difference between the feed offered and the leftover. Feed conversion ratio was calculated as the total feed consumed divided by the body weight gain. Vaccination

and other routine poultry management practices in the tropics which include daily inspection of the birds for symptoms of diseases, mortality, cleaning of troughs and supply of feed and fresh water were maintained (Oluyemi and Robert, 2000).

Carcass Evaluation

At the end of the experiment, four birds were randomly selected from each replicate group, deprived of feed but not water for 12 hours. They were weighed and slaughtered through cervical dislocation followed by exsanguinations. Dressing percentage was obtained as a percentage of the dressed weight after removing the feathers. They were then eviscerated for carcass yield and organ weight determination. The carcass yield and organ weights were weighed and calculated as percentage of the dressed weight.

Economics of Production

The prevailing market price of the ingredients at the time of the study was used to calculate the cost of feed per kg (₦), total cost of feed consume (₦), cost of feed per kg weight gain (₦) and cost saving (%).

Statistical Analysis

Data collected were subjected to analysis of variance according to the method of Steel and Torrie (1980). Differences were considered to be significant at $P < 0.05$ and significant differences between means were separated using Duncan's New Multiple Range Test as outlined by Obi (2002).

RESULTS AND DISCUSSION

Chemical composition

The proximate composition of BBRCM is shown in Table 1. The proximate composition of BBRCM showed that it contains 45.35% crude protein, 4.10% ether extract, 8.81% crude fibre and 15.42% ash. The nutrient quality of feed ingredient is one of the major prerequisite apart from availability (which sometimes is a function of cost and season) for production of good quality feeds. The basic nutrient that cannot be compromised in the choice of ingredients for feed formulation and preparation is protein (Zeitler *et al.*, 1984).The crude protein value is comparable to 46.1% crude previously reported by Odunsi, (2003) but higher than 33.81% reported by Dairo *et al*. (2005). The disparity in crude protein composition may be due the type of pasture consumed by the animals and the proportion of the constituent mixtures. This could also be influenced by the period of fasting prior to slaughter and stage of digesta degradation in the rumen. The high crude protein value of BBRCM suggests its utilization as a protein supplement in diets for finishing broilers.The calculated chemical composition of the diet is shown is Table 2. The crude protein and energy values of the experimental diets seemed to increase with increase in the level of BBRCM inclusion in the diets. The crude fibre values of the diets also increased progressively as dietary inclusion of BBRCM increased. .

The performance of broiler chicks fed graded levels of BBRCM as replacement for soyabean is as shown in Table 3. The results show that body weight gain increased linearly ($P < 0.05$) with increase in the level of bovine blood rumen content meal while the feed intake decreased with increase in the level in BBRCM. The higher feed intake of the birds fed maize-diet could be due to increased appetite of the birds. On the other hand, the reduced intake of the birds on BBRCM diets could be attributed to depressed appetite resulting from the unpleasant smell of the diets. Donkoh *et al*., 1999, Dongmo *et al*., 2000 and Odunsi (2003) had earlier reported that the inclusion of blood meal and / or rumen content impart obnoxious odour to the final diet and make it less palatable to birds causing a depression in consumption. In addition, the reduced feed intake with increase in the dietary BBRCM inclusion could also be due to the increase in the dietary energy concentration of the diets since birds eat to satisfy their energy requirement, they tend to attain their energy level faster with BBRCM diet (Onu, 2007; Teimouri *et al*. 2005).

