Nigerian J. Anim. Sci. 2019, 21 (2): 149-154

Effect of replacing brewer's spent grain with cassava peel meal on carcass and economy of West African dwarf bucks fed *Panicum maximum* basal diet

***Eyoh, G. D, Ekpo, J. S , Sam, I. M and Ukpanah U.A.**

Department of Animal Science, Faculty of Agriculture, Akwa Ibom State University, Akwa Ibom State, P.M.B 1167.

****Corresponding Author:*** gloryeyoh5@gmail.com; ***Telephone number:*** +234 7035232506.

Targeted Audience: Animal scientists, ruminant farmers, ruminant nutritionists, Extension agents

Abstract

Cassava peel meal (CPM), Brewer's spent grain, (BSG) and Panicum maximum (basal diet) were fed to West African dwarf bucks to determine the carcass characteristics and economy of production. Diet A, the control was 52% maize-based diet. Diet B was 25% CPM and 75%BSG), Diet C consists of 50% CPM and 50%BSG while Diet D is made up of 75%CPM and 25% BSG. The bucks were fed for 56 days. Diet C produced the highest warm carcass weight which was significantly higher Pp<0.05) from diet B. Dressing percent of bucks on diet C (43.52%) and diet A (40.72%) were similar but significantly higher (P<0.05) than diets B (34.02) and D (35.55). Shoulder weight for control treatment A (1225g) was significantly higher (P<0.05) than other treatment groups. Bone to lean ratio showed no significant difference among the diets. Except for heart and kidney, all other organs did not differ significantly (P>0.05). The cost of production per kilogram weight (kg) showed that bucks placed on diet C had the least cost (₦262.38) with cost reduction of 84.60%, while those on diet A had the highest cost (₦1,637). The outstanding results of bucks on diet C indicated that the inclusion of same quantities of cassava peel and brewer's spent grain in West African Dwarf bucks could be a diet of choice for fattening the bucks for more meat production at a lower economic rate because of the cheaper cost of cassava peel and brewers spent grain.

Keywords: Brewer's spent grain (BSG), Carcass characteristics, Cassava peels, *Panicum maximum*, West African dwarf goat

Description of Problem

Goats are the most important domesticated small ruminants in Nigeria and their production comprises largely of traditional rearing system. This system is characterized by lack of breeding control, proper record keeping, basic housing, irregular and inadequate feeding (1). The increased in the demand for livestock products in the world economy coupled with the high prices of grains has enhanced the use of non-conventional feedstuff which could be sourced locally and are readily available besides being cheap (2) which can be used for goat production in Nigeria Attempts at providing sustainable feed for ruminant production in Nigeria has concentrated on the use of crop residues and some agro-industrial by-products especially during the dry season (3). Cassava peel is a major by-product of cassava tuberous root processing industry which is largely under-utilized (4).

The study is aimed at determining the effect of cassava peel and brewer's spent grain

in a *Panicum maximum* based-diet on the carcass characteristics and economy of production of West African Dwarf (WAD) bucks.

Materials and Methods

Experimental site

The experiment was conducted at the goat unit of the Department of Animal Science, Akwa Ibom State University, Obio Akpa Campus. Obio which is situated between latitudes $4^0$30 and $5^0$30N and longitudes $7^0$30 and $8^0$00E of the Greenwich meridian (5).

Management of experimental animals

Twelve (12) bucks of West African Dwarf goats between the ages of 6-9 months and of average weight range of between 8.05kg and 8.10kg were purchased from smallholder farmers in Obio Akpa and used for the experiment that lasted for 56 days. The goats were given long lasting antibiotics (Oxytetracycline) and treated against ecto and endo parasites using Ivormectin (i.e administered subcutaneously at 0.5kg/animal) before the commencement of the experiment. A week to the arrival of the animals in the farm, the experimental pens were properly washed and fumigated. The cemented floor was covered with wood shavings, which served as litter materials and bedding for the goats. Upon their arrival, initial weights of the animals were taken and they were randomly assigned to four treatments with three goats per treatment in a Completely Randomized Design (CRD). Each goat was housed in separate pen equipped with water and feed troughs. Seven days adjustment period was given to allow the animals acclimatize to the new environment. During this period, the experimental diets were offered to them to clear the digestive tract of old feed residues.

