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Effect of Replacing Soyabean Meal with Bovine Blood/Rumen Content Mixture on the Performance of Broiler Chicks

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ABSTRACT

Bovine blood/rumen content mixture (BBRCM) is an abattoir by-product that provides a cheap source of livestock feed. It is a source of protein which is readily available at the slaughter house. This experiment was conducted to evaluate the performance of broiler chicks fed bovine blood/ rumen content mixture (BBRCM) as partial replacement for soybean meal. Experimental diets T_1 which served as the control contained 0% BBRCM, diets T_2, T_3 and T_4 contained 20%, 40% and 60% BBRCM respectively. Sixty (60) five weeks old Anak 2000 broiler chicks were randomly assigned to the four dietary treatments in a completely randomized design (CRD). Each treatment was replicated three times with five birds per replicate. The experiment lasted for 35 days. Results showed that there were significant differences in the growth performance of the birds on the treatment groups in all the measurements recorded. Birds fed T_4 diet 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 T_1 was significantly ($p<0.05$) higher than those fed other treatment diets while T_4 recorded the least. There were significant ($p<0.05$) differences on the feed conversion ratio of the birds fed diets T_1, T_2, T_3 and T_4. T_1 had the poorest feed conversion ratio. Organ weights were not significantly affected ($p>0.05$). The result of the experiment showed that bovine blood/rumen content mixture can replace soybean meal in the diet at up to 60% level without any negative effect. Economics of production showed that bovine blood/rumen content mixture were profitable as regards to the cost of feed per kg weight gain and thus cost savings.

Introduction

The level of animal protein consumption has direct influence on the general well-being and health of the ever-increasing population (Bamgbose *et al.*, 2002). Malnutrition, one of the major problems facing the world especially today is mostly associated with animal protein deficiency (Okon and Olayoyin, 2007). Thus there is urgent need for the improvement of the protein status of the diet of Nigerians. Poultry production offers considerable potential for bridging the animal protein gap in view of the high yielding exotic poultry that are easily adaptable to our environment and their fast growth rate (Madubuike, 1992).

Nutrition represents one of the most serious limitations to poultry production. Rising cost of poultry feeds have continued to be a major problem in Nigeria as feed cost is about 70-85% of total cost of production (Opara, 1996) compared to 50-60% in developing countries (Tackie and Flenscher, 1995). Thus poultry feed producers and animal nutritionists are faced with the task of finding alternative feed stuffs especially those that do not attract competition. Conventional ingredient are expensive because they suffer from stiff competition with channels in the food chain which command higher priority and can pay higher prices than the compound feed industry. This scenario has greatly reduced the rate of expansion of poultry industry in Nigeria, which has further diminished the already low of animal protein intake of the populace (Madubuike, 1992).

In an attempt to reduce the price of poultry feeds, efforts are made to utilize abattoir wastes as source of feeds. (Javanovic and Cuperlovic, 1977). The reports by Odunsi *et al.*, (1996), Okokwo and Oketola (1996), Salami and Oyewofe (1997) observed that a major solution to the problem of rising costs and scarcity of energy and protein source for monogastric farm animals, is seeking a new and non-conventional raw-materials. The recycling of slaughter house wastes as a source of feed for various categories of livestock has been continuous subject of investigation (kingori *et al.*, 1998; Haapapure *et al.*, 1997; Swan, 1992).

Bovine blood/rumen content mixture is an abattoir by-product that provides a cheap source of livestock feed. It has been used in Nigeria to feed monogastric animals especially poultry (Adeniji and Balogun, 2002; Dairo *et al.*, 2006) without any reported deleterious clinical effect on animal health and performance. Therefore, the objectives of this study were to evaluate the effect of bovine blood/rumen content mixture on the performance of broiler chicks, carcass characteristics and economics of production of broiler using BBRCM as a replacement for soyabean.

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Materials and methods

Location and duration of study

The experiment was carried out at the Poultry Research Unit of the Department of Animal Science, Ebonyi State University, Abakaliki. The study lasted for a period of five weeks.

