American Journal of Agriculture and Forestry
2026, Vol. 14, No. 1, pp. 69–73
https://doi.org/10.11648/j.ajaf.20261401.18

Research Article

Influence of Varying Elephant Grass-concentrate Ratio on Growth Indices, Respiratory *Rates* and Feed Cost of Cane Rats *(Thrynomys Swindarianus)*

Popoola Yemi Akinbowale*, Olorungbohunmi Temilola Olakanmi, Idowu Ayodeji Babatunde, Adedotun Adedamola Oluwatomilola, Olalere Mutiat Olaitan, Olatundun Bukola Ezekiel, Onuoha Chikaodiri Happiness, Oluwole Olufunke Oluwakemi

Institute of Agricultural Research and Training, Moor Plantation, Obafemi Awolowo University, Ibadan, Nigeria

Abstract

The experiment was carried out using thirty cane-rats in a randomized complete block design to determine the growth performance using varying levels of elephant grass and concentrate feed. The treatments were T1 100% concentrate, T2 - 25%: 70%, T3 - 50: 50%, T4 - 75%: 25% compounded feed and T5 100% grass respectively. Each treatment was replicated twice with 3 animals per replicate. The parameters measured include feed intake, weight gain and feed conversion ratio which was calculated. The respiratory rate was observed. Feed cost was also calculated at the end of the experiment. The results showed that parameter measured were significantly different among the different treatments. Highest total feed intake of 6373.51g was recorded in T3. The Total weight gain TWG showed that T4 (75% grass and 25% concentrate) was significantly ($p< 0.05$) higher than the other treatments with a value of 1410g at reduced cost per weight gain. The best FCR 4.4 was recorded in the diet containing 75% grass and 25% concentrate. The respiratory rate observed did not significantly influence the performance of cane rats, value ranged between 37.31 ℃ to 37.49 ℃ across the treatments. The conclusion from this study is that 25% inclusion of concentrate gave optimum growth performance with reduced cost without any adverse influence on physiological performance of cane rats.

Keywords

Growth Performance, Rectal Temperature, Compounded Feed, Elephant Grass, Cane Rat

1. Introduction

Cane rat farming offers a valuable opportunity to supplement both animal protein intake and household income [3]. Requiring minimal capital and land, cane rats are well-suited for small-scale production in both urban and rural settings. They are relatively resistant to disease, quiet in nature, and have low feed requirements when raised in captivity [15]. These characteristics make cane rat rearing an attractive option for mini-livestock farmers. Cane rat meat is not only

*Correspondence: Popoola Yemi Akinbowale (popoolayemi75@gmail.com)

Received: 22 January 2026; **Accepted:** 31 January 2026; **Published:** 20 February 2026

highly nutritious but also widely accepted and appreciated for its excellent taste [10]. With a higher meat yield compared to many other livestock species, cane rats are a promising source of both food and income, especially for small-scale producers, [5]. Also, the researchers reported that though cane rats are herbivorous animals [6], they can grow rapidly on compounded feeds. The domestication of cane rats in terms of nutrient requirements have not yet been perfectly established but when confined, should be fed with forages and concentrate. It was also suggested by [9] that the concentrates must be in low quantity to avoid a negative influence on the animal Elephant grass (*Pennisetum purpureum*), also known as Napier grass, is a tall, fast-growing tropical grass native to sub-Saharan Africa [11]. It is widely cultivated in tropical and subtropical regions for livestock fodder due to its high biomass production and nutritional value. Primarily, it is used as a high-yield forage for cattle, goats, sheep, and cane rats which they thrive on it. [4].

Respiratory rate can be considered a valuable physiological indicator for predicting growth performance and overall welfare in cane rat production system. It is driven by energy and nutrient utilization, that is the amount of energy available for tissue synthesis after maintenance processes are met. Monitoring balanced nutrition helps stabilize respiratory rate and promote optimal growth. Effective management strategies aimed at maintaining stable respiratory rate are essential for improving productivity and sustainability in cane rat farming.

The optimal ratio of grass to concentrate in diets for cane rats is yet to be well established. This study aims to investigate the effects of varying levels of grass and concentrate on the growth performance of cane rats, to determine the ratio of grass to concentrate for optimal growth.

