HAEMATOLOGICAL INDICES, CARCASS AND ORGAN CHARACTERISTICS OF CROSSBRED WEANER RABBITS FED DEHYDRATED BOVINE RUMEN DIGESTA

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ABSTRACT
Twenty four crossbred rabbit of mixed sexes were used to evaluate the effect of different inclusion levels of dehydrated bovine rumen digesta (DBRD) on growth performance, carcass and organ characteristics of weaner rabbits. Four diets were formulated to contain 0% (control), 5, 10 and 15% DBRD. The rabbits were randomly divided into four groups and allotted into four treatments of 6 rabbits each in a completely randomized design (CRD). The trial lasted for 8 weeks. The result showed that the WBC and PCV increased significantly ($p<0.05$) as the level of DBRD increased beyond 5% in the diets, while MCHC and MCV decreased significantly ($p<0.05$) in rabbits that consumed the DBRD diets. There were significant ($p<0.05$) differences in liver weight, heart weight, kidney weight, spleen weight, lungs weight, and large intestine lengths among the treatments, whereas treatments had no significant ($p>0.05$) effect on live weight, dressed carcass weight, stomach length and small intestine length. Organ and carcass weights increased as the level of DBRD in the diets increased beyond 5%. It was concluded that up to 15% of graded levels of DBRD can be included in the diet of weaner rabbits without any deleterious effect on haematological indices, carcass and organ weights and lengths.
Key Words: Effect, DBRD, haematological indices, carcass weights, organ weights, organ lengths,

INTRODUCTION
In spite of Nigeria's numerous natural resources which are sufficient to make her self-reliant in animal protein production and even become main exporter of all kinds of food items, there is an acute shortage of animal protein in Nigeria. The demand for animal protein is far higher than the supply. The high cost of animal protein has put it out of the reach of the average Nigerian (Ani and Adiegwu, 2005; Ugwuene, 2003). This could be attributed to low level of animal protein production. There is therefore, an urgent need to increase livestock production in the country especially those that are highly prolific with rapid turnover rate at very low cost. The production of animals like rabbits, with very short gestation periods and production cycles, can be a solution to the problem of protein shortage in Nigeria. Rabbits can be produced on forages alone, although production can improve by adding other feed supplements. The need to explore other less common, but potential, sources of animal protein such as rabbits has been supported (Bamgbose *et al.*, 2004). Nutritionally, rabbit has a higher protein (20-21%), low fat content (10-11%), when compared with meat from other species. Rabbit meat has the cholesterol value of 169mg/100g (dry matter basis) when compared with beef (200mg), chicken (220mg), and low sodium content (Fielding, 1991; Janieri, 2003). Consequently, rabbit meat has been listed in United State Department of Agriculture (USDA) as an approved meat source for hypertensive patients. However intensive livestock farming in Nigeria has been greatly affected by the high cost of feeds especially protein ingredients such as soybean cake and fishmeal. In addition there is intensive competition between human and animals for these feed ingredients and this has worsened the animal feed supply situation in the country. Therefore, there is an urgent need for alternative locally available and cheap sources of feed ingredients particularly those that do not attract competition in consumption between humans and livestock. One possible source of cheap material is dehydrated bovine rumen digesta (DBRD). Dehydrated bovine rumen digesta not only serve as a feed nutrient, recycling it will also reduce disposal and environmental pollution problem (Esonu *et al.*, 2006). The present study was therefore conducted to determine the haematological indices, carcass and organ characteristics of crossbred weaner rabbits fed diets containing dehydrated bovine rumen digesta (DBRD).

MATERIALS AND METHODS
Location of the experiment: The experiment was carried out at the Rabbit Unit of the Teaching and Research Farm, Department of Animal Science,

University of Nigeria, Nsukka in Enugu State, Nigeria.

