



RESPONSE OF WEANER RABBITS FED GRADED LEVELS OF COWPEA HUSK DIETS

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ABSTRACT

The study was carried out to determine the response of weaner rabbits fed graded levels of cowpea husk diets. A total of forty (40) weaner rabbits were randomly allotted to five dietary treatments, replicated four times in a completely randomized design, in which cowpea husk replaced groundnut haulm at 0, 25, 50, 75 and 100% levels designated as diets 1, 2, 3, 4 and 5 respectively. Growth performance such as initial weight, final weight, total feed intake and daily feed intake were not significantly affected by the dietary treatments except for total weight gain (397.33 to 638.66g), daily weight gain (7.10 to 11.40g), feed conversion ratio (5.41 to 7.94) and feed efficiency (0.12 to 0.19), which were significantly ($P<0.05$) affected. Nutrient digestibility indicated significant ($P<0.05$) difference in crude protein (91.64 to 93.42%), crude fibre (78.50 to 81.77%) and ash (90.93 to 93.95%). Most of carcass characteristics were not affected by the diets except live weight (1407 to 1750.66g), large intestine (28.66 to 43.93%), stomach (61.33 to 98%) and hind limb (18.70 to 26.26%) at ($P<0.05$). Diet 3 (50% cowpea husk) had the highest cost-benefit (₦710.97) with an 18.58% cost saving. It can be concluded that cowpea husk can replace groundnut haulm at 50% level in the diet of weaner rabbits without compromising their performance, carcass characteristics, digestibility as well as reduction in feed cost. Diet 3 is recommended for rabbit production.

Keywords: Rabbit, Digestibility, Feed conversion ratio, Carcass, Groundnut Haulms.

INTRODUCTION

In most developing countries of the world today, there is inadequate consumption of animal protein (FAO, 2009). Recent studies have shown that farming rabbits and other micro livestock species (grass cutter and snail) is emerging in many developing countries, Nigeria included as potential source of protein (Ozung *et al.*, 2017). However, the limiting factor for meat production from rabbits is mainly access to quality feed (Olugusi *et al.*, 2021). Cowpea husk is an alternative non-conventional feed resource not consumed by man (Van Hao and Ledin, 2001). It is a farm waste or fibrous crop residue characterized by low crude protein (12.9%) and high crude fibre (33.1%) (Van Hao and Ledin, 2001). The high cost of feed ingredients, has engendered the need to consider non-conventional feed ingredients that are readily available and underutilized (Ozung *et al.*, 2017).

Research findings have shown that rabbits can do well on non-conventional feed ingredients (Tabinda and Butt, 2012). Feed accounts for about 70% of the total cost of production in livestock and is a major threat to the expansion of the sector in Nigeria (Ojebiyi and Saliu, 2014). However, there is also paucity of information on the use of cowpea husk as a non-conventional feedstuff for feeding weaner rabbits (Malik *et al.*, 2020). Hence, this study aimed at determining the response of weaner rabbits to graded levels of cowpea husk.

MATERIALS AND METHODS

Experimental Site

The study was carried out at the Abubakar Tafawa Balewa University, Bauchi, Teaching and Research Farm, Yelwa Campus. The University is located at Yelwa along Tafawa Balewa Road, Bauchi. Bauchi lies between latitude 10°, 17° N, longitude 9°, 49° E and at altitude of 902 meters above the sea level. There are two distinct seasons in the area: rainy season, which usually starts in May and ends in October, and dry season, which starts from November to April. The mean annual rainfall is 1091mm (World Atlas, 2015).



Experimental Diets and Management of Rabbits

Five experimental diets (Table 1) were formulated where cowpea husk was incorporated to replace groundnut haulm at 0, 25, 50, 75 and 100% as diets 1, 2, 3, 4 and 5 respectively. Forty (40) weaner rabbits aged 6-8 weeks of both sexes were purchased from a reliable rabbit keeper for this experiment. The weaner rabbits were allowed to acclimatize with the environment for a week, during which feed and water were given *ad libitum*. After the acclimatization period, the rabbits were randomly allotted to five dietary treatments, replicated four times with two rabbits per replicate in a completely randomized design. The feeding trial lasted for a period of 56 days.

