# Effects of diets containing processed cassava peel meal on performance and feed economies of growing red Sokoto bucks

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#### **Abstract**

An experiment was carried out to evaluate the effects of differently processed cassava peel meal on the performance and economies of growing red sokoto bucks. Four experimental diets were formulated; diet  $T_1$  (control) contained 20 % sun-dried cassava peel meal while diets  $T_2$ ,  $T_3$  and  $T_4$  contained 20 % soaked, 20 % boiled and 20 % fermented cassava peel meal, respectively. Each diet was fed to a group of 3 bucks for 70 days in a completely randomized design. Among the differently processed cassava peel meals included in the diets of growing red sokoto bucks, inclusion of fermented cassava peel meal significantly (p<0.05) increased the final weight (19.63 kg), weight gain (6.63 kg) and total feed intake (19.93 kg) of the bucks; no significant effect was observed on other performance indices. There was also a significant (p<0.05) reduction in the feed cost per kilogram weight gain of bucks fed diet containing fermented cassava peel meal. It was therefore concluded that inclusion of fermented cassava peel meal in the diets of growing red sokoto bucks resulted in better performance of the bucks and reduced the cost of feed per kilogram weight gain.

**Keywords**: Performance, Red Sokoto bucks, Cassava peel meal, Processing methods, Cost economies

### Introduction

Products from food animals provide over 33 percent of protein consumed in human diets and about 16 percent of food energy globally (Martin, 2001). In Nigeria, the gap between supply and demand for animal products is widening as a result of increase in population, rapid urbanization, growing income, changing lifestyle, food preferences and several land conflicts (Anya and Ozung, 2018). Goats provide over 1.97 million tonnes of meat annually representing 3.5% of total world meat production and 8.5% of total estimated meat production in developing countries (Ozung et al., 2011). The productivity of goats under the prevailing traditional extensive production system is low mainly because of feed scarcity and lack of adoption of improved technologies and management practices (Kumar et al., 2010). Feed accounts for 60 - 70% of total cost of livestock production (Akpodiete and Inoni,

2000) and its inadequacy in quality and quantity could lead to undesirable situations such as low nutritional status, poor weight gain, poor reproductive ability, poor production, poor health condition and poor conversion ratio (Fajemisin et al., 2015). Fibrous crop residues are poor sources of fermentable nitrogen as their crude protein is below the level required by rumen microorganism. These crop residues are equally low in easily degraded carbohydrates, minerals nutrients required to balance the products of digestion to requirements, leading to limited intake, poor rumen function and low animal productivity (Anya and Ozung, 2018). The nutritional needs of goats can thus be addressed through the use of nonconventional feedstuff that are cheap and readily available (Ahamefule and Udo, 2010). One of such non-conventional feedstuff that is in abundance and can be a potential feed resource for livestock production is cassava peels. Cassava (Manihot spp.) is an important annual root crop renowned for its high supply of carbohydrates among staple crops. Cassava ranks fourth among food crops after maize, rice and wheat (FAO, 1991) and the peels are produced in large qualities from the processing of cassava for human, industrial and export purposes. Unfortunately, this enormous feed resource has received very little attention and is often discarded as waste (Ozung, 2009). Several processing techniques such as drying, toasting, cooking, extraction, autoclaving, fermenting, alkaline treatment and use of enzyme can be used to improve the nutritive value as well as remove or reduce antinutritional factors (Ayanwale, 1999; Ayanwale and Kolo, 2001). Cassava peels contain cyanogenic glycosides and phytate content and as such, should be processed prior to usage in ruminant feeding. Sundrying, ensiling and soaking plus drying of cassava peel will reduce its cyanogenic glycosides and phytate content and further preserve the nutritive quality (Oboh, 2006; Salami and Odunsi, 2003). Cassava peel is rich in metabolizable energy (3.03 Mcal/Kg DM) (Anya and Ozung, 2018), thus serving as a good source of energy in ruminant feeding; either as a basal diet or as a supplement (Anaeto et al., 2013). Cassava peel has been documented as a valuable feed ingredient that significantly increased animal performance when added to ruminant diets; and is highly degradable in the rumen (81 percent dry matter degradability) (Oppong-Apane, 2013). Thus, this study is therefore aimed at evaluating the effect of various processing methods on the performance and cost economies of growing red Sokoto bucks.

## Materials and methods Experimental site

The experiment was conducted at the Livestock Teaching and Research Farm,

Federal University Dutse, Jigawa State. Dutse lies on latitude 11°46'N and longitude 9°20'E (Abubakar et al., 2015) and has an elevation of 435 m above sea level (Ovebanji et al., 2017). The larger percentage of the local people engage mostly in farming and rearing of livestock such as cattle, guinea fowl, sheep, short and long-legged goat. The rainy season lasts from May to September with an average rainfall of between 600 to 1000 mm while high temperatures (mean annual temperature of 26.5°C) are normally recorded between the months of April and September (Oyebanji et al., 2017; Abdurrahman and Kibon, 2017).

