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Growth performance, carcass characteristics and internal organ weights of weaner rabbits fed replacement levels of sun-dried soyabean milk residue

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Abstract

This study evaluated the growth performance of weaner rabbits fed diets containing sundried soybean milk residue meal (SSMR) at five levels of inclusion. Forty weaner rabbit with an average initial weight of 520±1.04g arranged in a completely randomized design (CRD) were used. SSMR was used at 0, 25, 50, 75 and 100% levels to replace soya bean meal. The result of the growth performance showed progressive increase in parameter evaluated as the level of SSMR increases in the diets. Rabbits fed (100% SSMR) recorded significant higher final body weight 1351.73g which was similar to rabbits fed 25, 50 and 75% SSMR while those on T1 (0% SSMR) had the least value of 1194.50g. However, carcass characteristics and internal organ weights measurements were also not influenced by the treatment diets. It was therefore concluded that 100% SSMR can be used in compounding weaner rabbits without deleterious effect on growth performance, carcass characteristics and internal organ weights.

Keywords: Carcass, growth, performance, residue, soyabean

La performance de croissance, les caractéristiques de carcasse et le poids interne d'organe des lapins sevrés nourri des niveaux de remplacement des résidus de lait de soja séchés au soleil

Résumé

Cette étude a évalué le rendement de croissance des lapins sevrés nourris selon des régimes contenant des résidus de lait de soja séchés au soleil (RSSS) à cinq niveaux d'inclusion. Quarante lapins sevrés d'un poids initial moyen de 520±1,04 g disposés dans un modèle complètement randomisé (CRD) ont été utilisés. SSMR a été employé aux niveaux de 0, 25, 50, 75 et 100% pour remplacer le repas de haricot de soja. Le résultat de la performance de croissance a montré l'augmentation progressive du paramètre évalué comme le niveau des augmentations de SSMR dans les régimes. Les lapins nourris (100% SSMR) ont enregistré un poids corporel final plus élevé significatif 1351,73g qui était similaire aux lapins nourris 25, 50 et 75% SSMR tandis que ceux sur T1 (0% SSMR) avaient la valeur la moins élevée de 1194,50g. Cependant, les caractéristiques de carcasse et les mesures internes de poids d'organe n'ont pas non plus été influencées par les régimes de traitement. Il a donc été conclu que 100% SSMR peut être utilisé dans la composition des lapins sevrés sans aucun effet sur la performance de croissance, les caractéristiques de la carcasse et le poids interne des organes.

Mots-clés: Carcasse, croissance, performance, résidus, soja

Introduction

Rabbits have been identified as a cheap source of high-quality protein that can substantially improve the level of animal protein production and consumption in developing countries (Wafar *et al.,* 2018). Bassey *et al.* (2008) reported that rabbits are efficient converter of fibrous feed ingredients and agro- industrial by-products to meat than other livestock species. However, feeding and nutrition of rabbits requires adequate supply of feed in quantity and quality for optimal growth (Abonyi *et al.,* 2012). In most developing countries, rabbit production is based primarily on grasses and legumes which their availability and growth during dry season cannot sustain rabbit production all year round (Olomu *et al.,* 2019). The search for cheaper and available feed stuff that can sustain all year-round rabbit production has been the focus of animal nutritionist in recent years. The use of agro-by products in rabbit nutrition has been documented (Okorie, 2003 and Odeyinka *et al.,* 2007). One of such agro-byproducts considered in this study is sun dried soya bean milk residue (SSMR). SSMR is a byproduct of milk and cheese produced from soya bean (Iyegh-Erakpotobor*, et al.,* 2006). It has been reported to be a good source of protein in feeding livestock (Odeyinka *et al.,* 2007). A study conducted by Ngele *et al*. (2011) reported that weaner rabbits can utilize up to 40% inclusion levels of SSMR. However, information on the use of SSMR beyond 40% in rabbit diet is limited. The study therefore was designed to investigate the effect of feeding varying levels of SSMR on the growth performance, carcass characteristics and internal organ weights of weaner rabbits.

Materials and methods

The study was carried out at the Rabbit Unit of the Department of Animal Science and Range Management, Modibbo Adama University of Technology, Yola Nigeria. Yola is between latitude 7° 11' North and Longitude 11° 14' East and at an elevation of 364m above sea level in the north eastern part of Nigeria. The mean relative humidity ranges from 30 - 50% with a minimum in February to March when it drops to as low as 10% and a maximum of about 90% in August. The maximum temperature can reach 38°C particularly in April, while minimum temperature can be as low as 18°C (Adebayo, 1999). Forty weaner rabbits (5 weeks old) crossbred and mixed sexes were used for the study. The rabbits were randomly assigned to five treatment groups in a completely randomized design replicate four times with two rabbits per treatments. Each treatment group had eight rabbits (4 males and 4 females). The rabbits were housed in a three- tier metal framed and wire meshed cages raised 120cm above the ground. Cages were provided with an aluminum feeder and drinker. Fresh soya bean milk residue was obtained from local soya milk producers in Yola and environs, sun dried on a concrete floor until it was crispy to touch. Five experimental diets were formulated using SSMR to replace soya bean meal at 0, 25, 50, 75 and 100% in treatment 1 (T1 control), T2, T3, T4 and T5 respectively. The experimental animals were fed 2% of their body weight on dry matter basis daily. The animals were subjected to one-week adaptation period. They were given control diets and prophylactic treatment against ecto and endo parasites using ivomectin at 0.30/kg during the adaptation period. The experiment lasted for 56 days (8 weeks). Each animal was weighed before the commencement of the experiment to determine the initial weight gain. Weight gain of rabbits were obtained by subtracting the initial weight from the final weights. Feed conversion ratio was determined as the ratio of total feed intake to total weight gain of the rabbits. During carcass

