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COMPARATIVE STUDY OF GROWTH PERFORMANCE OF GRASSCUTTER FED ON DIVERSE FOODSTUFF IN CAPTIVITY

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ABSTRACT
This research study investigated the growth performance of grasscutter (*Thryonomys swinderianus* Temminick 1827) fed on diverse diet types A, B and C respectively in captivity for 24 weeks. The diverse diet types were compounded from the forages eaten by grasscutter at Nnamdi Azikiwe University and environs and agricultural by-products from the Eke Awka Market. Diet type A- compounded of forage, B- compounded of agricultural by-products and C- a combination of forage and agricultural by-products. Grasscutter of homogenous weight and age were used in the study (760.18 ± 25g). A total of 36 grasscutter were used in this study, each diet type had three replicates (Stocked at a density of four grasscutters per cage). Studies on the indices of diet utilization and growth showed that feed intake was highest in grasscutter fed diet type C (99.32g). The diverse diet types although portrayed good weight gain, the percentage weight gain and specific growth rate were significantly ($P<0.05$) different among the diet types. The diet types also showed good length increase and this was not significantly different ($P>0.05$) among the diet types. Although the best food conversion diet was recorded for the grasscutter fed on diet type A, (13.93), this was not significantly different ($P>0.05$) from the other diet types (B and C) respectively.

KEYWORDS: Grasscutter, feed, growth, agricultural by-products etc.

INTRODUCTION

With rapidly expanding population, Nigeria is incapable of providing or raising adequate amount of necessary livestock to meet the demands of the growing population. As a result Nigeria imports both frozen meat and fish to supplement the meager available protein sources. Thus, there exist a gap between the human requirement for animal protein and its supply in Nigeria. The scenario is generally attributed to short fall in animal production occasioned by scarcity and high cost of input in animal (livestock) production. Consequently there is high demand for the limited livestock products, leading to escalated cost, and this has led to low level of animal protein consumption by an average Nigerian (NRC 1991). Efforts to improve animal protein production through management and feeding of conventional animals have apparently failed to solve this problem of sub-optimal animal protein consumption (Madubuike 2000). Since human population grows at the rate of 3.0 – 3.3% per annum (Awa, 2000) while livestock population grows at the rate of 1 – 2% per annum (Awa, 2000) this sub-optimal animal protein intake may persist unless drastic measures are taken to boost animal protein supply from non-conventional sources (Odukwe, 2001).

Many unconventional sources of animal protein supply (especially from the wild sources) have not been harnessed, thus the problem of shortages of animal protein will linger for sometime if not properly checked as suggested by FAO (1980). A good number of authors (Ajayi 1978, Marton 1983), have emphasized on the importance of bush meat (wildlife) in the diet of rural populace who constitute about 60% of the total population. Wildlife breeding has been recognized as a possible way of achieving this objective of providing animal protein (Ajayi 1971). Among the few of the small wild mammals traded on or bred in captivity in Nigeria, wild rodents are the most reared (NRC, 1991). Among the captive reared rodents, the grasscutter *(Thryonomys swinderianus)* is the most preferred (Asibey, and Eyson, 1997). The grasscutter is a hystricomorphic rodent wildly distributed in the African subregions and exploited in most areas as source of animal protein (Asibey, 1974, Vos, 1978 and NRC. 1991). Being the most preferred (Martin 1985) and expensive bush meat in West Africa including Nigeria, Togo, Benin Republic, Ghana etc it contributes to both local and export earnings in these West African countries (GEPC, 1995, Ntiamoa-Baidu, 1998) and is therefore hunted extensively. The excessive and uncontrolled hunting and decimation of these animals for consumption poses a threat to the ultimate survival of the animal in the wild. The high demand for grasscutter meat and the economic benefit accring from its sales has resulted to aggressive hunting with complete disregard for conservation of the species and the environment.

