Utilisation of flavour treated blood-rumen content mixture in the diets of laying hens

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Abstract

One hundred and ninety-two Harco laying hens were employed in a feeding trial lasting 42 days, to determine the optimum inclusion level (8 or 12%) of Blood-Rumen content mixture (BRC) treated with four different flavouring agents i.e. meat broth, curry and vanilla. The interaction of the BRC and flavouring agents resulted in better egg weight. The 12% inclusion of BRC in the diet resulted in higher ($P < 0.05$) yolk colour. The body weight gain and the shell thickness also tended to increase with the increase in the BRC level of the diets. The laying trial showed that the 8% BRC diets resulted in a significantly ($P < 0.05$) higher Hen Day production percentage (HDP) than the 12% BRC diets (82.01 vs 77.73). Curry flavouring agent gave the best HDP ($P < 0.05$).

Keywords: Blood-rumen content, flavouring agents, hen day production

Introduction

A major problem of poultry in the under-developed countries today, apart from the incidences of disease is that of high cost of feeds, arising from high cost of feed ingredients, particularly the protein concentrates. This problem has tended to reduce the rate of expansion of the poultry industry and has added to the low-level of animal protein nutrition of their citizens. Efforts to reduce the high cost of feeds and therefore the cost of poultry products have concentrated on using feeds formulated from available and cheap alternatives and/or unconventional foodstuffs.

Research into the use of cheaper industrial by products and wastes at various levels of dietary inclusion for poultry has therefore been intensified in the last few years to determine

their efficiency of utilization in terms of growth and production (Din *et al*, 1979; and Longe and Adetola, 1983). Blood Rumen content (BRC) is an animal waste that can be converted to high quality protein source in terms of egg, milk and flesh.

BRC as a feed ingredient has a repulsive odour, whose palatability and acceptability by poultry and other livestock species need be enhanced by its treatment with flavouring agents. Also there is little or no information on the optimum dietary inclusion level of BRC that laying hens would tolerate and to also determine which flavouring agent will best enhance its utilization by test layers.

Materials and methods

Bovine blood was collected into a clean container on the slaughtering slab at the time of

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slaughtering. After the visceral has been brought out, the rumen was split open and its contents collected into another container. A mixture of the materials was made at a ratio of 1 of blood to 4 of rumen content (W/W) after which it was boiled in a drum with constant stirring to semi-dryness, an operation that requires about 2½ hours. The boiled mixture was sundried until the moisture content of the material was below 15%. The dried blood-rumen content mixture (BRC) was ground and treated with flavouring agent at the ratio specified below.

1. 5 litres of meat broth/100kg of BRC
2. 5 litres of fish broth/100kg of BRC.

3. 200g of curry/100kg of BRC.
4. 200ml of vanilla/100kg of BRC.

One hundred and ninety-two, 35 weeks-old Harco laying hens were employed in this study. They were fed the experimental diets shown in Table 1. The diets, which were isonitrogenous and isocaloric, consisted of a 2X4 factorial combination of dietary levels of BRC (8 or 12%) and four flavouring agents (meat broth, fish broth, curry or vannilla). Thus, there were weight treatments, each with 3 replicate pens of 10 birds. Water was given in excess. The feed intake was pegged at 130g feed/bird/day for all treatment throughout the six weeks trial period.

Table 1 *Composition of layers diets (g/kg)*

Ingredient	1	2	3	4	5	6	7	8
BRC + Meat broth	80.0	0.0	0.0	0.0	120.0	0.0	0.0	0.0
BRC + Fish broth	0.0	80.0	0.0	0.0	0.0	120.0	0.0	0.0
BRC + Curry	0.0	0.0	80.0	0.0	0.0	0.0	120.0	0.0
Groundnut Cake	20.0	20.0	20.0	20.0	18.1	18.1	18.1	18.1
Maize	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Maize offal	395.0	395.0	395.0	395.0	356.9	356.9	356.9	356.9
Soybean cake	200.0	200.0	200.0	200.0	200.0	200.0	200.0	200.0
Bone Meal	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Oyster shell	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
Salt	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vitamin mineral premix*	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
<i>Calculated analysis</i>								
Crude protein (g/kg)	180.0	180.0	180.0	180.0	180.0	180.0	180.0	180.00
Crude fibre (g/kg)	83.5	83.5	83.5	83.5	93.3	93.3	93.3	93.3
ME (MJ/kg)	11.75	11.75	11.75	11.75	11.75	11.92	11.92	11.92
Methionine (g/kg)	3.4	3.4	3.4	3.4	3.8	3.8	3.8	3.8
Lysine (g/kg)	12.5	12.5	12.5	12.5	13.8	13.8	13.8	13.8

