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Effect of yeast treated bovine blood-rumen content mixture on performance and blood profile of weaner rabbits

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Abstract

The study was conducted to evaluate the effect of yeast treated Bovine blood–rumen content mixture (YTBRM) on performance of 60 weaner rabbits with an average weight of 501.96 ± 0.22g. The rabbits were randomly assigned to five dietary treatments with five replicates in a completely randomized design. T1, T2, T3, T4 and T5 had 0%, 10%, 20%, 30% and 40% YTBRM. Data were collected on growth performance, carcass characteristics and haematological indices. At the end of the experiment, 4 rabbits were randomly selected from each treatment and slaughtered to determine the effect of graded levels of YTBRM on carcass yield and internal organs characteristics. The result of growth performance revealed that all parameters measured were significantly (P<0.05) affected by the dietary inclusion of YTBRM except for feed conversion ratio which ranged from 3.05 in T1 to 3.64 in T2. Average daily feed intake was significantly (P<0.05) higher (101.69) in treatment T5 while the other treatment groups were similar.. Average daily weight gain were significantly higher in T5 (29.72g) and T4 (28.05g) while the least value was obtained in T2 (25.46g). Carcass yield was significant (P<0.05) across the treatment groups. Dressing percentages were significantly (p<0.05) higher in T2 (82.35%), T1 (77.62%) and T4 (74.08%) than T5 (63.57%) and T3 (69.79%). Result of the internal organs shows that they were all similar across the treatment groups. Haematological and biochemical indices shows no significant diffrerence (P>0.05) in all the parameters evaluated. It could be concluded from this study that YTBRM can be included up to 40% in weaner rabbits diet without adverse effect on the growth performance, blood profile, carcass and internal organs characteristics.

Keywords: Performance, Bovine blood- rumen mixture, Yeast, weaner rabbit, Carcass

Introduction

Protein intake in Nigeria to both animal and human being is still a main problem since it is lacking both in quantity and quality without proper ways of addressing them while the population is on the increase (Egbunike, 1997). Animal products contribute about 15 – 20% of the total protein intake of an average Nigerian contrary to 33% recommended by Food and Agricultural Organization (Taiwo *et al.,* 2004). This wide gap between the recommended protein intake and the average consumption rate has resulted to increase in demand for the production of animal protein to the Nigerian populace. There is urgent need to increase the production of animals with short generation interval such as rabbit in order to bridge this gap. Rabbit production is esteemed as a veritable means of meeting the animal protein needs of the population due to its obvious advantages over other non-ruminants (Ojebiyi *et al.,* 2010). However, the major hindrance to the production of rabbit is the cost of feeds. Feed accounts for about 70% of the total cost of production and remains a main threat to the expansion

of this sector in Nigeria due to the stiff competition for feedstuffs by man and industry. Sourcing for alternative feeds especially energy and protein sources is therefore imperative. The use of by-products such as wastes from abattoir and agro-industries have been reported (Dairo *et al.*, 2005). Rumen content as well as bovine blood is an abattoir by-products which if not properly handled can cause nuisance in the environment. The rumen being the vat where fermentation of feed takes place contains various micro-organisms such as the phycomycetous fungi, protozoa, bacteria and others that are involved in this process (Preston, 1991). According to Adeniji and Balogun (2002) and Dairo (2005) the composition and potential of rumen content and blood mixture qualifies them as good sources of protein for monogastric animals. Study on the use of bovine rumen – blood meal by many people in its mash form in rabbit production resulted in significant drop in feed intake and weight gain (Togun *et al.*, 2009; Dairo *et al.*,2005). Yeast which is used to aid fermentation was added to enhance the digestibility of the rumen content because it has the potential of softening the fibre content (Mohammed *et al*. 2008). However, .there is paucity of information on the optimum level of inclusion of yeast treated bovine rumen content in rabbit nutrition. The study therefore was conducted to evaluate the optimum level of inclusion of yeast treated bovine blood-rumen content mixture on the growth performance, carcass characteristics, internal organ weight and blood profile of weaner rabbits.

