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GROWTH PERFORMANCE OF GRASSCUTTERS FED DIETS CONTAINING *Moringa oleifera* LEAF MEAL AND/OR SOYBEAN MEAL

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ABSTRACT

A total of ninety six-week old grasscutters were used in a study conducted to investigate the growth performance of grasscutters fed diets containing Moringa oleifera leaf meal (MOLM) and/or soybean meal (SBM). The ninety (90) grasscutters were randomly assigned to three experimental groups consisting of thirty (30) grasscutters each. The grasscutters were randomly assigned each to three experimental diets designated as follows: 15% MOLM, 15% SBM, and 10% MOLM + 10% SBM. Feed and water were provided ad libitum. Data were collected on growth performance during the period of the study which lasted for ten weeks including two weeks of acclimatization period. Results showed that grasscutters fed diet containing 10% MOLM+10% SBM had significantly ($p < 0.05$) higher performance indices than grasscutters on other treatment diets, except for feed conversion ratio, where grasscutters fed diet 1 (15% MOLM,) had the least FCR than grasscutters in other groups. Based on the results, the inclusion of MOLM and SBM at 10% levels each resulted in improved performance, and thus considered adequate for growth of grasscutters.

Key words: micro-livestock, captive, productivity, grasscutters, feeding

INTRODUCTION

Grasscutters (*Thryonomys swinderianus*) occur throughout West Africa, and are regarded as a major micro-livestock with potential for increasing animal protein intake particularly in low income countries (Edna *et al*., 2008; Adesope, 1996). As hardy, hystricomorphic rodents, grasscutters possess high breeding potential (Henry, 2011). Grasscutters display a seasonal breeding pattern, with breeding time affected mostly by prevailing weather conditions and location of the animal on the African continent (Fitzinger, 1997). Females generally have two litters per year, with an average of four offspring per litter (Mills, 1997). With an average gestation period of 137-172 days, female grasscutters have an oestrous cycle that last for over six days, and produce relatively well developed offspring with an average birth mass of 129 grams (Fitzinger, 1997). Being robust animals, grasscutters become sexually mature at about a year old, measuring up to 60 cm (head and body) and weighing more than 9 kg (Fitzinger, 1997; Henry, 2011). Free from religious and societal taboos, grasscutter meat, popularly called 'bush meat' is highly preferred by consumers in Nigeria to other meat products. This is due to its rich source of animal protein with high biological value. The meat also has a high dressing percentage, low fat content, and high mineral content and unique taste. All these make grasscutter meat of higher quality than the meat of domestic animals like sheep or goats (Olomu *et al*., 2003; Opara, 2010b).

Despite the high promise of good quality animal protein from grasscutters, the nutritional factor is however an important consideration in all livestock production, particularly as productivity of animals is often affected by feed type (Keunen *et al*., 2002). Hence, feeding is regarded as the most essential factor affecting the production of captive animals like grasscutters. This is attributable to the myriads of challenges such as increased mortality, low productivity, low birth weight, and so on, arising from feeding low quality diets to these animals (Ansah *et al*., 2012). Due to all season availability, the use of forages like Leucena, sugarcane, sweet potato vines and Moringa leaves have been proposed as one of the ways of addressing the nutritional constraints associated with low feed quality and improving productivity especially in micro-livestock. Of particular interest is the place of *Moringa oleifera* leaf meal in the diet of herbivorous micro-livestock such as grasscutters which seem to have high preference for thick-stemmed grass species. *Moringa oleifera* is among the most effective forage additives for micro-livestock due to its relatively low cost, exceptional nutrient density and high nutrient absorption rates (Schrage and Yewadan, 1999; Moringa source, 2011).

