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THE EFFECT OF THE REPLACEMENT OF SUGARCANE PEEL WITH CASSAVA PEEL MEAL ON THE GROWTH PERFORMANCE OF GRASSCUTTERS

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Abstract

A 90-Day feeding trial was conducted to determine the effect of replacing cassava peel meal with sugarcane peel meal in the diets of grasscutters. Twenty growing grasscutters with an average initial weight of 556 g were used for the experiment. Four grasscutters were allotted to each treatment in a completely randomized design. Five diets were formulated to contain 100, 75, 50, 25 and 0.0% of sugarcane meal and 0.0, 25, 50, 75 and 100% of cassava peel meal. Proximate analysis was carried out on the test ingredients and experimental diets. The growth response parameters were recorded. The results of proximate analysis of the experimental diets showed that crude protein ranged from 14.25-14.45%, while the Metabolizable energy values were 2710.232805.21 kcal/kg. The result of the experiment showed that, the feed intake ranged 56.08-58.26 and did not differ ($P > 0.05$) among treatments, while the final daily weight gain and feed conversion ratio were significantly ($P < 0.05$) different. The result of this experiment showed that cassava peel meal can replace sugarcane peel meal up to 100% in the diets of grasscutters without any deleterious effect on their health. Based on this study, 25% level of cassava peel replacement, though not significantly ($P>0.05$) different from others, is ideal from the point of view of the performance of the grasscutters. It is therefore recommended that for optimum performance, CPM could be included at 25%, considering the growth response and feed conversion ratio obtained from the present study.

Key words: cassava peel meal, sugarcane peel meal, grasscutters, growth response.

1. Introduction

The animal industry plays a very vital role in any country in meeting the protein requirements of the population. The current rate of population growth indicates that the World population might hit the 9 billion mark by the year 2040, with the developing countries being the most populous (UNDESA 2013). There is therefore the need to improve on the technology as well as managerial skills to be able to produce enough to feed the rising population. It has been observed that an average Nigerian cannot meet the minimum animal protein requirements despite the diversity in the consumption of the country's animal species. The importance of adequate protein intake (in terms of quality and quantity) in the nutrition of man cannot be over emphasized particularly in these globally challenging times. There is need, therefore, to attempt to bridge this animal protein gap for Nigerians to attain the FAO recommended daily animal protein intake of 35 g as well as attempt to reduce the under-five deaths commonly experienced by the provision of animal protein knowing its functions in the health status of the individual (Idufeko, 1984; Igben, 2000). This animal protein source should not only be available but affordable to the populace since poverty is not only tied to mal-nutrition but also to under-nutrition. In attempting to address this situation, therefore, we must think of animals from the wild with acceptable potentials, tractable and prolific and one of such animal is the grasscutter, a micro-livestock (Mbah, 1989). The urgent need to encourage micro or mini-livestock (grasscutter) as a strategy for food security is important since micro or mini-livestock animals means a small amount of input per unit, which in turn means more flexible production. Grasscutter production provides an opportunity for supplementing animal protein and income to Nigerians. The grasscutter can be reared with minimal capital outlay and land. It is less affected by disease, devoid of noise and its food requirements are low in captivity. It can, therefore, serve as a considerable income earner for the small scale urban and rural mini-livestock producers. Grasscutter is desirable for domestication because of its excellent taste, acceptability, comparatively high nutritional value and meat yield than most species of livestock (Ntiamoah-Baidu, 1998). Asibey (1974) have earlier on reported that grasscutter meat has a protein content of 24.7%, and a low fat content of 1.2% which makes it better than beef with a protein content of 19.6% and fat content of 6.6% and pork with a protein content of 19.4% and fat content of 13.4%.

Since Grasscutters have the potentials of reducing the wide animal protein demand gap and its production is becoming more popular in some part of Africa, the cost of production is also being affected like monogastric animals. This problem seems to be compounded by the fact that, we cannot afford to economically feed whole grains and tubers to animals in this country because of cost and the high demand by man for these produce. The lack of improvement in crop production and the competition between humans and animals for available grains and tubers make nutritional requirement at reasonable cost difficult to achieve, since a viable livestock industry is dependent on agro-products.

Consequently, as animals are unable to meet both their protein and energy requirements, there is not only marked weight loss, lowered disease resistance, death and also seasonal anoestrus, reduced fertility but also slow growth rate (Osori 1996).

Given the above scenario, the challenge is to search for inexpensive, readily available and nutritionally adequate feed materials especially those that are not in direct use by humans (Oyenuga 1999).