characteristics and internal organ weight, a rabbit from each replicate i.e. 4 rabbits per treatment were randomly selected and evaluated according to the method described by Yakubu *and* Wafar (2014). The rabbits were weighed individually, slaughtered and de-pelted completely. The internal organs were removed carefully and weighed and expressed as percentages of their live bodyweight. The dressing percentage was calculated as a ratio of carcass weight to live weight multiplied by 100. Proximate and anti-nutritional compositions of SSMR were determined using the methods described by AOAC, (2006). All data collected were subjected to one - way analysis of variance (ANOVA) using SAS, 1998 and Duncan's Multiple Range Test (DMRT) option of same software was used to separate means where significant differences exited.

Table 1: Ingredients composition of the experimental diets fed to weaner rabbits

Ingredient	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)
Maize	40.00	40.00	40.00	40.00	40.00
Soya bean	29.00	21.75	14.50	7.25	0.00
SSMR	0.00	7.25	14.50	21.75	29.00
Wheat offal	17.25	17.25	17.25	17.25	17.25
Ground haulms	9.75	9.75	9.75	9.75	9.75
Bone meal	3.00	3.00	3.00	3.00	3.00
Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25
Lysine	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
ME (kcal/kg)	2881.77	2862.41	2843.89	2833.78	2831.56
Crude protein	18.00	17.88	17.64	.17.34	17.17
Crude fibre	8.56	7.56	7.45	7.46	7.40
Calcium	1.15	1.14	1.15	1.14	1.14
Phosphorous	0.82	0.79	0.79	0.78	0.76
Lysine	1.19	1.11	1.09	1.08	1.09
Methionine	0.56	0.55	0.54	0.53	0.54

Vitamin-mineral premix will provide per kg the following: Vit. A 1500 IU; Vit.D_3 3000 IU; Vit.E 30 IU; Vit.K 2.5 mg; Thiamine B_1 3 mg; Riboflavin B_2 6 mg; Pyrodoxine B_6 4 mg; Niacin 40 mg; Vit. B_{12} 0.02 mg; Pantothenic acid 10 mg; Folic acid 1mg; Biotin 0.08 mg; Chloride 0.125 mg; Mn 0.0956 g; Antioxidant 0.125 g; Fe 0.024 g; Cu 0.006 g; Se 0.24 g; Co 0.240 g
SSBMR=Sundried Soya bean milk residue, ME=Metabolizable Energy

Results and discussion

Proximate compositions and anti-nutritional factors in sundried soya bean milk residue

The proximate compositions and anti-nutritional factors of sundried soya bean milk residue (SSMR) are presented in Table 2. The result showed it content 92.75% dry matter (DM), 26.37% crude protein (CP), 19.13% crude fibre (CF), 8.31% ether extracts (EE), 7.16% ash, 32.04% nitrogen free extracts (NFE) and 3033.00 ME kcal/kg Metabolizable energy. The values for anti-nutritional factors include tannins (0.92mg/100g), saponins (0.16mg/100g), phytate (0.19mg/100g), alkaloid (0.12mg/100g), glycoside (0.13mg/100g), phenol (0.11mg/100g), and flavonoids (0.08mg/100g). The CP content and CF recorded is lower than 27.29% and 9.14% reported by Maidala and Doma (2016) and 29.11% and 23.77% reported by Saleh *et al*. (2018). The CP content however is in line with 26.88% reported by Muhammed *et al.,*

(2015). This support an earlier report of Wafar *et al.* (2017) who stated that crude protein of 18% and above qualifies an ingredient as alternative protein source. The ether extracts recorded is slightly less than the value of 5.54% reported by Maidala and Doma (2016). The ash content obtained in the present study indicated the potential sources of dietary mineral elements. The energy value (3033.00 kcal/kg) in this present study is higher than 2396.55 kcal/kg reported by Saleh *et al.* (2018). The values obtained showed that they can as well be used as energy feed stuff for livestock especially monogastric animals. The anti-nutritional factors are within the acceptance range reported by Wafar *et al.,* (2017) for rabbits raised under tropical condition. The variation in nutrient composition may be attributed to climatic factors, edaphic factors, processing methods and laboratory analysis (Ojewole *et al.,* 2015).

