GROWTH PARAMETERS OF WEANED RABBITS FED FERMENTED SHEA BUTTER MEAL (FSBM) SUPPLEMENTED WITH QUATUM BLUE®

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Abstract
A six (6) weeks feeding trial was conducted at Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Nasarawa State University, Keffi, Shabu– Lafia Campus to evaluate the growth parameters of weaned rabbits fed fermented shea butter meal (FSBM) supplemented with enzyme. Thirty two (32) composite rabbits of same sex and average live weight (740-750.12g) were used for the study. Rabbits were randomly assigned to a test diet in a 2x2 factorial design fitted into a Completely Randomized Design (CRD) with 4 treatments 4 replicate haven 2 rabbits each. Four (4) types of diets, control, control with enzyme, 20% fermented shea butter meal and 20% fermented shea butter meal with enzyme were formulated to meet the nutrient requirements of rabbits and were designed to be isonitrogenous (18% crude protein) and isocaloric (2700kcal/kg ME). Rabbits were fed with weighed amount of the experimental diets and drinking water *ad-libitum* and other routine management practices were strictly observed throughout the experimental period. The result showed improvement in average feed intake and protein intake only. Rabbits fed with FSBM and enzymes had significant ($P<0.05$) higher feed intake (58.27g) for 20% and 100ppm respectively. Similarly, the interactive effects showed improvement in the feed intake and protein intake. Rabbits fed with diets containing 20%FSBM +100ppm (T4) had higher ($P<0.05$) feed intake (61.33g) and protein intake (10.42g) but statistically similar with rabbits fed diets containing 20%FSBM+0ppm (T3) only. It is concluded that FSBM (20%) and enzyme (100ppm) might improve growth of weaned rabbits.

Keywords: Enzyme**,** Fermentation, Growth Parameter, Rabbits.

Introduction

Most of the meats currently consumed in Nigeria, especially in the urban and peri urban region comes from ruminant species, pigs and poultry especially chickens which supply Nigerians with 7.99% of animal protein intake per day which is far below the recommended level of 35% per day required by an average adult for proper health (Ari *et al.*, 2012, 2016) This situation may become worse in the future unless there is drastic reorientation aimed at increasing output in the livestock subsection.

Effort have only focused on the major traditional livestock including ruminant, pigs and chickens with little attention paid to rabbit. One of the ways of bridging the demand supply gab of animal protein is through rearing of rabbits. What inspire the interest in rabbits are; short generation interval, high prolific, ability to thrive on forages that cannot be consumed by man, efficient converter to feed to meat and utilize up to 30% crude fibre against 10% by most poultry species. Rabbit is increasingly becoming an important meat sources worldwide and is now recommended for production in countries that are experiencing animal protein shortage (Ewuola *et al*., 2012). The rabbit is one of the animal of choice that produces fine grained low fat containing and delicious meat and so can serve as a suitable alternative to other types of meat. However, special attention needs to be given to the types of feed provided for the rabbit as this must meet the requirement for energy, protein, vitamins, minerals and other micronutrients necessary for normal growth and development.

Materials and methods

Study area: The experiment were carried out at the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Nasarawa State University, Keffi, Shabu– Lafia Campus. Lafia is located in the guinea savanna zone of north central Nigeria. It is found on latitude 08^0 35^lN

and longitude 08^0 33^1E. The mean monthly maximum and minimum temperatures are 35.06^0C and 20.16^0C respectively, while the mean monthly relative humidity is 74%. The average rainfall is about 1168. 90 mm. (NIMET, 2022).

Source and processing of shea butter

Shea butter seed were sourced from villages within shabu-Lafia metropolis, and subjected to processing method. Fifty kilogram (50kg) of Shea butter seed were milled to a size 0.5mm to produced shea butter seed meal SBSM. A portion of the SBSM was cooked for 1hour. After which it were allowed to cooled and bagged in an airtight polythene and allowed to ferment for 4days. Sub sample from fermented shea butter meal (FSBM) were taken for proximate analysis. See table 1.

Table 1. Proximate composition of FSBM

Parameters (%)	Values
Crude protein	15.18
Crude fat	4.52
Crude fibre	6.37
Ash	4.49
Dry matter	90.34
*ME(kcal/kg)	4134.00
Nitrogen free extract	59.71

Experimental diets for weaned rabbits and management of rabbits

Four (4) types of diets, control, control with Quatum Blue®, 20% fermented shea butter meal and 20% fermented shea butter meal with Quatum Blue® were formulated to meet the nutrient requirements of rabbits. The four (4) experimental diets were designed to be isonitrogenous (18% crude protein) and isocaloric (2700kcal/kg ME) for the weaner phase and is presented in Tables 2. Thirty two (32) composite rabbits of equal sex and average live weight were purchased from National Animal Production Research Institute (NAPRI) and reared in an open- sided mesh hutches. Lights were provided at night using electric bulb throughout the period of the experiment to enable rabbits eat both day and night. Rabbits were fed with weighed amount of the experimental diets and drinking water *ad-libitum* and other routine management practices were adopted as outlined by Alu *et al*. (2009) throughout the experimental period.

