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COST ANALYSIS AND PERFORMANCE OF GROWER RABBITS FED DIETS REPLACING SOYBEAN MEAL WITH GRADED LEVELS OF SOYABEAN CURD RESIDUE

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ABSTRACT

An experiment was conducted at the Poultry Unit of the Teaching and Research Farms, Plateau State College of Agriculture to determine the effect of soya bean curd residue (SBCR) on the performance of grower rabbits as replacement for soybean meal; focusing on determining optimum inclusion level of soya bean curd residue, feed consumption, growth rate, carcass characteristics and cost implication of using soya bean curd residue in place of SBM in rabbits' diets. The soya bean curd residue was used to replace soybean meal at 5%, 10%, 15% and 20% inclusion levels (designate as T_2, T_3, T_4 and T_5, respectively) of the basal diet (T_1 or control), forty five weaned rabbits at 11 weeks of age were grouped into 5 treatments in completely randomized design. They were fed with their respective treatment diets and water ad libitum for the period of 6 weeks. The results showed that rabbits fed diets 1 and 2 had similar total feed intake (TFI); those on T_1, T_2, T_3 and T_5 had similar daily feed intake (DFI) while rabbits on T_4 had lowest TFI and DFI. Total live weight (TLW), daily weight gain (DWG), feed conversion ratio (FCR) and feed efficiency (FE) were not significantly affected by treatment diets. Rabbits fed T_5 had highest carcass weight followed by those on T_2 and T_4; those on T_1 and T_2were similar while those on T_3 had least. Liver weight was similar between rabbits on T_1 and T_4 and least on those of T_5. Those on T_1 T_4 and T_5 had similar kidneys weight while rabbits on T_3 had the least. All the rabbits fed soya bean curd residue-based diets had similar lungs weight with their counterparts on control diet and those on T_3 had lowest lungs weight. It was concluded that soya bean curd residue can replace soybean meal up to 20% level of inclusion without adverse effect on the performance and carcass characteristics of rabbits Also, there was cost effectiveness in the use of soyabean cake residue in the diets of rabbits.

Keywords: cost analysis, grower rabbits, soya bean curd residue, soya bean meal,
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INTRODUCTION

Background information

Rabbit is a pseudo-ruminant having short generation interval with high prolificasy and good mothering ability (Ajani *et al., 2020).* It is easy to manage owing to the ability to utilize waste and other unconventional feed sources (Never, 2018). Livestock feed in Nigeria particularly of the monogastric species is very expensive and it will continue to rise as the demands for maize and soybean is high between man and livestock (Sudit, 2016). Maize and soybean are the most reliable energy and protein sources for both man and livestock. Anonymous (2018a) ascribed that the current high prices of commercial feed and on-farm feed in the country (Nigeria) continue to rely on the importation of animal proteins while there is banned on the use of meat meal in livestock for the fear of infection. Most newly established pigs or poultry farms hardly celebrate 5 anniversaries for their inability to cope with the rising cost of feed. This is a concern to animal nutritionist and the use of alternative, less traditional raw ingredients when formulating rabbit

diets may become more economical and attractive primarily to help the resource-poor farmers in cutting down their production cost, and at the same time to improve livestock production. To this end, one of such alternative ingredient is soya bean residue. Soya bean curd residue is a by-product of soybean seeds obtained when producing soyabean residue. Soya bean cake residue is a food eaten by man. Soya bean curd residue is rich in nutrients and was suggested to be incorporated in livestock feed (Anonymous, 2018b). Anonymous (2018b) reported that soyabean cake residue contains 26.38% CP, 15.28% CF, 0.72% Ca, 0.08% P.

Justification

Soya bean curd residue is readily available, cheap, and is usually thrown as waste despite it richness in nutrients. Being a thrown waste may cause environmental hazard if left untapped. This research is designed in order to ascertain the potential of soya bean curd. To achieve this, a feeding trial was conducted incorporating soya bean curd residue and was fed to 16 rabbits. The response criteria included weight gain, feed intake and carcass characteristics.

Objectives

The main objective of this study was to examine the nutritive potentials of soya bean curd residue in grower rabbits' diets.