Collection and processing of BBRCM

Fresh blood was collected into a clean container while the rumen content was obtained from freshly eviscerated cattle. Bovine blood and rumen content was weighed in the ratio of 1:1 into a drum. The mixture was placed on burning fire wood and allowed to boil until the mixture was almost free from steam and constantly stirred to prevent burning. The boiled bovine blood/rumen content mixture was preserved by sun drying for 3 days. This was done to eliminate the presence of micro-organisms that are potentially dangerous to animal health. The sundried BBRCM was bagged and stored in a cool dry place. A proximate analysis was carried out to determine the level of crude protein, crude fiber, ether extract, dry matter, crude ash and metabolized energy.

Experimental diets

Four experimental diets were formulated such that diet T_1 served as the control (contained 0%) BBRCM, diets 2, 3 and 4 contained 20%, 40% and 60% BBRCM as replacements for soyabean meal respectively.

Experimental birds and management

Seventy-five day-old Anak 2000 broiler chicks procured from a commercial hatchery were used for the study. The chicks were electrically brooded for 5 weeks during which time they were fed commercial broiler starter diets and watered *ad libitum* in a deep litter system. Wood shavings served as litter materials and were always replaced when wet. At the end of the five weeks brooding period, a total of sixty birds were randomly selected and divided into four treatment groups of 15 birds each. Each group was randomly assigned to an experimental diet in a completely randomized design. Each group was further subdivided into three replicate groups of five birds and kept in a compartment. The diets were labeled T_1 to T_4 to correspond with diets 1, 2, 3 and 4. 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. Vaccination and other routine poultry management practices which include daily inspection of the birds for symptoms of diseases, mortality, cleaning of troughs and supply of feed and fresh water were maintained.

Data collection

Data on daily feed intake of each replicate was determined by difference between feed offered and left over. Birds were weighed weekly; the body weight changes were calculated by subtracting the initial body weight from the final body weight. However, daily weight gain was determined by dividing the body weight change by the number of days the experiment lasted while the feed conversion ratios of the birds were computed by dividing the average daily feed intake by average daily body weight gain.

Carcass evaluation

At the end of the experiment, one bird was randomly selected from each replicate group, deprived of feed but not water for a period of 12 hours. They were slaughtered and eviscerated for organ weight determination.

Economics of production

The cost benefit analysis was carried out for the four groups to find out whether the use of bovine blood/rumen content mixture had economic benefits. The cost of production included the cost of feeding, procurement of birds, labor and medication. The revenue was based on N800 per kg live weight of broilers during the time of the experiment. The following parameters were obtained.

(1) Feed cost /kg feed consumed /bird /treatment

$$= \frac{\text{Total cost of feed(N)}}{\text{Total feed consumed/kg}}$$

(2) Feed cost (kg) weight gain /bird/ treatment

$$= \frac{\text{Total cost of feed (N)}}{\text{Total weight gain (kg)}}$$

(3) Total revenue generated = final body weight × number of birds ×cost per kg live weight

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

roximate composition of BBRCM is presented in Table 1. Proximate composition of BBRCM showed that it contains 45.25% crude protein, 8.88% crude fiber, 4.12% ether extract, 15.40% ash and 26.35% nitrogen free extract. Crude protein value is comparable to previous work done by Odunsi, (2003) but higher than 33.81% reported by (Dairo *et al.,* 2005).

Table 1. Proximate Composition of Bbrcm.

Nutrients (%)	
Crude protein	45.25
Crude fiber	8.88
Ether extract	4.12
Dry matter	92.68
Ash	15.40
Nitrogen free extract	26.35
Metabolize energy (kcal/kg)	2873.15

The ingredients composition of experimental diets is shown in Table 2 which shows the levels of replacement of soyabean meal by BBRCM.

