BOILED BOVINE RUMEN DIGESTA AS A FEED COMPONENT: EFFECTS ON CARCASS QUALITY, AND ORGAN WEIGHTS IN GROWING RABBITS

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ABSTRACT
This study was carried out to determine the carcass characteristics and organ weight of growing rabbits fed diets containing graded levels of boiled Bovine Rumen Digesta (BBRD) as a source of protein and energy. A total of sixteen (16) weaner rabbits (5-6 weeks of age) were randomly allocated into four treatment groups, comprising graded levels of 0, 7.5%, 15%, and 22.5 % of BBRD in the diets. The experimental design was completely randomized design and the study lasted 56-day. Data collected and analysed were Carcass characteristics, including live weight (1254.08–1279.05g), slaughter weight (1176.67–1187.50 g), and dressing percentage (72.41–74.56%), exhibited no significant differences among groups ($p< 0.05$). Similarly, weights of pelt, head, hindquarters, loins, and forequarters were consistent across treatments ($p> 0.05$). The organ weight analysis revealed no significant differences ($p< 0.05$), except for liver weight, which was highest in the $BBRD_{15}$ group (26.72 g, $p < 0.05$). Kidney, lungs and trachea, heart, large intestine, and small intestine weights showed minor variations without significant treatment effects. In conclusion, BBRD did not notably influence carcass characteristics, and most organ weights. Boiled Bovine Rumen Digesta could be incorporated up to 22.5% in rabbit diets without adverse effects on rabbit meat production.
Keywords: Processing, Rabbits, Rumen digesta, Performance indices

INTRODUCTION

The need to improve rabbit production in Nigeria to increase supplies of animal protein is clear, due to the high cost of chicken and beef. Also, the animal protein shortage facing Nigeria cannot be solved by large animals with their slow production cycle, animals like rabbits with very short gestation periods and production cycles, can help this protein shortage problem (Iyeghe-Erakpotobor *et al.,* 2013). Domestic rabbit is raised as a cheap source of meat due to its economic way of feeding, high prolificacy and small body size that makes it suitable for backyard rearing and easy consumption by a family, as well as extra income by sale of animals Iyeghe-Erakpotobor *et al.* (2013). 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). Egbo *et al.* (2001) reported that rabbits are efficient converters of feed to meat and utilize up to 30% fibre as against 10% by most poultry species. The meat of rabbit is pearly white, palatable and delicious. Their meat tastes better and contains less cholesterol, fats than conventional livestock and so good for hypertensive patient and old people. About 20% of the dressed carcass is bone so that the meat yields about 74% or more, rabbit meat is highly nutritious and of good quality (Adegbola and Osuji, 1981). Consequently, rabbit meat has been listed as an approved meat source for the hypertensive. The high and increasing prices for animal feeds have compelled researchers to direct their attention to non-conventional feed sources, with particular emphasis on protein substitutes (Gadzirayi *et al.,* 2012; Ogungbesan *et al.,* 2013). The search for alternative sources of energy in rabbit remained a tropical issue among animal nutritionists (Maina *et al.,* 2022). Therefore, rumen digesta is one of the unconventional feedstuffs that can be used in formulating feeds to reduce the cost of livestock production. The proximate compositions of rumen content were 92.83% dry matter; 17.13% crude protein; 7.49% ash; 2.81% ether extract; 24.58% crude fibre; 40.82% nitrogen free extract and 2278.50 Kcal/kg ME (Adeniji and Balogun, 2002).However, there appears to be limited information on boiled rumen digesta in order to increase the energy content. This study therefore investigated the carcass characteristics and organ weights of growing rabbits fed boiled rumen digesta in diet.

MATERIALS AND METHODS

Study site

The research was conducted at the Teaching and Research Farm, Federal University Gashua Yobe State in north eastern Nigeria, which has been previously described by Gashua, GeoNames (2009).

Processing of the Rumen digesta

Fresh rumen digesta were collected from the main abattoir in Gashua while slaughtering of the animals was in progress. The digesta was then sun dried for 48 h to reduce moisture content. About 10 kg dried bovine rumen

digesta was boiled in a clean water at 100ºC. The boiled rumen digesta was sun dried until completely dried, and then incorporated into the rabbit diets.

