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Performance of Growing Grasscutters (*Thryonomys swinderianus*) Fed Cassava-Based Diets with Graded Protein Levels

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Abstract: Forages and crop residues are inexpensive and easily available feedstuffs for feeding grasscutters in captivity. These feedstuffs are nutritionally poor, not balanced for optimum performance and, therefore, required supplementation. Protein requirement of growing grasscutters was determined using thirty two 10-weeks old male grasscutters of equal weights. The grasscutters were separated into four groups and fed forage supplemented with concentrate diets, which differed in their protein contents of 8, 12, 16 and 20%, respectively but having the same energy level. Cassava root meal served as the main source of energy. The experiment, in a completely randomized design, lasted 10 weeks, during which feed intake and growth performance of the grasscutters were examined. Results showed that growing grasscutters were not significantly influenced by differences in the levels of crude protein in their diets. However, it appeared that grasscutters on the 12% crude protein diet ranked best in respect of feed intake and weight gain, while those on the 20% crude protein diet had the lowest feed intake and weight gain, but the best feed conversion ratio. The cost to gain ratio was significantly ($P<0.05$) influenced by the diets. Also, the cost effectiveness of diets increased with increase in dietary crude protein. It is, therefore, concluded that though the effect of crude protein levels on feed intake and weight gain were not significantly different, the higher ranking in respect of these parameters on the 12% crude protein diet suggests that the optimum crude protein requirement for growing grasscutters on cassava-based diets is 12%.

Key words: Performance · Growing grasscutters · Fed · Graded energy levels

INTRODUCTION

Grasscutter farming holds promise for the supply of quality protein to the most poverty-stricken more effectively than raising large livestock on pastures. The grasscutter is a rodent species of high nutritive value generally harvested from the wild, but which has gained recognition as a potential healthy source of animal protein [1]. The high demand, attractive market price and small amount of investment required for intensive production makes grasscutter rearing a suitable mini-livestock activity for income generation in many parts of West and Central Africa [2]. The market for both fresh and smoked grasscutter meat, as well as its contribution to the per caput consumption of animal protein is unlimited [3].

Inspite of the great potential of grasscutter as a source of animal protein and income, high cost and inadequate supply of feed pose a challenge to sustainable intensive production. Animal production in the tropics is adversely affected by the cost and inadequate feed supply [4]. Feed cost constitutes the major component of the cost of producing a fryer, which cost can be as high as 80% of the cost of production, as feed ingredients constitute the major component of cost [5].

Raising the grasscutter on weeds, forage and agricultural by-products which are cheap sources of feedstuffs, would complement traditional livestock because of its unique physical, physiological, behavioural and economic characteristics. These feedstuffs are nutritionally poor and not balanced [6] for improved performance. It is important, therefore, to supplement grasscutter diets by harnessing feed resources that can provide adequate nutrition for optimum performance at least cost. It has been shown that rabbits fed diets containing urea had lower weight gains than rabbits fed diets containing casein as a source of protein [7]. Further, the performance of growing rabbits on poor quality protein has been found to be poor [8]. It is likely that the response of grasscutters to different sources of protein would vary with quality and quantity of protein.

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The chemical composition of feeds gives an indication of their nutrient content, while their digestibilities provide an estimate of the nutrients available to the animal. The growth rate of the animal is determined by the feed intake and digestibility, with feed intake being determined by the balance of nutrients, especially of protein in relation to energy, for metabolism [9]. The rate of growth provides information that helps in determining levels of optimum feeding and management for economic advantage [10].

The long-term growth of animal production in Nigeria would require increased utilization of farm residues [11] and cheaper agro-industrial by-products. The objective of this study, therefore, was to determine the protein requirements of growing grasscutters fed low-cost agro-industrial by-products namely; wheat offal, soybean meal and maize sievates.

MATERIALS AND METHODS

The experiment was carried out at the Grassccutter Research Farm at Calabar, under the supervision of the Department of Animal Science, University of Calabar, Calabar, Nigeria. The research area is located at latitude 3° North and longitude 7° East, with annual rainfall of 3000 to 3500 mm, relative humidity of 57 to 93% and temperature of between 25 and 35°C.