The improved weight gain of birds fed BBRCM diets could be attributed to higher protein content of the diets which were efficiently metabolized for growth. The improved performance could also probably be

due to adequate dietary crude fibre level of the diets. Esonu *et al*. (2004) had earlier reported that crude fibre activates the intestine and more occurrence of peristaltic movement, more enzyme production resulting in efficient digestion of nutrients. There was a significant improvement in the feed conversion ratio of the birds as the level of BBRCM inclusion in the diets increased. This result is in agreement with the reports of Adeniji and Balogun (2001, 2002) and Odunsi (2003) who reported significant effects of blood rumen content on poultry but did not conform with the reports of

Table 1 Proximate composition of bovine blood rumen content mixture

Nutrient (%)	
Dry matter	92.86
Crude protein	45.35
Crude fibre	8.81
Ether extract	4.10
Ash	15.42
Nitrogen free extract	26.32
Metabolized energy (kcal/kg)	2599.49

Table 2 Ingredient and chemical composition of the experimental diets

Ingredient	T_1	T_2	T_3	T_4
Maize	50	50	50	50
Soyabean meal	24	19.2	14.4	9.6
Wheat Offal	12	12	12	12
Fish meal	4	4	4	4
BBRCM	0	4.8	9.6	14.4
Palm kernel cake	6	6	6	6
Bone meal	3	3	3	3
Salt	0.25	0.25	0.25	0.25
Premix	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated Chemical Composition				
Nutrients				
Crude protein	19.05	19.72	20.13	20.54
Crude Fibre	4.56	4.77	4.97	5.17
Ether Extract	5.24	5.37	5.49	5.62
NFE	70.15	68.64	67.16	65.67
ME (Kcal/kg)	2747.76	2769.51	2791.26	2813.01

- To provide the following per kg of diet vitamin A – 15,000.00,[lu] Vitamin D_3 - 3, 000,000[lu], Vitamin E-30,000,[lu] Vitamin K – 3,000mg Vitamin B_1 3000,mg Vitamin B_2 6000mg, Vitamin B_6 5,000mg, Vitamin Bie 40mg, Biotin 200mg, Niacah-40,000mg, Pantothenic 15,000mg,Folic acid 2,000mg, choline 300,000mg,Iron 60,000mg, manganese 80,000mg, copper 25,000mg,Zinc 80,000mg cobalt 150mg, iodine 500mg, solencien 310mg, Antioxidant 20,000mg.

Table 3 Performance characteristics of finisher broilers fed different levels of BBRCM

Parameter	T_1	T_2	T_3	T_4	SEM
Av. Initial body weight (g)	948.6	922.0	967.0	943.3	
Av. Final body weight (g)	1946.00[d]	2000.60[c]	2170.70[b]	2258.00[a]	72.69
Av. Body weight gain (g)	991.33[d]	1078.66[c]	1183.49[b]	1314.66[a]	69.67
Av. Daily weight gain (g)	28.33[d]	30.82[c]	33.81[b]	37.56[a]	1.99
Av. Total feed intake	4059.32[a]	3939.93[b]	3800.63[c]	3591.78[d]	100.42
Av. Daily feed intake	115.98[a]	112.57[b]	108.54[c]	102.52[d]	2.895
Feed conversion ratio	4.09[d]	3.65[c]	3.21[b]	2.73[a]	0.52

[a.b.c d] Means with different superscripts on same row differ significantly (P<. 0.05).

Dairo *et al*., (2005) in rabbits. This suggests that BBRCM could replace up to 60% of the soyabean in broiler finisher diets.

The carcass characteristics of birds fed different levels of BBRCM are presented in Table 4. Dietary treatments had significant ($p < 0.05$) effect on the dressed weight of the birds. There was no significant

Table 4: Carcass characteristics of the birds fed different levels of BBRCM

Parameter	T_1	T_2	T_3	T_4	SEM
Dressed weight	1765.80[c]	1841.15[b]	1984.67[a]	2067.65[a]	58.65
Dressing %	90.74	92.03	91.43	91.57	0.58
Shank	4.82	4.85	4.41	4.03	0.195
Wing	9.35	9.46	9.14	8.71	0.17
Thigh	20.56	18.87	21.28	20.93	8.87
Breast	26.32	27.18	27.13	26.46	9.56
Liver	2.23	2.44	2.08	2.04	0.092
Gizzard	3.77	4.36	4.37	4.26	0.15
Heart	0.60	0.63	0.64	0.48	0.04

Table 5: Economics of production of finisher broilers fed different levels of BBRCM

Parameters	T_1	T_2	T_3	T_4
Feed cost/kg (₦)	41.96	38.84	35.72	32.60
Total feed cost (₦)	170.34	153.04	135.77	117.11
Cost of daily feed intake(₦)	4.87	4.37	3.88	3.35
Feed cost/kg weight gain (₦)	171.84	141.88	114.73	89.08
Cost Saving (%)	-	17.43	33.23	48.16

($P > 0.05$) differences existed in the carcass characteristics of the birds indicating that BBRCM had no adverse effect on the carcass yield and organ weights of the birds.