Experimental Design and Diet formulation

A total of sixteen weaned rabbits aged between 5-6 weeks (mixed sexes; crossbreed) were procured from rabbit farmers around Gashua community. The experiment was set up in a completely randomized design (CRD) with four treatments and each rabbit served as a replicate. Experimental diets were formulated to contain 0, 7.5, 15, and 22.5% inclusion levels of boiled rumen digesta as shown in Table 1. The study lasted 56-day Feed and water were provided *ad-libitum* thorough out the study period.

Table 1: Gross Composition of Experimental Diets

Feedstuff (Kg)	$BBRD_0$	$BBRD_{7.5}$	$BBRD_{15}$	$BBRD_{22.5}$
Maize	40	37.5	35.0	32.5
BBRD*	0	7.5	15	22.5
Maize offal	25	22.0	19.0	17.5
GNC	1.27	1.0	0.8	0.52
Rice offal	18	18	18	18
Bone Meal	2.00	2.00	2.00	2.00
Lime stone	0.20	0.20	0.20	0.20
Fish Meal	1.20	1.20	1.20	1.20
Salt	0.20	0.20	0.20	0.20
Premix	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Lysine	0.20	0.20	0.20	0.20
Total	**100**	**100**	**100**	**100**
Met. Energy (Kcal/kg)	2549	2519	2509	2504
Crude Protein (%)	16.93	15.53	15.85	15.81
Crude fibre (%)	10.51	10.51	10.51	10.51

*BBRD – Boiled Bovine Rumen Digesta. ME=Metabolizable energy.

Data collection

At the end of the feeding trial. The study continues with carcass characteristics, two (2) rabbits were randomly selected from each treatment and used for the carcass and organ weight assessment. Feed was withdrawn for 12 hours from the rabbits and water was supplied so as to empty their gastro intestinal tract (GIT) and to reduce the variability in body weight due to intestinal content. Prior to slaughtering the rabbits were weighed. The flaying was done using knife and then eviscerated. The carcass weight and dressing percentage was determined and recorded.

$$Dressing\ \% = \frac{Carcass\ weight}{Live\ weight} X\ 100$$

The carcass was cut into retail parts (fore quarter, hind quarter, loin, back, head and pelt) and then weighed with a sensitive electronic weighing scale. The weight of the liver, kidney, heart and lung was also taken. Individual weights were noted for each rabbit.

Statistical Analysis

Data collected were subjected to Analysis of Variance (ANOVA) using the statistical analysis software, version 9.3 (SAS, 2015). Significance was accepted at $p < 0.05$.

RESULTS AND DISCUSSION

The result **of Carcass characteristics of growing** rabbits fed diet containing graded levels of Boiled Bovine Rumen Digesta meal is shows in Table 2. There were no significant differences ($p<0.05$) in all the parameters measured. The similarity observed in all the carcass parameters measured could be attributed to the final live weights of experimental rabbits, which were similar across the treatment groups. This suggests that inclusion of Boiled Bovine Rumen Digesta meal to 22.5 % in diet of growing rabbit could promote the growth of edible portion of the rabbits (Makinde *et al*., 2017) and that the anti-nutrients present in BBRD meal exert direct or indirect effects on animal metabolism, probably by modulating animal metabolism in favour of increasing the development of edible portions of the rabbits (Valenzuela-Grijalva *et al*., 2017). Of the entire relative internal organs weights measured, only the weights of liver were influenced by the dietary treatments. Ayodele *et al*. (2016) reported that

relative weights of the internal organ of animals may increase or reduce abnormally in response to the presence of toxins in the diet. The liver, known as the largest gland in the body principally functions in the formation and secretion of bile, metabolism of nutrients and vitamins, inactivation of toxins, steroids and other hormones and synthesis of plasma protein such as acute-phase protein, albumin, clotting factors and steroid binding and other hormone-binding proteins Su *et al.,* (2019). The stability of the relative weight of other internal organs (heart, lung, kidney, and spleen) across the treatments as observed in this study also suggests the uncompromised health status of the experimental rabbits.