# Collection and preparation of experimental materials

Cassava peels were collected from processing point at Kila village in Gwaram Local Government Area of Jigawa state. The cassava peels collected were divided into four portions. The first portion (control) consisted of dried cassava peels, the second portion was soaked for 24 hours prior to drying, the third portion was boiled for 35 minutes prior to drying, and the fourth portion was fermented for 4 days prior to drying. The dried, differently processed cassava peels were milled separately and stored in sacks for use in feed formulation.

## Experimental procedure

Four (4) experimental diets were formulated with 20 kg each of the differently processed cassava peels. The treatments comprised of T<sub>1</sub> (sun-dried cassava peels), T<sub>2</sub> (soaked cassava peels), T<sub>3</sub> (boiled cassava peels) and T<sub>4</sub> (fermented cassava peels). The composition is shown in Table 1. Experimental animals were offered the concentrate diets in the morning at 4 % of their body weights while groundnut haulm was offered in the evening. Experimental animals were provided fresh drinking water *ad libitum*.

Record of daily feed intake was obtained for each animal while leftovers were collected

and weighed every morning to obtain an estimate of intake.

Table 1: Gross composition (%) of experimental diets

	Treatments					
Ingredients	$T_1$	$T_2$	$T_3$	$T_4$		
Processed cassava peel meal	20.00	20.00	20.00	20.00		
Sorghum	56.72	56.72	56.72	56.72		
GNC	19.28	19.28	19.28	19.28		
Bone meal	2.00	2.00	2.00	2.00		
Salt	1.00	1.00	1.00	1.00		
Premix	1.00	1.00	1.00	1.00		
Total (%)	100.00	100.00	100.00	100.00		
Calculated CP (%)	14.00	14.00	14.00	14.00		

 $<sup>\</sup>overline{T}_1$ - Sun-dried cassava peel meal,  $\overline{T}_2$ - Soaked cassava peel meal,  $\overline{T}_3$ - Boiled cassava peel meal,  $\overline{T}_4$ - Fermented cassava peel meal, GNC - Groundnut cake, CP - Crude protein

# Management of experimental animals and experimental design

Twelve (12) growing red sokoto bucks with average body weight of  $13 \pm 1$  kg were randomly divided into four dietary groups of three animals per group in a completely randomized design (CRD). Group 1 (T<sub>1</sub>) was the control group with 20% sundried cassava peel meal in their diet, Group 2 (T<sub>2</sub>) received 20% soaked cassava peel meal, Group 3 (T<sub>3</sub>) had 20% boiled cassava peel meal in their diet and Group 4 (T<sub>4</sub>) received 20% fermented cassava peel meal. The bucks were confined in individual pens and had access to fresh drinking water ad libitum. Experimental animals were treated with antibiotic (oxytetracycline L.A) at 1mL/10kg live weight and ivermectin injection at 1mL/50kg live weight to control against ecto and endo-parasites prior to the commencement of the experiment. Feed intake was measured daily and bucks were weighed weekly with a hanging scale. The experiment lasted 70 davs.

### Proximate analysis

The standard method described by AOAC (2000) was used for the determination of dry matter, crude protein, crude fibre, ether extract and ash.

### Statistical analysis

Data were subjected to analysis of variance (ANOVA) of SAS (2002) Linear Model and significant differences between means were separated using Fishers Least Significant Difference (LSD) at 5 % level of probability.

### Results and discussion

Table 2 shows the chemical composition of diets containing differently processed cassava peel meal and all the parameters observed were significantly (p<0.05) influenced by the processing methods of cassava peels. The observed DM value was significantly (p<0.05) higher in T<sub>3</sub> (92.53 %) having boiled cassava peel meal. The CP and CF had significantly (p<0.05) higher values in T<sub>3</sub> (9.48 % and 13.59 %, respectively) containing boiled cassava peel meal. Values observed for EE were significantly (p<0.05) higher in  $T_4$  (7.43 %) and lower in T<sub>1</sub> (6.03 %) while Ash was higher significantly (p<0.05) in the diet containing boiled cassava peel meal (T<sub>2</sub>; 6.55 %) but lower in the diet containing soaked cassava peel meal (T<sub>2</sub>; 4.81 %). The proximate values obtained for cassava peels were similar to values reported by Kalio et al. (2014) for cassava peels except for ash