Experimental diets, animals and management: Fresh Bovine Rumen Digesta was collected from Nsukka abattoir and sun dried until the desired moisture content of 7.95% was reached. It was then crushed in a hammer mill and incorporated into the experimental diets. Four experimental diets were formulated to contain 0,5,10 and 15% dehydrated bovine rumen digesta (DBRD). The percentage composition of the diets is presented in Table 1. A total of twenty-four 4 weeks old mixed sex crossbreeds (Chinchilla x New Zealand) weaner rabbits, with initial average weight of 0.91kg were used for the experiment. The rabbits were obtained from a reputable Farm in Enugu Metropolis. They were randomly assigned to four dietary treatments comprising four levels (0% (Control), 5%, 10% and 15%) of dehydrated bovine rumen digesta (DBRD). Each treatment was replicated 3 times with 2 rabbits per replicate. A three-tier cage was used with 2 rabbits housed per cage denoting replicates. The animals were acclimatized by placing them on diet containing *Centrosema pubescens* and growers mash for one week before the experimental diets were introduced. Experimental feed and water were given *ad libitum* to the animals, taking note of the quantity supplied and the left over. Feeding of the animals was done around 8am and 4pm daily. The rabbits were individually weighed at the beginning of the experiment to obtain the initial weight and then subsequently weighed at weekly intervals. The experiment lasted for eight weeks. The rabbits were de-wormed with Pirazine (containing piperazine citrate as its active ingredient) and other routine management practices such as cleaning of drinkers, feeders and the cages were done. At the end of the experimental period, three rabbits from each treatment were randomly chosen for heamatological analysis, carcass and organ evaluation. The PCV was determined by the microhaematocrit method described by Schalm *et al.*(1975), and Mitruka and Rawnsely (1977) using a microhaematocrit centrifuge and reader (Hawksley and Sons Ltd, England). The Hb was determined using a haemoglobinometer (Marienfeld, Germany), while the WBC counts were carried out by the haemocytometer method using an improved Neubauer counting chamber (Hawksley, England) and avian RBC and WBC diluting fluids as described by Campbell and Coles (1986) and Lamb (1991).

Proximate and Statistical analyses: Proximate analysis of feeds was done according AOAC (1990). Data collected were subjected to analysis of variance (ANOVA) as described by Steel and Torrie (1980). Significant means were detected and separated using Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The haematological indices of crossbred weaner rabbits fed graded levels of DBRD are presented in Table 2. The result showed that there were highly significant ($p<0.01$) differences in hemoglobin, packed volume (PVC), mean corpuscular haemoglobin concentration (MCHC), white blood cell (WBC) and MCV among the treatments. However, no significant differences ($p>0.01$) existed among treatments in RBC and MCH. As shown in Table 2, the haemoglobin, WBC and PCV increased significantly as the level of DBRD increased beyond 5% in the diets, while MCHC and MCV decreased significantly in rabbits that consumed the DBRD diets. These results agree with the report of Dairo and Egbeyemi (2012) which showed that all the haematological indices of weaner rabbits fed fermented cassava peel and caged layer manure were significantly affected by treatments. Nevertheless, the values reported by these workers are lower values than the values obtained in the present study. Okpanachi *et al.* (2010) also reported WBC, PCV and RBC values far below the values obtained in this study. The higher values of haematological indices observed in this study is an indication that the animals did not manifest any anaemic condition and this also tends to indicate a better utilization of DBRD by the treated rabbits. Generally there was improved performance on the weaner rabbits fed graded levels of dehydrated bovine rumen digesta. The improved performance could probably be due to adequate availability of dietary nutrients. Crude fibre in particular is known to activate the intestine, and thus leads to more peristaltic movement, more enzyme production, thereby resulting in efficient digestion of nutrients (Kekeocha, 1984; Esonu *et al.*, 2001; Esonu *et al.*, 2004. Table 3 shows the effect of feeding graded levels of rumen content on organ and carcass characteristics of weaner rabbits. There were significant ($p<0.05$) differences in liver weight,

heart weight, kidney weight, spleen weight, lungs weight, and large intestine lengths among the treatments, whereas treatments had no significant ($p>0.05$) effect on live weight, dressed carcass weight, stomach length and small intestine length. Organ and carcass weights increased as the level of DBRD in the diets increased beyond 5%. Olabanji *et al.* (2007) reported significant differences in small intestine and liver weight of rabbits fed diets containing rumen content, but most of the organs of the treated rabbits did not indicate any significant difference. Similarly, Esonu *et al.* (2006) and Okpanachi *et al.* (2010) reported that there were no significant differences in the organ and carcass weights of rabbit that consumed DBRD diets. The significantly ($p<0.05$) higher liver weight recorded for rabbits on diet T4 (15% DBRD) indicated the possibility of the liver being overload. This could be due to the effect of microbial load in the dehydrated bovine rumen digesta. The high fibre content in the diets may have resulted in the observed increase of the stomach and large intestine lengths of the treated rabbits, especially at the 15% DBRD inclusion level. Interestingly, there were no significant differences in the lengths of small intestine among treatments. This tends to suggest that nutrient absorption in the small intestine was not impaired by dietary treatments. Sakaguchi (1992) stated that the lining of the small intestine has numerous tiny projections called villi, which are used for absorption. However, the values of the kidney weight, lung weight, spleen weight and heart weight obtained in the present study were lower than the values reported by Okpanachi *et al.* (2010).