Table 2: Carcass characteristics and organ weight of rabbits fed BBRD in Diet

Parameters	$BBRD_0$	$BBRD_{7.5}$	$BBRD_{15}$	$BBRD_{22.5}$	SEM
Live weight g	1258.17	1279.05	1254.08	1264.87	3.68
Slaughter weight (g)	1185.59	1184.35	1187.50	1176.67	1.25
Dressed weight (g)	937.45	926.16	935.05	929.54	3.70
Dressing percent %	74.51	72.41	74.56	73.49	0.70
Pelt (g)	107.31	105.66	104.56	107.71	3.51
Head (g)	115.08	116.10	118.68	116.08	1.01
Hindquarter (g)	201.05	197.84	203.35	206.36	1.08
Loin (g)	137.18	142.46	140.15	136.10	0.99
Forequarter (g)	180.31	184.64	184.18	182.60	1.15
Organ weight (g)					
Liver	24.35^b	25.75^b	26.72^a	23.70^c	0.34
Kidney	7.09	9.25	6.89	7.21	0.22
Lungs +Trachea	7.58	6.29	8.17	7.21	0.17
Heart	4.13	3.64	3.77	4.09	0.13
Full large intestine	184.75	180.36	177.05	179.58	0.20
Full small intestine	74.50	76.61	77.50	78.00	1.31

^{abc} = means with different superscripts on the same row are significantly different ($p<0.05$), SEM= Standard error of mean.

CONCLUSIONS

The result obtained from this study showed that Boiled Bovine rumen digesta meal could be considered as a high energy source in place of maize and growing rabbits could tolerate up to 22.5% in their diets without impairing the Carcass and organ indices of the animals.

REFERENCES

Adegbola, T. A., Osuji, P. O. (1981). Effect of supplementation of a basal diet of maize stover with graded levels of concentrate feed on the performance of zebu steers. *Journal of Animal Production Research, 1*(1), 45–58.

Ayodele, S.O., Oloruntola, O.D. and Agbede, J.O. (2016). Effect of Alchorneacordifolia leaf meal inclusion and enzyme supplementation on performance and digestibility of rabbits. *World Rabbit Science*, 24, 201-206.

Adeniji AA, Balogun OO. Utilization of Flavour Treated Blood-Rumen Content Mixture in the Diets of Laying Hens, Nig. J. Anim. Prod. 2002; 29(1): 34-39.

Bamgbose, A. M., Eruvbetine, D., Iyayi, E. A., Oduguwa, O. O., & Oso, A. O. (2004). Utilization of different fibre sources by broilers and rabbits. *Tropical Animal Production Investigation, 7*(1), 27–35.

Egbo, M. L., Doma, U. D., &Lacun, M. L. (2001). Characteristics of small-scale rabbit production and management in Bauchi metropolis. *Proceedings of the 26th Annual Conference of the Nigerian Society for Animal Production (NSAP)*, 160–162.

Gadzirayi, C. T., Masamha, B., Mupangwa, J. F., &Washaya, S. (2012). Performance of rabbits fed graded levels of dried rumen digesta. *International Journal of Science and Technology, 2*(8), 556–560.

Iyeghe-Erakpotobor, G. T., Olugbemi, T. S., &Nsa, E. E. (2013). Rabbit production: A practical approach to production and marketing. *Nigerian Journal of Animal Science, 15*(1), 68–79.

Makinde OJ, Abdullahi AM, Mohammed, G. Evaluation of Camel Rumen Content as a feed for Broiler chickens. Trakia Journal of Sciences. 2017a; 2: 128-134

Maina A, Makinde O. J., Mohammed C., Bagudu I.A. and Hamman H. (2022). Dried rumen waste as feedstuff for growing rabbits. International Journal of Science and Technology Research Archive, 2022, 02(02), 095–102. https://doi.org/10.53771/ijstra.2022.2.2.0044

Ogungbesan, A. M., Alade, A. A., & Fashina, O. E. (2013). Nutritional evaluation of unconventional feed resources for rabbits. *African Journal of Agricultural Research, 8*(22), 2712–2717.

SAS (2015). Statistical Analysis System Institute. User's guide. Version 9.3, SAS Institute Inc. Cary, N. C.

Su W., Mao Z, Liu Y, Zhang X, Zhang W, Gustafsson JA, Guan Y. Role of HSD17B13 in the liver physiology and pathophysiology. Moll cell Endocrinol. 2019 june 01; 489: 119-125. [pubmed] URL:http://www.geonames. Geodata: vector:2009.

Valenzuela-Grijalva, NV, Pinelli-Saavedra, A, Muhlia-Almazan, A, Domínguez-Díaz, D & González-Ríos, H 2017, 'Dietary inclusion effects of phytochemicals as growth promoters in animal production. *Journal of Animal Science Technology*, vol. 58, pp. 8. https://doi.org/10.1186/s40781-017-0133-9