Experimental diets and feeding

Cassava peels were collected from processing units in the rural areas. The peels were sundried for 7 days then coarsely ground. Brewers' spent grains (BSG) were obtained from Champion Brewery Plc, Uyo. The wet grain was pressed using screw press to remove moisture before it was sun dried for five (5) days. Diet A which served as control contain BSG. Diets B, C, and D contained 40% CPM/60% BSG, 50% CPM/50% BSG, and 6/0%CPM/40%BSG, respectively. The goats were weighed and randomly assigned to four dietary treatments. Concentrated ration was given at the rate of 400g-500g based on their body weights and chopped forage was served *ad libitum*. Fresh clean water was served daily. The experimental design was completely randomize design (CRD)

Chemical analysis of experimental diets

Samples of the experimental diets and forage were analyzed for their proximate composition using standard procedure (6).

Carcass evaluation

At the end of the 56 days study, a total of eight goats (i.e 2 animals per treatment) from the four treatments were fasted for 24 hours prior to slaughter. Slaughtering was done by severing the jugular vein of the goats with a sharp knife. Pre-slaughter weights and weights at slaughter were measured. Dressing weight was determined after removal of skins, heads, contents of the thoracic cavity and limbs. The warm carcasses were split into two halves along the vertebrate axis and subsequently separated into the various wholesale cuts using the procedure reported by (9) with the aid of a sharp machete. The weights of full guts, empty guts, internal organs (lungs, liver, spleen, kidney, heart) were measured. The leg and loin cuts were then dissected into muscles and bones with ligaments to obtain meat to bone ratio (10). Calculation of dressing percentage was based on the weight of dressed warm carcass in relation to live weight before slaughter.

Table 1: Composition of the experimental diets

	DIETS			
Ingredients	A	B	C	D
Maize	15.00	15.00	15.00	15.00
Cassava peel	-	14.80	18.50	22.20
BSG	37.00	22.20	18.50	14.80
Soybean meal	3.00	3.00	3.00	3.00
PKC	36.00	36.00	36.00	36.00
Molasses	5.00	5.00	5.00	5.00
Bone meal	3.00	3.00	3.00	3.00
Salt	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00
Calculated Analysis				
CP(%)	15.69	13.76	13.29	12.80
ME(Kcal/kg)	2230.81	2160.00	2142.57	2124.71

Diet A= 37% BSG; Diet B = 40% CPM/60% BSG; Diet C = 50% CPM/50% BSG; Die t D = 60% CPM 40% BSG; CPM = Cassava peel meal; BSG = Brewer's spent grain; PKC=palm kernel cake

Nutrients	A	B	C	D	*Panicum maximum*	BSG	CPM
DM(%)	91.30	92.45	91.88	91.54	35.46	90.49	80.00
CP(%)	13.25	15.82	13.72	11.57	8.89	17.69	4.20
CF(%)	5.51	10.16	12.51	7.81	28.91	5.87	1.40
EE(%)	4.33	4.75	4.14	3.53	2.94	16.29	12.70
Ash	7.05	7.65	9.34	6.34	2.70	5.78	8.70

CPM = Cassava peel meal; BSG = Brewer's spent grain; DM=dry matter; CP=crude protein; CF= crude fibre; EE= ether extract; NFE= nitrogen free extract

Statistical analysis

Data obtained were subjected to a one way analysis of variance (ANOVA) using the method of Steel and Torrie (1980). Mean Separation was carried out using Duncan's Multiple Range Test (8).

Results and Discussion

The proximate composition of the experimental diets is as shown in Table 1.The crude protein content of 11.57% to 15.82% obtained in this study indicate that the use of cassava peel meal in the diet of ruminants will be suitable as a maintenance ration, suggesting its potential as feedstuff for ruminants. Previous reports confirm that ruminant animals require a minimum of 7%CP for proper ammonia production required by the rumen microorganisms to support optimum microbial activity (11,12).The values of crude fibre (5.51 to 12.51%) were lower when compared with the reported values by (13).These values revealed that cassava peel meal can serve as a supplement especially during the dry season. Result of carcass characteristics is presented in Table 2. There were significant differences in dressed weight, dressing, percentage, shoulder thigh, loin, ends, diaphragm, skin heart and bone to lean ratio of diets A, B, C and D, respectively. The dressed weight (5.08kg) of diet C and diet A (4.14 kg) are within the range (3.86 – 4.65 kg) and (3.90 – 4.75 kg) reported by (10) and (11). Dressing percentages in diets C (43.58%) and A (40.72%) were similar but differed ($P > 0.05$) from diets B and D (34.92%) and (35.55%). The values obtained in this study fell within the range of 34 – 40% reported by (13) and 45 – 54% (15). The thigh, loin and ends followed the same trend with diet C recording the highest values. This result indicates that inclusion of equal quantity of cassava peel and brewer's dried grain in the diet of West African dwarf bucks promotes formation of thigh, loin and ends. The

comparatively low bone to lean ratio observed for bucks fed diet C is an indication of the quantity of the diet which was effectively converted into meat. This further confirms the dressing percentage (43.57%) when compared to other treatment groups. The bone to meat ratio recorded in this study is better than the value reported by (15) and in line with 21 – 27% reported by (17). This outstanding performance makes diet C a choice for fattening West African dwarf bucks.