Specifically, the study sought to:

i. Determine the optimum level of inclusion of soya bean curd residue in places of soybean meal in grower rabbit diets, using growth performance, feed utilization and carcass characteristics as response criteria;
ii. Determine the cost implication of using soya bean curd residue in grower rabbits' diets.

MATERIALS AND METHODS

Study Area

The experiment was conducted at the Poultry Unit of the Teaching and Research Farms, Plateau State College of Agriculture, Garkawa. Garkawa town lies within the Plateau State Southern Zone; is 212 km away from Jos along Wukari-AmperPankshin road. It is about 300m above sea level. It is located on latitude 8.8955°N and longitude 9.4537°E. Its annual average temperature is usually about 27.7°C and annual average precipitation is usually about 1178mm (Sudik, 2018).

Feed ingredients and Processing

Soya bean curd residue as by-product of soya bean was obtained in Garkawa town from soyabean cake residue producing houses. It was left to dry under a shade to avoid evaporation of micronutrients. While maize.soybean. rice offal, soy oil and salt were purchased in Garkawa local market and bone meal, premix. lysine and methionine were purchased from a feed miller in Jos, Plateau state, Nigeria.

Experimental Diets

A basal diet (designated as T_1 or control) was formulated following the nutrient requirements of a grower rabbits. Thereafter 4 other diets (T_2, T_3, T_5 and T_5) were formulated by replacing soybean meal at 5%, 10%, 15% and 20%, respectively (Table 1).

Experimental Rabbits and Management

Forty five grower rabbits at 11 weeks of age were purchased from a rabbit farmer in Jos, Plateau state capital. They were grouped into 5 treatments of 9 rabbits per treatment by using a diagonal

method of weight balancing in a completely randomized design (CRD). Each treatment was replicated thrice with each replicate containing three rabbits. The rabbits were fed with their respective treatment diets and water *ad libitum* for 6 weeks experimental period. Antibiotics and anticoccidial drugs were occasionally administered in the drinking water as a preventive measure.

Data Collection

At the start of the experiment initial live weights of all the rabbits were taken and were subsequently taken on weekly basis. They were served with a known quantity of their respective treatment diets at the commencement of the study, and was supplied on weekly basis. The remains of feed at the end of each week were weighed back. The following calculations were computed.

Total live weight: TLW = was cumulative

Daily weight gain: DWG = $\frac{TLW}{42\ days}$

Total feed intake: TFI = cumulative feed consumed

Daily feed intake: DFI = $\frac{TFI}{42\ days}$

Feed conversion ratio: FCR = $\frac{TFI}{TLW}$

Feed efficiency: FE = $\frac{TLW}{TFI}$

Cost Analysis

The costs of the formulated treatment diets were computed using the market prices of the ingredients as at the time of the experiment.

Data Analysis

Data collected were subjected to the analysis of variance (ANOVA) using SPSS version 16.0 statistical package. Differences in the means were separated using the Duncan new multiple range test (DNMRT).

Table 1: Composition of the experimental diets

Ingredients	0% T_1	5% T_2	10% T_3	15% T_4	20% T_5
Maize	26.00	26.00	26.00	26.00	26.00
Soybean	11.50	10.93	10.35	9.78	9.20
Rice offal	10.00	10.00	10.00	10.00	10.00
Soybean residue	0.00	0.58	1.15	1.73	2.30
Bone meal	0.50	0.50	0.50	0.50	0.50
Oster shell	1.00	1.00	1.00	1.00	1.00
Premix	0.13	0.13	0.13	0.13	0.13
Methionine	0.13	0.13	0.13	0.13	0.13
Lysine	0.13	0.13	0.13	0.13	0.13
Salt	0.13	0.13	0.13	0.13	0.13
Oil	0.50	0.50	0.50	0.50	0.50
Total	**50.00**	**50.00**	**50.00**	**50.00**	**50.00**

Table 1 shows the composition of the experimental diets. T_1 has an inclusion level of 0% of soyabean cake residue and being regarded as the control while T_2,T_3, T_4 and T_5 represent 5, 10, 15 and 20% level of inclusion of soya bean curd residue in that order.

RESULTS AND DISCUSSION

The results of the experiment are presented as follows.