content which was slightly lower. The dry matter content of the experimental diets (90.57 - 92.53 %) was higher than the range of 87.52 - 89.64 % reported by Ukanwako and Ibeawuchi (2014). The crude protein contents of the diets containing differently processed cassava peel meal were within the 6–8 % crude protein values recommended by NRC (1985). Diets containing boiled and fermented cassava peel meal ( $T_3$  and  $T_4$ , respectively) had CP values above the critical level of 7 % for ruminants (Lanyasunya et al., 2006). The result of this study suggests that cassava peels, irrespective of the method of processing, will provide adequate nitrogen requirement

for rumen micro-organisms to maximally digest the components of the dietary fiber leading to the production of volatile fatty acids (Okoruwa et al., 2016). Goats require adequate dietary?bre for normal rumen function, as such, dietary?bre contributes signi? cantly to the balancing of nutrient requirements and also plays a pivotal role through its in? uence in and interaction with the intake and digestion of nutrients (Lu et al., 2005). The dietary fibre content reported in the present study for diets containing differently processed cassava peel meal falls within values (7.40 - 12.23)%) reported by Fajemisin et al. (2018) except for diet T<sub>3</sub> which was slightly above the reported value.

Table 2: Proximate Composition (%) of Experimental Diets

		Treatments				
Parameters	$T_1$	$T_2$	$T_3$	$T_4$	LSD	CP
Dry matter	91.65 <sup>b</sup>	90.57°	92.53ª	91.72 <sup>b</sup>	0.45	92.64
Crude Protein	6.92 <sup>b</sup>	$6.74^{b}$	$9.48^{a}$	$8.02^{b}$	1.19	6.45
Crude Fiber	11.63 <sup>b</sup>	10.68°	13.59a	$12.12^{b}$	0.55	14.01
Ether Extract	$6.03^{d}$	$6.60^{c}$	$6.97^{b}$	7.43 <sup>a</sup>	0.34	5.23
Ash	$6.07^{b}$	$4.81^{d}$	$6.55^{a}$	5.60°	0.27	6.47

a, b, c, d, means in the same row differs significantly (p<0.05), T<sub>1</sub>- Sun-dried cassava peel meal,

The performance of growing red Sokoto bucks fed diets containing differently processed cassava peel meal is presented in Table 3. The result showed significant (p<0.05) differences in all the parameters evaluated with the exception of average daily weight gain, average daily feed intake, and feed to gain ratio. Bucks fed fermented cassava peel meal diet (T<sub>4</sub>) had final weight (19.63 kg) greater than bucks fed diet T<sub>3</sub> (18.47 kg), but similar to bucks fed diets  $T_1$  (19.03 kg) and  $T_2$  (18.77 kg). Bucks on diet containing fermented cassava peel meal (T<sub>4</sub>) also had significantly (p<0.05) higher weight gain (6.63 kg) and equally consumed statistically more feed (19.93 kg) than bucks on diets containing soaked (5.76 kg and 19.11 kg, respectively)

and boiled (5.47 kg and 18.14 kg, respectively) cassava peel meals. The average daily weight gain of the bucks showed no significant (p>0.05) difference irrespective of the processing method employed, though bucks on diet T<sub>4</sub> had numerically higher average daily weight gain. The average daily feed intake and feed to gain ratio were similar (p>0.05) across the treatments, although, bucks fed diet T<sub>4</sub> (fermented cassava peel meal) had numerically higher average daily feed intake and the best feed to gain ratio. The significantly higher weight gain observed in bucks fed diet T4 (fermented cassava peel meal) is evident from the fact that bucks on this treatment consumed more feed, probably due to higher reduction of anti-

 $T_2$  - Soaked cassava peel meal,  $T_3$  - Boiled cassava peel meal,  $T_4$  - Fermented cassava peel meal, LSD - Least significant difference, CP - Cassava peel

nutrients as a result of processing (i.e. fermentation) which enhanced better nutrient utilization in the diet (Akintunde et al., 2018). The weight gain and average daily weight gain of bucks fed the experimental diets were in agreement with reported values (2.02 - 6.99 kg and 36.07 -124.82 g/day respectively) by Anya and Ozung (2018) in their study of the performance and carcass characteristics of WAD goats fed cassava peel meal based diets supplemented with African yambean concentrate. Average daily feed intake reported in the present study falls within the range (215.30 - 290.25 g/day) reported by Fasae et al. (2012). The feed to gain ratio

showed that bucks fed diet containing fermented cassava peel meal (T<sub>4</sub>; 3.06) were more efficient in feed utilization over those on diets  $T_3$  (3.36) and  $T_2$  (3.34), although the difference was not significant. Generally, the performance of animals on diet containing fermented cassava peel meal was better in comparison with animals on other diets: which is in line with the report of Ari et al. (2017) who reported fermentation as the best processing method that will guarantee the preservation of essential nutrients. This explains why bucks on fermented cassava peel meal diets had better performance, in addition they were more efficient in the conversion of feed to flesh.