2. Methodology

The study was carried out at the Cane-rat Unit of the Institute of Agricultural Research and Training, (IAR&T), Ibadan, Nigeria and the experiment lasted for period of 16 weeks. A total of thirty growing cane rats between the ages of 5-6 months with weight ranging from 1342g to 1350g was used. The cane rats were individually housed in clearly and properly labeled concrete cells measuring 90 x 75 x 40 cm (length x width x height). Each cell was provided with a feeder and a drinker. Elephant grass (*Pennisetum purpureum*) was cut and allowed to wilt for about 12 hours, weighed and served to the animals along with compounded ration (concentrate). The formulated diet was calculated to contain crude protein of 17.68% and energy of 2244MEKcal/kg The cane rats were allotted into five dietary treatments in a Randomized completely block design. Each treatment was replicated two times with three animal per replicate. The animals were given elephant grass and compounded feed in the following ratio: T1 25%: 75%, T2 50%: 50%, T3 75: 25%, T4 100% compounded feed and T5 100% grass respectively.

Parameter measured include weekly feed intake, weigh gain, feed conversion ratio, calculated feed cost and respiratory rate. All data collected were subjected to Analysis of variance (ANOVA) and Duncan Multiple Range test (DMRT) was used for the separation of means.

Five experimental diets were formulated with the inclusion of grass and concentrate as follows;

Treatment 1: 0% grass + 100% concentrate
Treatment 2: 25% grass + 75% concentrate
Treatment 3: 50% grass + 50% concentrate
Treatment 4: 75% grass + 25% concentrate
Treatment 5: 100% grass + 0% concentrate

Table 1. *Gross Composition of Experimental Diets.*

Ingredients	Quantity (Kg)
Maize	50
Wheat offal	9
Rice Bran	20.25
Soya bean meal	10
Groundnut	5
Fish Meal	2
Bone Meal	2.50
Premix	0.25
Limestone	1
Total	100
Calculated Analysis	
Crude Protein (%)	17.68
Metabolizable Energy MEKcal/Kg	2244

3. Results and Discussion

Table 1 showed the gross composition of the experimental diet. The calculated crude protein was 17.68% while the metabolizable energy was 2244MEKcal/K. The results of growth performance of cane rat fed diets containing varying level of grass and concentrate as shown in Table 2 below, the highest total feed intake of 6373.51g was recorded in T3, T4 respectively with mean value of 6154.33g, T4 had 6260.32g with least value recorded in T2 (6213.80g), The mean total body weight gains of cane rat were significantly different across the treatment and followed same pattern with feed intake. This agrees with [8] who found out that forages are viable options for cane rat production as it improves economic gains without adverse effects on the animals' health and carcass quality. The highest weight gain P<0-05) was recorded in T4 (1410g), the diet containing 75% grass and 25% concentrate and the lowest weight gain was recorded in T5 (962g). This is in agreement with Gboshe (2021), that

supplementing forages with formulated concentrate improves the growth performance of cane rats in captivity.

Table 2. *Growth performance of cane rats fed diets containing varying levels of grass and concentrate.*

Parameter	T1	T2	T3	T4	T5	SEM
Initial weight (g)	1342	1345	1340	1350	1348	1.84
Final weight (g)	2505^{b}	2603^{ab}	2655^{ab}	2760^{a}	2310^{c}	76.22
Total weight gain (g)	1163^{c}	1258^{b}	1315^{b}	1410^{a}	962^{d}	75.26
Total Feed intake (g)	6154.33^{c}	6213.80^{b}	6373.51^{a}	6260.32^{b}	6010.55^{d}	59.95
FCR	5.2^{d}	4.9^{c}	4.8^{b}	4.4^{a}	6.2^{e}	0.28
Mortality	0	0	0	0	0	

^{a,b} Means with same letter (s) in a column are not significantly different at 5% level of probability by Duncan Multiple Range Test (DMRT)

The feed conversion ratio is a critical performance indicator in the feeding and management of animals. It measures how efficiently the animal converts feed into body weight and it has direct implications for profitability, sustainability and animal health [12]. This study shows a significant difference in the feed conversion ratio (FCR) across the treatment. The best FCR 4.4 was recorded in the diet containing 75% grass and 25% concentrate. The 25% level of concentrate feed supplement was found to be optimal for rearing cane rat, based on nutrient intake, utilization, and performance. The result of economic influence of cane rat fed diets containing varying levels of grass and concentrate is as shown in Table 3. The highest feeding cost of 942.60 Naira were recorded in T5 with mean total feed intake of 1570.55g and total weight gain of 1028g followed T2 with least feeding cost of 823.20 Naira, mean total of 1373.51g and total weight gain of 906g. This implies that 75% grass and 25% concentrate had best feeding cost implication when compared with other treatments.

