



Original Contribution

EFFECT OF FEEDING GRADED LEVELS OF COWPEA (*VIGINA UNGUICULATA*) TESTA MEAL ON GROWTH AND ECONOMIC PERFORMANCE OF GROWING RABBITS

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ABSTRACT

An 8-week feeding trial was conducted to assess the growth and economic performance of growing rabbits fed graded levels of cowpea testa meal (CTM). Wheat offal was replaced with cowpea testa meal at 0, 25, 50, 75 and 100% levels in diets 1, 2, 3, 4 and 5, respectively. Twenty-five crossbred rabbits (Dutch X New Zealand White) between 5 – 7 weeks of age were randomly allocated to the 5 treatments in groups of 5 rabbits and allowed unlimited access to the feed and drinking water throughout the experimental period. The daily weight gain and feed conversion ratio were not significantly ($P>0.05$) different among the treatments while the final body weight and daily feed intake were affected by the inclusion of cowpea testa meal (CTM) in the diets. Rabbits fed T2 (25% cowpea testa meal) diet recorded the highest final body weight while those fed T5 (100% cowpea testa meal) diet recorded the least; other treatments were similar to the control (0% CTM). Rabbits fed T2 (25% cowpea testa meal) diet consumed more feed compared to rabbits fed other diets. The cost per kg feed decreased as the level of CTM increased in the diets. The best cost per kilogram of weight gain was obtained by rabbits fed T4 (75% cowpea testa meal) diet while the poorest was recorded by rabbits fed T2 (10% cowpea testa meal) diet. Therefore, 100% of the wheat offal in the diets of growing rabbits could be replaced with cowpea testa meal without adverse effects on growth and economic performance.

Key words: Cowpea testa meal, growing rabbit, growth and economic performance

INTRODUCTION

There is deficit of animal protein in diets of people in the third world countries like Nigeria, where it is estimated that on average only 10 g of animal protein is consumed per day per head against 35 g recommended by (1-2). Mini livestock production has been identified as the possible means to bridge the protein shortage of the undernourished average African people (3). The advocacy for expanding mini-livestock production particularly rabbit, is due to short generation interval, high prolificacy, good mothering ability, ability to utilize forage and other unconventional feed sources (4). Nutritionally, rabbit meat is high in protein but low in fat and cholesterol, and highly digestible with dressing percentage of 82 to 85% (5).

(6) stated that conventional feeds account for about 70% of total cost of rabbit production making them expensive to most farmers.

Recent difficulties with animal production inputs in Nigeria and the high cost of feed ingredients in particular have brought about the need to look for cheaper alternatives to the conventional feed resources. These products could be cheaply available for compounding livestock feeds as it will reduce or remove the competition between man and livestock (7). Cowpea (*Vigna unguiculata*) otherwise known as “beans” is very popular among households in Africa and is a widely grown leguminous crop in Nigeria. The testa covering the cotyledons of the bean is usually removed during the processing and this by-product can be fed to ruminants (8). Currently, its use in rabbit feeding is limited, hence the need for further research. This study was therefore, conducted to evaluate the effect of feeding different levels of cowpea testa meal on growth and economic performance of growing rabbits.

MATERIALS AND METHODS

Experimental Animals and Management

The study was conducted at the Livestock Teaching and Research Farm, University of Maiduguri, Maiduguri, Borno State, Nigeria.

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Twenty-five crossbred rabbits (Dutch x New Zealand white) between 5 and 7 weeks of age were used for the 8 – week feeding trial. The rabbits were individually weighed, equalized for weight and randomly assigned to the five (5) treatments in groups of five (5). Each rabbit was caged individually. The rabbits were provided with the experimental diets and clean drinking water *ad libitum*. Data collection commenced after an initial adjustment period of seven days.

Experimental Diets

The experimental diets are shown in **Table 1**. Maize, wheat offal, groundnut haulm, groundnut cake, fish meal, cowpea testa meal, bone meal, common salt and premix were used in compounding the experimental diets. Cowpea testa meal (CTM) replaced wheat offal at levels of 0, 25, 50, 75 and 100% in diets 1 (control), 2, 3, 4 and 5, respectively.

Table 1. Ingredient Composition of the experimental diets

Ingredients (%)	Levels of wheat offal replaced with cowpea testa meal				
	T1(0%)	T2(25%)	T3(50%)	T4(75%)	T5(100%)
Maize	40.98	40.98	40.98	40.98	40.98
Wheat offal	17.00	12.75	8.50	4.25	0.00
Cowpea testa meal	0.00	4.25	8.50	12.75	17.00
Groundnut cake	23.37	23.37	23.37	23.37	23.37
Fish meal	3.00	3.00	3.00	3.00	3.00
Groundnut haulms	13.00	13.00	13.00	13.00	13.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Common Salt (NaCl)	0.50	0.50	0.50	0.50	0.50
Premix*	0.15	0.15	0.15	0.15	0.15
Total	100.00	100.00	100.00	100.00	100.00

