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Performance evaluation of growing rabbits fed varying levels of rumen content and blood rumen content mixture.

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Abstract

A total of 42 growing rabbits of different crossbreeds with initial average weight of 1.20 kg were fed rations in which rumen content (RC) and blood-rumen content (BRC) proteins were substituted for groundnut cake protein in a completely randomized design. They were grouped into 7 treatments of 3 replicates, each containing 2 rabbits. They were fed RC and BRC in a practical diet at 0,10,20 and 30% dietary inclusion levels for 56 days. The average daily feed intake (ADFI), average daily weight gain (ADWG), feed conversion ratio (FCR) and protein efficiency ratio (PER) were not significantly influenced (P>0.05) by the treatments. The dry matter and protein digestibility coefficients were significantly (P<0.05) affected. The feed cost per kg diet and feed per kg gain were significantly (P<0.05) influenced. Among the internal organs evaluated, the liver and kidney weights, small intestine and caecum length were also significantly (P<0.05) influenced. The dressing percentage was also affected significantly (P<0.05). The study showed that RC and BRC could be influenced at 30% dietary inclusion in growing rabbit's ration without deleterious effect. However, further investigation into long-term effect of feeding on the organs of the animal is suggested.

Key words: Rumen content, blood rumen content, growing rabbit diet.

Introduction

Rumen Content (RC) is one of the abattoir by-products that could be environmentally unfriendly if not properly handled. The rumen being the vat where fermentation of roughages take place contains micro-organisms such as the phycomycetous fungi, protozoa, bacteria and others that are involved in this process (Preston, 1991). Investigations had revealed the compositions and potentials of rumen content and blood-rumen content mixture as good source of protein in monogastric ration (Mann, 1984; Dairo and Aina, 2000; Adeniji and Balogun, 2001, 2002). As a result of variation in the chemical composition of the pasture, rumen environment and species, Ekwuoma (1992) elucidated clear differences between the rumen content of cattle, sheep and goats. The crude protein range of 9-20% had been reported for RC (Ekwuoma, 1992; Adeniji,1996; Whyte and Wadak 2002).

The availability of the rumen content in the Nigeria abattoir could be a good source of protein in livestock feed if properly processed and harnessed. Adeniji (1996) estimated the rumen content of bovine origin output in Nigeria abattoir to be 9,634 tonnes while 18,067 tonnes per annum could be obtained from caprine sources. This study therefore, investigated the performance of growing rabbits fed rations in which RC and blood-rumen content (BRC) mixture replaced groundnut cake.

Materials and Methods

Preparation of experimental diet

Bovine rumen content and blood were collected from the main abattoir in Ikorodu town while slaughtering of the animals was in progress. The rumen was split open with the aid of a sharp butcher's knife and the content emptied into a 50L plastic vat. When filled up, the rumen content (with fluid) was emptied into a plastic bucket to drain. The drained RC was divided two halves. One-half was mixed with fresh bovine blood collected from the abattoir after partial drying on the second day, by wearing rubber gloves in another 100L vat in ratio 1:4 as described by Mann (1984).

The mixing took sometime as the blood coagulated. This notwithstanding, a thorough mix of blood- rumen content was obtained. The RC and BRC mixture bags were immediately transported in thoroughly washed and dried bags to the Lagos State Polytechnic Farms.

The RC and BRC were sun-dried on a concrete floor to about 12% moisture. This was possible because the experiment was carried out during the harmattan season. The RC and BRC were properly shredded after the removal of foreign objects to allow for proper milling and mixing with other feed ingredients.

Experimental design and animal management

RC and BRC were used to replace GNC at 0,10,20 and 30% with a common control diet in a completely randomized design containing dietary treatments. (Table 1). A total of 42 growing rabbits of different crossbreeds with initial average weight of 1.20 kg and 18 weeks of age were divided into 7 treatments each. Each replicate contained 2 male or female rabbits. The rabbits were housed in 21 hutches of 90 cm x 91 cm x 98 cm dimension that had been thoroughly cleaned and disinfected 2 weeks before their arrival. They were given vitamins and coccidiostat on arrival and later dewormed. They were allowed an adjustment period of 14 days and weighed on replicate basis before the commencement of the experiment that lasted 56 days.