Materials and methods

Study site

The study was conducted at the Small Unit of the Teaching and Research Farm of the Department of Animal Science, Taraba State University, Jalingo, Jalingo lies between latitude 8^0 53^1" North and longitude $11^0 23^1$" East of the equator in the guinea savannah zone of northern Nigeria. There are two main seasons existing in the area, the dry and rainy seasons. It has an annual rainfall between 1000 – 15000mm with a temperature range of 30 – 42^0c depending on the season (Taraba State Diary, 2008).

Collection and processing of blood and rumen content

Fresh bovine rumen content and blood were collected from the central Abattoir in Jalingo and spread to sun dry on a concrete floor for five days. It was latter ground to 2mm particle size, mixed with live yeast and then stored.

Experimental diets, design and management

Five experimental diets were formulated using bovine rumen content and blood content (BRBM) at 0, 10, 20, 30 and 40% and were designated as T1, T2, T3, T4 and T5, respectively. Sixty weaner rabbits sourced within Jalingo metropolis were randomly allotted into the five treatment groups with 12 rabbits in each treatment and replicated four times with three rabbits per replicate in a completely randomized design. Each hutch was thoroughly cleaned and disinfected two weeks before the arrival of the rabbits. The rabbits were de-wormed using Piperazine®, antibiotics and coccidiostats were also administered against bacterial and coccidial infections.

Data collection

Growth performance

Feed intake was determined by subtracting the left-over of the feed supplied the previous day from the quantity given. Each rabbit was weighed at the beginning of the experiment and thereafter weekly using weighing scale. Weight gain was then

Table 1: Percentage composition of experimental diets

	Inclusion levels of BRBM				
Ingredients	T1	T2	T3	T4	T5
Maize	57.16	57.16	57.16	57.16	57.36
Maize bran	17.00	17.00	17.00	17.00	17.00
Groundnut cake	19.69	17.72	15.75	13.78	11.87
Fish meal	3.00	3.00	3.00	3.00	3.00
BRBM	0.00	1.97	3.94	5.91	7.88
Yeast	0.50	0.50	0.50	0.50	0.50
Bone meal	2.00	2.00	2.00	2.00	2.00
Premix*	0.15	0.15	0.15	0.15	0.15
Salt	0.50	0.50	0.50	0.50	0.50
Total	**100**	**100**	**100**	**100**	**100**
Calculated Analysis					
Crude protein	17.43	17.74	18.06	18.38	18.69
Crude fibre	3.33	3.33	3.33	3.33	3.33
Ether extracts	3.48	3.37	3.27	3.27	3.17
ME(Kcal/Kg)	3630.84	3616.72	3612.81	3607.23	3602.86

***Vitamin-Mineral premix (Bio -mix) provided per kg include the following: Vitamin A 500 IU; Vitamin D3, 888,000 iu; Vitamin E, 12,200mg; Vitamin K3 15,000mg; Vitamin B1, 100mg; B2, 200mg; B6, 1500mg; Niacin, 1200mg; Pathothenic acid, 2000mg; Biotic, 100mg; Vitamin B12, 3000mg; Folic acid, 1500mg; Chlorine chloride, 60,000mg; Manganese, 10,000mg; Iron, 1500mg; Zinc, 800mg; Copper, 400mg; Iodine, 80mg; Cobalt, 40mg; Selenium, 8000mg.**

TI= Bovine blood-rumen mixture sole **T2= Bovine blood-rumen mixture+10% yeast**
T3= Bovine blood-rumen mixture+20% yeast **T4 =Bovine blood-rumen mixture+30% yeast**
T5=Bovine blood-rumen mixture +40% yeast

determined by subtracting weight obtained in two consecutive weeks. Feed intake and weight recorded were used to calculate feed conversion ratio (FCR).