Table 2: Carcass Characteristics of West African Dwarf bucks fed *Panicum maximum* supplemented with diets containing cassava peels and brewers' spent grain

`Parameters	A	B	C	D	SEM
Live weight (kg)	10.13^{b}	8.30^{d}	11.63^{c}	8.38^{c}	0.005
Empty bodyweight (kg)	7.88	7.35	10.25	8.13	1.07
Dressed weight(kg)	4.14^{ab}	2.90^{b}	5.08^{a}	2.99^{b}	0.49
Dressing (%)	40.72^{ab}	34.92^{b}	43.58^{a}	35.55^{b}	0.97
Shoulder (%)	12.25	6.725	9.45	6.75	1.61
Thigh (%)	8.50	5.58	11.35	6.90	0.08
Loin (%)	7.455	5.025	9.65	6.637	2.92
Set (%)	4.075	3.675	6.525	4.875	2.29
Ends (%)	4.22	6.975	9.55	4.30	1.75
Tail (%)	0.254	0.301	0.225	0.325	0.08
Diaphragm (%)	0.495	0.325	0.375	0.375	0.11
Head (%)	6.50	6.925	7.65	6.975	2.71
Skin (%)	7.325	7.425	7.00	5.825	1.05
Feet (%)	2.90	2.375	2.575	2.575	0.46
Eull gut (%)	0.063	0.0243	0.0323	0.0260	0.30
Empty gut (%)	0.0118	0.0101	0.0119	0.0100	0.27
Liver (%)	0.703	1.475	2.20	1.725	0.50
Kidney (%)	0.2375	0.250	0.325	0.325	0.02
Heart (%)	0.060	0.975	0.375	0.550	0.14
Spleen (%)	0.202	0.225	0.275	0.275	0.05
Lungs (%)	1.0523	0.8250	0.9750	1.1050	0.20
Abdominal fat (%)	0.6521	0.3000	1.9025	0.4023	1.75
Bone to lean ratio	0.22^{bc}	0.24^{b}	0.18^{c}	0.29^{a}	0.08

[a, b, c] Means on the same row with different superscripts are significantly different (P>0.05);
SEM = Standard Error of Mean; Diet A = (52% maize-control); Diet B = (25%CPM/75%BSG);
Diet C = (50%CPM/50%BSG); Diet D = (75%CPM/25%BSG)

The economics of feeding WAD goats with diets containing brewers' spent grains and cassava peel are presented in Table 5. The cost of production per kilogram of feed showed that diet B was the cheapest but similar (P >0.05) to diets C and D while Diet A was the most expensive feed. However, the cost of concentrate per kilogram of weight gained revealed that diet C was the cheapest, followed by diets B and D while diet A remained the most expensive. The implication of this result is that feeding (WAD) goats with cassava peel and brewers' spent grains at equal proportion is more economical. This is due to the fact that diet C had the least cost per kg weight gain which makes the feed more superior than others. The cost per kg of CPM and BSG were within the range of ₦15 – ₦20 per kg which is quite low. The cost of CPM and BSG were almost the same based on the prices bought. So when used in the computation of the economics of diet, it was observed that the cost per kg of feed revealed near uniform values.

Table 3: Economics of feeding WAD goats with diets containing cassava peel, brewers' spent grains and *Panicum maximum*

Parameters	A	B	C	D	SEM
Cost/kgdiet (₦)	53.87	54.61	54.80	54.98	0.000
Feed consumed(kg)	8.26^{b}	7.25^{b}	11.03^{a}	7.68^{b}	0.48
Cost of feed consumed (₦)	445.00^{b}	395.90^{d}	604.40^{a}	422.20^{c}	0.003
Weight gain (kg)	1.17^{ab}	1.08^{ab}	2.08^{a}	0.38^{b}	0.29
Cost/kg weight gain (₦)	380.31	366.59	290.60	728.28	0.000

$^{a, b, c}$ Means on the same row with different superscripts are significantly (P<0.05) different
Diet A = (52% maize-control); Diet B = (25%CPM/75%BSG); Diet C = (50%CPM/50%BSG);
Diet D = (75%CPM/25%BSG.

