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Effects of Feeding Three Protein Sources with or Without Fishmeal Supplementation on the Performance of Growing Grasscutters

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Abstract: Fifty-four growing grasscutters of nine weeks old and of mixed sexes were used to investigate the effect of feeding different protein sources; Groundnut Cake (GNC), Soyabean Meal (SBM) and Blood Meal (BM) supplemented with different levels of fish meal (0 and 1%) on the performance of growing grasscutters. There was no significant effect ($p>0.05$) of the treatments on feed intake, weight gain and feed to gain ratio. Thought it seemed that blood meal diets had the highest feed intake and weight gain but soyabean meal diets had the best feed to gain ratio. The digestibility trial also showed no significant differences ($p>0.05$) for all parameters assessed but the soyabean meal diets and 1% fishmeal supplemented diets seemed to have higher digestibility values.

Key words: Soyabean meal, groundnut cake, blood meal, fish meal, performance, growing grasscutter

INTRODUCTION

The grasscutter is a robust animal with short tails, small ears and stocky body. There are two common species-the large *Thryonomys swinderianus* that has been used in this study weight up to 9 kg or more with a head to body length of up to 60 cm. The smaller species (*Thryonomys gregorianus*) may occasionally reach 8 kg and a body length of 50 cm. They both have yellow-brown to grey-brown bodies with whitish bellies. The fur is coarse and firm.

The grasscutter or cane rat is a wild hystricomorph rodent hunted particularly in West Africa for its meat (Ntiamo-Baidu, 1998). It is desirable for domestication because of its excellent taste and comparatively higher nutritional value (Asibey and Eyeson, 1973) and meat yield (Clottey, 1981) than most livestock species. Considerable efforts are put at the domestication of the grasscutter (Ajayi, 1975) because the rodent has the potential to produce more protein in a given area than small ruminants at much less cost in terms of labour and habitat.

The demand for bush meat is high; although some species have reduced or become extinct (Falconer, 1992; Ntiamo-Baidu, 1998). Grasscutters are still harvested in large quantities. It is not classifies among species presently considered to be rare or threatened. Some of the reasons for grasscutter survival are that they breed throughout the year and their small size put them at advantage. It was reported by Vos (1978) that rodents do not decrease easily because of their small size that gives room for their quick escape.

Grasscutter are found only in Africa (Rosevear, 1969; Baptist and Mensah, 1986). In Western Africa where grass provides its main habitat and food, it is commonly known as grasscutter; while in other parts of Africa where it is closely associated with cane fields it is called cane rat. Although their diet in the wild has not been determined, grasscutters are vegetarians. They consume nuts, bark and soft parts of grasses and shrubs. They particularly favour elephant grass and sweet potatoes. They raid cassava and yam plantations.

This study is important because grasscutter is an animal in great demand. Agboola (2000) reported that for grasscutters raised in confinement to be in good health, reproduce and maintain a steady growth rate, they must be provided with balanced diet or feed. The feeding of protein concentrates is assumed to improve feed conversion efficiency thereby resulting in faster growth. This implies more meat to the populace compared with when grasses or fibrous feedstuffs alone are fed. For animals raised under the intensive system of production, livestock feed accounts for about 60-80% of the total cost of raising the animal. Livestock feed have become imperatively costly due to the competition between increasing human population and livestock for the available feedstuffs. Hence, the aim of this study was to examine which of these three protein sources (soyabean meal, groundnut cake and blood meal) when fed with or without fish meal supplementation that will best improve the performance of growing grasscutters.

MATERIALS AND METHODS

A total of 54 grasscutters of nine weeks of age were used for this eight weeks feeding trials; which was conducted at university of Ilorin, Ilorin, Nigeria in December, 2004. The grasscutters were randomly weighed into 6 treatment groups, such that each treatment had three replicates and there were 3 grasscutters on each replicate.