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The presence of flavonoids like quercetin and kaempferol in Moringa leaves confers it with strong antioxidant properties (Siddhuraju and Becker, 2003). The use of supplements, along with the feeding of roughages has been found to improve performance in animals. In view of this, soybean has been reported to be the most widely used protein supplement in animal feeds (Agboola, 2000; Schwab, 1999). As a vegetable protein, soybean is reputed for its high quality crude protein and amino acid composition, with low crude fibre value of 6% when compared to other vegetable protein feeds (Banaszkiewicz, 2000). The aforementioned facts notwithstanding, there is a dearth of information on the growth performance of grasscutters under different dietary regimes. This study was therefore designed to investigate the growth performance of grasscutters fed *Moringa oleifera* leaf meal and/or soybean based diets.

MATERIALS AND METHODS

The study was carried out at the Grasscutter Research Unit of the Department of Animal Science, University of Nigeria, Nsukka. The experiment lasted for ten weeks with an initial 2 weeks acclimatization period. Three experimental diets were formulated to contain 15% *Moringa oleifera* leaf meal (MOLM), 15% soybean meal (SBM), and 10% *Moringa oleifera* leaf meal+ 10% soybean meal (10% MOLM+ 10% SBM) respectively. The percentage compositions of the diets are shown in Table 1.

Grasscutters and Experimental Design

A total of 90 six-week old, large-sized grasscutters (having initial body weight of 832-843 g) procured from Demaco Farms, Enugu State, Nigeria were used for the study. They were randomly divided into three treatment groups of 30 grasscutters per group. The groups were randomly assigned to the three experimental diets containing 15% MOLM, 15% SBM, and 10% MOLM+ 10% SBM, respectively in a completely randomized design (CRD). The grasscutters were housed in concrete pens facing North-South direction to avoid excessive penetration of sunlight and consequent heat stress. The floors of the pens were cleaned daily, water and feed troughs were also washed daily, beddings were changed at 3 days interval to maintain optimum sanitation and health status.

Table 1: Percentage composition of experimental diets

Ingredients	Treatments		
	T1	T2	T3
Maize	10.00	34.00	32.00
Wheat offal	34.00	28.00	23.00
Palm kernel cake	36.00	18.00	20.00
Soybean meal	0.00	15.00	10.00
Moringaoleifera	15.00	0.00	10.00
Bone meal	4.00	4.00	4.00
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
*Vitamin premix	0.25	0.25	0.25
Salt	0.25	0.25	0.25
Total	100.00	100.00	100.00
Calculated composition			
Crude protein	17.06	17.84	17.78
Energy (Mcal/kg ME)	2.07	2.45	2.41
Crude fibre	8.48	6.19	6.29

*Vit A – 10,000.00 iu., D_3-2,000 iu., B_1-0.75g., B_2-5g., Nicotinic acid – 25g., Calcium pantothenate 12.5g., B_{12}-0.015g., K_3-2.5g., E-25g., Biotin – 0.050g., Folic acid –1g., Manganese 64g., Choline chloride 250g., Cobalt-0.8g., Copper 8g., Manganese 64g., Iron – 32G., Zn-40g., Iodine-0.8g., Flavomycin-100g., Spiramycin 5g., Dl-methionie-50g, Selenium 0.6g., Lysine 120g., BAT-5g.

Management of Experimental Animals and Data Collection

The grasscutter pens were washed and disinfected two weeks prior to the arrival of the animals. Medication was given to the grasscutters by a Veterinarian. Feed and water were offered *ad libitum*. The weight of the feed offered minus the weight of left over feed was recorded as the daily feed intake. The grasscutters were weighed at the beginning of the experiment to obtain their initial body weights, and subsequently on weekly basis to determine their growth performance. The animals were finally weighed at the end of the experiment to determine their final live weights. Feed conversion ratio was calculated from these data as quantity (gram) of feed consumed per unit (gram) weight gained over the same period.