Table 3: Performance of growing red sokoto bucks fed diets containing processed cassava peel meal

	Treatments				
Parameters	$T_1$	$T_2$	$T_3$	$T_4$	LSD
Initial weight (kg)	13.30	13.00	13.00	13.00	1.72
Final weight (kg)	$19.03^{ab}$	$18.77^{ab}$	$18.47^{b}$	19.63a	0.97
Weight gain (kg)	$5.70^{\rm b}$	$5.76^{b}$	$5.47^{b}$	6.63a	1.20
Average daily weight gain (g/day)	81.43	82.38	78.10	94.76	17.12
Total feed intake (kg)	18.37°	19.11 <sup>b</sup>	$18.14^{d}$	19.93 <sup>a</sup>	1.21
Average daily feed intake (g/day)	262.49	273.03	259.13	284.74	74.50
Feed/gain ratio	3.22	3.34	3.36	3.06	1.20

a, b, c, d, means in the same row differs significantly (p<0.05), T<sub>1</sub>- Sun-dried cassava peel meal,

Table 4 shows the economics of feeding bucks with diets containing differently processed cassava peel meal. Cost per 100 kg diet and cost per kilogram of the experimental diets were significantly (p<0.05) higher in T<sub>3</sub> (N7220.40 and N72.20, respectively). Total feed consumed as well as total cost of feed were significantly higher (p<0.05) in  $T_4$  (19.93 kg and N1429.06, respectively); this is evident from the fact that animals in this treatment had higher feed intake. Feed cost per kilogram weight gain was lowest for bucks fed fermented cassava peel meal diet and this differed significantly (p<0.05) from the corresponding costs obtained for bucks fed

sundried, soaked and boiled cassava peel meal diets. The result obtained in this study indicates that there might not be much difference in terms of profitability when differently processed cassava peel meal diets are fed to growing red Sokoto bucks. However, feeding fermented cassava peel meal will nonetheless result in maximum feed utilization through improved feed intake and weight gain. The cost of feed per kilogram of weight gain was lower (N215.55) in diet T<sub>4</sub> with fermented cassava peel meal because animals in the treatment had higher live weight gain which agreed with similar observations made by Maigandi *et al.* (2002).

 $T_2$  - Soaked cassava peel meal,  $T_3$  - Boiled cassava peel meal,  $T_4$  - Fermented cassava peel meal, LSD - Least significant difference

Table 4: Cost economics of diets containing processed cassava peel meal fed to growing red sokoto bucks

		Treatments					
Parameters	$T_1$	$T_2$	$T_3$	$T_4$	LSD		
Cost/100 kg diet (N)	7023.07 <sup>d</sup>	7120.40°	7220.40 <sup>a</sup>	$7170.40^{b}$	7.26		
Cost/kg (N)	70.23 <sup>d</sup>	71.20 °	$72.20^{a}$	$71.70^{b}$	0.07		
Total feed consumed (kg)	18.37°	19.11 <sup>b</sup>	18.14 <sup>d</sup>	19.93 <sup>a</sup>	0.05		
Total cost of feed (N)	1290.14 <sup>d</sup>	1360.71 <sup>b</sup>	1309.78°	1429.06a	4.69		
Initial weight (kg)	13.33	13.00	13.00	13.00	1.72		
Final weight (kg)	19.03 <sup>ab</sup>	$18.77^{ab}$	18.47 <sup>b</sup>	19.63 <sup>a</sup>	0.97		
Weight gain (kg)	$5.70^{b}$	5.76 <sup>b</sup>	$5.47^{\rm b}$	$6.63^{a}$	0.29		
Feed cost/kg weight gain (N)	226.74 <sup>b</sup>	236.25ab	239.45a	215.55°	11.00		

a, b, c, d, means in the same row differs significantly (p<0.05), T<sub>1</sub>- Sun-dried cassava peel meal,

#### Conclusion

This study shows that inclusion of 20 % fermented cassava peel meal in the diet of growing red Sokoto bucks resulted in better performance of the bucks through improved feed intake and weight gain with a subsequent reduction in the cost of feed per kilogram weight gain. It was therefore concluded that out of the three processing methods employed, fermentation was the best method.

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 $T_2$  - Soaked cassava peel meal,  $T_3$  - Boiled cassava peel meal,  $T_4$  - Fermented cassava peel meal, LSD - Least significant difference

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