EVALUATION OF BLOOD-RUMEN CONTENT MIXTURE IN THE DIETS OF STARTER CHICKS

A.A. ADENIJI and O.O BALOGUN

Department of Animal Production,
Faculty of Agriculture, University of Ilorin, Ilorin

Received 14 September 1999; Accepted 26 October 2000

ABSTRACT

A trial with 234 day-old Olympian Black pullet chicks was conducted for a duration of eight weeks to determine the optimum level of inclusion of Blood-Rumen content Mixture (BRC) in the diet of starter chicks. Chicks were fed *ad-libitum* starter diets containing 0, 5, 10, 15, 20% BRC and another 20% BRC diet containing no soya bean cake. Birds on all BRC-based diets had higher body weight gains and higher feed intakes than birds on the control diet. A progressive increase in feed: gain ratio was observed from 10%BRC to 20% BRC in the diets. The decline in the performance of chicks fed higher levels of BRC in the diet is suggested to be due to the high crude fiber content and possible amino acid imbalance of such diets. The results of this trial shows that starter pullets should not be fed more than 10% BRC.

Keywords: Pullets chicks, Blood-Rumen content (BRC), performance.

INTRODUCTION

The increase in the price of feed ingredients in developing countries has greatly reduced the rate of expansion of the poultry industry, which has further diminished the already low-intake of animal protein of its citizens. In order to arrest this trend, emphases have been directed towards the use of economical and efficient feeds such as abattoir wastes. This will allow savings in feed cost without reducing the nutritive quality of the ration. Recycling abattoir wastes can provide unconventional dietary ingredients as well as reducing disposal and pollution problems.

It has been reported that the livestock industry in Nigeria wastes up to 79,000 tonnes of inedible slaughter house by-products valued at about ₦2,026,785.50 annually (Anon, 1981). The author further indicated that about 14,000 tonnes of blood equal to 2,800 tonnes of bloodmeal or 2,400 tonnes of pure protein per year valued at about ₦461,957.00 are wasted. The need to make the fullest use of each slaughtered, dead or condemned animal for its great financial and sanitary advantage has long been recognized (Aganga and Aganga, 1985).

Adeniji (1996) put the estimated output of blood-rumen content from bovine and caprine sources from Nigeria abattoir at 9,634 tonnes and 18,067 tonnes per annum respectively. BRC at mixture is wet, bulky and difficult to dry particularly during the raining season. The rumen is rich in nutrients including food particles, micro-organisms and fermentation products (Church, 1973). The food particles (residues) may be considerably influenced by the type of diet fed to the ruminant and the time interval between feeding and slaughtering. The practice of pooling large quantities of waste material before processing would give uniform residue, which implies a more uniform chemical composition of the rumen content. In practice, however, the contents of the rumen and abomasums are still regarded as useless wastes products and considerable quantities are discarded. Thus, the trial investigated the use of blood rumen content mixture (BRC) from abattoirs in the diets of starter pullets.

TABLE 1: GROSS COMPOSITION OF STARTER DIETS (%)

Ingredient	DIET NO.					
	1	2	3	4	5	6
Blood-Rumen Content	0	5	10	15	20	20
Cassava Flour	3.00	0.00	0.00	0.00	0.00	0.00
Dried Brewer's Grain	34.83	24.27	19.57	12.63	5.48	26.15
Maize	35.00	30.00	24.00	20.00	18.00	25.00
Maize offal	12.57	26.13	31.83	37.77	41.92	24.25
Soybean Cake	10.00	10.00	10.00	10.00	10.00	0.00
Bone Meal	1.80	1.80	1.80	1.80	1.80	1.80
Furazolidone	0.05	0.05	0.05	0.05	0.05	0.05
Grits	1.00	1.00	1.00	1.00	1.00	1.00
Cyster Shell	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.50	0.50	0.50	0.50	0.50	0.50
Vitamin-mineral premix*	0.25	0.25	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00	100.00	100.00
Determined analysis:						
Crude Protein (%)	18.12	18.07	18.04	18.00	18.00	18.00
Crude fibre (%)	4.04	5.09	6.00	6.83	7.65	7.35
Calculated Analysis						
ME Kcal/kg	2663.91	2654.68	2637.06	2665.20	2725.89	2719.62
Methionine (%)	0.35	0.31	0.30	0.27	0.25	0.29
Lysine (%)	0.74	0.80	0.88	0.95	1.01	0.85
Calcium (%)	0.76	0.88	1.00	1.00	1.00	1.00
Phosphorus (%)	0.28	0.35	0.41	0.42	0.43	0.39
Cost of diet (N/kg)	17.80	17.72	17.60	17.55	17.42	14.11

*Pfizer product containing the following: Vitamin D₃, Vitamin E, Vitamin K, Riboflavin, Vitamin B₁₂, Nicotinic acid, Choline chloride, Folic acid, Pyridoxine, Biotin, Calcium, Selenium, Iodine, Copper, Manganese, Zinc, Iron Terramycin, Antioxidant and Anticaking agent.