Table 1: Percentage Composition of the Experimental Diets

Ingredients	Diets				
	1(0%)	2(25%)	3(50%)	4(75%)	5(100%)
Maize	54.67	54.83	55.00	55.17	55.33
SBM	11.33	11.17	11.00	10.83	10.67
Wheat offal	10.00	10.00	10.00	10.00	10.00
Cowpea Husk	0.00	5.00	10.00	15.00	20.00
G/nut haulms	20.00	15.00	10.00	5.00	00.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Premix	0.30	0.30	0.30	0.30	0.30
Salt	0.30	0.30	0.30	0.30	0.30
Lysine	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20
Total	100.00	100.00	100.00	100.00	100.00
Calculated Analysis (%)					
Crude protein	16.00	16.00	16.00	16.00	16.00
ME (Kcal/kg)	2674.53	2721.30	2768.13	2814.95	2861.76
Crude fibre	9.35	9.18	9.00	8.81	8.64
Ether Extract	5.18	5.30	5.42	5.55	5.66
Calcium	1.28	1.26	1.24	1.21	1.19
Phosphorus	0.73	0.70	0.67	0.64	0.62
Lysine	0.98	1.00	1.01	1.03	1.06
Methionine	0.43	0.44	0.45	0.46	0.48

Data Collection

At the commencement of the experiment, each rabbit was weighed to determine its initial weight using EK3250 digital weighing scale. Each rabbit was weighed on weekly basis to obtain the weekly and daily body weight gain throughout the experiment. Data were collected on growth parameter and digestibility. Data were collected for final weight, daily feed intake, daily weight gain, feed conversion ratio. The daily feed intake was obtained by the difference between quantity of feed offered and the left over, retrieved the following morning. Weight gain was determined by difference between two consecutive weighing carried out on weekly basis while feed conversion ratio was computed using the relationship between daily feed intake and daily weight gain.

Growth Performance of Rabbits Fed Graded Levels of Cowpea Husk Diets

At the beginning of the experiment, the experimental animals were weighed to obtain their initial body weights and thereafter on weekly basis. The weight of the rabbits per replicate was taken on weekly basis to determine the weekly body weight gain. The weight of the rabbits at the end of the experiment was the final weight gain. The weight gain was determined as:

Weight gain = Final weight gain - Initial weight gain

Feed was offered to each group of the experimental animal twice (morning and evening) daily. Water was giving *ad libitum*. The left-over feed was collected the following day and weighed. The

weight of the left-over feed was subtracted from the weight of feed offered, the difference was recorded as feed intake.

Feed intake = feed offered - feed left over

The weight of rabbits per replicate was taken on weekly basis to determine the weekly body weight gain.

Feed conversion ratio was calculated as the ratio of feed intake per weight gain using the formula:

$$FCR = \frac{\text{Feed intake}}{\text{Weight gain}}$$

At the 8th week of the experiment, faeces were collected for five days dried and bulked. The fecal samples were taken for chemical analysis. The fecal samples were analyzed for dry matter, crude protein, crude fibre, Ash, ether extracts and nitrogen free extract.

The digestibility values were calculated as thus:

$$\text{Digestibility} = \frac{\text{Nutrient intake} - \text{nutrient excreted}}{\text{Nutrient intake}} \times 100$$

Experimental diets and faecal samples were analysed for proximate composition using the methods described by (AOAC, 2010).

Statistical Analysis

Data generated were subjected to one-way analysis of variance (ANOVA) using completely randomized design. Means was then separated using Duncan multiple range test at 5% level of significance using SPSS data tool.

RESULTS AND DISCUSSION

Performance of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

The growth performance of weaner rabbits fed graded levels of cowpea husk as replacement for groundnut haulms is presented in Table 2.

Table 2: Performance of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

Parameters	Diets					SEM
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)	
Initial weight (g)	825.33	785.16	804.33	872.16	826.50	65.95 ^{NS}
Final weight (g)	1350.16	1276.66	1443.00	1382.00	1224.50	96.32 ^{NS}
Total weight gain (g)	524.83 ^{ab}	491.50 ^{ab}	638.66 ^a	509.83 ^{ab}	397.33 ^b	69.98 [*]
Daily weight gain (g)	9.37 ^{ab}	8.77 ^{ab}	11.40 ^a	9.10 ^{ab}	7.10 ^b	1.24 [*]
Total feed intake (g)	3551.16	3176.00	3288.83	3630.00	3140.33	232.65 ^{NS}
Daily feed intake (g)	63.41	56.72	58.73	64.82	56.08	4.15 ^{NS}
Feed conversion ratio	6.79 ^{ab}	6.46 ^{ab}	5.41 ^a	7.19 ^b	7.94 ^b	0.80 [*]
Feed efficiency	0.14 ^{ab}	0.15 ^{ab}	0.19 ^a	0.14 ^b	0.12 ^b	0.02 [*]
Mortality (number)	0.00	1.00	1.00	0.00	0.00	-

^{a,b}: Means on the same row with different superscripts are significantly ($P < 0.05$) different; SEM: Standard Error of the Means; NS: Not Significant.