Table 5 shows the economics of bird production using the various diets. From the data, it is more profitable and economical to partially replace soyabean meal in broiler finisher diets with bovine blood rumen content mixture. Results show that the cost of feed intake of broilers significantly reduced ($P < 0.05$) with increase in the level of BBRCM in the diets. Similarly, cost of producing a kilogramme of broiler meat decreased significantly ($P > 0.05$) with high rate of BBRCM inclusion in the diets. The reduction in the cost of diets containing higher levels of BBRCM is because the cost per kilogramme of processed BBRCM was by far cheaper than soyabean at the period of this experiment.

Conclusion

The use of bovine blood rumen content mixture in poultry nutrition has positive effect as alternative feed ingredients for broiler finishers. Its use to partially replace soyabean in broiler finisher diets has shown that high level of inclusion (60%) decreases feed intake, increases the weight gain and improves the feed

conversion ratio of the birds. The carcass characteristics and organ weights were also favourably comparable to the controlThis suggests that replacement of soyabean with BBRCM at 60% level is effective in improving performance since it has no deleterious effects on the performance of the birds. BBRCM supplementation of the diets reduced the cost of production.

REFERENCES

Adeniji, A. A. and Balogun, O. O. (2001). Evaluation of blood-rumen content mixture in the diet of starter broilers. *Nigeria Journal Animal Production*, 28(2): 153-157

Adeniji A. A. and Balogun O. O. (2002). Utilization of flavour treated blood-rumen content mixture in the diet of laying hens. *Nigeria Journal Animal Production* 29(1): 34-39

Adeniji, A. A. and Jimoh, A. (2007). Effects of Replacing Maize with Enzyme- Supplemented Bovine Rumen Content in the Diets of Pullet Chicks. *International Journal of Poultry Science.* 6 (11): 814-817

Aniebo, A. O. , Wekhe, S. N. andOkoli, I. C.(2009) 'Abattoir blood waste generation in Rivers State and its environmental implications in the Niger Delta', *International Journal of Toxicological & Environmental Chemistry, 91: 4, 619 — 625*

Atawodi, S. E., Mari, D., Atawodi, J. C. and Yahaya, Y. (2008). Assessment of *Leucaena leucocephala* leaves as feed supplement in laying hens. *African Journal of Biotechnology*. 7 (3): 317-321.

Dairo, F.A.S., Aina, O.O., and Asafa A.R. (2005). Performance evaluation of growing rabbits fed varying level of rumen content and blood rumen content mixture. *Nigerian Journal of Animal Production*, 32(1):67-73

Dongmo, T., Ngou Ngoupayou, J. D. and Pouilles Dupoix, M. (2000). Use of some local animal protein sources in the feeding of broilers. *Tropicultura*, 18:122-125.

Donkoh, A., Atuahene, C. C, Anang, D. M. and Ofori S. K. (1999). Chemical composition of solar dried blood meal and its effects on performance of broiler chickens. *Animal Feed Science and Technology*, 81: 299-307.

El – Deek, A.A, Al – Harthi, M., Yakout, H. M. (2008). Use of enzymes to supplement diets containing date waste meal for lohmann white layers. *International Journal of Poultry Science.* 7 (4): 397-407

Esonu, B. O., Azubuike, J, C., Emenalom, O. O, Etuk, E. B., Okoli, I. C., Ukwu, H. D. and Nneji, C. S. (2004). Effect of enzyme supplementation on the performance of broiler finisher fed *Microdesmis Puberula* leaf meal. *International Journal of Poultry Science*, 3:112-114

NAVN. (1994). Nigeria Agro Vet. News, Jan / Feb 1994, 1: 6.