Some of the possible sources of cheap and available ingredients include the cassava peel meal (CPM) and the sugarcane peel meal (SPM). CPM is a cheap and readily available by-product of cassava processing, which contains 5% crude protein, 5.8% fat, 9.5% crude fibre, 7.2% ash and 2036 Kcal/kg Metabolizable energy (Aduku 1993). While SPM is one of such usable by-product crop residue used as ruminant feed because of its nutritional components (Ademosun 1994). Sa'adullah (1984) reported that ruminants responded positively when fed diets based on crop residues and sugar-rich agro industrial by-products supplemented with small quantities of by-pass protein.

Sugarcane peel is available in abundance during the dry season in the study area and in the sugarcane farming areas in Nigeria and the use of sugarcane peels as feedstuff will help in reducing the problem of feed shortage in Nigeria and reduce environmental pollution. According to Ayoade *et al.* (2007) exploitation of cheap feed resources for animal production would lower the market price of animals and their products in Nigeria.

Since Grasscutters have the potentials of reducing the wide animal protein demand gap their production is becoming more popular in some part of Africa, and there is need to improve on their level of feeding both qualitatively and quantitatively to meet their nutrients requirement to enable them exhibit their potentials. Therefore, there is need for Animal Nutritionists to work towards the utilization of alternative cheap feed sources for the feeding of grasscutters. The findings will provide the baseline information for safe and effective usage of cassava peel meal and sugar cane peel meal needed by grasscutter researchers, Managers and Farmers. It was, therefore, the aim of the study to evaluate the performance and carcass characteristics of Grasscutters fed sugarcane peel meal partially replaced by cassava peel meal.

2. Materials and methods

2.1 Experimental Location

The study was carried out in Obubra, Cross River State. This is located between longitude 8^0-9^0 E and Latitude 6^0-7^0 N of the equator, with a mean annual rainfall of 500 to 1070 mm, and a warm weather and ambient temperature of about 20^{0c}-30^{0c} (Mfam, 2002). Obubra is located along the banks of the Cross River in the Southern Guinea Agro-Ecological Zone of Nigeria. Obubra is about 159 km from Calabar, the State Capital of Cross River State of Nigeria.

2.2 Experimental Animals and Design

A total of Twenty (20) weaned grasscutters aged, 2 months obtained from a local farmer in Imo were used for the feeding trial. The grasscutters were put into groups of similar body weights and were randomly assigned to five dietary treatments in a Completely Randomized Design. There were four replicates in each treatment with an animal serving as a replicate. The animals were given their respective formulated concentrate feed *ad libitum* throughout the period of the experiment.

2.3 Collection of experimental ingredients and processing:

The experimental ingredients, cassava peels (CP) and sugarcane peels (SCP)were sourced within the premises of the campus's environs. These ingredients were sun dried intensively on a concrete slap separately for a period of 3 days and finally SCP were milled with a forage chopping machine while the CP were roughly milled using a hammer mill to produce the peel meals that were used in their various levels in the experimental diets and samples sent for proximate analysis (AOAC, 2010) as shown in Table 1.

Table 1. Proximate composition of the test ingredients

Ingredients	Crude protein	Ether extract	Crude fibre	Ash	NFE	ME(kcal/kg)
Cassava peel meal	5.80	5.70	10.52	7.50	63.03	2,913.86
Sugarcane peel meal	6.69	4.07	25.50	9.00	51.44	2,366.32

NFE= Nitrogen free extract, ME =Metabolizable energy calculated from Pauzenga equation (1985) ME= (37 X % CP) + (81 X % EE) + (35.5 X % NFE)

Based on the results of the chemical analysis, five diets were formulated to contain 100, 75, 50, 25 and 0.0% of sugarcane meal and 0.0, 25, 50, 75 and 100% of cassava peel meal (Table 2)

Table 2. Composition of the experimental diets

Ingredients %	Dietary levels of the peel meals, %				
	T1 100 SPM 0.0 CPM	T2 75 SPM 25 CPM	T3 50 SPM 50 CPM	T4 25 SPM 75 CPM	T5 0.0 SPM 100 CPM
Sugarcane peel meal	30.00	22.5	15.00	7.5	0.00
Cassava peel meal	0.00	7.5	15.0	22.5	30.00
Maize	10.55	10.55	10.55	10.55	10.55
Maize offal	20.00	20.00	20.00	20.00	20.00
Full-fat-soya bean	15.00	15.00	15.00	15.00	15.00
Palm kernel cake	20.00	20.00	20.00	20.00	20.00
Bone meal	3.00	3.00	3.00	3.00	3.00