There were 6 experimental diets (Table 1) in which a 3×2 factorial experimental design was adopted such that there were 3 protein sources and 2 levels of fishmeal supplementation. The three protein sources fed were soyabeans meal, groundnut cake and blood meal while fish meal was supplemented at 0 and 1% inclusion levels. All feed were formulated for 14% crude protein and 2800 kcal kg^{-1} of metabolizable energy based on the report of Adeniji and Ilesanmi (2004).

The grasscutters were housed in wire battery designed cages which allowed for ease of feaces and urine collection. Feed and water were given to test animal *ad libitum* throughout the experimental period. The grasscutters were allowed one-week adaptation period to both the feed and cage before the 8 weeks of data collection commenced. During the pre-one-week adaptation period, the grasscutters

Table 1: Composition of experimental diets (kg/100 kg)

Ingredients	1	2	3	4	5	6
Maize	36.0	38.0	38.5	37.0	42.0	41.0
SBM	11.5	10.0	-	-	-	-
GNC	-	-	10.5	9.0	-	-
Blood meal	-	-	-	-	5.0	4.0
Fishmeal	0.0	1.0	0.0	1.0	0.0	1.0
Wheat offal	9.0	7.0	8.0	8.0	12.0	12.0
PKC	20.0	20.0	20.0	20.0	20.0	20.0
Corn bran	19.5	20.0	19.0	21.0	17.0	18.0
Bone meal	2.5	2.5	2.5	2.5	2.5	2.5
Oyster shell	1.0	1.0	1.0	1.0	1.0	1.0
Salt	0.3	0.3	0.3	0.3	0.3	0.3
*VIT premix	0.2	0.2	0.2	0.2	0.2	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
Calculated values						
CP (%)	14.1	14.0	14.0	14.0	14.1	14.0
ME (kcal kg^{-1})	2831.2	2806.4	2808.4	2803.4	2809.0	2808.6
CF (%)	7.0	6.9	6.8	6.9	6.5	6.5
Lysine (%)	0.6	0.6	0.5	0.5	0.6	0.6
Methionine (%)	0.2	0.3	0.2	0.2	0.7	0.7
Ca (%)	1.3	1.4	1.3	1.4	1.3	1.4
P (%)	0.6	0.6	0.6	0.6	0.6	0.6

* Agricare product which contained: - Vit A, Vit D_3, Vit E, Riboflavin, Vit B_{12}, Panthothenic acid, Nicotinic acid, choline Chloride, Folic acid, Pyrioxine, Biotin, Phosphorus, Calcium, Iodine, Copper, Manganese, Zinc, Iron, Coxistac, Terramycin, antioxidant and anticaking agent. Percentage composition of the vitamins and micro nutrients were not given by the manufacturer

were given Ivomec injection subcutanously to treat for both internal and external parasites. At the 4th week of experiment, the animals were given prophylactic dosage of triple-sulphur to prevent coccidiosis.

Nitrogen digestibility was conducted during the last week of the experiment. Weighed quantity of feed was given and feaces collected over 72 h period; using the method of total collection. Feacal samples were weighed, then oven-dried at 70°C for 48 h for moisture determination.

The initial and weekly body weights were recorded. Feed intake was recorded and feed to gain ratio calculated. For the nitrogen digestibility, the total collection method was used in which both feaces and urine were collected over three consecutive days. Urine samples collection was treated with sulphuric acid and stored in plastic bottles and kept in the fridge for analysis. All proximate analysis was conducted following the procedures described by AOAC (1980). All data collected were subjected to statistical analysis using the model for a 3×2 factorial experiment (Steel and Torrie, 1980).

RESULTS

There was no significant effect of treatment on the observed feed intake. The grasscutters fed on the blood meal diets had a feed intake value of 29.40 g which tended to be higher but is comparable ($p>0.05$) to the feed intake values obtained on the grasscutters fed on the soyabean meal and groundnut cake diets that ate 22.03 and 23.86 g, respectively. The grasscutters fed the 1% fishmeal supplementation seemed to have eaten more of their feed (27.85 g), but it is comparable ($p>0.05$) with the feed intake value for the grasscutters fed without fishmeal supplementation that ate 22.27 g (Table 2).