* Vitamin-mineral premix contained the following (g/kg): Vitamin A-4, 000,000,; Vit, D3-1,000,000IU,; Vit E-6.00g; Vit K- 080 Vit., B2-2.00g; Nicotinic acid-12.00g; Calcium D-Pantothenate-4.00g; Vit. B12-4.80mg; Folic acid-0.40g; Biotin-0.02g 40.00g; iron-20.00g; Zinc-18.00g; Copper-0.80g. Iodine-0.62g; Cobalt0.80g. Iodine-0.62g; Cobalt-0.09g and Selenium-0.04g.

Blood-rumen content as feed for laying hens

The BRC used contained by analysis a crude protein (NX 6.25) values of 35.02%, an estimated metabolizable energy value of 11.2MJ/kg, ether extract of 5.79% and crude fibre of 15.48%.

During the experimental period, records of initial and final live weight of hens, mortality, daily feed intake, egg production, number of cracked eggs and egg weight were kept. Six eggs per replicate on weekly basis were randomly selected, cracked open and egg quality measurements (Haugh unit, yolk index, yolk colour and eggshell thickness) determined. All data collected were subjected to statistical analysis appropriate for a factorial design. Where treatment means were subjected to Duncan's multiple-range test and the means of the two factors were compared using the student's t-test. (Steel and Torrie, 1980).

Results

Throughout the study period only a bird died, which occurred on the diet containing 12% BRC with fish broth flavouring agent. The total

number of cracked eggs collected were 32, with an equal number of cracked eggs collected both in the 8% and 23% BRC diets. Overall, meat broth treated 12% BRC diet had the highest amount of cracked egg (8) collected during the trial period.

The production performance data for the experimental period are presented in Table 2. There was a decrease in HDP as the inclusion level of BRC was increased from 8% to 12% in the diets ($P, 0.05$). There was also a significant variation in HDP associated with the different flavours HDP for birds fed diets with curry flavour was comparable to those fed diets with meat broth, but significantly higher than those fed diets with fish broth or vanilla ($P < 0.05$).

There seemed to be a direct relationship between body weight gain and the inclusion level of BRC in diet. The birds on 12% BRC diets had a higher weight gain (35.42g) than those on 8% BRC diets (26.34g). There was no significant interaction of factors on the body weight gain obtained. Averaged over the BRC

Table 2 *Effects of dietary levels of BRC and various flavours on performance of laying hens*

Dietary factor	HDP(%)	Egg wt. (g)	Body wt. gain (g)	kg of feed/dozen eggs
Levels of BRC (%)				
8	82.01 ^b	60.58 ^a	26.34	1.91 ^a
12	77.73 ^a	61.42 ^b	35.42	2.02 ^b
SEM	11.72	2.32	4.54	0.03
Flavours (F)				
Meat broth	80.84 ^{ab}	60.90 ^{ab}	37.67 ^{bc}	1.94 ^a
Fish broth	78.24 ^a	61.26 ^b	38.34 ^c	2.02 ^b
Curry	82.08 ^b	60.34 ^a	30.84 ^b	1.91 ^a
Vanilla	78.33 ^a	61.51 ^b	16.67 ^a	2.00 ^b
SEM	5.20	1.39	5.03	0.05
BRC X F (Interaction)	NS	SG	NS	NS
SEM	4.29	1.50	9/34	0.45

Means in the same column not followed by the same letter superscript are significantly different ($P < 0.05$).

NS - Not Significant SG - Significant.

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levels, fish broth treated diets had the highest body weight gain (38.34g) while vanilla treated diets had the lowest weight gain of 16.67g. Birds on the 8% BRC diets, irrespective of the flavouring agent used gave a better kilogramme of feed per dozens of eggs (1.19) than the 12% BRC diets with a value of 2.02. Birds on curry flavoured diets displayed the best efficiency of egg production value of 1.91.

The birds were fed 130g of feed/bird/day. From observation birds on 8% BRC treated with vanilla flavouring agent had a better appetite for their feed which they fully consumed before 15.30hr.