Common Salt	1.00	1.00	1.00	1.00	1.00
Vit-min-premix+	0.25	0.25	0.25	0.25	0.25
Methionine	0.10	0.10	0.10	0.10	0.10
Lysine	0.10	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00	100.00
Calculated nutrients					
Crude protein%	14.35	14.36	14.36	14.38	14.38
Crude Fibre %	13.72	12.60	11.48	10.35	9.23
ME(Kcal/kg)	2,650.02	2,691.09	2,732.16	2,773.22	2,814.29

CPM: Cassava Peel Meal, SCPM= Sugarcane peel meal, NFE: Nitrogen Free Extract, ME/kcal/kg: calculated from Pauzenga equation (1985) ME= (37 X %CP)+(81 X %EE)+(35 X %NFE)

2.4 Experimental Procedure

At the commencement of the experiment, all the animals were provided with antistress (Vitalyte) agents 2 g each. They were also dewormed and given cocciodiostat using piperazine citrate and proccox, respectively. The experimental diets and water were served *ad libitum*. The grasscutters were individually weighed using Camry top loading weighing scale, grouped into five in such a way as to ensure uniformity of initial body weights in all the groups and allotted to different treatments in agreement with the design of the study.

2.5 Data collection:

Each grasscutter was offered a weighed quantity of feed daily. The grasscutters were fed in the morning hours between 7.00-8.00 am. Feeding was *ad-libitum* and had access to fresh and clean drinking water always. Left over feeds were collected into clearly labelled envelopes and weighed with a sensitive scale daily. The feed intake was computed by deducting from the quantity offered from the amount left over. The animals were weighed individually at the beginning of the experiment and weekly thereafter. The body weight gain was determined by differences. A sensitive weighing scale was used for all measurements. Feed conversion ratio (FCR) was calculated as the ratio of feed intake to body gain.

FCR= (weight of feed\weight gain).

2.6 Statistical analysis:

All data obtained were subjected to one way Analysis of variance (ANOVA) using mini-tab statistical software. Where significant differences occurred, means were separated using Fisher's least significant difference (LSD) as contained in the statistical package.

3. Results

3.1 Proximate composition of the formulated experimental diets:

As shown in Table 3, all the experimental diets fell within the nutrient requirements of growing grasscutters reported by other researchers. The crude protein was (14.25 - 14.47%), Crude fibre (7.03 - 7.65%), EE (6.83 -7.62%), Ash (9.10 - 9.96%), NFE (49.12 - 52.6%) and Energy (3203.03 - 3252.30 Kcal/kg).

Table 3: Proximate composition of the formulated experimental diets.

Parameters%	T1 100 SPM 0.0 CPM	T2 75 SPM 25 CPM	T3 50 SPM 50 CPM	T4 25 SPM 75 CPM	T5 0.0 SPM 100 CPM
Moisture	10.01	10.28	10.28	10.63	10.74
Dry matter	89.99	89.72	89.42	89.37	89.26
Crude protein	14.25	14.27	14.44	14.45	14.47
Crude fibre	14.00	13.70	12.88	11.50	10.25
Ether extract	5.90	4.62	4.70	4.02	3.90
Ash	6.38	6.20	6.10	5.99	5.60
NFE	49.47	50.93	51.30	53.41	55.04
ME(Kcal/kg	2,761.34	2,710.23	2,736.13	2,756.33	2,805.21

CPM: Cassava Peel Meal, SPM= Sugarcane peel meal, NFE: Nitrogen Free Extract, ME/kcal/kg: calculated from Pauzenga equation (1985) ME= (37 X %CP)+(81 X %EE)+(35 X %NFE)

The proximate composition of the sugar cane peel meal (SPM) is presented in Table 6. The results showed that, the crude protein value of 5.69% in this study is slightly lower than 6.56% reported by Ochepo *et al*. (2012) but higher than 4.02% reported by Adesoji (2012). The crude fibre 25.50% reported in this study is higher than 12% reported by Ayoade *et al*. (2007) but lower than 36.48% reported by Alu *et al*. (2013). The ether extract of 4.07% reported by this study is higher than 2.8% reported by Ayoade *et al*. (2007). The nitrogen free extract 51.44% reported in this study is lower than 66.12%

and 77.1% reported by Ochepo *et al*. (2012) and Ayoade *et al*. (2007) respectively. The ash content of 9% recorded in the study is higher than 7.31% and 12.8% reported by Ochepo *et al*. (2012) and Ayoade *et al*. (2007) respectively. The energy content of the SPM reported in this study 2,366.32 kcal/kg is higher than 1,945 kcal/kg reported by Adesoji (2012). The cassava peel meal (CPM) crude protein 5.8, ether extract 5.70, crude fibre 10.52, ash 7.5, nitrogen free extract 63.03% and energy 2,913.86 kcal/kg are almost similar to 4.40, 5.80, 9.50, 7.20, 73.10% and 2,030 kcal/kg respectively, reported by Esonu (2000); Omole *et al*. (2005) except the energy value which was higher.