Similarly, for body weight gain, the treatment had no significant effect ($p>0.05$) on the observed weight gain in this study. The grasscutters fed on the blood meal and soyabean meal diets seemed to have gained more ($p>0.05$) weight (12.95 and 11.61 g) than the grasscutters fed on the groundnut cake diets that tended to have the lowest ($p>0.05$) body weight value of 8.93 g. The grasscutters fed the 1% fish meal supplemented diet even-though seemed to have gained more body weight of 12.5 g, it is comparable ($p>0.05$) with the weight gained by the grasscutters not fed on fishmeal supplementation (9.52 g).

The grasscutters fed on the groundnut cake diets and those fed on the blood meal diets have compared ($p>0.05$) feed to gain ratio (2.67 and 2.27, respectively), but the grasscutters fed on the soyabean meal diets tended to have the better feed to gain ratio of 1.90, but was still not significantly different ($p>0.05$) to the feed to gain ratio obtained on the groundnut cake and blood meal fed grasscutters. The feed to gain ratio for both the grasscutters fed 1% fish meal and those without fish meal supplementation were very comparable ($p>0.05$) with values of 2.23 and 2.34, respectively.

Table 2: Effects of feeding three protein sources with or without fish meal supplementation on the performance of grasscutters

Dietary factors	Feed intake (g)	Weight gain (g)	Feed gain ratio	Feed cost (N kg^{-1})
Protein source				
Soyabean meal	22.03	11.61	1.90	31.74
Groundnut cake	23.86	8.93	2.67	28.62
Blood meal	29.40ns	12.95ns	2.27ns	28.25ns
SEM	0.99	0.51	5.01	
Fishmeal levels (%)				
0	22.27	9.52	2.34	28.64
1	27.85ns	12.50ns	2.23ns	30.43
SEM	2.61	1.25	0.26	
Interaction protein source× fish meal levels	ns	ns	ns	

ns = Not significant ($p>0.05$), ₦ 1 = $140 as at October 2004 when the experiment was conducted

Table 3: Effects of feeding protein sources with or without fish meal supplementation on nitrogen digestibility of feed grasscutters

Parameters	Nitrogen intake (g)	Faecal nitrogen (g)	Urinary nitrogen (g)	Total nitrogen output (g)	Nitrogen retained (g)	Nitrogen digestibility (%)
Protein source						
Soyabean meal	0.46	0.02	0.06	0.08	0.38	83.91
Groundnut cake	0.98	0.23	0.09	0.14	0.84	73.52
Blood meal	0.80ns	0.09ns	0.08ns	0.16ns	0.65ns	78.90ns
SEM	1.09	1.97	3.36		3.12	3.89
Fish meal levels (%)						
0	0.76	0.16	0.08	0.12	0.64	74.73
1	0.73ns	0.06ns	0.07ns	0.13ns	0.60ns	82.81ns
SEM	6.14	5.60	5.93		1.55	12.94
Interaction protein source× Fish meal levels	ns	ns	ns	ns	ns	ns

ns: Not significant ($p>0.05$)

In terms of feed cost, the protein sources had no effect ($p>0.05$) on the prices of feed. The blood meal and groundnut cake based diets were very comparable costing ₦ 28.25 kg^{-1} and ₦ 28.62, respectively; but the soyabean meal diets seemed to be the most expensive costing ₦ 31.74 kg^{-1} even-though still statistically comparable ($p>0.05$). The diets without fishmeal supplementation tended to be cheaper than those with the 1% fishmeal inclusion (₦ 28.64 and ₦ 30.43 kg^{-1}, respectively), but not statistically significant ($p>0.05$).

In Table 3 there was no significant effect ($p>0.05$) of the protein sources fed on observed nitrogen intake by grasscutters despite the nitrogen intake on the soyabean meal seemed low. The nitrogen consumed by the grasscutters on the different fish meal levels were comparable ($p>0.05$); with nitrogen intake values of 0.76 and 0.73 g, respectively for grasscutters not fed and those fed fishmeal supplementation.