The result revealed that initial weight (785.16-872.16g), final weight (1224.50-1443.00g), total feed intake (3140.33-3630.00g) and daily feed intake (56.08-64.82g) were not affected by the dietary levels of cowpea husk. This observation is in agreement with the report of Soji *et al.* (2025) who observed non-significant in the growth performance parameters of rabbits fed graded levels of urea treated cowpea husk diets.

However, the total weight gain (397.33-638.66g), daily weight gain (7.10-11.40g), feed conversion ratio (5.41-7.94) and feed efficiency (0.12-0.19) were significantly ($P < 0.05$) influenced by the diets. This finding is contrary to the result of Soji *et al.* (2025) in weaner rabbits fed graded levels

of urea treated cowpea husk based diets, but comparable to the values obtained by Agunbiade *et al.* (2001) in growing rabbits fed different sources and levels of dietary fibre.

Carcass Characteristics of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

Table 3 shows the carcass characteristics of weaner rabbits fed graded levels of cowpea husk diets. Most of the carcass characteristics measured were not affected by the dietary levels of cowpea husk diets except live weight (1407.00–1750.66g), large intestine (28.66–43.93g), stomach (61.33–98.00g) and hind limbs (18.70–26.26g) that were affected by the diets. These observations were in conformity with the result of Abubakar (2024) in rabbits fed maize milling residue based diets.

Table 3: Carcass Characteristics of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

Parameters	Diets					SEM
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)	
Live weight (g)	1476.66 ^{ab}	1445.66 ^{ab}	1750.66 ^a	1469.00 ^{ab}	1407.00 ^b	130.47*
Carcass weight (g)	793.00	743.00	909.66	764.00	753.33	86.39 ^{NS}
Dressing %	53.69	51.27	51.82	51.85	53.54	1.70 ^{NS}
Head weight (g)	142.63	144.40	147.73	131.50	133.66	11.21 ^{NS}
Heart weight (g)	3.83	4.60	3.73	4.83	3.73	0.82 ^{NS}
Liver weight (g)	38.66	37.80	49.46	38.66	36.40	5.48 ^{NS}
Lungs weight (g)	11.00	9.60	9.80	11.20	9.50	1.61 ^{NS}
Kidney weight (g)	8.10	8.60	8.70	9.00	7.56	0.72 ^{NS}
Small intestine weight (g)	54.80	63.00	75.30	63.90	52.46	9.51 ^{NS}
Large intestine weight (g)	28.66 ^b	38.66 ^{ab}	43.93 ^a	34.03 ^{ab}	35.86 ^{ab}	4.89*
Stomach weight (g)	65.43 ^b	61.33 ^b	98.00 ^a	69.10 ^b	64.30 ^b	7.23*
Pelt weight (g)	126.00	118.33	138.26	134.00	116.00	15.75 ^{NS}
Caecal weight (g)	96.26	102.00	118.06	96.83	95.70	11.21 ^{NS}
Spleen weight (g)	1.13	0.73	1.30	1.10	1.03	0.24 ^{NS}
Abdominal fat (g)	16.30	6.80	27.00	15.83	10.50	10.32 ^{NS}
Fore limb weight (g)	9.53	9.60	10.70	8.96	8.66	1.01 ^{NS}
Hind limb weight (g)	20.73 ^b	21.76 ^b	26.26 ^a	19.73 ^b	18.70 ^b	1.60*
Tail weight (g)	4.96	5.53	7.50	5.36	5.13	2.96 ^{NS}

^{a,b}: Means on the same row with different superscripts are significantly ($P < 0.05$) different; SEM: Standard Error of the Means; NS: Not Significant.