Carcass evaluation

Twenty (20) rabbits made up of four (4) rabbits from each treatment group were randomly selected and slaughtered for carcass evaluation. Animals were slaughtered, bled, dressed by flaying, eviscerated, split and weighed. Internal organs weight was determined using an electronic (master^{R}) digital scale and expressed as percentage live-weight. Dressing percentage was determined by dividing the dressed weight by the slaughter weight and multiplied the result by one hundred.

Haematological and biochemical indices

Blood samples were collected from four rabbits per treatment for determination of haematology and serum biochemical parameters on the last day of the experiment (8^{th} week). 5 mLs of blood samples were collected from ear vein using a disposable needle and syringe into specimen test tubes containing Ethylene Diamine Tetra Acetic Acid (EDTA) as anticoagulant for haematological parameters (Packed Cell Volume, Red Blood Cells, Heamoglobin Concentration and White Blood Cells). The Erythrocytic Component; Mean Corpuscular Volume (MCV), Mean Corpuscular Heamoglobin (MCH) and Mean Corpuscular Heamoglobin Concentration (MCHC) were determined using the formula described by Jain (1993), while another 5ml were placed in test tubes without anticoagulant to determine the serological parameters (total protein, albumin, urea, cholesterol, globulin and glucose).

Chemical analysis

Proximate composition of experimental diets, yeast treated bovine rumen-blood mixture were analysed using the methods

described by A.O.A.C. (2000).

Statistical analysis

The data obtained during the experiment were analysed according to the ANOVA model, using the ONEWAY procedure of SPSS (2016) and where significant differences exist, Duncan's multiple range test option of the same statistical software was employed.

Results and discussion

Proximate composition of Yeast Treated Bovine Rumen-Blood Mixture (YTBRM)

The results of the proximate composition of the yeast treated bovine blood-rumen content mixture is presented in Table 2. The result showed that YTBBRM had 92.50% dry matter (DM), 59.00% Crude protein (CP), 14.00% crude fibre (CF), 18.50% Ash, 14.00 % Ether Extract (EE) and 25.50% Nitrogen extract (NFE), respectively. The CP content is higher than 46.1% reported by Odunsi (2003), 33.81% reported by Dairo *et al*. (2005) and 13.56% by Okpanachi *et al*. (2010) for untreated bovine rumen blood mixture. The values of ash, crude fibre and metabolizable energy (kcal/kg) are higher than 7.49%, 24.58% and 2278.58 kcal/kg energy reported by Adeniji and Balogun *et al*. (2000). Variations in chemical composition could be attributed to the addition of yeast to the bovine rumen blood mixture which shows improvement in the nutrient composition. Dairo *et al*. (2005) also attributed the change in composition of bovine rumen blood mixture could be due to the type of pasture consumed by the slaughtered animal, specie differences and the proportion of the constituent mixtures.

Table2: Proximate composition of Bovine Rumen-Blood Mixture (%/DM)

Nutrients	% Composition
Dry matter	92.50
Crude protein	59.00
Crude fibre	14.00
Ether extracts	1.07
Ash	17.50
Nitrogen free extracts	8.43
$^{+}$ME (Kcal/Kg)	2568.94

Metabolizable Energy = ME (kcal/kg) = 37 x % CP + 81 x % EE + 35.5 x % NFE; Calculated according to the formula of Pauzenga (1985)

Performance characteristics of weaned rabbits fed Yeast Treated Bovine Rumen-Blood Mixture

The growth performance of weaned rabbits fed graded levels of yeast treated bovine rumen- blood mixture (YTBRM) is presented in Table 3. The result showed significant differences ($P<0.05$) in all the parameters measured except feed conversion ratio. Final weight and total feed intake increased ($P<0.05$) progressively with increasing levels of YTBRM in the diets. The result is similar to report by Mohammed *et al.* (2005) that increase in protein content of the feed increases intake. The increase in feed intake obtained could be attributed to increase in appetite resulting from the addition of yeast which could have changed unpleasant smell of the diets. Odunsi (2003) reported that the inclusion of untreated blood meal and rumen content impart obnoxious odour to the diet thereby causing decrease in feed intake. The improved weight gain of rabbits fed YTBRM diets could also be attributed to the balance of nutrients content of the diets which were efficiently metabolized for growth