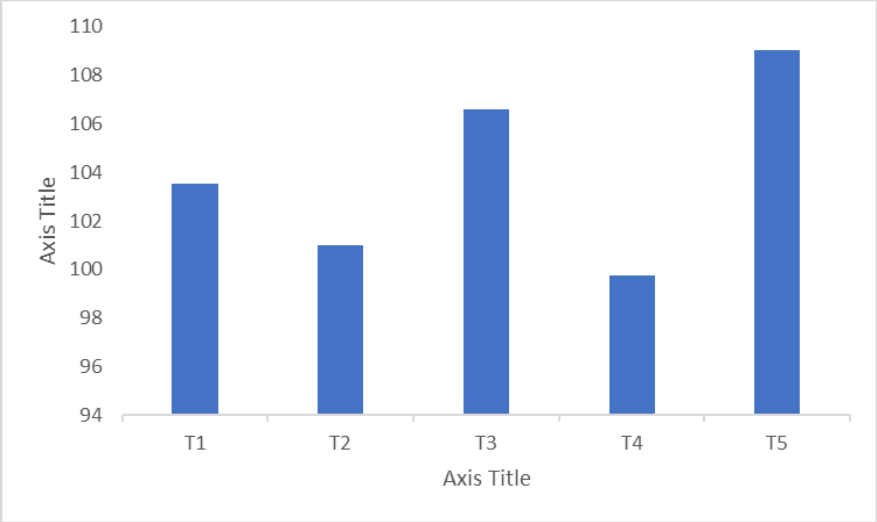

Figure 1. *Respiratory rates of cane rats fed diets varying level of elephant grass and concentrate.*

Respiratory rate is a strong indicator of metabolic status and stress of an animal and both directly affect growth performance. It indicates metabolic efficiency which is essential for optimizing productivity and improving management practices [13]. From the Figure 1 above, there was no significant difference across the different treatments. This shows that the feed did not have any influence on the respiratory rate and growth performance of the cane rats. This corroborates the work of [7] that the values fell within normal range for small mammals (70- 150bpm) and did not significantly differ across locations in west Africa. This shows that when respiratory rate remains within normal limit, energy derived from feed is efficiently utilized for growth and tissue deposition [14].

Table 3. *Cost analysis of fed diets containing varying levels of elephant grass and concentrate.*

Parameter	T1	T2	T3	T4	T5	SEM
Total weight gain (g)	1163c	1258b	1315b	1410a	962d	75.26
Total Feed intake (g)	6154.33c	6213.80b	6373.51a	6260.32b	6010.55d	59.95
Feed Cost/g	0.64a	0.51b	0.37c	0.24d	0.10e	0.09
Total feed cost	3,938.77a	3,168.88b	2,358.19c	1,502.47d	601.05e	590.10
Cost /weight gain	744.32b	679.32c	486.55d	338.40e	96.2a	114.28

The Total feed intake (TFI) was not significantly different for all the treatments. The value ranged between 6010.55g (T5) and 6373.51g (T3). The Total weight gain (TWG) showed that T4 (75% grass and 25% concentrate) was significantly ($p< 0.05$) higher than the other treatments with a value of 1410g. Lowest total feed cost and cost/g feed was recorded in T5, while the highest feed cost was recorded in T1. Cane rats on these treatments were fed solely on grasses and concentrate respectively. Cane rat fed solely on grasses and also those fed solely on compounded feed can have several implications such nutritional imbalances, adverse growth performance which may have effect on productivity of cane rat as observed by [2]. There were significant differences ($p<0.05$) in the values obtained for the cost/ weight gain. As the level of concentrate in the diet increases so also does the cost.

The Feed conversion ratio FCR indicated that T4 was able to convert its feed better than the other treatments. The cane rats were able to utilize their feed which cost less compared to other treatments with higher feed cost.