Nutrient Digestibility of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

At the 8th week of the feeding trial, a 5-day faecal collection was carried out for the determination of apparent digestibility of the nutrient. Faecal sample were collected from each rabbit (replicate) using a clean cloth and placed on a safe place. Faeces from each rabbit were weighed and dried for days and stored in an air tight polythene bag for chemical analysis.

Results for nutrient digestibility of weaner Rabbits fed graded levels of cowpea husk is presented in Table 4.

Dry matter (81.95–84.31%), ether extract (88.43–90.83%) and Nitrogen free extract (79.37–81.93%) showed no significant difference across the treatments. However, the digestibility of crude fibre (78.50–81.77%), crude protein (91.64–93.42%) and ash (90.93–93.95%) were affected by the diets and compared favourably with the result of Malik *et al.* (2020) in weaner rabbits fed diets containing varying levels of cowpea milling waste, even though, their study revealed significant ($P < 0.05$) differences in digestibility of ether extract and nitrogen free extracts.

Table 4: Nutrient Digestibility of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

Parameters (%)	Diets					SEM
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)	
Dry Matter	84.31	82.59	82.88	84.25	81.94	1.11 ^{NS}
Crude Protein	93.42 ^a	92.53 ^{ab}	92.28 ^{ab}	93.30 ^a	91.64 ^b	0.52 [*]
Crude Fibre	81.20 ^{ab}	78.50 ^b	79.95 ^{ab}	81.77 ^a	78.71 ^b	1.27 [*]
Ash	93.95 ^a	92.99 ^{ab}	91.92 ^{bc}	92.15 ^{bc}	90.93 ^c	0.64 [*]
Ether Extract	88.96	89.28	88.43	90.83	88.77	0.99 ^{NS}
Nitrogen Free Extract	81.00	79.37	80.22	81.93	79.53	1.31 ^{NS}

^{a,b,c}: Means on the same row with different superscripts are significantly ($P < 0.05$) different; SEM: Standard Error of the Means; NS: Not Significant.

Economic Analysis of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

Cost of feed were calculated using the prevailing market prices of ingredients at the time of the experiment for the economic appraisal of the feeds.

The cost/kg of each diet was calculated as the summation of the cost/kg of each ingredient multiply by the level of inclusion Cost of feeding was computed as a product of the cost of the diet and the amount of consumed during the period of study

Feed cost/kg weight gain was calculated as cost of feeding divide by the total weight gain multiply by 100

The cost benefits of feeding weaner Rabbits with graded levels of cowpea husk is presented in Table 5. Feed cost/kg increased with increasing levels of cowpea husk from ₦560.62 to ₦651.82 for D1 and D5. However, the feed cost per kg gain was lowest in diet 3 which had 50% of cowpea husk as a replacement for groundnut haulm, having ₦710.97 cost saving with percentage cost saving of 18.58%. This contradicts the report on the varying levels of maize milling residue of rabbits fed diets by Abubakar *et al.* (2023) where feed cost/kg gain decrease with increasing levels of maize milling residues.

Table 5: Cost Benefit of Weaner Rabbits Fed Graded Levels of Cowpea Husk Diets

Parameters	Diets				
	1 (0%)	2 (25%)	3 (50%)	4 (75%)	5 (100%)
Total feed intake (kg)	3.55	3.18	3.29	3.63	3.14
Feed cost (₦/kg)	560.62	583.44	606.22	629.00	651.82
Total feed cost (₦)	1990.20	1855.34	1994.46	2283.27	2046.71
Total weight gain (kg)	0.52	0.49	0.64	0.51	0.40
Feed cost/ kg gain (₦)	3827.31	3786.41	3116.34	4477.00	5116.78
Cost saving (₦)	-	40.90	710.97	-649.68	-1289.47
Cost saving (%)	-	1.07	18.58	-16.98	-33.69

CONCLUSION AND RECOMMENDATION

Based on the results obtained from this study, it can be concluded that cowpea husk can replace groundnut haulm up to 50% level in the diets of weaner rabbits without compromising their performance, carcass characteristics and nutrient digestibility. Diet 3 (50% cowpea husk) also had the highest cost-benefit (₦710.97) with percent cost saving of 18.58%.

This study recommended 50% cowpea husk as replacement for groundnut haulm in the diets of weaner rabbits for profitable production. Further studies should be carried out to determine the suitability of cowpea husk for other species of Herbivorous animals.



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