Table 3: Performance of Weaned Rabbits Fed Yeast Bovine Rumen-Blood Mixture

	Dietary Treatment(s)					
Parameter	T1	T2	T3	T4	T5	SEM
Initial weight (g)	504.00	500.00	501.67	500.00	504.17	4.99^{ns}
Final weight (g)	2039.58^{a}	1925.84^{b}	1995.83^{b}	2070.84^{a}	2168.75^{a}	19.10^{*}
Total Weight Gain (g)	1535.41^{ab}	1425.84^{c}	1494.16^{c}	1570.84^{a}	1664.58^{a}	14.89^{*}
Average daily weight gain (g)	27.41^{ab}	25.46^{c}	26.68^{c}	28.05^{a}	29.72^{a}	1.17^{*}
Total feed intake (g)	4682.50^{b}	5203.75^{a}	5365.03^{a}	5467.32^{a}	5695.00^{a}	49.56^{*}
Average feed intake (g)	83.61^{b}	92.92^{b}	95.84^{b}	97.63^{b}	101.69^{a}	0.94^{*}
Feed conversion ratio	3.05	3.64	3.59	3.48	3.42	0.17^{ns}

Means on the same row with different subscripts are significantly different (p>0.05) * SEM= Standard error mean, Ns = not significant (p>0.05)

Carcass characteristics of weaned rabbits fed Yeast Bovine Rumen-Blood mixture

The carcass characteristics and internal weight organs of rabbit fed YTBRM are presented in Table 5. The inclusion shows significant (P<0.05) influence across the treatment groups except for lungs, liver and kidney weights. The dressing percent obtained in this study is similar to the range values of 63.89 to 74.89% reported by Olorunsanya *et al.* (2007), but higher than the average of 56.50% of different European breeds reported by Lebas *et al.* (1997) and the difference could be due to the yeast inclusion. Kidney and liver weights were lower than the range values of 5.90 to 8.60 and 2.26 to 2.90 reported by reported by Okpanachi *et al.* (2010) and Ojebiyi and Saliu (2014), when the rabbits were fed untreated bovine rumen blood mixture. Internal organs weights like liver and kidney were used to study the toxicity in feeding trials, since this organs did not show significant (P>0.05) differences among dietary treatments. It is evident therefore, that inclusion of YTBRM in the diet did not illicit any toxic responses by the rabbits as liver and kidney which are the major organs of detoxification did not undergo any hypertrophy (Carew *et al*., 2003).

Table 5: Carcass analysis and internal organ weight

	Dietary Treatment(s)					
Parameters	T1	T2	T3	T4	T5	SEM
Live weight	2039.58^{a}	1925.84^{b}	1995.83^{b}	2070.84^{a}	2168.75^{a}	19.10^{*}
Dressed weight	1583.25^{a}	1586.00^{a}	1392.90^{b}	1534.25^{a}	1378.75^{b}	10.19^{*}
Dressing percentage	77.62^{a}	82.35^{a}	69.79^{b}	74.08^{a}	63.57^{b}	0.73^{*}
Internal Organs (% live weight)						
Liver	1.09	1.60	1.39	1.66	1.79	0.01^{ns}
Kidney	2.01	2.50	2.45	2.48	2.50	0.02^{ns}
Lungs	1.14	1.45	1.32	1.42	1.53	0.01^{ns}

Means on the same row with different subscripts are significantly different (p>0.05) * SEM= Standar d error mean, Ns = not significant (p>0.05).