The grasscutter today is known to feed on a variety of forages in the wild. The raising and breeding of the grasscutter in captivity requires sound knowledge of its feed. In the wild their feeds are subjected to seasonal conditions; which make it difficult for feeding the grasscutter in captivity. The forages are readily available during the rainy season and are scarce during the dry season due to wild fire or manmade fire. The appropriate feed composition either with forage or conventional feed stuff that will enhance the optimal performance and production of the grasscutter is yet to be established. Hence the importance of this study, which is aimed at

investigating and finding out basic data for the formulation of diet (feed) that will physiologically and economically boost the farming of grasscutter in captivity.

MATERIALS AND METHODS

Study area

The study was carried out at the Nnamdi Azikiwe University, Awka in Awka South Local Government Area of Anambra State. It falls within the humid area, high rainfall and short period of dry season. Average rainfall is about 2169.8mm, average ambient temperature range of 29^{o}C and maximum of 34^{o}C. The vegetation is the guinea savannah.

Study animals and management

The experimental animals, *Thryonomys swinderianus* (grasscutter) were collected from the Idama grasscutter farm, Ubulu-ukwu, Delta State. The animals were between 5-6 weeks old, weighing about 700g-772g. The animals were transported from the Idama farms to the laboratory in metal boxes with circular perforation to ensure adequate ventilation. The study lasted for a period of six calendar months (168 days) besides two weeks of acclimatization period. The animals were randomized into three groups with three replicates of live weight of 546.25g±30.75, 564g±50 and 578.18±14.6 respectively, each housed in a cage with dimensions 2m x 1m x 0.5m. Each group was fed with one of the three diet types: Diet A, B and C. fresh water was also supplied adlibtum.

Animal feed formulation and feeding

Three diet types were formulated for the experiment (Diets A, B and C). Diet A (forage) was formulated with grasses fed on by the grasscutter in the wild and they included: Elephant grass, Guinea grass, Gambia grass, Cassava *(Manihot esculenta)Leuceana leucocephala,* sugar cane molasses, mineral/vitamin premix and salt (NaCl). Each of the plant (forage) materials were collected, chopped, sun dried under shade and milled separately. Diet B was formulated from agricultural by-product which includes: Maize grain *(Zea mays),* maize bran, Soya beans meal, Blood meal, Breweries grains, sugar cane molasses, bone meal, Salt (Nacl) *Leuceana leucocephala* and mineral/vitamin premix. Diet C was formulated using a combination of the forages and agricultural by-products.

The different proportions of the ingredient for the diet types A, B and C are as follows: (Diet A - Guinea grass 30g, Gambia grass 18.4g, Elephant grass 25.6g, Cassava flour 10g, *Leacenea leucocephala* 10g, Sugar cane molasses 5g, Mineral salts/vitamin premix 0.5g and Salt (NaCl) 0.5g, Diet B - Maize grain 18g, Maize bran 40g, Soyabean meal 7g, Blood meal 5g, Breweires grain 20.4g, Sugar cane molasses 5g, *Leucenea leucocephala* 3g, Bone meal 1g Vitamin/mineral premix 0.6g and Diet C - Elephant grass 18g, Gambia grass 22g, Guinea grass 15g, Maize grain 15g, Brewieres grain 10g, Sugar cane molasses 5g, Soyabean meal 7g, Blood meal 5g, Mineral/vitamin premix .5g and Salt 0.5g were measured out and then mixed in a large plastic bowl respectively. The mixture were then milled and pelleted, sun dried, bagged and stored at a room temperature to avoid spoilage and deterioration. The pellets measured 8mm in diameter.

The grasscutters were fed adlibtum of the trial diets [A, B and C] two times daily at 8.00am and 6.00pm. The groups fed on diet B (agricultural by-products) were intermittently fed with forage supplement from the wild at night to avoid stomach disorder. The animals were provided with fresh water every morning for the six months period of study.

Data collection

The following data were collected: Daily food intake, Bi-weekly weight gain (BWG), percentage weight gain (PWG), food conversion ratio (FCR), specific growth rate (SGR), mean length increase (MLI).