Table 2. Ingredients Composition of Experimental Diets

Ingredients (%)	T_1	T_2	T_3	T_4
Maize	**50.00**	**50.00**	**50.00**	**50.00**
Soyabean meal	24.00	19.20	14.40	9.60
Wheat offal	12.00	12.00	12.00	12.00
Fish meal	4.00	4.00	4.00	4.00
BBRCM	0.00	4.80	9.60	14.40
Palm kernel cake	6.00	6.00	6.00	6.00
Bone meal	3.00	3.00	3.00	3.00
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

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- 3000mg, Vitamin B_2 6000mg, Vitamin B_6 5,000mg, 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 is the calculated chemical composition of the diet. The crude protein values of the experimental diets increased with the increase in the level of BBRCM inclusion in the diets. Crude fiber values of the diets also increased progressively as dietary inclusion of BBRCM increased. The energy values

increased slightly with increase in the level of BBRCM in the diets.

Table 3. Calculated chemical composition of the experimental diets.

NUTRIENTS	T_1 (0%)	T_2 (20%)	T_3 (40%)	T_4 (60%)
Crude protein	20.05	21.22	22.38	23.54
Crude fiber	4.56	4.77	4.97	5.62
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

The performance of broiler chicks fed BBRCM as a replacement for soybean is shown in Table 4. There were significant differences on the performance of the birds per treatment groups for all measured parameters.

Table 4. Performance of Broiler Chicks Fed The Experimental Diets

Parameters	T_1	T_2	T_3	T_4	SEM
Av. Initial body weight (g)	948.60	922.00	967.00	943.00	
Av. Final body weight (g)	1944.0^{d}	2000.2^{c}	2170.5^{b}	2256.0^{a}	72.17
Av. Body weight gain (g)	997.33^{d}	1078.63^{c}	1183.30^{b}	1314.66^{a}	69.62
Av. Daily weight gain (g)	28.31^{d}	30.81^{c}	33.80^{b}	37.54^{a}	1.78
Av. Total feed intake (g)	4059.30^{a}	3939.92^{b}	3800.61^{c}	3591.77^{d}	100.34
Av. Daily feed intake (g)	115.96^{a}	112.55^{b}	108.52^{c}	102.50^{d}	2.89
Feed conversion ratio	4.06^{d}	3.63^{c}	3.19^{b}	2.72^{a}	0.42

$^{a, b, c, d}$ Means within rows with different superscripts are significantly different ($p<0.05$)

The result in Table 4 explicates that body weight gain increased linearly ($p<0.05$) with increase in the level of bovine blood/rumen content meal. Birds fed T_4 diet had the highest weight gain. The improved performance in the body weight could be attributed to higher protein content of the taste undigested starchy and fibrous carbohydrates. In addition, it could be as a result of long chain fatty acids and partially digested feed protein material due to the influence of microbial protein (Okorie, 2005; Ekwuoma, 1992 and Whyte and Wadak, 2002). Furthermore, the improved performance could probably due to adequate dietary crude fiber level (Esonu *et al.*, 2004). Crude fiber activates the intestine and with more occurrence of peristaltic movement and more enzyme production that results in efficient digestion of nutrients (Kekeocha, 1984; Esonu *et al.*, 2001; Esonu *et al.*, 2004).

The feed intake of the birds fed diet T_1 was significantly ($p<0.05$) higher than other treatment diets. The feed intake decreased with increase in the level of BBRCM. The decrease in feed intake is not surprising since feed intake in chickens is inversely related to dietary energy concentration (Tuleun *et al*., 2001). BBRCM is high in energy and as the level of inclusion increased, the metabolizable energy also increased. Since birds eat to satisfy their energy requirement, they tend to attain energy level faster with experimental diet (Tuleun *et al*., 2001).

There were significant ($p<0.05$) differences on the feed conversion ratio of the birds fed diets T_1, T_2, T_3 and T_4. T_1 had the poorest feed conversion ratio. The feed conversion ratio recorded for birds fed T_4 diet indicated that the nutrients were more available, efficiently digested and utilized by the birds (Tuleun *et al*., 2001; Broz and Frigg, 1990).