Proximate Composition of Feed and Statistical Analysis of Data

Experimental diets were subjected to proximate analysis according to AOAC (2006). The *Moringa oleifera* leaves which were purchased from a local market were dried under shade for 10 days and thereafter the leaves where threshed carefully to separate leaves from twigs before blending to obtain the leaf meal. The dried leaves were ground to powder using an electric blender. Soybean meal was procured from a commercial feed mill in Nsukka, Enugu, Nigeria. Data were analyzed using the One way analysis of variance (ANOVA) in a completely randomized design (CRD) with the statistical package for social science (SPSS) version 20.0 (SPSS, 2007). Significantly different means were separated using Duncan's New Multiple Range Test option in SPSS (2007).

RESULTS

Effect of *M. oleifera* Leaf Meal and/or Soybean Meal on Growth Performance of Grasscutters

The proximate compositions of the experimental diets are shown in Table 2. Table 3 shows the growth performance of grass-cutters fed diets containing *Moringa oleifera* meal and/or soybean meal. There were significant differences ($p < 0.05$) among treatments in final and cumulative body weights. Grasscutters on treatment 3 (10% MOLM+10%SBM) had significantly higher ($p <$

0.05) final and cumulative body weights than those on the other treatments. The final and cumulative body weights of grasscutters on treatment 2 (15% SBM) were also significantly higher ($p < 0.05$) than those of grasscutters fed treatment 1 (15% MOLM) whose final and cumulative body weights were significantly ($p < 0.05$) lower than those on the other treatments. The daily weight gain of grasscutters on treatment 1 was significantly lower ($p < 0.05$) than those on the other treatments, with treatment 2 having the highest daily weight gain. Although, grasscutters on treatment 1 had the least feed intake, it was not significantly ($p > 0.05$) different from the feed intake of grasscutters fed treatment 3. The feed intake of grasscutters on treatment 2 was higher ($p < 0.05$) than that of those on the other treatments. The feed conversion ratio values differed significantly ($p < 0.05$) across the various treatments with grasscutters on treatment 1 having the least FCR value, while grasscutters on treatment 2 had the highest FCR value.

DISCUSSION

As shown in Table 3, feed intake was lowest among grass-cutters fed 15% *Moringa oleifera* leaf meal (MOLM). Obi *et al*. (2008) reported that crude fibre content of a diet usually affect feed consumption, invariably, the higher the crude fibre of the feed, the lower the feed consumed. From the data for the proximate analysis of the experimental diets (Table 2), treatment 1 diet had the highest crude fibre content and this probably may have impacted on the feed intake of grasscutters on that diet. According to Kung and Grueling (2000), high dietary fibre resulted in the limitation of the amount of energy available to poultry birds with consequent increase in the amount of nutrients excreted. Lee *et al*. (2003) reported that inclusion of fibre in the diets of monogastrics like poultry species has been discouraged owing to the negative effect it has on performance and nutrient utilization. It is also probable that the feed intake of grasscutters on treatment 1 may have been affected by the characteristic odour of MOLM. Makkar and Becker (1997) reported that moringa leaves had anti-nutritive factors like saponins which are responsible for its characteristics odour. Saponins are bitter and so reduce palatability of livestock feeds and this may be responsible for the decrease in feed intake noticed in grasscutters fed 15% MOLM.

Table 2: Proximate composition of experimental diets

Components (%)	Treatments		
	T_1	T_2	T_3
Dry Matter	90.40	92.31	88.57
Ether extract	2.55	3.20	3.30
Ash	9.60	4.05	5.30
Fibre	13.03	7.69	11.43
Protein	17.73	13.48	14.44
Nitrogen free extract	47.49	63.89	54.10