*Premix (grow fast) manufactured by Animal Care Service Consult (Nig) Ltd. Lagos, Supplied the following per kg of premix: Vitamin A, 5000,00 IU; Vitamin D₃ 800,000 IU; Vitamin E, 12,000 mg; Vitamin K, 1,5000 mg; Vitamin B₁, 1,000 mg; Vitamin B₂, 2,000 mg, Vitamin B₆, 1,500 mg; niacin, 12,000 mg; pantothenic acid, 20.00 mg; biotin,10.00 mg; Vitamin B₁₂, 300.00 mg; folic acid, 150,000 mg; choline, 60,000 mg; manganese, 10,000 mg; iron;15,000 mg, zinc 800.00 mg; copper 400.00 mg; iodine 80.00 mg; cobalt 40 mg; selenium 8,00 mg.

Data collection

The daily feed intake was obtained by subtracting the left-over from total amount of feed supplied. Each rabbit was weighed at the inception of the experiment and weekly thereafter to obtain the weekly and daily body weight gain throughout the experimental period. The feed conversion ratio was calculated as the dry matter feed intake per unit weight gain. The proximate composition of the diets and test material (cowpea testa meal) were determined according to (9).

Economic analysis

The economic implication of including cowpea testa meal in the diets of growing rabbits was assessed by calculating the:

- (i) Total feed intake per rabbit;
- (ii) Total weight gain;
- (iii) Cost per kilogramme of each diet;
- (iv) Cost per kilogramme of weight gain by the rabbit.

Statistical Analysis

Data collected were subjected to analysis of variance and where significant differences

were observed, means were compared by Duncan's multiple range test (10) as outlined by (11). Computer package statistix version 9.0 was used for the analysis.

RESULTS AND DISCUSSION

Proximate Composition of the Experimental Diets and Cowpea Testa Meal

The proximate composition of the experimental diets and the cowpea testa meal are shown in **Table 2**. The crude protein (22.06%) of the cowpea testa meal is lower than the value reported by (8) but higher than the value (18.0%) reported by (13). However, the crude fibre value (10.07%) is higher than 7.85% reported by (8) and lower than 13.6% reported by (13) The difference in the levels of crude protein and crude fibre may be due to different methods of processing cowpea testa meal by the producers. Values for ether extract and ash content were similar to the results of other authors (13; 8) who analyzed cowpea testa. The crude protein levels of the experimental diets (16.03 to 18.57%) are higher than the value reported by (14) that incorporated abattoir waste in the diets of rabbits. However, the values reported here are

close to the recommended levels of 15% and 13% for growth and maintenance, respectively reported by (15). The crude fibre of the experimental diets ranged from 8.0 to 14.0% which is higher than 6.25 to 12.50% reported by (17), but adequate for rabbit diet as reported by (18). This is also in line with the observation of (19) who found that crude fibre levels of 10 to 17% could support weight gain and normal gut function in rabbits. The ether extract (3-4%) of the experimental diets were similar and adequate for growing rabbit. (20) reported that a minimum level of 3% fat is

adequate to meet the requirement of the rabbit. The lowest value of ash content was reported in T4 (75% CTM) diet but higher values were obtained in T3 (50% CTM) and T5 (100% CTM), respectively. The T1 (0% CTM) recorded the highest value of nitrogen-free extract (NFE) while the lower values were obtained in T3 (50% CTM) and T5 (100% CTM), respectively. The metabolisable energy of the experimental diets was similar to the value (2800 Kcal/kg) reported by (21) for growing rabbit.

Table 2. Proximate composition (%) of the experimental diets and cowpea testa meal (CTM)

Parameters	Levels of wheat offal replaced with cowpea testa meal					CTM
	T1(0%)	T2(25%)	T3(50%)	T4(75%)	T5(100%)	
Dry matter (DM)	93.40	93.60	94.10	95.90	94.90	83.04
Crude protein (CP)	16.42	16.03	16.60	16.57	16.47	22.06
Crude fibre (CF)	8.00	12.00	13.00	14.00	13.00	10.07
Ether extract (EE)	3.00	4.00	4.00	3.00	4.00	5.37
Total Ash	2.00	2.00	4.00	1.00	4.00	5.60
Nitrogen-free extract (NFE)	70.58	65.59	62.40	65.43	62.53	56.90
ME(Kcal/kg)	3356.13	3245.56	3153.40	3178.86	3152.82	3271.14