TI= Bovine blood-rumen mixture sole **T2 =Bovine blood-rumen mixture+10% yeast**
T3= Bovine blood-rumen mixture+20% yeast **T4= Bovine blood-rumen mixture+30% yeast**
T5=Bovine blood-rumen mixture +40% yeast

Haematological and biochemical Indices of Weaner Rabbits Fed Yeast Treated Bovine Rumen-Blood Mixture

The result of haematological and biochemical indices of weaner rabbits fed yeast treated bovine rumen-blood mixture is shown in Table 6. The result showed no significant difference (P<0.05) across the treatment groups for all the parameters measured. The PCV and Hb are within the normal range values of 31 to 50% and 8 to 17g/100ml respectively as reported by

Anon (1980) for healthy young rabbits. The values obtained for all the rabbits fed various dietary levels of YTBRM indicated that there was nutritional adequacy. The RBC,WBC, MCV, MCH and MCHC values obtained in this study fall within the normal range of 5 to 8.0 , 3.0 to 12.5, 60 to 73, 16 to 23 and 26 to 34%, respectively reported by Anon (1980). The values of total protein, albumin and globulin contents of the serum were not influenced by inclusion levels of YTBRM. They are within the ranges of 5.81 to 6.75g/dl, 3.07 to 4.50g/dl and 1.94 to 2.26g/dl, respectively reported by Onifade and Tewe (1993) and in consonance with reference values reported by Anon (1980). This is because the total protein, globulin and albumin are averagely responsive to total protein intake and the normal values obtained indicates nutritional adequacy of the dietary protein. Schalm (1975) reported that the concentration of serum protein at any given time is a function of the nutritional status, water balance and other factors affecting the state of health of the animals. Therefore, the levels of YTBRM in the diet did not adversely affect biochemical parameters. The cholesterol levels are within the reference range of 20 to 83mg/dl. There was no change in cholesterol values as the dietary levels of YTBRM increased. Since cholesterol levels are within the normal range there will be no problems of severe liver dysfunction, nephrosis, debility or malabsorption of fat (Igwebuike *et al.,* 2008).

Table 6: Haematological and biochemical indices of weaner rabbits fed Yeast Treated Bovine Rumen-Blood Mixture

Means on the same row with different subscripts are significantly different (p>0.05) * SEM= Standard error mean, Ns = not significant

	Dietary treatments					
Parameter	T1	T2	T3	T4	T5	SEM
Hematology						
PVC (%)	36.98	34.71	37.56	38.47	38.85	1.75^{ns}
Hb (g/dl)	10.70	10.90	10.93	11.20	11.33	0.46^{ns}
MCV (µl)	55.34	54.45	56.89	50.23	55.04	0.54ns
MCH (pq)	17.89	17.84	17.56	17.45	17.78	0.17^{ns}
MCHC (%)	27.11	27.78	28.00	27.21	27.89	0.27^{ns}
WBC ($\times 10^3$ µl)	11.44	12.40	10.26	13.61	12.68	1.25^{ns}
RBC ($\times 10^6$µl)	73.37	68.33	67.33	71.33	65.45	0.28^{ns}
Biochemical indices						
Total protein (g/dl)	50.00	50.41	42.70	47.34	50.09	3.60^{ns}
Albumin (g/dl)	34.05	30.52	30.75	31.76	35.99	1.11^{ns}
Globulin (g/dl)	25.65	26.67	29.01	24.69	27.68	1.21^{ns}
Glucose (Umo/l	1.94	2.49	1.63	1.65	2.09	0.39^{ns}
Cholesterol (mg/dl)	50.46	50.43	50.63	50.22	50.25	0.81^{ns}

(p>0.05), RBC= Red blood cell, WBC= White blood cell MCH= Mean corpuscular haemoglobin, MCV= Mean corpuscular volume, MCHC= Mean haemoglobin concentration

Conclusion

It could be concluded from the results obtained that YTBRM incorporated into weaner rabbits diets up to 40% did not show any adverse effect on the growth performance, blood profile, carcass and internal organs characteristics. This means the cost of producing rabbits will reduce since only yeast will be purchased and required in small quantity, while rumen content is relatively free and reduced inclusion of other expensive protein sources.

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