Table 2: Nutrients composition of the experimental diets for weaned rabbit

Ingredients	T1$_{control+0E,}$	T2 $_{control+100E}$	T3$_{20\%FSBM+0E}$	T4$_{20\%FSBM+100E}$
Maize	32.00	32.00	25.60	25.60
FSBM*	0.00	0.00	6.40	6.40
Maize bran	7.00	7.00	7.00	7.00
GNC	10.00	10.00	10.00	10.00
Rice bran	32.00	32.00	32.00	32.00
Bone meal	2.00	2.00	2.00	2.00
Fall fat soya	7.00	7.00	7.00	7.00
Palm oil	5.00	5.00	5.00	5.00
Fish meal	4.00	4.00	4.00	4.00
Salt	0.10	0.10	0.10	0.10
Premix	0.50	0.50	0.50	0.50
Methionine	0.20	0.20	0.20	0.20
L-Lysine	0.10	0.10	0.10	0.10
Toxic binder	0.10	0.10	0.10	0.10
Total	**100**	**100**	**100**	**100**
Enzyme(ppm)	-	100.00	-	100.00
Calculated analysis				
ME (kcal/kg)	2700.05	2700.05	2700.02	2700.02
Crude Protein %	18.03	18.03	18.09	18.09
Lysine %	0.99	0.99	1.01	1.01

Methionine %	0.42	0.42	0.45	0.45
Moisture %	2.37	2.37	0.63	0.63
Ether Extrat %	6.76	6.76	6.64	6.64
Crude Fibre %	9.72	9.72	10.66	10.66
Calcium %	0.03	0.03	1.04	1.04
Phosphorus %	0.99	0.99	0.99	0.99

FSBM= fermented shea butter meal, The vitamin- mineral premix supplied the following per 100kg of diet: vitamin A15,000 I.U, vitamin D3 300,000 I.U.,vitamin E 3,000 I.U., vitamin K 2.50mg, vitamin B_1 (thiamin) 200mg, Riboflavin (B_2) 600mg, pyridoxine (B_6), Niacin 40.0mg, vitamin B_{12} 2mg, Pantothenic acid 10.0mg, folic acid 100mg, Biotin 8mg, choline chloride 50mg, anti-oxidant 12.5mg, manganese 96mg, zinc 6mg, Iron 24mg, Copper 0.6mg, Iodine 0.14mg, Selenium 24mg, cobalt 214 m

Experimental design

Rabbits were randomly assigned to a test diet in a 2x2 factorial design fitted into a Completely Randomized Design (CRD) with 4 replicates having 2 rabbits per replicate. The following statistical model were used: $Y_{ijk} = U + A_i + B_j + (AB)_k + e_{ijk}$ where Y_{ijk} =individual observation, U= population mean, A_i = effect of FSBM A, B_j = effect of enzyme, and AB_k = effect of interaction of factor FSBM and enzyme, e_{ijk} = experimental error.

Data collection

The required quantity of feed was weighed daily with a sensitive scale before given to the animal. Left over shall be measured and subtracted from feed offered to get actual feed intake;

Total Feed intake: TFI (g) = Feed offered (g) – Feed left over (g). The rabbits were weighed at beginning and at the end of each week using a sensitive scale. Weight gain were determined by subtracting the Initial weight from the final weight.

Weight gain (g) = Final weight (g) - Initial weight (g).

Feed conversion ratio = FCR was calculated as: **FCR** =Feed intake (g)/ Body weight gain (g)

Protein efficiency ratio = Body weight gain (g)/Protein intake (g) where protein intake = Feed intake (DM) × Percentage Protein in Diet

Protein intake was calculated as feed intake x percent protein in diets

Energy Efficiency Ratio = Body weight gain (g) x 100/ Total metabolizable energy intake; Where metabolizable energy was calculated using formula by Pauzenga (1985) ME=37 x % CP+81.1x % EE+35.5 x % NFE.

Statistical analysis

All data collected were subjected to two way analysis of variance (ANOVA) for factorial experiment using general linear model of SPSS, 20 version. Significantly different means were considered and separated at 5% levels ($P<0.05$) using Duncan's Multiple Range Test (DMRT) as described by Steel and Torries (1980).

Results and discussion

Table 3 presents the main and interactive effect of fermented shea butter meal and enzymes on growth parameters of weaner rabbits. The result showed no effects on all the growth parameters except on average feed intake and protein intake. Rabbits fed with FSBM and enzymes had significant ($P<0.05$) higher (58.27g) for 20% and 200ppm respectively. Similarly, the interactive effects showed improvement in the feed intake and protein intake. Rabbits fed with diets containing 20%FSBM +100ppm (T4) had higher ($P<0.05$) feed intake (61.33g) and protein intake (10.42g) but statistically similar with rabbits fed diets containing 20%FSBM+0ppm (T3) only. Rabbits fed with diets containing 0%FSBM+0ppm (T1) and with 0%FSBM+100ppm (T2) had the least ($P<0.05$) values (7.50 and 7.68g) respectively. This observations could be due to the fermentation and enzyme supplementation in the diets making it more palatable and the animal relished eating thereby more nutrients were release for body development and maintenance. This agreed with Oso *et al.* (2011) who stated that, the nutritive value of legume based fermented food were higher than their raw components which is accompanied by the destruction of anti-nutritional factors during fermentation. Also, Alu (2012) stated the significant of enzyme addition in monogastric nutrition, in terms of reduction of inherent chemicals in raw oil seeds, improvement in the feed intake and released of minerals ions. This is also in conformity with the earlier report of Adeola and Olukosi (2008) who stated that

utilization of dietary nutrients in monogastric animals can be improved by exogenous enzymes supplementation.

