



## **GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF WEANER RABBITS FED VARYING LEVELS OF KENAF SEED MEAL (*HIBISCUS CANNABINUS L.*) AS A REPLACEMENT FOR SOYBEAN MEAL**

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### **ABSTRACT**

This study was carried out at Abubakar Tafawa Balewa University Research Unit, Yelwa campus, Bauchi, Bauchi State. The aim of the research was to evaluate the performance of weaner rabbits fed varying levels of Kenaf seed meal as a replacement for soybean meal. Thirty (30) weaner rabbits were randomly assigned to five experimental diets in a Completely Randomized Design (CRD), with three (3) replicates per treatment and two (2) rabbits per replicate. The diets were formulated with kenaf seed meal replacing soybean meal at 0, 25, 50, 75 and 100% replacement levels, corresponding to diets T1, T2, T3, T4, and T5, respectively. Significant differences ( $P<0.05$ ) were observed in feed intake, with rabbits on diet T3 (50%) showing the highest total feed intake (2678.83 g) and the lowest feed conversion ratio (5.84). Carcass analysis indicated significant differences ( $P<0.05$ ) in dressed weight (338.50 to 560.00g) and dressing percentage (40.34 to 53.16 %), with diet T5 (100% Kenaf seed meal) showing the lowest values. There was also reduced cost with the use of kenaf seed meal. Kenaf seed meal (T3) can replace up to 50% of soybean meal in weaner rabbit diets without adverse effects on growth performance and carcass traits. Kenaf seed meal should be incorporated in the diet of rabbits at 50% to substitute soyabean meal.

**Keywords:** Kenaf, Seed meal, Soybean, Growth, Performance, Carcass

### **INTRODUCTION**

The huge animal protein deficit in the diet of Nigerians presents a significant challenge, which can be addressed by emphasizing the production of highly prolific and short-cycle animal species such as rabbits (Oyawoye, 2022; Hasanat *et al.*, 2016). Rabbits are particularly suited for this purpose due to their rapid growth rates and efficient reproductive capabilities. However, for optimal performance and productivity, rabbits require a well-balanced dietary protein. In Nigeria, conventional protein sources like soybean meal have long been utilized in animal feed due to their high protein content and balanced amino acid profiles (Ismail *et al.*, 2018). Despite their effectiveness, the increasing cost of soybean meal has significantly impacted the overall cost of livestock production. This rising cost poses a substantial barrier to expanding rabbit production and underscores the need for more affordable and accessible feed alternatives. The search for viable substitutes to soybean meal has led to an exploration of unconventional feed ingredients. These alternative sources not only aim to reduce feed costs but also address the scarcity of conventional feedstuffs, which are often expensive and highly sought after for human consumption. The use of non-conventional feed ingredients has been documented as a practical approach to decreasing production costs and enhancing the sustainability of livestock farming (Abeke, 2018; Dafwang *et al.*, 2021). Among the promising alternatives, kenaf seed meal has emerged as a viable feed resource. It offers a cost-effective solution for regions where kenaf is grown. Its availability and relatively low cost make it an attractive option for animal feed. Similar to



sorrel, kenaf thrives in tropical soil conditions and performs well in relatively poorer soil environments (Adanlawo & Ajibade, 2016). The nutritional profile of kenaf seed meal further supports its potential as an alternative feed ingredient. It is known for its substantial content of protein, dietary fiber and essential minerals, including phosphorus (P), calcium (Ca), and magnesium (Mg) (Ismail *et al.*, 2018). The proximate composition of kenaf seed meal typically includes approximately 38.40% crude protein (CP), 8.70% ether extract (EE), 11.20% ash, and 23-25% crude fiber (CF). These values reflect its high protein and fiber content, which are critical for supporting the growth and development of livestock. Kenaf seed meal therefore has the potential to meet the protein needs of weaner rabbits while reducing feed costs. However, limited research exists on its efficacy in rabbit diets. This study aims to evaluate the growth performance and carcass characteristics of weaner rabbits fed varying levels of kenaf seed meal as a replacement for soybean meal.

## **MATERIALS AND METHODS**

### **Experimental Site**

The experiment was conducted at the Animal Production Research Unit, Abubakar Tafawa Balewa University, Bauchi, Nigeria. The state is located between latitudes 10°17' North and longitudes 9° 49' East at an altitude of 690.2m above the sea level.