Conclusion

It is evident from the results obtained in this study that up to 15% DBRD can be included in the diet of weaner rabbits without any deleterious effect on haematological indices, carcass and organ weights and lengths of rabbits.

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Table 1: Percentage Composition of Experimental diets

Ingredient	T1	T2	T3	T4
Maize	48.00	43.00	38.00	33.00
Wheat offal	19.00	19.00	10.00	15.00
Dehydrated rumen contact	0.00	5.00	10.00	15.00
GNC	12.50	12.50	12.50	12.50
PKC	16.00	16.00	16.00	16.00
Bone meal	4.00	4.00	4.00	4.00
Salt	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated composition:				
CP%	15.95	16.04	16.12	16.14
Energy (MJME/kg)	3.68	3.81	3.85	4.21
CF%	5.00	6.00	8.00	10.00
Determined composition:				
Dry matter	90	85	90	85
Crude protein	15.95	16.04	16.12	16.14
Ash	10	10	10	20
Ether extract	5./25	5.3	5.2	5.15
Crude fiber	5.28	6.30	8.29	10.31
NFE	53.52	48.36	53.39	38.4

Table 2: Haemotological values of rabbits fed graded levels of rumen content

	T1	T2	T3	T4	Level of sig.
HB (G/100ML)	14.80 ± 0.15^{b}	14.13 ± 0.08^{b}	15.40 ± 0.05^{a}	15.99 ± 0.14^{a}	**
PVC (%)	41.56 ± 0.56^{b}	44.25 ± 1.25^{b}	50.21 ± 0.16^{a}	52.08 ± 0.23^{a}	**
RBC ($X10^{6}/cm^{3}$)	7.18 ± 0.16	6.98 ± 0.07	7.38 ± 0.08	7.16 ± 0.11	NS
WBC x $10^{6}/cm^{3}$	15.34 ± 0.75^{b}	16.10 ± 0.75^{b}	18.10 ± 1.10^{a}	19.01 ± 2.80^{a}	*
MCH (pg)	212.00 ± 3.00	220.00 ± 5.00	205.50 ± 5.50	229.00 ± 16.00	NS
MCHC (%)	42.93 ± 0.07^{a}	40.15 ± 0.20^{c}	41.92 ± 0.08^{b}	40.37 ± 0.16^{c}	**
MCV (um^{3})	71.90 ± 0.10^{a}	70.18 ± 0.18^{b}	69.89 ± 0.19^{b}	69.14 ± 0.72^{b}	**

a,b,c,d-Row means with different superscripts different significantly at 1% or 5%* = ($p<0.05$)** = ($p<0.01$), NS = Not significant.

Table 3: Carcass and organ weights of weaner rabbits fed varying levels of rumen content

Parameters	0%	5%	10%	15%	Levels of sig.
Live weight (kg)	2.30±0.02	2.20±0.05	2.34±0.04	2.42±0.04	NS
Dressed carcass (kg)	1.52±0.10	1.47±0.15	1.64±0.09	1.83±0.03	NS
Liver (g)	43.65±0.75^{b}	41.25±0.75^{b}	55.10±1.10^{b}	55.20±2.80^{a}	*
Heart (g)	6.78±0.28^{b}	6.60±0.20^{b}	8.13±0.13^{a}	8.23±0.23^{a}	*
Kidney (g)	10.42±0.20^{b}	10.72±0.28^{b}	11.98±0.03^{a}	12.58±0.43^{a}	*
Spleen (g)	0.93±0.03^{ab}	0.75±0.05^{b}	0.94±0.06^{ab}	1.08±0.13^{a}	*
Lungs (g)	8.92±0.69^{b}	8.70±0.70^{b}	11.82±0.17^{a}	12.38±0.53^{a}	*
Stomach (cm)	11.50±0.50^{b}	11.00±0.00^{b}	12.50±0.50^{a}	12.50±0.50	NS
Small intestine (cm)	11.50±0.50	11.00±0.00	12.50±0.50	12.50±0.50	NS
Large intestine (cm)	67.50±2.50^{b}	63.00±4.00^{b}	82.50±2.50^{a}	87.50±2.50^{a}	*

a, b – Row means with different superscripts are statistically different at 5%* ($p<0.05$) NS = Not significant.