In conclusion better feeding cost implications were recorded in T4 (75% grass and 25% concentrate). Also, animals performed better than other treatments which showed in the value of the FCR. This indicates that 25% inclusion of concentrate in cane rat diets gave optimum performance. The research concluded that given cane rat 25% compounded feed aid in digestion and better growth performance of cane rat in captivity. This suggested that the more the concentrate a farmer gives the higher the cost of the feed. The finding agreed with [1] which indicated that productivity of intensive small holder livestock production systems directly correlates with the amount of pelleted feed and feeding available to enterprise.

Abbreviations

FCR Feed Conversion Ratio
TWG Total Weight Gain

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Addo P. G., Awumbila b., Awotwi E. and Ankrah N. A. (2007). Reproductive characteristics of the female grasscutter (Thryonomys swinderianus) and formulation of colony breeding strategies. Livestock Research for Rural Development, 19(4): Article 59.

[2] Gboshe P.N. 2021. Utilisation and performance of cane rat fed Pennisetum purpurem as basal feed supplement with concentrate feeding regime. A journal of research in Agriculture and Animal Science. Vol 8 (2) Pp14-21.

[3] Laudia Titilola, O. Zacchaeus Olaniyi, and A. Adenike Adebusola, 2015 "Mini-Livestock Farming as a Strategy for Food Security in Oyo State of Nigeria," J. Agric. Sustain., vol. 7, no. 2, pp. 171-186.

[4] Olomu, M., Ezieshi, J. M & Orheruata, V. E. 2003. "Cane rat Production: Principles and Practice," Jachem Publ. Benin Niger., vol. 8, p. 67,

[5] Opara, B. O. & Fagbemi, M. N. 2010 "Prevalence of Gastrointestinal Helminthes of Cane rat intensively reared in Imo State, Nigeria," Anim. Prod. Res. Adv.

[6] Opara M. N., 2010. "Cane rat: The haematology and major parasites," Res. J. Parasitol., vol. 5, no. 4, pp. 214-223, https://dx.doi.org/10.3923/jp.2010.214.223

[7] Olorungohunmi T.O., Popoola Y.A., Oluwole O.O., Dunmade A.S., 2024 Physiological response of cane rat sourced from three West African countries during the wet season in a humid tropical environment. Nigeria Journal of animal production (2024) NSAP Proceeding of the Nigeria society for Animal Production.

[8] Swallah A. M. M (2018). Effect of pelleted feed on the performance of cane rat. A journal of Agricultural Science and food Research. Vol9 (2) Pp218.

[9] Wogar, G. S. I. 2011 "Performance of growing grass cutters (Thryonomys swinderianus) fed Cassava-based diets with graded protein levels," J. Agric. Sci., vol. 5, pp. 510-514, 2011, https://dx.doi.org/10.3923/ajas.373.380

[10] Hoffman L.C (2008) The Yield and nutritional value of meat from African ungulate, Camelidae, rodents, ratites and reptiles. MeatScience 80(1): 94-100 https://doi.org/10.1016/j.meatsci.2008.05.018

[11] FAO, 2015. Grassland Index. A searchable catalogue of grass and forage legumes. FAO, Rome, Italy.

[12] Davison, C., Michie, C., Tachtatzis, C., Andonovic, I., Bowen, J., & Duthie, C.-A. (2023). Feed Conversion Ratio (FCR) and Performance Group Estimation Based on Predicted Feed Intake for the Optimisation of Beef Production. *Sensors*, *23*(10), 4621. https://doi.org/10.3390/s23104621

[13] Fausnacht DW, Kroscher KA, McMillan RP, Martello LS, Baumgard LH, Selsby JT, Hulver MW, Rhoads RP. Heat Stress Reduces Metabolic Rate While Increasing Respiratory Exchange Ratio in Growing Pigs. Animals (Basel). 2021 Jan 17; 11(1): 215. https://doi.org/10.3390/ani11010215

[14] Prates JAM. Heat Stress Effects on Animal Health and Performance in Monogastric Livestock: Physiological Responses, Molecular Mechanisms, and Management Interventions. Vet Sci. 2025 Apr 30; 12(5): 429. https://doi.org/10.3390/vetsci12050429

[15] Addo P G, Awumbila B, Awotwi E and Ankrah N-A 2007: Reproductive characteristics of the female grasscutter (*Thryonomys swinderianus*) and formulation of colony breeding strategies. *Livestock Research for Rural Development. Volume 19, Article #59.* Retrieved February 5, 2026, from http://www.lrrd.org/lrrd19/4/addo19059.htm