Daily feed intake = Food fed - Food left over (gm)

$$\text{Bi-weekly weight gain} = \frac{\text{Bi-weekly final mean weight (g) - Bi-weekly initial mean weight (g)}}{\text{Final time – initial time}}$$

$$\text{Percentage weight gain} = \frac{\text{Mean final weight – mean initial weight}}{\text{Mean initial weight}} \times 100$$

$$\text{Food conversion ratio} = \frac{\text{Food consumed by grass cutter(g)}}{\text{Mean weight gain by grass cutter (g)}}$$

$$\text{Specific growth rate} = \frac{\text{Log}^{w2}_{e} - \text{Log}^{w1}_{e}}{T_2 - T_1} \times \frac{100}{1}$$

Where; W1 = Initial mean weight.
W2 = Final mean weight.
T1 = Initial time
T2 = Final time
Log =Natural logarithm

$$\text{Mean length increase} = \frac{\text{Bi-weekly final length(cm) - Initial length(cm)}}{\text{Final time (weeks) - Initial time (week)}}$$

The Proximate analysis of the diets (A, B and C) were carried out for moisture content, crude proteins, fibre, crude fat content, carbohydrate content, ash content, dry matter content and food energy mass using the methods of the Association of Official Analytical Chemists (AOAC, 1990)

Statistical analysis

The data obtained from the growth and feed utilization were subjected to analysis of variance (ANOVA). Difference among the treatment means were separated using the least significant difference (LSD) at 95% confidence limit or Duncan's Multiple Range Test (SAS 1999).

RESULT

Feed utilization/performance of the grasscutter fed diets A, B and C.

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TABLE 1: Mean (dry matter) feed intake of the grasscutter fed on diverse diet types A, B & C respectively for 24 weeks (168days).

Feed type	Total Feed(g)(a)	Total Feed left over(g)(b)	Total Feed consumed (g)(a-b)=c	Daily Feed intake(g)(d) C/168 days.
A	3600	21109.33	12490.67	74.36
B	3600	20592.00	13009.33	77.44
C	3600	16912.33	16687.66	99.32

Ration A is not significantly different ($P > 0.05$) to ration B, but significantly different ($P < 0.05$) to C. The ration C was significantly different ($P < 0.05$) to both rations A and B.

TABLE 2: Bi-weekly mean weight gain of grasscutter on diverse diets A, B and C for 24 weeks**.**

Diet types	Initial Weight(g)	W2(g)	W4(g)	W6(g)	W8(g)	W10(g)	W12(g)	W14(g)	W16(g)	W18(g)	W20(g)	W22(g)	W24(g)	Total WtGain (g)
A	763.18	852.52	933.87	981.13	1057.96	1092.20	1167.71	1259.54	1342.04	1420.66	1499.10	1535.00	1660	**896.82**
B	752.24	851.97	938.97	988.16	1063.80	1089.74	1165.71	1251.08	1332.16	1413.65	1491.62	1572.26	1638.73	**886.50**
C	763.38	843.31	927.85	972.85	1074.20	1130.81	1206.97	1284.00	1377.40	1476.00	1572.87	1677.86	1771.27	**1007.90**

TABLE 3: Biweekly mean percentage length increase of grasscutter fed diverse diets A, B, and C for 24 weeks

Food type	Replicates I	II	III	Total	Mean±SE
A	46.42	42.01	43.01	131.44	43.81 ±1.33
B	38.60	38.94	40.00	117.54	39.18±0.42
C	44.64	44.10	44.76	133.5	44.50±0.20

grasscutters fed on ration types A, and B did not differ significantly ($P > 0.05$), C was significantly different ($P<0.05$) when compared with B and A, but B and C were not significantly difference ($P>0.05$). Rations A differed significantly with type C ration ($P< 0.05$).

The following feed utilization indices and growth performance results of grasscutter fed on diverse diets (A, B and C) for 24 weeks are presented in the tables below respectively (Dry matter, bi -weekly weight gain, Percentage weight gain, Specific growth rate and Food conversion ratio.)

