Influence of bovine blood-rumen content meal in the diets of growing pullets on their subsequent laying performance

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ABSTRACT

Three hundred 8-week-old black Harco pullets were used to establish the optimum level of bovine blood-rumen content meal (BBRCM) that grower birds can tolerate, and its effects on the subsequent laying performance of test birds. At the growing phase, the experimental diets contained 0, 5, 10, 15, and 20 per cent BBRCM, while at the laying phase treatment birds were fed a common layer mash devoid of BBRCM. The performance of pullets at the growing phase was not influenced ($P>0.05$) by the inclusion of BBRCM. The rate of lay tended to increase with the increasing level of BBRCM in diets. The mean egg weights were comparable for birds on all treatments, except for the smaller eggs laid by the hens on the 20 per cent BBRCM diet ($P<0.05$).

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RÉSUMÉ

ADENIJI, A. A. & BALOGUN, O. O.: *Influence de la farine du sang bovin-contenu de rumen dans les régimes de poulettes croissantes sur leur rendement pondeur postérieur.* Un total de 300 poulettes de Harco noir ayant l'âge de huit semaines étaient utilisées pour déterminer le niveau optimum de la farine du sang bovin-contenu de rumen (FSBCR) que les volailles productrices pourraient tolérer et son effet sur leur rendement pondeur postérieur des volailles d'essai. A la phase productrice les régimes expérimentaux contenaient 0, 5, 10, 15, et 20 % de FSBCR, alors qu' à la phase pondeuse, les volailles de traitement étaient nourries de pâtée commune de pondeuses sans FSBCR. Le rendement de la phase de production des poulettes n'était pas influencé ($P > 0.05$) par l'inclusion de FSBCR. La proportion de ponte aussi avait la tendance d'augmenter avec l'augmentation du niveau de FSBCR dans les régimes. Les poids moyens d'œuf étaient comparables pour les volailles suivant tous les traitements, à l'exception des œufs pondus par les poules suivant 20 % de régime de FSBCR qui étaient plus petits ($P < 0.05$).

Introduction

Several low cost feedstuffs are locally available all year round. However, information on their feeding values, particularly to monogastric animals, is either scanty or lacking. Bovine blood-rumen content meal (BBRCM) is a novel feedstuff, processed from the mixture of blood and rumen content. The BBRCM is highly fibrous (18.71 %) and thought of as being of little or no nutritive value to non-ruminants. Its fibrous nature reduces the palatability of the diet which contains it. The BBRCM is a potential viable alternative protein supplement, and of economic importance in reducing the cost of poultry feed (Adeniji, 1996).

The blood and rumen content are considered as wastes which cause disposal problems in abattoirs. They are easy to process and are non-toxic when fed to poultry (Adeniji, 1996).

Therefore, this study aimed at establishing the optimum level of BBRCM that grower birds (8-18 weeks) can tolerate, and the effect of this ingredient fed at the growing phase on the

subsequent laying performance of the birds.

Materials and methods

The BBRCM is a meal from abattoir waste prepared by collecting the bovine blood and rumen content hygienically into separate containers at the abattoir immediately after slaughter. The bovine blood and rumen content were mixed at a ratio of 1:3 (w/w) after which it was boiled in a drum with constant stirring to semi-dryness which lasted about 2½ h. The boiled mixture was sun-dried until its moisture content was below 15 per cent. The BBRCM on analysis, had a crude protein value of 31.42 per cent, ether extract of 3.88 per cent, crude fibre of 18.71 per cent, and calculated metabolizable energy value of 2 686 Kcal/kg.

Three hundred 8-week-old black Harco pullets were randomly distributed into five treatment groups of 60 birds per treatment with three replicates of 20 birds each. The growing phase feed lasted for 10 weeks (8-18 weeks) during which birds were fed on five isonitrogenous and nearly isocaloric diets (Table 1). During the laying period, birds on all treatments were fed on a common layer mash (Table 2), which was devoid of BBRCM, to study the residual effect of the BBRCM fed at the growing phase. The laying phase lasted for 17 weeks (19-35 weeks).

The birds were fed and watered *ad libitum* throughout the study period, and the deep litter system of housing was adopted throughout. The initial and final live weights, weekly feed intake, and mortality were recorded. Egg performance indices such as age at first drop, egg production percentage, and egg weight were recorded. The method of AOAC (1980) was used for all proximate analysis. All data were subjected to statistical analysis appropriate for the randomized complete block design. Treatment means were compared by the Duncan's Multiple Range Test (Steel & Torrie, 1980).