Table 3 shows the record of egg internal quality measurement. Yolk index values for the diets were fairly comparable, with the birds on the 8% BRC diets having a lower ($P>0.05$) yolk index value (0.420) than eggs obtained from birds on the 12% BRC diets (0.43). A significant ($P<0.05$) increase in yolk colour

development was observed with the increase in the inclusion level of BRC in diet. There were no significant effect of dietary treatments on the haugh unit and shell thickness values obtained. But, there tended to be an increase in eggshell thickness as the level of BRC in the diet increased.

Discussion

BRC as a feedstuff can be said to be non-toxic with little, if any, harmful effect as judged by the mortality rate. The low incidence of egg cracks reflects the satisfactory thickness of the eggshells.

The decrease in HDP reported with the increase in the inclusion level of BRC in diet, signifies that layers tend to tolerate and produce eggs better on 8% BRC in diets than the 12% BRC diets. This may be due to the increase in the amount of dietary fibre as the BRC increased in the diet, whereby egg production is decreased.

Table 3 *Effects of dietary effect levels of BRC and various flavours on egg quality parameters*

Dietary Factor	Yolk Index	Yolk Colour Score	Haugh Unit	Shell Thickness
		Score		(mm)
Level of BRC (%)				
8	0.42	4.79 ^b	58.13	0.50
12	0.43	3.82 ^a	57.84	0.52
SEM	0.0051	1.19	0.35	0.03
Flavours (F)				
Meal broth	0.43	4.28	59.01	0.48
Fish Broth	0.43	4.19	55.71	0.52
Curry	0.43	4.28	58.76	0.52
Vanilla	0.43	4.48	58.45	0.52
SEM	0.0027	0.14	1.88	0.02
BRCXF (Interaction)	NS	NS	NS	NS
SEM	0.01	0.36	2.88	0.01

Means in the same column not followed by the same letter superscript are significantly different ($P<0.05$)

NS - Not Significant

Blood-rumen content as feed for laying hens

The increase in egg weight observed with the increase in BRC level of diet might be due to the improved body weight of birds as the BRC level of diet increased, also there was an interaction of the BRC and the flavouring agent. This suggests that the inclusion of a higher level of BRC in layer diet would bring about heavier eggs. Interestingly enough, birds on all the experimental diets gained body weight.

The feed intake was pegged at 130g/bird/day because feed consumed by the test birds had already exceeded the 110g/bird/day recommended for layers (NRC, 1984; and Oluyemi and Roberts, 1985). The flavouring agents used in treating the BRC mixture to mask its inherent odour has improved the feed intake of the hens (130g) in this study compared with the reports of Bamgbose (1991) and Ibigbemi, (1991) in which feed intake values of 94 and 98g/bird/day were reported for hens on the 8 and 12% BRC diets respectively. The flavouring agents seemed to have stimulated an increase in feed intake by the layers whose effect could be due to smell or taste.

Birds on 8% BRC with vanilla flavouring agent had a poor feed to weight gain ratio because the birds had the highest appetite and as a result would have finished their feed as early as 15.30hr after which they would be left with nothing to eat for the rest of the day. Since it takes about 3 to 4 hours for feed to pass through the digestive tract of poultry, it implies that by 20.30hr the digestive system of the birds on this diet would be almost empty. For the fact that layers need nutrient for their egg formation, they probably call on their body reserves for this function. This also reflected in their low HDP of 78.47% compared with the results from other diets.

The values for the yolk index and haugh unit were highly comparable for all the diets. The effect of BRC level on the yolk colour development agrees with reports by Bamgbose (1991) and Ibigbemi (1991). Littlefield *et al*, (1973) and Faruga *et al*, (1974) also reported that yolk colour was improved by the inclusion of cattle waste in layers diet. The rumen content is a good source of vitamin A. This is because the feed of ruminant is predominantly green pastures which are sources of b-carotene (vitamin A precursor).

The Inclusion of BRC at high levels depressed laying performance with similar observation made by Serfontein (1947) in respect to the inclusion of blood meal in the diets of laying hens. The performance indices employed in this study indicate that the inclusion of 8% BRC fortified with curry flavouring agent can be recommended as the adequate level of this by-product in diets of laying hens. Curry is readily available and is devoid of drying problems, whereas broths and vanilla are wet and would need drying. The 8% BRC gave a better HDP probably due to the reduced fibre level of such diets.

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