The differences in chemical compositions could be attributed to the inherent variability of biological materials, location, method of processing, storage and other factors which might have resulted in these differences since all authors cited worked on sugar cane peels and cassava peels.

According to Table 5, all the experimental diets fall within the nutrient requirement of growing grasscutters as reported by some authors. The crude protein within (16.70 - 17.78%), Crude fibre (7.03 - 7.65%), EE (6.83 -7.62%), Ash (9.10 - 9.96%), NFE (49.12 - 52.6%) and Gross Energy (Kcal/kg) (3203.03 - 3252.30 kcal/kg)

3.2 The results of the performance of grasscutters fed sugarcane peel meal replaced with cassava peel meal:

The results of the performance of grasscutters fed sugarcane peel replaced with cassava peel meal is presented in Table 4. The results shows that, the final weight (g), weight gain (g/day) and feed conversion ratio were significantly different ($P<0.05$) while the feed intake (g/day) did not differ significantly ($P>0.05$). The final weight and the weight gain (g/day) followed a particular trend. It decreased as the levels of cassava replaced the sugarcane peel meal. The highest feed intake was with the 25% replacement level with cassava peel meal while the lowest was with 100% level of replacement.

Table 4: Performance of Grasscutters fed sugarcane peel partially replaced with cassava peel meal

Parameters	**T1**	**T2**	**T3**	**T4**	**T5**	**SEM**
Grasscutter	**100%SPM 0% CPM**	**75% SPM 25% CPM**	**50% SPM 50% CPM**	**25% SPM 75% CPM**	**0% SPM 100% CPM**	
Initial weight (g)	554	556	556	558	558	
Final weight (g)	1760^{a}	1632^{ab}	1506^{bc}	1454^{c}	1452^{c}	59.58

Ave. feed intake (g/day)	57.37	58.36	57.26	57.34	56.08	0.36
Weight gain (g/day)	14.36[a]	12.81[ab]	11.31[bc]	10.67[c]	10.64[c]	0.72
Average weekly weight gain	201.04[a]	179.34[ab]	158.34[bc]	149.38[c]	148.96[c]	10.05
Feed conversion Ratio	4.03[a]	4.62[ab]	5.11[b]	5.46[b]	5.47[b]	0.27

a,b,c Means having the same letter(s) in a row are not significantly (p>0.05)different, SEM =standard error of means, SPM= Sugarcane peel meal, CPM=Cassava peel meal

3.3 Performance of Grasscutters fed sugarcane peel partially replaced with cassava peel meal:

The results of the Performance of Grasscutters fed sugarcane peel partially replaced with cassava peel meal was presented in Table 4. The lack of difference in average feed intake by the grasscutters in this study is an indication that the animals were able to tolerate the increased levels of the CPM resulting from the replacement of sugarcane peel meal in their diets. The results of this study is in agreement with the finding of Banjo *et al*. (2009) who worked on the replacement of maize with graded levels of brewer's dried grain (BDG) in the diets of weaner grasscutters. The average daily intake of the diets was highest (58.36 g) for grasscutters on treatment two T_2 though this did not differ (P>0.05) significantly from other treatments and lowest (56.08 g) for grasscutters on treatment five, T_5. Feed intake did not follow any particular trend so as to be attributed to the different levels of replacement of sugar cane peel with cassava peel. Generally, the feed intake recorded in this study is less than the range of values reported by Onyeanusi *et al*. (2008), 178.02-262.05 g; Henry *et al*. (2009), 161.97-213.88 g and also lower than the values (92.98-148.75g reported by Gboshe *et al*. (2018). The variations in the feed intake with the various researchers may be attributed to factors like size of the animal and variations in the level of nutrients composition in feeds. This agrees with the assertion of Mc Donald *et al*. (1995) that animals tend to be eating more feed of low quality in order to satisfy their need for energy and other nutrients. Another possible reason for variation in the feed intake could be as a result of individual preference by the grasscutters or differences in the feeding habits of the animals as reported by Payne (1990) and Lynch *et al*. (1992) who stated that individual variations among animals affects the rate of feed intake.