Data collection and proximate analysis

The average feed intake and body weight gain were monitored on weekly basis. The feed conversion ratio, and protein efficiency ratio were computed from these data. The feed cost per Kg feed and gain were also monitored. The RC and BRC were obtained free, however, transportation and handling charges were estimated based on ₦200 man hour/day. The cost per Kg of RC and BRC were ₦2:00k per Kg and ₦3.00k per Kg as at 1999 when this study was carried out. The test feedstuffs, the experimental diets and faeces were subjected to proximate analysis according to AOAC (1990) methods. The M.E of RC and BRC were estimated and adapted for rabbit using Pauzenga (1985) formula; ME = 35 x CP % + 81.8 x EE% + 35.5 x NFE. This is because rabbit is not a ruminant and thrives well on poultry feed with adequate energy.

Table 1 Composition of experimental diets

Ingredients	% Replacement of GNC by RC				% Replacement of GNC by BRC		
	0	10	20	30	10	20	30
Maize	39.75	33.95	28.90	22.84	39.76	39.52	39.28
Palm Kernel Cake	22.00	26.00	27.00	28.00	23.00	24.00	24.00
Wheat Offal	24.25	23.00	22.00	20.00	23.00	22.00	22.00
GNC	12.00	10.80	9.60	8.40	10.80	9.60	8.40
Rumen Content	-	4.25	8.50	12.76	-	-	-
Blood rumen content	-	-	-	-	1.44	2.88	4.32
Fixed Ingredients*	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Total (kg)	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Determined Analysis (%)							
Crude Protein	17.23	17.31	17.00	16.64	17.35	17.08	17.41
Crude Fibre	7.30	7.59	7.99	10.01	6.61	7.10	7.11
Fat	5.63	4.99	5.27	6.11	5.41	5.68	6.23
ME (Kcal/Kg)	2613.79	2560.53	2545.0	2643.57	2613.56	2568.80	2602.20

*Fixed Ingredients supplied the following per 100kg diet: 0.25 lysine; 0.25 methione; 0.25 Premix; 0.225 salt; 1.50 oyster shell; Premix supplied the following per kg diet: Vit. A 3.2 x 10^6 I.U; Vit D 8.0 x 10^5 I.U; Vit E 2.4 x 10^3 I.U; Vit B_1 400 mg; Vit B_3 300mg; Vit B_2 800mg; B_6 400 mg; B_{12} 3mg; Niacin 6000mg; Panthothenic acid 1000mg; Folic acid 140mg; choline chloride 5.75 x 10^4 mg; Zn 1.6 x 10^5 mg; 1,480 mg; Co 85mg; Etoxyquine 650mg.

Digestibility trial

Digestibility trial was carried out during the 23-28 day and 52-56 daysfor all the rabbits. Polythene sheet were tied to the four legs of the rabbits so that they are suspended. Total collection method was adopted. On the 4th day of each trial, faecal samples were weighed, dried in the Gallenkamp oven at 50° C for 2 days; weighed again and samples taken for proximate analysis in aluminium foil.

Carcass evaluation

Two rabbits in a pool of 6 were slaughtered. The skin removed and cut into parts. The carcass weight and the cut parts value were also subjected to statistical evaluation.

Statistical analysis.

All the data collected were statistically analyzed by ANOVA. The Duncan Multiple Range Test (DMRT) was used to separate the means as described by Steel and Torrie, (1980).

Results and Discussion

Rumen content (RC) was analysed to contain 92.83% DM; 17.13% CP; 7.49% ash; 2.81%

Table 2 Performance characteristics and production efficiency of rabbits fed diets in which GNC protein was replaced with RC and RB.