Table 5 depicts that the organ weights were not significantly ($p>0.05$) affected by the dietary treatments but the dressed carcass weight was significantly ($p<0.05$) different among the treatments

Table 5. Carcass Evaluation Of Chicks Fed Diets

Parameters	T_1	T_2	T_3	T_4	SEM
Dressed weight(g)	1761.80^{d}	1839.15^{c}	1983.67^{b}	2065.65^{a}	58.62
Dressing %	90.74	90.90	91.43	91.57	0.68
Liver (g)	2.23	2.44	2.08	2.04	0.089
Shank (g)	4.82	4.85	4.41	4.03	0.192
Gizzard (g)	3.77	4.36	4.37	4.26	0.15
Wing (g)	9.35	9.46	9.14	8.71	0.18
Heart (g)	0.60	0.63	0.64	0.48	0.039

$^{a, b, c, d}$ Means within rows with different superscripts are significantly different ($p<0.05$)

The result of the dressed weight was significantly ($p<0.05$) higher among T_4. The improvement in dressed carcass weight of T_4 may be as a result of higher protein content (Okorie, 2005). This is also in accordance with the findings by Ekwuoma, 1992; Whyte and Wadak, 2002).

Table 6 shows the economics of production using various diets.

Table 6. Economics of Production of the Broilers Chicks Fed on the Experimental Diets.

Parameters	T_1	T_2	T_3	T_4
Total feed consumed kg /bird	4.0593	3.9399	3.8006	3.5917
Total cost of feeding/ bird/N	235.44	228.51	220.45	212.31
Total cost of bird/N	150.00	150.00	150.00	150.00
Feed cost (N)/kg formulated feed consumed	58.00	58.00	58.00	58.00
Labuor & Exigencies (N)/bird	100.00	100.00	100.00	100.00
Total cost of production(N)/bird	485.44	478.51	470.45	462.31
Total weight gain/kg/bird	0.9974	1.0786	1.2037	1.3147
Feed cost (N)/kg weight gain/bird	236.05	211.86	183.14	161.49
Revenue (N)/bird	797.92	862.88	962.96	1051.78
Net returns(N)/bird	312.48	384.37	492.51	589.47

The result pertaining to the economic value of the diets indicates that it is more profitable and economical to partially replace soybean meal with bovine blood/rumen content mixture. Cost of feed produced and cost of feed consumed by birds significantly reduced ($p<0.05$) with increase in the level of BBRCM. Similarly, cost of producing a kilogram of weight decreased significantly ($p<0.05$) with increase in BBRCM inclusion in the diet. The reduction in the cost of diets containing higher levels of BBRCM is because the cost per kilogram of processed BBRCM was far cheaper than soybean at the time of the experiment.

Conclusion

The use of BBRCM to partially replace soybean meal in broiler ration has shown that high level of inclusion (60%) increases the weight gain and decreases feed intake. However, BBRCM can replace soybean in the diet at up 60% inclusion without any deleterious effects on the performance of the birds. BBRCM supplementation of the diets reduces the cost of production and increases revenue.

References

Adeniji AA, Balogun OO. Utilization of flavor treated blood-rumen content mixture in the diet of laying hens. *Nigeria Journal of Animal Production, 2002;* 29(1).

Bamgbose AM, Abimbola M, Olayemi WA, Orofonora AO, Oso AO, Ojo OT. Intake of tropical grass, legume and legume-

grass mixture in weaner rabbits. Proceeding of the 7th Annual Conference of Animal Science Association of Nigeria. (ASAN), 2002 .University of Agriculture Abeokkuta, Nigeria.

Broz J, Frigg KI. Influence of Trichoderma viridae enzyme complex on nutrient value of barley and oats for broilers. Archive Geflugelk, 1990; 54:34-37.