Table 2 : Proximate compositions and anti -nutritional factors of s undried soya bean milk residues (SSMR)

Parameter	% Composition
Dry Mater	72.75
Crude Protein	26.37
Crude fibre	19.13
Ether Extracts	8.31
Ash	4.56
Nitrogen free extracts	32.04
Metabolizable energy (Kcal/kg)	3033.00
Anti-nutrients mg/100g	
Tannins	0.92
Saponins	0.16
Phytate	0.19
Alkaloid	0.12
Glycoside	0.13
Phenol	0.11
Flavonoids	0.08

Calculated according to the formula Pauzenga, (1985)

Growth performance of weaner rabbits fed graded levels of sundried soya bean milk residues (SSMR)

The results of growth performance of weaner rabbit fed graded levels of soya bean curd residue are presented in Table 3. It showed significant (P>0.05) differences on all the parameters examined. The result showed progressive increase in parameter evaluated as the level of SSMR increases in the diet. The final body weight ranges from 1194.50-1351.45g. Rabbits fed (100% SSMR) recorded significantly higher final body weight 1351.73g which was similar to rabbits fed 25, 50 and 75% SSMR while those on T1 (0% SSMR) had the least value of 1194.50g. The higher final body weight recorded in rabbits fed 100% SSMR agreed with the findings of Saleh *et al.* (2018) who reported improved growth performance of weaner rabbits fed SSRM based diets. However, increased in total body weight gain observed could be attributed to increase in feed intake and better utilization of soya bean milk residue meal. This confirmed earlier reports of Lei *et al*. (2004), Shunong *et al.* (2013) and Saleh *et al* (2018) that soya bean milk residue is a good source of nutrients. Average daily weight gain was significantly (P>0.05) influenced by the dietary treatments. The values obtained are within the range of 9.88 – 15.55g reported (Saleh *et al.,* 2018). However, the daily weight gain values recorded in this study was lower than the 18.1g of Phimmasan *et al.* (2004).

Difference in the weight gain with other studies could be attributed to breeds, diets and duration of study (Lei et *al.,* 2004).

Rabbits showed significant (P<0.05) differences for feed conversion ratio (FCR). The best FCR was obtained for rabbits on T5 (100% SSRM.)

Table 3: **Growth performance of weaner rabbits fed graded levels of sundried soya bean milk residues (SSMR)**

Parameter	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)	SEM	P-value
Initial body weight (g/rabbit)	550.90	552.42	551.34	550.59	550.79	0.70	0.40
Final body weight (g/rabbit)	1194.50^{b}	1255.02^{ab}	1287.53^{ab}	1275.14^{ab}	1351.73^{a}	45.14	0.02
Average daily weight gain (g)	11.49^{b}	12.54^{ab}	13.14^{ab}	12.43^{ab}	14.30^{a}	0.80	0.05
Average daily feed intake (g)	60.14^{c}	64.78b^{c}	68.10^{ab}	68.59^{ab}	70.93^{a}	1.62	0.02
Feed conversion ratio	5.29^{a}	5.25^{a}	5.28^{a}	5.34^{a}	4.97^{b}	0.34	0.04

Mean on same row bearing different superscript differ significantly
SEM= standard error mean

Carcass characteristics and internal organ weights of weaner Rabbits fed graded levels of sundried soya bean milk residues (SSMR) Results for carcass characteristics and internal organ weights of weaner rabbits fed graded levels of SSMR are presented in Table 4. The result showed that all the parameters measured were not significantly (P<0.05) affected by dietary treatments. The dressing percentage value obtained were lower than values (72.6-76.20%) reported by Okorie, (2003) but higher than the values (45.5-52.6%) reported by Biya *et al.,* (2008). The result of internal organ weights was not significantly (P>0.05) influenced by inclusion levels of SSMR in the diets. Study have shown that organs such as liver and kidney undergo hypertrophy as a result of metabolites in diet (Carew *et al.,* 2003). It is evident therefore, feeding weaner rabbit with vary levels of SSMR did not show any adverse effect on the internal organs

Table 4 : Carcass characteristics and internal organ weights of weaner rabbits fed graded levels of sundried soya bean milk residues (SSMR)

Parameter	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)	SEM	P-value
Live weight (g)	1662.61	1223.13	1255.63	1319.83	1243.25	45.14	0.23
Dressed weight (g)	862.14	850.85	853.46	891.49	869.00	19.26	0.66
Dressing percentage (%)	74.68	69.89	69.13	67.65	70.05	3.13	0.60
Internal organs weights (% live weight)							
Kidney	0.97	0.91	0.76	0.80	0.83	0.09	0.53
Lungs	0.88	0.77	0.77	0.79	0.60	0.07	0.16
Liver	3.15	3.68	3.52	3.53	3.56	0.18	0.60
Small intestine length (cm)	211.65	207.22	238.00	240.00	247.02	21.67	0.60
Large intestine length (cm)	102.20	101.57	102.41	102.32	102.36	0.65	0.88

SEM= Standard error mean

Conclusion and recommendation

It was concluded that rabbits fed SSMR based diet showed improved growth performance. However, those fed 100% SSMR recorded significant higher final body weight, average daily feed intake, average daily weight gain and better feed conversion ratio. The study thus recommends that 100% SSMR should be used in compounding weaner rabbit diets.

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