ME = Metabolizable energy calculated according to the formula of (12):

$$ME = 37x\% CP + 81x\% EE + 35.5\% x NFE$$

Table 3. Growth performance of rabbits fed different levels of cowpea testa meal

Parameters	Levels of wheat offal replaced with cowpea testa meal					SEM
	T1(0%)	T2(25%)	T3(50%)	T4(75%)	T5(100%)	
Mean initial body weight (g)	450.00	491.01	453.67	465.68	473.33	35.04 ^{NS}
Mean final body weight (g)	1127.0 ^{ab}	1283.36 ^a	1220.00 ^{ab}	1250.30 ^{ab}	1120.00 ^b	49.86 [*]
Mean daily feed intake(g/rabbit)	58.95 ^b	67.99 ^a	55.33 ^b	54.76 ^b	56.96 ^b	2.23 [*]
Mean daily weight gain (g/rabbit)	12.50	13.37	13.07	14.27	11.35	1.97 ^{NS}
Feed conversion ratio (feed : gain)	6.41	6.65	5.30	5.57	3.15	1.28 ^{NS}

SEM = Standard error of mean; NS = Not significant (P>0.05); * = Significant (P<0.05);

a, b = Means in the same row bearing different superscripts differ significantly (P<0.05)

Growth Performance

The growth performance of the rabbits is shown in **Table 3**. The initial body weight, daily weight gain and feed conversion ratio were not significantly (P>0.05) different among the treatment groups while final body weight and daily feed intake were significantly (P<0.05) different among the treatments. Rabbits fed T2 (25% cowpea testa meal) diet recorded the highest final body weight which is significantly (P>0.05) higher than those fed T5 (100% cowpea testa meal) diet, but similar to the other treatments. The values obtained were higher than those reported by (22) who fed *Asystasia gangetica* leaf meal (ALM) as a replacement for wheat offal. The differences in final body weight recorded may be attributed

to difference in the feed conversion ratio, composition of the diet and environmental condition during the experimental period. Rabbits fed T2 (25% cowpea testa meal) consumed more feed than other treatments. The value recorded were similar to values reported by (22) who fed *Asystasia gangetica* leaf meal (ALM) as a replacement of wheat offal. The values (11.35 to 14.29 g) obtained for daily weight gain in this experiment are within the range of 10 to 20 g reported for growing rabbit reared in the tropics (18). The values (3.15 to 6.65) for feed conversion ratio recorded in this experiment are similar to the values obtained by (16) that reared growing rabbits in same environment.

Table 4. Economic analysis of rabbits fed different levels cowpea testa meal

Parameters	Levels of wheat offal replaced with cowpea testa meal					SEM
	T1(0%)	T2(25%)	T3(50%)	T4(75%)	T5(100%)	
Initial weight (g/rabbit)	450.00	491.01	453.67	465.68	473.33	35.04 ^{NS}
Final live weight (g/rabbit)	1126.70 ^{ab}	1283.30 ^a	1220.00 ^{ab}	1250.00 ^{ab}	1120.00 ^b	49.86 [*]
Total feed intake (g/rabbit)	3301.20	3807.44	3099.60	3066.56	3190.88	-
Total feed intake (kg/rabbit)	3.30	3.81	3.10	3.07	3.19	-
Total weight gain (g/rabbit)	90.49	88.95	88.02	87.53	86.74	-
Total weight gain (kg/rabbit)	0.70	0.75	0.73	0.80	0.64	-
* Cost/kg feed (₦)	700.17	748.51	732.83	800.03	635.32	-
Total feed cost (₦)	283.11	324.84	262.69	258.56	267.00	-
Cost/kg gain (₦/kg)	404.44	433.12	359.85	323.20	417.19	-

* Cost per kilogram of the various ingredients used in compounding the experimental diets: Cowpea testa meal, ₦71.94; maize, ₦74.07; wheat offal, ₦84.19; groundnut cake, ₦100.00; groundnut haulms, ₦80.00; fish meal, ₦125.00; bone meal, ₦50.00; salt, ₦10.00 and premix, ₦1400.00.

- = Not analyzed statistically

SEM = Standard error of mean

NS = Not significant (P>0.05)

a, b = Means in the same row bearing different superscripts differ significantly (P<0.05)

Economic analysis

The economic analysis of growing rabbits fed graded levels of cowpea testa meal is presented in **Table 4**. The total cost per kg feed decreased with increasing levels of cowpea testa meal in the diets due to the cheaper cost of cowpea testa meal (₦ 71.94) compared to wheat offal (₦ 84.19) which is the dietary component replaced by cowpea testa in the diets. The best feed cost/kg gain was observed in rabbits fed diet T4 (75% cowpea testa meal) while the poorest cost/kg gain was recorded in rabbits fed T2 (25% cowpea testa meal). This may be attributed to the higher feed intake recorded by rabbits fed 25% CTM. The lower cost per kg feed is an incentive that will warrant the replacement of wheat offal with cowpea testa meal in rabbit diet.

CONCLUSION

The results from this study revealed that up to 100% of wheat offal could be replaced with cowpea testa meal (CTM) in the diets of growing rabbits without adverse effect on the growth and economic performance of the rabbits. Additional advantage is reduced feed cost per kilogram as the level of cowpea testa meal increased in the diets. However, the best feed cost/kg gain was obtained in rabbits fed T4 (75% CTM). Therefore, farmers can use CTM as a replacement for wheat offal in rabbit diets without detrimental effect on performance.

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