There was no significant effect ($p>0.05$) of the protein sources fed on the values obtained for the total nitrogen output. Blood meal and groundnut cake meal fed grasscutters had very comparable ($p>0.05$) values for total nitrogen output of 0.16 and 0.14 g, respectively. The total nitrogen outputs for the two fishmeal levels were comparable.

The soyabean meal and blood meal fed grasscutters retained 0.38 and 0.65 g of nitrogen respectively while the groundnut cake fed grasscutters retained 0.84 g ($p>0.05$). The 0% fishmeal fed grasscutters retained 0.64 g of nitrogen while those fed the 1% fish meal retained 0.60 g.

The nitrogen digestibility results showed that the grasscutters had comparable ($p>0.05$) nitrogen digestibility values. The soyabean meal fed grasscutters seemed to have the best ($p>0.05$) nitrogen digestibility value of 83.91% compared ($p>0.05$) with those fed groundnut cake which had 73.52% and those on bloodmeal with 78.90% digestibility. In terms of fishmeal levels, those fed the 1% fishmeal had 82.81% digestibility which was comparable ($p>0.05$) to 74.73% obtained on the grasscutters not fed fish meal.

DISCUSSION

Blood meal as animal protein source has been shown to be high (80%) in crude protein, which might be responsible for the better weight gain obtained on the grasscutters fed bloodmeal. Protein as a nutrient is responsible for growth and muscle building. Blood meal is poor in protein quality. This is in reference to its amino acid profile. Blood meal is deficient in isoleucine. Spreadbury (1978) reported that feed intake is a reflection of protein quality. The grasscutters in this study might have increased the feed intake on the blood meal diets to meet up with the amino acid deficiencies. The lower

metabolizable energy value of blood meal compared to soyabean meal and groundnut cake that are proteins from oil meals, could have been responsible for the increased feed intake on blood meal for the grasscutters to meet and maintain their energy needs. Generally, animals are reported to eat to meet their energy demands. But contrary to expectations that soyabean meal which is of better protein quality should give higher body weight gain; this could be because grasscutter is a non-ruminant herbivores and can survive on and utilize fibrous feedstuffs solely. Barnes *et al*. (1963) reported that coprophagy which the grasscutter also practice contributes 12-25% of the growth of rabbits.

Fishmeal as a feed stuff has an attractive odour and can be used as feed stimulant and flavourant to increased feed intake, this is observed in the better feed intake on the feed supplemented diets. Fish meal is of good quality protein and which is responsible for the high price of fishmeal in the market, hence the quality of fish meal has reflected in the fed grasscutters gaining more body weight.

The better feed gain ratio obtained on soyabeasn meal fed grasscutters may be due to the fact that soyabean meal is highly rated as number one plant protein source. Similarly, with fishmeal as a good animal protein source, the feed to gain ratio on the fed grasscutters was better.

The digestibility values for all the fed proteins were high. This is probably because the diets were low in dietary fiber. Eggum (1973) studying factors affecting protein utilization noted a negative influence of dietary fiber levels on nitrogen digestibility. Onwudike (1986) also reported that increased crude fiber content of a diet reduces feed efficiency.

Though the results of this study showed that both the growth performance parameters and nitrogen digestibility of the fed grasscutters were not significantly affected by the fed protein sources; but the soyabean meal fed grasscutters tended to have given the best performance in terms of feed to gain ratio of 1.90 and a nitrogen digestibility value of 83.91%. Soyabean meal has been reported to be a good source of plant protein (Hittle, 1975). Soyabean meal has well balanced amino acid profile, which makes it of better quality than other plant-rich supplements. The fish meal supplemented diets also seemed to have given a better performance over the unsupplemented fish in diets. Fish meal has been reported to be ideally balanced in terms of the ratio of its essential amino acids (Fowler, 1997).

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