Results

Table 3 shows the performance characteristics of

TABLE 1

Composition of Pullet Grower's Diets (kg/100 kg)

Ingredient	*1*	*2*	*3*	*4*	*5*
BBRCM	0.00	5.00	10.00	15.00	20.00
Dried brewer's grain	22.50	18.00	13.50	8.50	4.00
Maize	32.00	32.00	32.00	32.00	32.00
Maize offal	31.00	30.50	30.00	30.00	29.50
Soybean cake	10.00	10.00	10.00	10.00	10.00
Bone meal	1.50	1.50	1.50	1.50	1.50
Grits	1.00	1.00	1.00	1.00	1.00
Oyster shell	1.00	1.00	1.00	1.00	1.00
Salt	0.50	0.5	0.50	0.50	0.50
Vitamin-mineral premix*	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00
Crude protein (% analyzed	15.06	15.04	15.18	15.20	15.19
ME (Kcal/kg, calculated)	2661.70	2689.70	2703.42	2706.17	2699.04
Crude fibre (% analyzed)	5.45	5.88	6.41	7.03	7.70

*Agricare product which contains: vit A, vit D3, vit E, vit K, riboflavin, vit B12, pantothenic acid, nicotinic acid, choline chloride, folic acid, pyridoxine, biotin, phosphorus, calcium, selenium, iodine, copper, manganese, zinc, idiostart, terramycin, antioxidant and anticaking agent (percentage composition of the vitamins and minerals were not given by the manufacturers).

TABLE 2

Composition of Layers' Diet (kg/100 kg)

Ingredient	*Percentage*
Dried brewer's grains	21.20
Maize	35.00
Fish meal	1.50
Soybean cake	20.00
Bone meal	2.00
Oyster shell	7.50
Salt	0.50
Vitamin-mineral premix*	0.30
Total	100.00
Crude protein (% analyzed)	17.09
ME (Kcal/kg calculated)	2584.33
Methionine (% calculated)	0.29
Lysine (% calculated)	0.88

*Agricare product which contains: vit A, vit D3, vit E, vit K, riboflavin, vit B12, pantothenic acid, nicotinic acid, choline chloride, folic acid, pyridoxine, biotin, phosphorus, calcium, selenium, iodine, copper, manganese, zinc, iron, coccidiostart, terramycin, antioxidant, anticaking agent and yolk colourant (percentage composition of the vitamins and micronutrients were not given by the manufacturers).

grower pullets on the different BBRCM diets. A gradual increase in feed intake with the higher levels of BBRCM in the diets was observed. Growth rates were higher ($P>0.05$) in birds as the BBRCM level of their diet increased. Pullets on the 15 per cent BBRCM diet had the best ($P>0.05$) feed to gain ratio in this study. Values for the other diets were fairly close, with the exception of birds on the 20 per cent BBRCM diet (6.24). Only birds on the 10 and 20 per cent BBRCM diets had mortality of 3.33 and 6.67 per cent, respectively.

A reduction in the price of feed was observed with the increase in the levels of BBRCM in the test diets; the 20 per cent BBRCM diet had 16.24 naira/kg as the cost of feed. For the total cost of raising the pullets from day-old to point-of-lay, the 20 per cent BBRCM diet was better than the control.

Table 4 shows the effects of feeding graded levels of BBRCM on the laying performance of test pullets. Feed intake by birds increased ($P<0.05$) at the higher levels of BBRCM inclusion in their diets. A higher ($P<0.05$) feed intake was observed in the birds fed on the 20 per cent BBRCM diet (138.13 g/bird/day). This was not

TABLE 3

Performance of Grower Pullets (8-18 Weeks Old) on Different Levels of BBRCM

Performance characteristic	*BBRCM level*					
	0	*5*	*10*	*15*	*20*	*SEM*
Initial body wt bird (8th wk, g)	317	320	327	328	318	0.19
Final body wt/bird (18th wk, g)	928[b]	901[c]	939[b]	980[a]	933[b]	4.45
Feed intake/bird/day (g)	49.87[b]	50.91[b]	51.70[b]	52.20[b]	54.82[a]	0.62
Rate of wt gain/bird/day (g)	8.73	8.30	8.74	9.31	8.79	0.32
Feed/gain ratio	5.71	6.13	5.92	5.61	6.24	0.30
Mortality (%)	0.00	0.00	3.33	0.00	6.67	
Price naira/kg of diet	18.2	18.06	17.78	17.5	16.24	
Total cost of raising the birds (from day-old to point of lay)	371.2	368.31	364.50	361.88	359.55	

Treatment means in the same row followed by the same letter are not significantly different ($P>0.05$).
130 naira = $1