Obi, I. U. (2002). *Statistical methods of detecting differences between treatment means and research methodology issues in laboratory and field experiments*. AP. Express Publishing Company Ltd. Nsukka.

Odunsi, A. A. (2003). Blend of bovine blood and rumen digesta as a replacement for fishmeal and Groundnut Cake in Layer Diets *International Journal of Poultry Science* 2 (1): 58-61

Okonkwo, A.C., Isaac, L. J., Solomon, I.P. and Eyoh, G.D. (2008). Effect of diertary cassava leaf meal on growth performance of weaner rabbits. Proceeding of the 33rd Annual Conference of the Nigerian Society of Animal Production, Ogun.142 – 144.

Oladunjoye, I.O.and Ojebiyi , O. O. (2010). Performance Characteristics of Broiler Chicken (*Gallus gallus*) Fed Rice (*Oriza sativa*) Bran with or Without Roxazyme G2G *International Journal of Animal and Veterinary Advances* 2(4): 135-140.

Oluyemi, J. A and Roberts, F. A. (2000). Poultry production in warm wet climate. Macmillian Press Ltd. 2nd Edition, Spectrum Books Ltd. Ibadan, Nigeria.

Onu, P.N. and Otuma, M.O. (2008). Utilization of heat – treated sheep chopping in the diets of broiler finisher chicks. *International Journal of Poultry Science*, 7 (2): 169 – 173.

Onu, P. N. (2007). The influence of heat- treated sheep manure on the performance, carcass characteristics and economics of production of starter broilers. *Journal of Animal and Veterinary Advances* 6(11): 1323- 1327

Onu, P.N., Madubuike, F. N., Esonu, B. O. and Onu, D.O. (2001). The effect of wild cocoyam (Caladium bicolor) on the performance and internal organs weights of finisher broilers. *Journal of Science, Agriculture, Food technology and the enviro*nment. 1:9-24.

Rios Rincon, F. G., Bermudez-Hurtado, R. M. and Estrada-Angulo, A. (2010). Dried ruminal contents as a substitute for alfalfa hay in growing-finishing diets for feedlot cattle. *Journal of Animal and Veterinary Advances 6*: 505- 508

Salinas-Chavira, J., Dominguez-Munoz, M. Bernal-Lorenzo, R., Garcia-Castillo, R. F. and Arzola-Alvarez, C. (2007). Growth performance and carcass characteristics of feedlot lambs feddiets with pig manure and rumen contents. *Journal of Animal and Veterinary Advances* 6(11): 1323- 1327

Steel, R. G. D. and Torrie, J. H. (1980). *Principles and Procedures of statistics. A biometric approach*. 2nd ed. McGraws-Hill Book Co.

Taiwo, B. B. A., Aluko, F.A. and Olayemi, J.O. (2004). Cane rat production in some part of Ogun State. Proceeding of the 9th Annual Conference of the Animal Science Association of Nigerian, Abakaliki, Nigeria. 169 –173.

Teimour, A, Rezae, M., Pourreza, J., Sayyahzedch, H., and Waldroup, P.W. (2005). Effect of diet dilution in the starter period on the performance and carcass characteristics of broiler chicks. *International Journal of Poultry Science* 4 (12): 1006 – 1011.

Zeitler, M.H., Kirchgessner, M. and Schwarz, F.J. (1984). Effects of different proteins and Energy supplies on carcass composition of carp (*Cyprinus carpio*, L.) *Aquaculture*, 36: 37-48.

Togun, V. A., Farinu, G. O., Ojebiyi, O. O. and Awotunde, A. I. (2009). Effect of replacing maize with a mixture of rumen content and blood meal on the performance of growing rabbits: Initial study with mash feed. *World Rabbit Science*. 17: 21-26