MATERIALS AND METHODS

Bovine blood was collected into a clean container at slaughtering at the abattoir. A hygienic procedure in which a clean and disinfected container was placed just beneath the neck of the cattle for blood to flow into was employed. After the visceral has been brought out, the rumen split open and its content collected into another clean container. The blood and rumen content were mixed at a ratio of 1:3 (W/W). The mixture was boiled in a drum at about 100°C with intermittent stirring, which lasted for about two and half (2½) hours after which the mixture was semi

dried. The boiled mixture was sun-dried for about four days after which the moisture content was below 15%. The mixture was later ground.

The dry BRC was flavoured with curry at the rate of 200gm of curry per 100kg of BRC. This was done to mask the inherent odour of the BRC and improve its palatability (Adeniji and Balogun, 1992). Five maize-soybean based diets (Table 1) were compounded containing 0, 5, 10, 15 and 20% BRC inclusion, while the sixth diet also containing 20% BRC had no soybean meal. The six

BLOOD-RUMEN CONTENT MIXTURE IN DIETS FOR STARTER CHICKS

experimental diets were isoenergetic and isonitrogenous. The BRC used in this study contained, by analysis, crude protein (N x 6.25) value of 30.74%. The amino-acid content of BRC for lysine and methionine were 2.29 and 0.30% respectively as estimated from the reports of Alhassan *et al.* (1985). The metabolizable energy value for BRC at ratio 1:3 was estimated as 2686.42 kcal/kg based on reports of NRC (1984) and Amoo (1990) and the market price of BRC at the time of the study was ₦9/kg.

A total of 234 day-old Olympian black pullets were employed in the eight weeks trial, such that there were six equal treatment groups of 39 birds each. All treatments had three replicates of 13 birds each. The birds were raised in the conventional deck battery cage measuring 30cm x 60cm x 90cm per unit. The diets and water were given *ad libitum*

throughout the study period. Feed samples were analyzed for crude protein and fiber content according to the methods of A.O.A.C. (1980). Records of initial and weekly live weight, weekly feed intake, and mortality were kept for the computation of relevant response criteria. Data were subjected to statistical analysis appropriate for the completely Randomized Design (CRD) and, where significant, means were tested by the Duncan's multiple range test (Steel and Torrie, 1980).

RESULTS

The growth performance characteristics of the starter chicks fed different levels of BRC are presented in Table 2.

Throughout the eight weeks experimental period, only 3 birds died with one each occurring in diets containing 5% BRC, 20% BRC and the 20% BRC without soybean meal.

TABLE 2: ¹PERFORMANCE OF STARTER CHICKS ON DIFFERENT LEVELS OF BRC

Performance Characteristics	² BRC Level						SEM
	0	5	10	15	20	20WSI ³	
Initial body weight (g/bird)	30.25 ^a	31.00 ^a	30.25 ^a	31.63 ^a	31.38 ^a	32.50 ^a	0.0013
Final body weight (g/bird)	315.00 ^c	120.51 ^a	415.00 ^a	392.50 ^{ab}	351.28 ^{bc}	317.95 ^c	0.0313
Rate of gain (g/bird/day)	6.09 ^b	6.96 ^a	6.87 ^a	6.44 ^{ab}	5.71 ^{ab}	5.10 ^b	0.0402
Feed Intake (g/bird/day)	25.50 ^c	29.34 ^a	28.25 ^b	28.47 ^{ab}	26.95 ^a	29.50 ^a	0.1493
Feed/gain	5.01 ^b	4.22 ^{cd}	4.11 ^d	4.42 ^{cd}	5.78 ^a	5.78 ^a	0.1134
Price ₦/25kg of diet	445.00	443.00	440.00	438.75	435.50	352.75	
Feed cost/Kg	89.19 ^a	74.75 ^{bc}	72.36 ^c	77.53 ^{bc}	82.18 ^b	81.65 ^a	1.3450
Body weight gain (₦)							
Total cost of raising the birds (Day-old-8 weeks) (₦)	150.42 ^b	154.11 ^c	152.84 ^b	152.98 ^{ab}	151.29 ^a	148.31 ^a	

¹Treatment means in the same row followed by different superscripts are significantly different (P<0.05).

²BRC = Blood Rumen Content; ³WSI = Without Soyabean Inclusion

On post mortem examination, non-specific enteritis was diagnosed. The feed intake were comparable for all diets except for birds on diets with 0%BRC and 20% BRC that were significantly low ($P<0.05$). Birds on 20% BRC without soybean diets had the highest feed intake of 29.50g/bird/day. Weight gain linearly ($P<0.05$) decreased with increasing level of BRC in the starter diets. Birds fed on the 5% BRC diet exhibited the highest weight gain which was not significantly different from those fed on 10, 15 and 20% BRC. An interesting observation in the trial was the satisfactory level of the performance of the birds on 20% BRC as the sole protein concentrate, despite their low ($P<0.05$) weight gain among the BRC based diets. An economic feed and gain ratio of between 4.11 and 4.72 were recorded for birds fed on maize – soybean – BRC diets. There was a significant effect of diets on the feed to gain ratio ($P<0.05$) with the birds on 20% BRC without soybean diet having the highest feed to gain ratio. A better feed to gain ratio was observed on all diets at the 8th week of age. There were savings in the cost of feed as the inclusion level of BRC increased in the diets ranging from ₦445/25kg of feed in the 0% BRC to ₦352.75/kg/25kg in the 20% BRC diet without soybean inclusion. Based on the economy of producing a kilogramme of body weight, the 10% BRC diet was the cheapest feed, while the 0% BRC diet was the most expensive.