TABLE 4

Effects of Feeding Graded Levels of BBRCM on the Laying Performance of Test Birds

Parameter	*Treatment (level of BBRCM)*					
	0	*5*	*10*	*15*	*20*	*SEM*
Initial live weight (18 wks, g)	928	901	939	980	933	4.448
Final live weight (35 wks, g)	1710	1750	1700	1760	1740	0.513
Feed intake (g/bird/day)	119.71[b]	119.71[b]	128.2[a]	119.71[b]	138.13[a]	3.461
Age at first egg drop (days)	148	147	135	150	149	2.156
Egg production (% HDP)	48.91	46.69	50.27	50.39	53.85	3.241
Mean egg weight (g)	47.02[a]	47.20[a]	46.62[a]	47.81[a]	42.74[b]	2.619
Production at peak (days)	91.95	89.52	95.42	90.48	96.70	
Age at peak production (days)	238	238	231	231	231	
Feed efficiency (kg of feed/dozen eggs)	2.86	2.88	2.97	2.78	2.91	

Treatment means in the same row followed by the same letter are not significantly different ($P>0.05$).

significantly different ($P>0.05$) from the intakes by pullets on the 10 per cent BBRCM diet (128.26 g/bird/day). The age at first egg drop seemed comparable ($P>0.05$) for birds on all the treatment groups. Higher ($P>0.05$) hen-day production (HDP) of 53.85 per cent was recorded in pullets fed on 20 per cent BBRCM diet, which compared favourably with the rate of lay observed on the other diets, except for the birds on control and 5 per cent BBRCM diet (Table 4).

The mean egg weight seemed comparable for birds on all the treatments, except for the eggs laid by the hens on 20 per cent BBRCM diet that were significantly ($P<0.05$) smaller (42.74 g). Pullets on the 20 per cent BBRCM diet had the best percentage production at peak (96.70 %). Birds fed on higher levels of BBRCM diet reached peak production earlier in age. The test birds seemed to have used their feed efficiently, with a better feed efficiency of 2.78 for hens fed on 15 per cent BBRCM diet, while the hens on the 10 per cent diet had the poorest ($P>0.05$) value of 2.97.

Discussion

The gradual increase in feed consumption with the higher levels of BBRCM in diet agrees with reports of Shim *et al.* (1989) and Pond (1989) that feed intake is high on fibrous diets, which could have caused the very high feed intake by the pullets on 20 per cent BBRCM diet. The better growth rate observed in birds fed on the high fibre diets shows that grower birds can tolerate such diets and still have good weight gain. Hassan *et al.* (1993) made similar observations and reported that egg-type chicks can tolerate a high fibre diet when such diets are introduced after the 5th week of age. An average high feed/gain ratio was recorded in this study (5.71 in control and 5.98 in BBRCM diets). High fibre diets reduce feed/gain ratio (Kass *et al.*, 1980; Pond, Dickson & Itacheck, 1989), probably because it is the grower phase where growth rate tends to be reduced.

The reduction in the price of feed with increase in the level of BBRCM in the diet was a result of the cheap price per kg of the BBRCM feedstuff. The BBRCM can still be prepared at a total cost of N9/ kg, which is far cheaper compared with prices of most conventional protein supplements available.

At the laying phase, the feed intake was a bit higher than the 110 g/bird/day recommended by

NRC (1984). The high intake on the BBRCM diet might be to satisfy the nutrient requirement of hens with a high rate of lay. The better feed intake on the BBRCM diet at the growing and laying phases stimulated the better HDP in such diets compared with the control. Also, the birds on the BBRCM-based diets (except the 5 per cent BBRCM fed birds) had better initial body weight, resulting in good body conformation and development for egg production.

Speculations suggest an inverse relationship between the rate of lay and egg size. This might have caused the very low egg weight from hens on the 20 per cent BBRCM diet which had the highest rate of lay in this study. The BBRCM as a feedstuff supports good egg lay to a very high level, as can be seen from the production at peak by the hens on the 20 per cent BBRCM diet; they sacrificed their egg size for the high rate of lay. This small egg size could be improved by adding methionine to the layers' diet.

The trial had shown that grower birds can tolerate the 20 per cent level of BBRCM in their diets because the gastrointestinal tract might be more developed to handle the increased fibre contents; subsequently, a satisfactory laying performance was observed in the test hens.

The BBRCM is a potential feedstuff for livestock; it is cheap (N10/ kg) and easy to prepare (Adeniji, 2001). The BBRCM tends to be a promising feedstuff, particularly during the periods of scarcity and high cost of groundnut cake, soyabean cake, and other conventional protein concentrates.

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