The total weight gain in this study ranged from 894-1206 g with the highest in the animal fed the control though not significantly (P>0.05) different from the animals fed the test ingredients. It followed a particular pattern, it decreased as the level of replacement increased. The values recorded are higher than values reported by Onyeanusi *et al*. (2008) who reported value range of 650-850 g when the grasscutters were fed varying levels of dietary protein on growth performance. Annor *et al*. (2009) reported values that ranged from 225-625 gas total weight gain for grasscutters at the end of an experiment that lasted for 24 weeks. In another study by Obi *et al*. (2008) where performance of grasscutters were assessed when fed four different conventional forages, the total weight gain reported were between 1024 and 1121 g. Karikari and Nyameasem, (2009) reported values range of 650-1190 gas total weight gain for grasscutters fed concentrate diets containing varying levels of guinea grass. Henry *et al*. (2012) reported 993.14-1182.72 g when they fed elephant grass as basal feed and a mixed feeding regime with crude protein of 24% and Metabolizable energy of 2340 kcal/kg. Ogunjobi *et al*. (2014) reported 528.08-532 g when they assessed elephant grass, Gambia grass and their fractions using concentrate supplement of 16% and Metabolizable energy of 2500 kcal/kg but lower than 667.5-2185 g reported by Gboshe *et al*. (2018) with the exception of the lower range and some similarities with other researchers. These variations may be attributed to the nature of the diets and the feeding regime adopted by the various researchers.

Even when the live weight of the grasscutters were equalized among the treatments at the beginning of the trials, the final body weight ranged from 894.00 g for grasscutters on 100% cassava replacement diet to 1206 g for grasscutter on a 0% replacement (Table 4).

The average daily body weight gain was significantly ($P<0.05$) affected in this study which disagrees with reports by Ogunjobi *et al*. (2014) and Henry *et al*. (2012) who had no significant ($P>0.05$) differences in their studies but agrees with Gboshe *et al.* (2018) who had a significant ($P<0.05$) difference when concentrate feed supplementation regime was assessed on the growth performance and economics of production of grasscutters. The average daily weight gain was highest (14.36 g) for grasscutters on 0.0% level though not significantly ($P>0.05$) to 25% level and lowest (10.64 g) for 100%. Average daily weight gain showed a significant effect ($P<0.05$) between the test ingredients and the control except 25% levels of replacement. This daily weight gains was almost similar ($P>0.05$) to the value range reported by Onyeanusi *et al*. (2008) 13.27- 15.00 g, 9.41 g, 10.88 g reported by Wogar *et al*. (2007) and Gboshe *et al*. (2018) with value range of 9.23-15.93 g. The average daily weight gains of the grasscutters were significantly ($P<0.05$) affected by the percentage levels of the replacements and had a defined trend in the relationship between average daily weight gains and the levels of replacements. It followed the same pattern like the total weight gain. This was expected because the accumulations of daily weight gain gives the total weight gain over the period of study.

The marginal decline in weight gain observed in this study as the level of cassava peel meal replaced sugarcane peel meal may be attributed to the low protein content of cassava peel and also it's dusty nature which affected the low feed intake and subsequently the low weight gain. This agrees with the observation that, CPM could serve as a cheap source of energy for farm animals but should be fortified with additional protein source because of its low protein level (Obioha and Anikwe, 1982).

The feeding trial on the grasscutters had a significant ($p<0.05$) effect on the feed conversion ratio. The feed conversion ratio followed the same pattern of significance ($p<0.05$) as the average daily weight gain. It increased as the level of cassava replaced sugarcane. The worst FCR recorded was in 100%(5.47) though did not differ from the test ingredients and the best was in 0.0% level. This FCR values obtained in this research are better than the values of 543.24, 82.30 and 119.38 reported for grasscutters at the end of a 24 week feeding trial (Annor *et al*., 2009). These values are, however, higher than the value ranges of 1.66 - 3.52 Wogar *et al*. (2007), Onyeanusi *et al*.(2008) whose values ranges from 0.80-0.96, value ranges of 1.81-6.95 Henry and Njume (2008), almost similar 4.86-5.04 Obi *et al*. (2008) and 4.8-7.5 Karikari and Nyameasem, (2009) but less than the value range 9.91-19.49 reported by Gboshe *et al*. (2018). The variations in FCR values may be attributed to the differences in the experimental diets used by different authors and the feeding regimes practiced while carrying out their various experiments.

4. Conclusion

The results of this experiment showed that cassava peel meal can replace sugarcane peel meal up to 100% in the diets of grasscutter without any deleterious effect on the health of grasscutters. For performance, the best level of replacement was 25%, though it did not differ significantly ($P>0.0$) from 50% replacement level; and further study is suggested to affirm the 50% level. Based on this present study, It is however, recommended that for optimum performance CPM could be included at 25%, considering the growth response and feed conversion ratio obtained from the present study.

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