DISCUSSION

The low mortality (i.e. 1.28%) recorded over a period of 56 days coupled with the result of the post mortem examination suggest that the BRC as a feed ingredient when well processed is not harmful to birds. In view of the high correlation between feed intake and weight gain, the fairly high feed to gain ratio obtained was due to the increased fibre level of the diets and possible amino-acid imbalance of such diets. The BRC as a feed ingredient has a high fibre of 19.48% which was evident as the crude fibre percentage of the diets

proportionally increased as the inclusion levels of BRC in the diets also increased. It has been shown that with increasing fibre content in ration, there is reduction in feed intake, time for the process of digestion and absorption (short transit time), efficiency of feed conversion and body weight of birds (Jenson, *et al.*, 1962, and Miles *et al.*, 1988). This implies that the high fibre content of the diets reduced the level of the nutrient utilization by the birds.

Although a better feed to gain ratio was obtained at the 8th week of age in all the test birds which implies that the birds were getting to tolerate the high fibre level of the diets or physiologically adjusting to the status of the diets. This seems to suggest that the grower birds would likely tolerate BRC diets better than the starter chicks, because at the grower stage, the birds would have a more developed gastro intestinal tract to handle the high fibre content of the diets.

The overall poor performance of birds on the 20% BRC diets without soybean, suggest that it is not economically advantageous to omit soybean from the maize – BRC based starter ration. Hence, BRC should not be used as the sole protein supplement in starter chicks ration. In situations where soybean meal and other protein concentrates are expensive or unavailable, BRC may be used solely to obtain reasonable growth rates. BRC would also be a good source of protein concentrate in improving the nutrition of the local chickens.

The results therefore show that with starter pullets, the 10% BRC level is the optimum level which can be tolerated. This agrees with reports by Williamson and Payne (1978) that dry rumen content can be used in poultry feeds in amounts up to 10% of the total ration. Also using the dry poultry manure, Biely and Stapleton (1976) suggested that they can be incorporated at 10% level into a chick starter diet.

BLOOD-RUMEN CONTENT MIXTURE IN DIETS FOR STARTER CHICKS

REFERENCES

- ADENIJI, A.A. (1996): The value of bovine blood-rumen content meal as a feedstuff for pullets. Ph.D. Thesis, University of Ilorin, Pg. 127-130.
- ADENIJI, A.A. and BALOGUN, O.O. (1992): Utilization of blood-rumen content mixture in the performance of laying hens (Unpublished work).
- AGANGA, A.O. and AGANGA, A.A. (1985): Prospects of abattoir by-products utilization in Nigeria? A review *Vet. Spectrum* 1 (1):8-11
- ALHASSAN, W.S. LUFADJEU, E.A. and BELLO S.A. (1985): The potential of dry ruminal content-blood mixture as feed for ruminants. Proceeding of the Annual Conference of Nigerian Society of Animal Production, Ife. Pg. 61.
- AMOO, A.K. (1990): Protein and energy values of rumen content and a mixture of rumen content and bovine blood in broilers. *Bachelor of Agric. Project*. Dept. of Animal Production, University of Ilorin.
- ANON (1981): \$1.1 million livestock by-products wasted annually in Nigeria. *Business Times*, 8th June, pg. 32.
- ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS (1990): Official methods of Analysis (13th Ed) Washington, D.C.
- BIELY, J. and STAPLETON, P. (1976): Recycled dried poultry wastes in chick starter diets. *Br. Poultry Sci.* 17:5-12.
- CHURCH, D.C. (1973): Digestive Physiology and Nutrition of Ruminants Vol. 1. Digestive physiology published by D.C. Church Pg. 151-187.
- JENSON, L.S., MERRIL, L.H. REDDY, C.V. and MCGINNIS, J. (1962): Observation on eating patterns and rate of food passage of birds fed pelleted and unpelleted diets *Poultry Sci.* 41:1414-1419.
- MILES, C.W. KELSAY, J.L. and WONG, N.P. (1988): Effect of dietary fibre on the metabolizable energy of human diets *J. Nutrition* 118:1075-1081.
- N.R.C. (1984): Nutrient Requirement of Poultry. 8th Ed. National Academy of Science. Washington, D.C.
- STEEL, R.G.D. and TORRIE, J.H. (1980): Principles and Procedures of Statistics. McGraw-Hill Book Co. Inc. New York.
- WILLIAMSON, G. and PAYNE, W.J.A. (1978): An Introduction to Animal Husbandry in the tropics. Pg. 705. Low Priced Ed. Longman Group Ltd. Hongkong.