Performance of Grower Rabbits

Table 2 shows the performance of grower rabbits fed diets replacing SBM with soya bean curd residue from 11 to 17 weeks of age. The parameters studied showed that only TFI and DFI were significantly affected (P>0.001) by the treatment diets. This is in agreement with Sudik, *et al.*, 2020 who stated that TFI and DFI were significantly affected by the treatment of diets. Rabbits fed on T_2 had similar TFI (4.81 ± 0.30kg) with those on control (4.88 ± 0.70kg). Again, rabbits on T_2, T_3 and T_5 had (0.11 ± 0.00, 0.11 ± 0.00 and 0.11 ± 0.00kg respectively) had similar DFI with their counterparts on the control while the rabbits on T_4 had the lowest TFI (4.09 ± 0.04kg) and DFI (0.10 ± 0.00kg). Total live weight, DWG, FCR and FE were not significantly affected by the treatments which disagree with Sudik, *et al.*, 2020

Carcass and Organs Characteristics of Grower Rabbits

The live weight and carcass characteristics of grower rabbits fed diets replacing SBM with soya bean curd residue are presented in table 3. Majority of the parameters (carcass weight, liver, kidneys and lungs) were significantly affected by the treatment diets not in agreement with Sudik, *et al.*, 2020. This shows that increasing the SBCR up to 20% inclusion level gives a good weight gain which will translate into good weight for better productivity. Rabbits fed T_5 had highest carcass weight (1.35±0.03kg), followed by those on T_2 and T_4 (1.25±0.03 and 1.25±0.03kg respectively) than those on control (1.03±0.03kg) while those on T_3 had similar carcass weight (1.05±0.03kg) With those on control. Liver weight was similar between rabbits on T_4 and control (40.00±0.91g and 42.00±0.91g, respectively) while those on T_5 had the least (33.50±1.55g). This implies that the SBCR is not toxic to liver otherwise it would have been enlarged and inflamed. However those on T_4 and T_5 had similar kidneys weight with their counterparts on control (12.00±1.82 12.00± 0.91g and 12.00±0.91g) while rabbits on T_3 had the least (9.00±1.08g) and all the rabbits fed soya bean curd residue based diets had similar lungs weights (14.00±1.68, 13.00±0.71, 10.75±0.85g) like those on control (12.00±0.91g) with those on T_3 had lowest (7.00±0.47g).

Cost Benefit

Table 3 also depicts the cost of the formulated grower rabbit's diets that show a decrease with increase in inclusion of soya bean curd residue in the diets. The control diet had the highest cost of feed per kg (4095.19) while diet 5 had the least cost per kg (N3153.83). This shows that increase in soya bean curd residue will make the feed less expensive.

DISCUSSIONS

Rabbits fed T_2 shows similar feed consumption with those on control this may probably due to similarity in the nutrients content of their diets while the non-significant differences in other parameters might be a good development meaning any inclusion level of soya bean curd residue can be used in grower rabbit's feed production. The variations in most of the carcass traits which appeared superior in grower rabbits fed T_5 and in some cases the other grower rabbits fed soya bean curd residue based treatments diets further confirmed the potential of soya bean curd

residue to be incorporated in the diets of grower rabbits. The lower cost achieved when inclusion levels of soyabean cake residue increases in the treatment diets means that farmer who incorporated soya bean curd residue will save money and use it for other expenses other than feed production.