Four different levels of 8, 12, 16 and 20% dietary protein were formulated using soybean as the main protein source. All the ingredients used were purchased from the local market in Calabar. The composition of the test diets are shown in Table 1, while the proximate composition of the diets is shown in Table 2.

Thirty two (32) growing male grasscutters, of the same age (10 weeks), were separated in groups of eight grasscutters per treatment. Each group was randomly fed one of the four dietary protein levels. There were four replicates per treatment with 2 grasscutters per replicate in a completely randomized experimental design. Water and feed were supplied *ad libitum*. The animals were weighed every two weeks throughout the experiment, which lasted for 12 weeks.

Records of daily feed (forage and concentrate) intake and weekly weight gain were taken. Data collected were subjected to analysis of variance [12].

RESULTS

The proximate composition of the experimental diets is presented in Table 2, while the effects of feeding different protein levels to growing grasscutters are presented in Table 3.

Table 1: Composition of test diets for growing grasscutters

	Experimental diets (% CP level)			
Ingredients (%)	8	12	16	20
Cassava	59.40	54.60	49.80	44.10
Wheat offal	35.00	29.20	24.00	18.80
Soybean meal	1.60	12.20	22.80	33.10
Vitamin premix	2.00	2.00	2.00	2.00
Bone meal	1.50	1.50	1.50	1.50
Salt	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00
Cost of diet (N/kg)	80.30	80.50	81.15	81.20

Table 2: Proximate composition of test diets

	Experimental Diets (% CP Level)			
Nutrients (% of DM)	8	12	16	20
Dry matter	85.67	85.63	85.28	85.37
Crude protein	7.95	11.85	16.25	20.35
Crude fibre	17.90	15.60	13.23	13.36
Ether extract	8.32	7.10	5.42	3.16
Ash	11.40	10.63	9.53	7.55
Nitrogen Free Extract	40.10	40.45	40.85	40.95
Calculated ME (kcal/kg)	2476.00	2561.00	2632.00	2576.00

Table 3: Performance of Growing Grasscutters Fed Varying Dietary Protein Levels

	Treatments (% CP Level)				
Parameters	8	12	16	20	SEM
Initial body weights (g)	753.23.00	771.10	737.31	842.12	69.10
Final body weight (g)	14.44.11	1764.31	1633.23	1915.32	92.10^{ns}
Average Daily Weight gain (g)	9.10.00	14.41	12.11	8.70	2.00^{ns}
Average Daily Forage Intake	241.04.00	560.11	238.14	255.13	144.90^{ns}
Average Daily forage DM intake (g)	29.70.00	33.31	28.62	31.21	2.00^{ns}
Average Daily Diet Intake (g)	103.91.00	105.81	93.00	89.90	8.90^{ns}
Average Daily Total Feed Intake (g)	133.60.00	138.80	114.41	120.21	10.23^{ns}
Feed conversion ratio	12.80.00	11.40	10.30	9.00	1.70^{ns}
Average Daily Cost of diet (N.k)	8.32.00	8.38	7.44	7.19	71.30^{ns}
Cost to Gain Ratio (N.k/g)	0.95^{a}	0.72^{ab}	0.70^{ab}	0.53^{b}	0.09

^{abc}Means along the same row having no common superscript differ significantly at P<0.01; ns refers to non-significant differences between means

There were no significant differences among treatments in respect of the average daily forage intake, average daily forage dry matter intake, average daily diet intake, average daily total feed intake, average daily feed intake per unit weight gain, average daily cost of diet and the average daily weight gain of grasscutters.

There were significant (P<0.05) differences among treatments in respect of the average cost of diet per unit weight gain. Growing grasscutters fed the CP8 diet had the highest (N0.95/g) cost to gain ratio, while the least (N0.53/g) cost to gain ratio was observed with grasscutters fed the CP20 diet.

DISCUSSION

The proximate composition of the experimental diets is presented in Table 2. The results showed that the proximate composition of the protein (CP) fraction of the diets increased with increase in dietary crude protein from the 18% to the 20% diet. The proximate composition of the crude fibre (CF) and ether extract (EE) fractions, however, decreased with increase in dietary protein, while the proximate composition of the other (Dry matter (DM), Ash and Nitrogen Free Extract (EE)) fractions were similar for all diets.