Table 3. Main and interactive effect of fermented shea butter meal and enzymes on growth parameters of weaner rabbits

		Parameters								
Factors		Av. IW	Av. FW	TWG	DWG	Av. FI	FCR	PI	PER	EER
***FSBM**										
	0%	740.06	1435.87	695.81	16.56	44.67^{b}	3.15	7.59^{b}	6.41	25.30
	20%	750.12	1458.50	708.37	16.86	58.27^{a}	3.80	9.90^{a}	4.94	25.75
	SEM	5.56	87.80	87.37	2.08	2.08	0.49	0.35	0.81	3.17
	LOS	NS	NS	NS	NS	*	NS	*	NS	NS
Enzyme										
	0ppm	740.06	1435.87	695.81	16.56	44.67^{b}	3.15	7.59^{b}	6.41	25.30
	100ppm	750.12	1458.50	708.37	16.86	58.27^{a}	3.80	9.90^{a}	4.94	25.75
	SEM	5.56	87.80	87.37	2.08	2.08	0.49	0.35	0.81	3.17
	LOS	NS	NS	NS	NS	*	NS	*	NS	NS
Interactions										
	T1	734.75	1388.25	653.50	15.55	44.14^{b}	3.35	7.50^{b}	5.97	23.76
	T2	745.37	1483.50	738.12	17.57	45.20^{b}	2.96	7.68^{b}	6.85	26.84
	T3	750.00	1376.25	626.25	14.91	55.22^{a}	4.21	9.38^{a}	4.60	22.77
	T4	750.25	1540.75	790.50	18.82	61.33^{a}	3.39	10.42^{a}	5.28	28.74
	SEM	16.06	60.05	59.71	1.42	2.26	0. 34	0.38	0.58	2.17
	LOS	NS	NS	NS	NS	*	NS	*	NS	NS

*FSBM=fermented shea butter meal, Av = average, IW=initial weight, FW= final weight, TWG=total weight gain, DWG= daily weight gain, FI= feed intake, FCR=feed conversion ratio, PI = protein intake, PER=protein efficiency ratio and EER=energy efficiency ratio.

Conclusion and recommendation

Based on the outcome of this research, fermentation and enzyme supplementation has improved growth performance and therefore, 20% FSBM with 100ppm enzyme is recommended for weaned rabbits production.

References

Adeola, O. and Olukosi, O.A (2008). Opportunities and challenges in the use of alternative feedstuffs in poultry production. *Nigeria poultry science journal*. 5(4): 147-155.

Alu, S. E., Kaankuka, F.G. and Oluremi, O.I.A. (2009). Effects of Nutrase Xyla® enzyme supplementation on nutrient digestibility by weaner pigs fed low or high fibre diets. *Production Agriculture and Technology Journal, PAT 5*(2):327-334.

Alu, S.E (2012). Nutrient digestibility and serum biochemistry of laying quails *(cortunix japonica*) fed sugarcane scrapping meal-based diets supplemented with exogenous enzymes. *JOSR Journal of agriculture and veterinary science*, 1: 29-35.

Ari, M.M., Alu S.E., Daniel, M.A., Omede, A.A., Umoren, E. & Iji, P.A. (2016). Gross Responses, Haematological Indices and Serum Biochemistry of Growing Cockerels Fed Diets Containing Graded Levels of Rumen Liquor Fermented Sugarcane Scrappings as Replacement for Maize. *Open Access Journal of Agricultural Research*. ISSN: 2474-8846.

Ari, M.M., Ayanwale, B.A., Adama, T.Z., Olatunji E.A. (2012). Effects of Different Fermentation Methods on the Proximate Composition, Amino Acid Profile and Some Antinutritional Factors (ANFs) In Soyabeans (Glycine Max). Fermentation Technology and Bioengineering 2: 6-13

Ewuola E.O., Jimoh O.A., Atuma O.V., Soipe O.D. (2012). Haematological and Serum Biochemical Response of Growing Rabbits Fed Graded Levels of Moringa Oleifera Leaf Meal. *World Rabbit Science Association Proceedings 10th World Rabbit Congress – September 3 - 6, 2012– Sharm El- Sheikh –Egypt, 679 - 683*

NIMET (2022). Nigerian Meteorological Agency, Lafia, Nasarawa State, Nigeria.

Oso, A.O., Olayemi, W.A., Bamgbose, A.M. and Fowoyo, O.F. (2011), Utilization of Fermented Castor Oil Seed (Ricinus Communis, L) Meal In Diets For Cockerel Chicks. Arch. Zootec. 60 (229): 75-82. 2011.