Conclusion and Applications

Based on the results from this study, it is established that:

1. Bucks fed equal proportions of cassava peel meal and brewer's spent grains (diet C) performed better than others in terms of dressed weight, dressing percentage and parts.
2. The research has revealed that replacing brewer's spent grain with cassava peel-meal in ruminant diet is an economically viable alternative which could bring about sustainable and production for developing countries.
3. The performance of the experimental goats showed that ,the same equal proportions of brewer's spent grain and cassava peel meal in a ratio of 50:50 made them to utilize the diet more as compared to other treatments.

References

1. Ahamefule, F. O, Ibeawichi, J. A, Ibe S. N. (2005). Performance of West African dwarf bucks fed pigeon pea-cassava peel based diets. *Journal of Animal and Veterinary Advances* 4 (12): 1010 – 1015.
2. Akinybe, E. G. and Adeleye, I. O. A. (2002). Effect of supplementary poultry droppings meal on the live weight changes of West African dwarf sheep. *Proceedings of 7th Annual Conference of Animal Science Association of Nigeria*, Sept 16 – 19th 2002. FUNAAB Abeokuta, Ogun State. Pg 177 – 179.
3. Agishi, E. C. (1985). Forage resources of Nigerian rangeland. Proceedings of the National Conference of Small Ruminant Production, Oct 6 – 10, Zaria, Nig. pp 115 – 140.
4. FAO (2005). Food and Agricultural Organization Annual report, 2005. http/www.fao/org/ag/AGA/AGAP/FRG/afris/Data/231.htm
5. SLUS-AK (1989). Soils and Land Use Studies. Government Print Office, Uyo, Akwa Ibom State. Soil Survey Staff, 1994.Keys to Soil Taxonomy. Soil Management Service (SMSS). Tech. *Monogr*. No. 19.30-60.
6. AOAC: Association of official Analytical Chemists,(2000).Official method of analysis, Gatherburg, M.D, USA;A.O.A.C. International.
7. SAS, (Statistical Analysis Systems). (2002). Procedures Guide. North Carolina, USA: Statistical Analysis Systems Institute, Gray.
8. Duncan, D.G. (1995). Mutiple range and multiple F-test.biometrics.11:1-2.
9. Omojola, A. B and Attah, S. (2006). Carcass and non-carcass components of the male West African Dwarf goats slaughtered at different weights. *Tropical Journal of Animal Science*, 9 (2): 119 – 126.

10. Odoemelam, V.U. (2012). Evaluation of Bambara nut (*Vigna subterranean*) seed meal-based diets for goat production in South Eastern Nigeria. Ph.D dissertation Michael Opara University of Agriculture Umudike, Nigeria Pp102.
11. Norton, B.W (1998). The nutritive value of tree legumes. In: Gutteridge, R, C, Shelton, HIM (Eds) Forage tree legumes in Tropical Agriculture Tropical Grassland Society of Australia Inc. St Lucia, Queensland.
12. Fasae, O. A, Obasa, O. A and Akinade, O. P (2017). Nutritional potential of post-extraction residue and silage from leaves of five cassava varieties as feed for ruminants. *Nigeria Journal of Animal Science* 19 (1) 108-116.
13 Obe, A. A and Yusuf, K. O (2017). Performance of West African Dwarf goats fed Agro-industrial by-products and Pennisetum purpureum hay as dry season feed. Nigeria *Journal of Animal Production*.44 (2) 152-160.
14 Ifut, O. J., Inyang, U. A., Udosi, I. S., Ekpo, M. I. (2011). Carcass yield of West African Dwarf goats fed mixed forages and brewer's spent grain. *National Journal of Agriculture, Food and Environment.* 7(2):77-83.
15 Kalio, G.A., Ayuk A.A. and Agwunobi, L. N. (2013) Performance and economics of production of West African Dwarf bucks fed crop by-products as sole feed in Cross River State, Nigeria. *World Journal of Agricultural Sciences,* 1(3):081-087.
16 Eyoh, G. D. (2015). The potentials of selected browse plants fed to West African dwarf goats under five housing systems. Ph.D thesis. University of Calabar, Calabar. Pp 136.
17 Udo, M. D. (2009). Performance of West African dwarf goats fed raw and processed pigeon pea (*Cajanus cajan*) seed meal based diets. M.Sc. dissertation MOUA??, Umudike – Abia State. Pp 89.