### **Experimental Animals and their Management**

The feeding trial was conducted with thirty (30) mongrel weaner rabbits obtained from different rabbit farmers and open markets. The thirty weaner rabbits were randomly assigned to five treatment groups, each receiving one of five diets where kenaf seed meal replaced soybean meal at 0%, 25%, 50%, 75%, and 100% (coded as T1, T2, T3, T4, and T5, respectively). The diet composition is shown in Table 1. The weaner rabbits were managed intensively. Water and feeds were given *ad libitum*. The experiment lasted for a period of six weeks.

### **Experimental Diets and Design**

The ingredients for diet formulation were maize, wheat offal, soyabean, kenaf seed meal (KSM) bone meal, premix, lysine, methionine and salt. Experimental diets were formulated to meet protein and energy requirements of weaner rabbits. There were five treatments and each treatment was replicated three times with two rabbits per replicate in a completely randomized design



**Table 1:** Ingredients and Composition (%) of the Experimental Diet

Ingredients	Diets				
	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)
Maize	31.35	31.35	31.35	31.35	31.35
Soyabean meal	20.00	15.00	10.00	5.00	0.00
JSM	0.00	5.00	10.00	15.00	20.00
Wheat offal	25.00	25.00	25.00	25.00	25.00
GNH	20.00	20.00	20.00	20.00	20.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Lime stone	1.00	1.00	1.00	1.00	1.00
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Salt	0.25	0.25	0.25	0.25	0.25
Premix	0.20	0.20	0.20	0.20	0.20
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Calculated Analysis</b>					
Crude protein	17.85	17.40	16.95	16.50	16.05
Me/kcal/kg energy	2700.74	2700.02	2634.67	2623.01	2605.09
Crude fibre	9.40	9.93	10.45	10.98	11.50
Calcium	1.12	1.12	1.11	1.11	1.10
Phosphorus	0.93	0.88	0.86	0.82	0.78
Lysine	0.93	0.89	0.84	0.77	0.69
Methionine	0.32	0.29	0.29	0.28	0.24

### Data Collection

Weekly measurements of body weight and feed intake, and feed conversion ratio (FCR) were taken to assess growth performance. At the end of the trial, two rabbits from each treatment were slaughtered for carcass analysis, which included measurements of dressed weight, dressing percentage, and organ weights.

### Statistical Analysis

Data were analyzed using one-way ANOVA with the SPSS software package, and means were separated using Duncan's Multiple Range Test at a significance level of 5%.

## RESULTS AND DISCUSSION

### Growth Performance

The growth performance of rabbits fed varying levels of kenaf seed meal is summarized in Table 2. There were no significant differences in initial body weights between treatments. However, final body weight, total weight gain and daily weight gain were slightly higher in the T3 group (50% kenaf seed meal), though not statistically significant. Total feed intake was significantly higher in T3 ( $P < 0.05$ ), indicating that the 50% replacement level was well accepted by the rabbits. There was also reduction in cost as the levels of kenaf seed meal increases in the diets



**Table 2:** Performance of Weaner Rabbits Fed Varying Levels of Kenaf Seed Meal as Replacement for Soybean Meal

Parameter	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)	SEM
Initial weight (g)	598.33	578.33	589.17	547.50	524.17	32.97 <sup>NS</sup>
Final weight (g)	1030.00	970.83	1050.00	876.66	828.50	92.74 <sup>NS</sup>
Total weight gain (g)	450.27	423.33	451.67	304.33	287.50	96.60 <sup>NS</sup>
Daily weight gain (g)	10.15	10.08	10.75	7.85	7.25	2.05 <sup>NS</sup>
Total feed intake (g)	2597.17 <sup>ab</sup>	2525.67 <sup>bc</sup>	2678.83 <sup>a</sup>	2445.00 <sup>c</sup>	2481.83 <sup>c</sup>	37.87 <sup>*</sup>
Daily feed intake (g)	61.84 <sup>ab</sup>	60.13 <sup>bc</sup>	63.78 <sup>a</sup>	59.09 <sup>c</sup>	58.21 <sup>c</sup>	0.90 <sup>*</sup>
Feed conversion ratio	8.51	5.97	5.84	6.41	8.28	1.53 <sup>+</sup>
Feed cost/kg of feed (₦)	76.85	67.70	67.02	60.51	60.25	-
Feed cost/kg gain (₦/Kg gain)	3595.40	3582.10	3577.20	3560.00	3537.60	-

<sup>abc</sup> - Means bearing different superscripts within a row are significantly different (\* =  $p < 0.05$ )

SEM - Standard error of means; NS: Non significant difference

The feed conversion ratio (FCR) improved with the inclusion of kenaf seed meal up to 50% (T3), suggesting that rabbits on this diet efficiently utilized the feed. This indicates that kenaf seed meal can be a suitable replacement for soybean meal up to this level without compromising growth. This finding correlates with the study by Omole *et al.* (2018), which reported that rabbits fed diets with 50% inclusion of pigeon pea meal showed significantly higher feed intake and weight gain. Similarly, Akinmutimi *et al.* (2017) reported that diets containing 50% cottonseed meal showed improved daily weight gain and feed intake in rabbits, similar to the trends observed in the present study.