TABLE 4: Mean specific growth rate of grasscutter fed diverse diet types (A, B, and C) for 24 weeks

Food type	Replicates			Total	Mean±SE.
	I	II	III		
A	0.013	0.014	0.015	0.042	0.014±.00
B	0.014	0.014	0.014	0.042	0.014±.00
C	0.015	0.015	0.015	0.045	0.015±.00

TABLE 5: Feed conversion ratio of grasscutter fed diverse diet types (A, B, and C) for 24 weeks

Feed type	Replicate	Mean initial wt (g)	Mean Final Wt (g)	Mean wt diff (g)	Food consumed (g)	FCR	Mean ± SE
A	I	778.18	1634.57	856.39	13050	15.23	
	II	764.25	1688.25	919	12250	13.33	13.95±0.32
	III	747.12	1662.46	915.34	12172	13.30	
B	I	746.25	1595.88	849.64	12678	14.92	
	II	761.23	1656.72	895.50	13417	14.98	14.69±0.26
	III	749.34	1662.52	913.20	12939	14.17	
C	I	771.18	1799.42	1028.24	16469	16.01	
	II	762.52	1789.18	1026.66	16387	15.96	16.57±0.55
	III	756.45	1725.21	968.76	17207	17.76	

Feed conversion ratio of diet C is significantly different from those of diet B and C

TABLE 6: Proximate Composition of experimental diverse diet types (A ,B, and C)

Proximate Composition %	Forage (A).	Agricultural by product (B).	Forge Agricultural by products and forages (C).
Crude protein	20.88	20.81	22.98
Crude fat	8.02	8.22	8.82
Carbohydrate	50.02	50.04	50.10
Total Nitrogen	10.14	10.13	10.48
Ascorbic acid	1.53	0.90	0.90
Moisture content	2.50	6.00	5.50
Dry matter	97.00	94.00	94.50
Ash content	25	35	28.50
Crude fibre	21	17	11
Food energy	696.02	742.12	796.75.

DISCUSSION

The highest daily dry matter intake was observed in the grasscutter fed on diet C (99.32g), followed by those fed on diet B (77.44g) and the least was in those of diet A (74.36g) Table 1. This result could be associated with the composition of the diets and their palatability. The highest dry matter intake recorded by the grasscutters fed on diet type C, could be due to the taste and nutrient content of the diet and the different feed components (agricultural by-products and forages). Ration A is not significantly different ($P > 0.05$) to ration B, but significantly different ($P < 0.05$) to C. The ration C was significantly different ($P < 0.05$) to both rations A and B Thus from the result, diet type C showed good dry matter intake and could be recommended for use in rearing grasscutter in captivity. The highest mean final bi-weekly weight gain was recorded by the grasscutters fed on diet type C (1007.90g) while the least was recorded by those fed on diet B (886.50g) (Table 2).The better weight gain recorded in diet C could be due to increased feed and protein intake, which also could have resulted from the diet utilization (ratio of feed intake to weight gain). Although all the diet type had good weight gain and percentage weight gain, the highest percentage weight gain was recorded by the grasscutters fed on diet type C, while the least was recorded by those fed on diet type A, (Table 3). The percentage weight gain was not significantly different ($P >0.05$) among the diet types A and B, but A and B each differed with C ($P < 0.05$), they all portrayed good weight increase .This increase in diet C show that the diet contained a good level of nutrient composition. On the other hand the better

performance by diet C compared to the other diets A and B could be due to the high content of crude protein and energy in the diet which resulted to high food intake and weight increase. The specific growth rate followed the same trend as the percentage weight gain. The grasscutters fed on diet type C showed higher specific growth rate and was significantly different ($P< 0.05$) from those of grasscutters fed on the other diet types A and B (Table 4). This different in specific growth rate could be as a result of the nutrient composition of the different diets. Diet type C had, higher protein content which was utilized well for formation and deposition of muscles in the grasscutter. The highest food conversion ratio was recorded in the grasscutters fed the diet type C (16.57+0.5), while the least was recorded in the grasscutters fed on diet type A (13.95+0.32) (Table 5). Diet C was significantly different ($P>0.05$) from those fed on diets A and B, while A and B was not significantly different ($P>0.05$) . Comparing the food conversion ratio values, the result could have been, because of the food intake, the gasscutter fed on diet type A consumed less thus the quantity of food converted into flesh decreased.

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