The growth performance of the grasscutters are presented in Table 3. There were no significant differences in the average forage dry matter intake, average daily forage intake, average daily concentrate (diet) intake, average daily total feed intake, feed conversion ratio and average cost of feed. Growing grasscutters on the CP12 (12% CP) diet had the highest (14.41g) weight gain during the experimental period. The weight gain on the CP16 (16% CP) diet was second highest (12.11g), while the least (8.70g) weight gain was observed on the CP20 (20% CP) diet. Though not significantly different from each other, the daily weight gain on the different protein diets declined with increase in dietary protein levels above the 12% CP level, which is probably the optimum requirement of growing grasscutters. These findings suggested that higher than required dietary protein intake depressed growth in grasscutters. The average daily weight gain of growing grasscutters (8.70 to 14.41g) obtained in this experiment was higher than the 8 to 13g [13] and 7 to 12g [14] reported in other studies.

The reason for the higher weight gain of growing grasscutters on the 12% CP diet is probably because of the higher feed intake response on that diet. Grasscutters on the 12% CP diet had the highest intake (total feed (138.80g), forage (560.11g), forage DM (33.31g) and protein diet (105.81g)) response. Intake response declined with increase in dietary protein levels above 12%. This finding suggests that higher than required (optimum) dietary protein intake depressed feed intake. The average daily total feed intake (120.21 to 138.80g) obtained in this experiment is lower than the range of 150 to 250g reported in another study [14].

The lack of statistically significant differences in feed intake and growth responses among the treatments suggests that growing grasscutters may be relatively insensitive to varying levels of dietary protein supplements. The observable trend, however, is that growing grasscutters probably benefited from protein supplementation at dietary levels of 12% CP and lower. At lower than 12% dietary crude protein level, growing grasscutters probably adjust intake and digestibility to meet nutrient requirements. Rabbits have been reported to adjust feed intake to meet their nutrient requirements [15].

The 1964 report of the United States National Research Council [16] Sub-committee on Rabbit Nutrition suggested that the rabbit was relatively insensitive to differences between high and low quality protein. What may be observed as the insensitivity of growing grasscutters to dietary protein concentrations in this experiment may probably be explained by the ability of grasscutters to adjust their feed intake to meet their nutrient requirements. Further explanation may be based on the role of microbes of the caecum and large intestine in fermentation, which convert fibre and simple nitrogen compounds to volatile fatty acids and microbial cells, which can be utilized by the grasscutter as substrates for protein synthesis [17], which is necessary for growth. The practice of coprophagy in rabbits, yet to be established in grasscutters, which may be another source of protein, may also explain the low protein requirement of grasscutters.

The amount of feed consumed by growing grasscutters per unit weight gain (or feed conversion ratio) was lowest (9.00) on the 20% CP diet, followed by that on the 16% CP diet (10.30). Feed conversion ratio was increasingly poorer with decrease in the dietary protein level. Similarly, the cost effectiveness of the diets improved with increase in dietary protein levels, since growing grasscutters fed the 8% CP diet had the highest (N0.95/g) cost to gain ratio, followed by those fed the 12% CP (N0.72/g) and 16% CP (N0.70/g) diets, which did not differ significantly from each other. The least (N0.53/g) cost to gain ratio was observed with grasscutters fed the 20% CP diet.

CONCLUSION

The performance of growing grasscutters, in respect of all feed intake responses, daily weight gain and feed conversion ratio were not significantly different. Though the findings of this experiment suggest that the performance of growing grasscutters was relatively insensitive to differences in the levels of crude protein in their diets, there was a consistent trend indicating that feed intake and growth responses were best for animals on the 12% crude protein diet. However, inspite of non-significant differences among the treatments in the results obtained, the findings of this experiment tended to suggest that the optimum crude protein requirement for growth in grasscutters on cassava-based diets is 12%. However, in terms of economy, raising of growing grasscutter on the 20% CP diet was most cost effective.

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