### Carcass Characteristics

Carcass characteristics of rabbits fed varying levels of kenaf seed meal are shown in Table 3. There were no significant differences in most of the parameters examined. However, significant differences ( $P < 0.05$ ) were observed in dressed weight and dressing percentage. The dressed weight and dressing percentage were highest in rabbits on the 50% replacement diet (T3). However, both parameters declined significantly ( $P < 0.05$ ) in the 100% kenaf seed meal diet (T5), suggesting that higher levels of kenaf seed meal may negatively affect carcass quality.

**Table 3:** Carcass Traits of Weaner Rabbits Fed Varying Levels of Kenaf Seed Meal as Replacement for Soybean Meal

Parameter	T1 (0%)	T2 (25%)	T3 (50%)	T4 (75%)	T5 (100%)	SEM
Live weight (g)	1030.00	970.83	1050.00	876.66	828.50	92.74 <sup>NS</sup>
Slaughter weight (g)	1010.00	950.06	836.66	830.83	788.50	92.75 <sup>NS</sup>
Dressed weight (g)	560.00 <sup>a</sup>	480.83 <sup>ab</sup>	540.06 <sup>ab</sup>	416.66 <sup>ab</sup>	338.50 <sup>b</sup>	86.27 <sup>*</sup>
Dressing percentage (%)	53.16 <sup>a</sup>	48.78 <sup>ab</sup>	51.86 <sup>a</sup>	47.46 <sup>ab</sup>	40.34 <sup>b</sup>	4.61 <sup>*</sup>
Head (%)	11.27	11.33	13.12	11.84	13.44	1.55 <sup>NS</sup>
Skin (%)	10.95	10.19	11.59	10.64	12.07	1.22 <sup>NS</sup>
Forelimb (%)	0.73	0.84	0.80	0.69	0.80	0.10 <sup>NS</sup>
Hind limb (%)	1.59	1.62	1.90	1.72	2.01	0.15 <sup>NS</sup>
Liver (%)	2.86	2.43	2.85	2.40	2.61	0.49 <sup>NS</sup>
Lung (%)	0.63	0.58	0.76	0.65	0.80	0.10 <sup>NS</sup>
Kidney (%)	0.73	0.81	0.84	0.79	1.01	0.84 <sup>NS</sup>
Heart (%)	0.44	0.42	0.57	0.48	0.56	0.02 <sup>NS</sup>
Small intestine (g)	5.33	5.66	6.66	6.66	7.00	1.52 <sup>NS</sup>
Large intestine (g)	78.33	80.00	78.33	78.33	78.33	8.02 <sup>NS</sup>
Caecum (g)	46.66	45.00	45.00	45.00	43.33	5.67 <sup>NS</sup>
Abdominal fat (g)	15.00	16.66	13.00	13.33	11.66	3.77 <sup>NS</sup>

<sup>abc</sup> - Means bearing different superscripts within a row are significantly different (\* =  $p < 0.05$ )

SEM - Standard error of means; NS: Non significant difference

The 50% replacement level (T3) resulted in optimal carcass traits, while higher levels (75% and 100%) led to a reduction in dressed weight and dressing percentage. This indicates that kenaf seed meal should not exceed 50% in rabbit diets to maintain optimal carcass quality. These findings are in agreement with Ayoade *et al.* (2022), who reported a decrease in dressed weight and dressing percentage in rabbits fed high levels of kenaf seed meal. Abeke *et al.* (2018) also found that increasing levels of neem leaf meal in rabbit diets led to reduced dressed weight and dressing percentage, likely due to reduced feed intake or nutrient absorption. The results of the current study suggest that while lower inclusion levels of kenaf seed meal may not significantly affect dressing percentage, higher levels might reduce carcass yield.

## CONCLUSION AND RECOMMENDATION

The results of this study suggest that kenaf seed meal can replace up to 50% of soybean meal in rabbit diets without adversely affecting growth performance or carcass traits. This has significant implications for reducing feed costs and enhancing the sustainability of rabbit farming in regions where soybean meal is expensive or scarce.

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