	% Replacement of GNC by RC				*% Replacement of GNC by RB*			
Parameters	**0**	**10**	**20**	**30**	**10**	**20**	**30**	**SEM**
Average Daily Feed Intake (g)	80.53	81.64	78.16	72.55	74.05	78.29	79.71	9.00
Average Daily Body Gain (g)	42.76	45.36	45.16	44.80	44.32	44.66	44.67	1.20
Feed Conversion Ratio (FCR)	1.87	1.80	1.73	1.62	1.67	1.75	1.78	0.20
Protein Efficiency Ratio (PER)	3.08	3.21	3.39	3.63	3.45	3.34	3.21	0.30
Feed Cost per Kg (₦/Kg.)	18.25^{a}	16.23^{c}	15.55^{d}	17.75^{b}	17.21^{b}	16.64^{c}	16.64^{c}	1.70
Feed Cost per Kg gain (₦/Kg.)	64.56^{a}	54.78^{b}	51.95^{c}	59.63^{b}	54.05^{b}	50.76^{c}	50.92^{c}	6.70
DM digestibility %	86.62^{a}	58.99^{c}	59.19^{c}	54.37^{c}	64.91^{bc}	69.80^{b}	58.54^{c}	8.05
CP (N x 6.25) digestibility	76.16^{a}	69.13^{b}	57.23^{d}	52.61^{e}	61.97^{c}	71.11^{b}	57.46^{d}	3.51

Means with different superscripts on the same row differ significantly (P < 0.05)

ether extract; 24.58% CF and 40.82% N.F.E., Blood rumen content (BRC) contained 94.98% DM; 33.81% CP; 19.27% CF; 16.13% ash; 4.27% ether extract and 21.50 N.F.E. The estimated M.E for RC and BRC are 2278.50 and 2295.89 Kcal/Kg respectively.

The growth performance indices of the rabbits are indicated in Table 2. The average daily feed intake (ADFI), average daily body weight gain (ADWG), feed conversion ratio (FCR) and the protein efficiency ratio (PER) were not significantly (P>0.05) influenced by the dietary levels of RC and BRC. However, the dry matter digestibility coefficient was highest for the control diet (86.62%). It significantly (P<0.05) increased from 10% to 20% RC and BRC respectively. The DM digestibilities were optimum at 20% RC i.e. 59.19% and 20% BRC i.e. 69.80%.

The crude protein digestibility was highest for the control diet i.e 76.16%. This significantly decreased (P<0.05) from 10% RC to 30% and also from 10% BRC to 30%.

The feed cost per Kg and feed cost per Kg gain significantly decreased (P<0.05) as the dietary level of RC and BRC increased. The control diet had the highest feed cost per Kg of ₦18.25 and the lowest was recorded by rabbits fed 20% RC. Rabbits on 20% BRC had the best feed cost per Kg gain (N50.76 per Kg).

The dressing percentage of the rabbits was significantly (P<0.05) affected by RC and BRC. Rabbits on 20% RC had the highest dressing percentange of 59.03% while those on 30% RC recorded the lowest i.e. 51.61%. The liver and kidney weights, the small intestine and the caecum length were significantly affected (P<0.05) by the inclusion of RC and BRC. Rabbits on 30% RC recorded the highest liver

weight 3.60 g and the lowest on the control 2.62 g. The diet with 30% BRC inclusion had the highest kidney weight of 0.69 g and 20% RC recorded the lowest (0.28 g). Similarly, the small intestine and the caecum length were both significantly highest in 20% and 30% BRC and lowest in 30% RC respectively.

The proximate composition and M.E estimate of the RC and BRC were similar to results obtained by Ekwuoma, (1992), Adeniji and Balogun (2001) while Mann, (1984) reported a gross energy of 4.467 Kcal/g DM. Variation in the proximate values is obvious as this may be affected by the chemical composition of the type of pasture consumed and specie differences. The ADFI, ADWG, FCR and PER were not influenced significantly. Rabbits are pseudoruminants with capacity to handle high fibre feedstuffs. This obviously was responsible for the observed result as the crude fibre levels in the diets were still within limit for rabbits. This result conforms with the report of Whyte and Wadak (2001) who also reported no significant effect of RC on ADFI in weaner rabbits but contrary to the observation of Adeniji and Balogun (2001, 2002) on poultry.