Dairo FAS, Aina OO, Asafa AR. Performance evaluation of growing rabbits fed varying level of rumen content and blood rumen content mixture. *Nigeria Journal of Animal production, 2006;* 32(1) 67-72

Ekwuoma C. The Chemical Composition of ruminal contents of cattle, sheep and goats B.Sc. project report, 1992; University of Agriculture Abeokuta, Nigeria.

Esonu BO, Iheukwumere FC, Iwuji TC, Akanu N, Nwugo OH. Evaluation of Microdesmis Puberula leaf meal as feed ingredient in broiler starter diets. *Nigeria Journal of Animal Production, 2001;* 30:3-9.

Esonu BO, Azubike JC, Emenalom OO, Etuk EB, Okoli IC, Ukwu HO, Nneji CS. Effect of Enzyme Supplementation on the performance of broiler finisher fed microdesmis puberula leaf meal. International Journal of Poultry Science, 2004; 3:12-14.

Haapapure ER, Barnard ND, Simon M. Review-Animal waste used as livestock feed: Danger to human health. Prev, Med., 1997; 26: 599-602.

Javanovic M, Cuperlovic M. Nutritive value of rumen contents for monogastric. *Animal feed science and Technology, 1997;* 2:351-380.

Kingori AM, Tuitock JK, Muiruiri HK. Comparison of fermented dried blood meal as protein supplements for growing pigs. *Tropical Animal Health and Production*, 1998; 30:191-196.

Kekeocha CC. Pifzer Poultry Production Handbook. Pfizer Corporation, Nairobi in association with Macmillan publisher, London, 1984

Madubuike FN. The effects of inclusion of graded level of Brewers Dried Grains (BDG) in the diet of early- weaned pig on their performance up to 10 week of age. Pakistan Journal of Biological Sciences, 1989

Obi IU. Statistical method of detecting methodological issue in laboratory and field experiments A.P. Co. Ltd Nsukka, 2002

Odunsi AA, Formi GO, Akintola JO. Influence of dietary wild flower (Tithonia Diversflolia Hend. A. Grony) leaf meal on layer performance and egg quality. *Nigeria Journal Animal production,* 1996; 23:28-32.

Okon BI, Olayoyin OO. Evaluation of Rabbit performance on millet bran as replacement for wheat brain. Proceedings of the 32nd Annual Conference of the Nigeria society for Animal production Calabar, 2007; 323-325.

Okonkwo AC, Oketola FA. Effect of dietary level of unprocessed and delulled sun flower seed meal on the performance of laying hens. *Nigeria Journal Production,* 1996; 23:24-27.

Okorie KC. The effect of Dried Pulverized Rumen content on the performance carcass and organ characteristics of finisher broiler. *Animal production .Research Advances*, 2005; 2:96-100

Oluyemi JA, Roberts FA. Poultry production in warm wet climate: Spectrum books Ltd (Rev). 2000

Opara CC. Studies on the use of Alcornia Cordifolia leaf meal as feed Ingredient in poultry diets. MSc .thesis Federal University of Technology, Owerri, 1996

Salami RI, Oyewofe SOO. Evaluation of Poultry Visceral offal meal as a substitute for fish meal in grower pullets diets. *Nigeria Journal .Animal Production*, 1997; 24:30-25.

Swan JE. Animal by-product processing. In Hui, Y.H. (ed), Encyclopedia food Technology, 1992; Vol. 4: 42-49.

Tackie AM, Flenscher JE. Nutrition value of wild Sorghum Fortified with Leacaena Lencocephala (Wh-Lam). Bulletin Animal Africa, 1995; 47:223-275.

Tuleun CD, Njoku PC, Yaakugh IDI. The performance of growing pullet fed Roxazyme in rice offal-based diets. Proceeding of the 26th Annual Conference Animal Science Association of Nigeria, Zaria, 2001; 219-221.

Whyte EP, Wadak I. Evaluation of rumen content on the growth performance of weaner rabbits. Proceeding 7th Annual Conference Animal Science of Nigeria (ASAN), September 16-19, 2002. University of Agriculture Abeokuta, Nigeria. Pp. 143-146.