SUMMARY AND CONCLUSION

Summary

An experiment was conducted at the Poultry Unit of the Teaching and Research Farms, Plateau State College of Agriculture to determine the effect of soya bean curd residue on the performance of grower rabbits as replacement for soybean meal; focusing on determining optimum inclusion level of soyabean residue, feed consumption, growth rate, carcass characteristics and cost implication of using soyabean cake residue in place of SBM in rabbits' diets. The soya bean curd residue was used to replace soybean meal at 5%, 10%, 15% and 20% inclusion levels (designate as T_2, T_3, T_4, and T_5, respectively) of the basal diet (T_1 or control). 20 grower rabbits at 11 weeks of age were grouped into 5 replicates in completely randomized design (CRD). They were fed with their respective treatment diets and water *ad libitum* for the 6 weeks experimental period. The results showed that grower rabbits fed T_1, andT_2 had similar total feed intake (TFI); those on T_1, T_2, T_3 and T_5 had similar daily feed intake (DFI) while rabbits on T_4, had lowest TFI and DFI. Total live weight (TLW), daily weight gain (DWG), feed conversion ratio (FCR) and feed efficiency (FE) were not significantly affected by treatment diets. Rabbits fed T_5 had highest carcass weight followed by those on T_2 and T_4; those on T_1 and T_2 had similar, while those on T_3 had least. Liver weight was similar between rabbits on T_1 and T_4 and least on those of T_5. Those on T_1 T_4 and T_5 had similar kidneys weight while rabbits on T_3 had the least, all the rabbits fed soyabean residue-based diets had similar lungs weight with their counterparts on control diet and those on T_3 had lowest lungs weight.

CONCLUSION

It was revealed in this experiment that soya bean curd residue can replace soybean meal up to 20% level of inclusion without any adverse effect on the performance and carcass characteristics of grower rabbits. Further research is recommended for grower females and pregnant rabbits with the use of soyabean cake residue there is a cost benefit of using soya bean curd residue in the diets of grower rabbits.

Table 2: Cost Analysis and Performance of Grower Rabbits fed diets replacing SBM with Soya bean curd residue from 11 – 17 weeks of age

Treatments	% of SBM replace by SBCR	TWG (kg)	DWG (kg)	TFI(kg)	DFI(g)	FCR	FE	Cost (₦)
T_1	0	1.87 ±0.18	0.04 ±0.00	4.88 ±0.70^a	0.12 ±0.00^a	2.69±0.27	0.38±0.03	4095.19
T_2	5	1.84±0.12	0.04±0.00	4.81±0.30^a	0.11±0.00^a	2.64±0.13	0.38±0.02	4030.82
T_3	10	1.88±0.12	0.04±0.02	4.52±0.04^b	0.11±0.00^a	2.44±0.18	0.42±0.03	3785.62
T_4	15	1.78±0.08	0.05±0.00	4.09±0.04^c	0.10±0.00^b	2.31±0.10	0.44±0.02	3417.58
T_5	20	1.76±0.09	0.04±0.00	4.49±0.03^b	0.11±0.00^a	2.57±0.13	0.39±0.02	3153.83
P-Value	-	0.944	0.945	0.000	0.000	0.542	0.475	-

Values are averages of 4 grower rabbits SBM=soybean meal, SBCR= soya bean curd residue, TWG=total weight gain, DWG=daily weight gain, TFI=total feed intake, DFI=daily feed intake, FCR=feed conversion ratio and FE=feed efficiency, column with difference superscripts are significance difference

Table 3: Live Weight and carcass characteristics of grower rabbits fed diets replacing SBM with soya bean curd residue from 11 – 17 weeks of age

Treatments	% of SBM replace by SBCR	Live weight (kg)	Carcass weight (kg)	Liver (g)	Kidney (g)	Heart (g)	Lungs (g)
T_1	0	1.97 +0.14	$1.03+0.03^{c}$	$42.00+0.91^{a}$	$12.00+0.91^{a}$	5.00+0.91	$12.00+0.91^{a}$
T_2	5	2.00+0.04	$1.25+0.03^{b}$	$38.00+1.47^{ab}$	$11.00+0.71^{ab}$	6.00+0.91	$14.00+1.68^{a}$
T_3	10	1.97+0.10	$1.05+0.03^{c}$	$34.00+1.63^{bc}$	$9.00+1.08^{c}$	3.00+0.91	$7.00+0.47^{b}$
T_4	15	1.97+0.08	$1.25+0.03^{b}$	$40.00+0.91^{a}$	$12.00+1.82^{a}$	5.00+0.91	$13.00+0.71^{a}$
T_5	20	1.93+0.08	$1.35+0.03^{a}$	$33.50+1.55^{c}$	$12.00+0.91^{a}$	5.00+0.91	10.75+0.85
P-Value	-	0.987	0.000	0.001	0.128	0.269	0.008

Values are averages of 9 grower rabbits, SMB=soybean meal, soya bean curd residue, column with difference superscripts are significance difference.

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