T_1 - 15% MOLM; T_2 - 15% SBM; T_3 - 10% MOLM+10% SBM

Although grasscutters on 15% MOLM had better feed conversion ratio (FCR) values than those on the other treatment, this did not translate into higher final and cumulative body weights and also average daily weight gain (ADWG). This result corroborates that of Adu *et al*. (2010), who observed a significant reduction in live weight among grasscutters fed *Panicum maximum* plus *Moringa oleifera* leaf meal, compared to those on *Panicum maximum* plus sweet potato vine based diet. The authors attributed this to the findings of Schrage and Yewadan (1999) which showed that grasscutters tend to prefer the more succulent portions of forages which the *Panicum maximum* plus *Moringa oleifera* leaf based diets could probably not afford them. It is well known that feed intake is a major factor influencing weight gain. Thus, reduction in weight gain observed among grass-cutters that consumed 15% MOLM diets may be attributed to depressed feed intake and lower efficiency of feed utilization (Ani and Okeke, 2011). In some earlier reports (Ani and Okorie, 2004; Ani, 2007; Ani and Okorie, 2007), it was observed that growth depression was directly linked to reduced feed intake. As the average daily feed intake (ADFI) per grasscutter decreased, the grasscutters receiving these diets did not have sufficient dietary nutrients, hence, the resultant depressed growth. Consequently, the metabolic and production requirements of these grasscutters could not be met with the decline in feed intake.

Several studies (Wang *et al*., 2000; Douglas, 1999; Mankind *et al*., 1996) have confirmed that daily gain in body weight and feed conversion are lower in animals fed diets containing trypsin-inhibitor, and lectin, which is anti-nutritive factors present in soybean, the reverse was however, the case in this study. It was observed that although grasscutters on treatment 2 (15% SBM) had the highest average daily weight gain, (ADWG), their average daily feed intake (ADFI) and feed conversion ratio (FCR) values were the highest compared to those on the other treatments. The better weight gain recorded in treatment 2 over treatment1 and treatment 3 may be attributed to the increased feed intake which could be due to low fibre content of the diet. This result is in line with the findings of Fayenuwo *et al*., (2003) who reported that grasscutter prefer feeds that are succulent and sweet and low in fiber contents. More so, it has been reported that feed intake is a major factor affecting weight gain, thus, growth depression is often directly linked to reduced feed intake. Notwithstanding, Esonu *et al*. (2010) reported that inclusion of 30% soybean hull (with/without safzyme® supplementation) in the diet of laying birds increased the feed intake of birds, attributing it to the high fibre content of soybean hulls which tend to increase the total fibre content of the diet and dilute other nutrients.

Table 3: Growth performance of grass-cutters fed experimental diets

Parameters	Treatments		
	T_1	T_2	T_3
Initial body weight (g)	832.17±9.94	843.62±9.95	838.43±9.94
Final body weight (g)	1671.72±9.30^c	1779.97±9.30^b	1871.63±9.30^a
Cumulative body weight (g)	838.10±11.89^c	947.80±11.89^b	1033.20±11.89^a
ADWG (g)	13.50±11.83^c	15.63±11.83^a	14.76±11.83^b
ADFI (g)	43.29±0.00^b	50.71±0.00^a	45.10±0.00^b
FCR (g)	3.06±0.52^c	4.29±0.52^a	3.96±0.52^b

Means on the same row with different superscripts are significantly different ($p < 0.05$). T_1 - 15% MOLM; T_2 - 15% SBM; T_3 - 10% MOLM+10% SBM; ADWG- Average daily weight gain; ADFI- Average daily feed intake; FCR- Feed conversion ratio.

However, the high FCR value of these grasscutters may be probably due to the presence of anti-nutritional factors like trypsin-inhibitor and lectin present in the soybean which according to Chunmei (2010), Herkerman *et al*. (1992) and Schulze *et al*. (1993a) affects the nutritional value, utilization and digestibility of soybean. This may be the reason for increased feed intake among grasscutters on treatment 2 translating into higher gain weight, though not so much different from that of grasscutters on treatment 3.

CONCLUSION

The results obtained in this study show that the inclusion of MOLM and SBM each at 10% levels resulted in improved performance, and thus considered adequate for growth of grasscutters.

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