The DM Digestibility was highest at 20% BRC. Even among the rabbits fed RC, 20% inclusion recorded the best digestibility. The optimum DM digestibility at 20% BRC may not be unconnected with the blood mixture. Blood contain nutrients (and one of the blood cells components lyzosomes have enzymes) that may serve as a good medium for the proliferation of protozoa and other bacteria involved in the lytic process of the rumen of the rumen contents, which are predominantly secondary cell wall ingested by ruminant. The cell content of the RC therefore becomes available to all the micro-organisms involved in the fermentation process for their own growth and also the rabbits. Hence the rabbit can utilize both the microbes and the secondary cell wall contents. Treatments with 10%, 20% and 30% BRC recorded better DM digestibility values than their corresponding

Table 3: Carcass evaluation of rabbit fed diets in which GNC protein was replaced with RC and BRC protein

PARAMETERS	% Replacement of GNC by RC				% Replacement of GNC by RB			
	0	10	20	30	10	20	30	SEM
Live weight (g)	2002.00	1901.59	2130.67	2054.33	2107.34	2007.00	2083.00	10.19
Dressed weight (g)	1118.75	1041.25	12578.84	1060.27	1110.16	1107.26	1151.31	8.03
Head (g)	7.24	5.37	7.69	6.30	6.21	6.64	6.36	1.20
Dressed Wt (%)	55.88^{b}	54.75^{bc}	59.03^{a}	51.61^{c}	52.68^{b}	55.17^{b}	55.27^{b}	3.50
Liver weight (g)	2.62^{b}	3.16^{b}	3.41^{b}	3.60^{a}	3.00^{a}	2.68^{c}	3.57^{a}	0.81
Kidney weight	0.47^{b}	0.41^{b}	0.28^{b}	0.32^{b}	0.61^{a}	0.59^{b}	0.69^{a}	0.03
Length of small intestine (cm)	343.43^{c}	286.60^{c}	359.21^{c}	317.98^{d}	275.67^{e}	391.37^{b}	403.03^{a}	11.23
Caecum length (cm)	10.20^{a}	11.54^{a}	12.03^{a}	9.32^{b}	12.53	13.59^{a}	13.36^{a}	4.03

Means with different superscripts on the same row differ significantly ($P < 0.05$)

dietary levels of RC (Table 2). The protein digestibility follows a similar trend. The control treatment recorded the highest protein digestibility of 76.16%.

Expectedly, the control diet had the highest feed cost per kg. Also the 20% BRC recorded the best feed cost per Kg gain of flesh. This however is consistent with the results of the two nutrient digestibilities evaluated.

The observed highest liver weight recorded by the 30% BRC indicated the possibility of liver overload. In this regard, histological studies of the liver and physiological analysis of the RC and BRC to ascertain the microbes type and most importantly to ensure there is no transfer of residual organophosphate compounds on pastures which bovine might have consumed is recommended for further study. Some of this may be responsible for culling the cattle and the subsequent slaughtering, as this could have escaped the meat inspectors at the abattoir. The small intestine, and the caecum followed the same trend. Whereas reports indicated that RC contains no anti physiological factors (Adeniji and Balogun, 2002), the result obtained on the internal organs weights might well be a window to properly ascertain the suitability of RC and BRC in livestock feeds. This is against the backdrop that grazing of cattle is not properly controlled in Nigeria. While no mortality was recorded in the treatments feeding consistently for longer period than 56 days may be quite revealing.

Conclusion

RC and BRC can be included optimally at 30% in growing rabbit rations. However, further investigation as enumerated above will greatly assist in providing the necessary information on the effect on the physiology of the animals especially in this part of the world where grazing is not controlled.

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