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ORGAN WEIGHTS AND CARCASS CHARACTERISTICS OF RED SOKOTO GOATS FED DIETS CONTAINING GRADED LEVELS OF CASSAVA PEELS MEAL AS SUPPLEMENT TO NEEM LEAVES

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ABSTRACT

The study evaluated the organ weights and carcass characteristics of red sokoto goats fed diets containing graded level of cassava peel meal as supplement to neem leaves .Sixteen (16) Red Sokoto bucks aged about 8 – 9 months old were allocated into four (4) treatment of four (4) bucks each. The buck were fed neem leaves at 300g/buck/day and a concentrate supplement diet at 250g per buck/day for a duration of fifty (50) days, water was served ad li bitum, feed intake was monitored and recorded. The experimental design was a complete randomized design, data were analyzed using a one-way analysis of variance and least significant difference to separate the significant means using SAS, 9.04 2009 statistical package. Concentrate and neen leaves samples were analyzed for their proximate composition using the method of AOAC(2000). All the performance parameters examined showed significant (P<0.05) differences. The values for daily feed intake, daily weight gain and feed conversion, ranged from 50.83-60.26g, 4.00 -15.00g and 0.005 – 0.25 respectively. All the by-product weight determined was significantly (P<0.05) difference. The weight of the legs, belly fat and empty gut ranged from 350-500g, 0.00-13.75g and 775-1200g respectively. It was concluded that cassava peels meal in concentrate diets for Red Sokoto goats had no adverse effect on the performance of red sokoto goats at 10% level of inclusion. Inclusion of cassava peel meal at graded levels in supplement diets for Red sokoto goats significanttly (P<0.05) lnfluenced the weights of the by-products, whole sale cuts and carcass yield , but the weights of the organs were not influenced It was recommended that cassava peels meal can be used in supplement diets for Red Sokoto goats Further research using other classes and breeds of goat as well as species of ruminants was also recommended.

Keywords: Carcass, Cassava Peels Meal, Feeds, Organs , Neem Leaves , Supplement

1.0 INTRODUCTION

A major challenge to ruminant livestock production in most tropical ecosystem is the seasonal fluctuation in forage availability and quality due to modal rainfall patterns. During the dry season, forage yield and quality declines drastically. For both cultivated pastures (Olanite *et al* 2004) and natural pastures (Adorlolo 2014) forage biomass yields have been shown to decline drastically in the dry season. Other studies have indicated sharp changes in forage quality during the dry season. For instance, for forage legumes, crude protein content as low as 5-7% have been reported during the dry season (Peters *et al* 1997). Similarly Fuihara *et al* (2004) reported decrease in crude protein and increases in neutral detergent fibre of some forage legumes as the season changes from wet to dry. Without appropriate supplementation, ruminants on range tend to lose weight during the dry season and in some cases reproductive wastage occurs.

The nutritional plane of an animal reflects in the meat quality and meat quality depends largely on the nutritive value, proximate and mineral composition of the feeding materials (Oguche *et al.*, 2018). The value of a goat carcass depends on the quality of edible parts available for sale and the nutrition of goats have been reported to reflect in the meat quality (Steele, 1996). The ideal carcass can be described as one that has a minimum quantity of bones, a maximum quantity of muscle and an optimum quantity of fat. Ocheja *et al. (*2020) reported positive influence of concentrate supplementation on the carcass yield and sensory properties of the meat of West African dwarf goats. Oguche *et al.* (2017) also reported favorable influence of goat feeding on the whole sale cuts and sensory characteristics of their meat.

Good nutrition is a prerequisite for good health, good reproduction, high milk yield, fast growth rate and a successful goat production system (Peacock, 1996). The goat is considered superior to other ruminants in its utilization of poor quality and high fiber forage for its body maintenance and production (Howe *et.al*., 1988). An enhancement of this potential through improved utilization of supplements and agricultural wastes could enhance the productivity of these animals. Norton,(1994) reported that the nutritive value of a feed is measured by its ability to deliver nutrients to the animal for maintenance and growth in absence of toxic factors.

Steele (1996) reported the daily dry matter intake of goats in the tropics to be 4 – 5 % of body weight for dairy breeds, 3 % of body weight for meat goats and up to 8 % for dairy goats in the tropics. Adequate feeding of goats in terms of quantity and quality is highly imperative (Ocheja *et al.* (2021).

Cassava peels meal is cheap and readily available by-product of cassava processing and contain 5% crude protein, 5.8% fat, 9.5% crude fibre, 7.2% ash and 2036 kcal Metabolizable energy. Sa'adullah reported that, ruminants responded positively when fed diets based on crop residues. According to Ayoade *et al.* exploitation of cheap feed resources for animal production would lower the market price of animals and their products in Nigeria.

From the forgoing, it is important to strive to feed goats appropriately and asses their organ and carcass characteristics considering the fact that they can be influenced by nutrition.

The aim of this study therefore is to assess the organ weights and carcass characteristics of Red Sokoto goats fed supplement diets containing graded levels of cassava peels meal 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 carcass yield, poor reproductive ability, low 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 and other 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.

2.0 MATERIALS AND METHODS

2.1 Study Area

The study was conducted at Small Ruminant Unit, Department of Animal Science Teaching and Research Farm of federal University of Kashere, Gombe State. Kashere is located at an elevation of 431 metres above the sea level. Its coordinates lies between latitude $9^0$46”0” N and longitude $100^0$57”0” E, Altitude 349m (2006, census).

The annual rainfall of Kashere ranges between 800mm-900mm per annum and it is characterized by distinct dry season (October – May) and rainy season (June - September). The annual temperature ranges from 30-32^0 C, and it experience a relative humidity of 70-90%.

2.2 Experimental Animal and their Management

Sixteen (16) Red Sokoto bucks aged between 8-9 months were sourced from Kashere Market.
they were randomly allocated into four (4) Treatments of four (4) goats each. The Experimental animals were treated with antibiotic (oxytetracycline L.A) at 3mls and ivermectin injection at 1mL/50kg live weight to control ecto and endo-parasites prior to the commencement of the experiment.

2.3 Experimental Diets

The feed ingredients consists of Bambaranut shell meal, Cassava peel meal (CPM), Groundnut cake (GNC) Maize offal (MO), Egg shell meal (ESM), and Table salt (TS). These components were thoroughly mixed together after pounding and grinding as the case may be.

Table 1 Composition of Experimental Diet (%)

Ingredient	% T1	% T2	% T3	% T4
Groundnut Cake	25.00	25.00	25.00	25.00
Bambara nut shell meal	15.00	10.00	5.00	0.00
Cassava peelmeal	0.00	5.00	10.00	15.00
Maize offal	58.00	58.00	58.00	58.00
Egg shell meal	1.00	1.00	1.00	1.00
Table salt	1.00	1.00	1.00	1.00
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated nutrient content				
Crude Protein %	18.54	18.54	18.49	17.63
Crude Fibre %	13.84	13.12	12.92	12.72
MetabolizableEnergy Kcal/kg diet	3182	3145	3150	3122

2.4 Chemical Analysis

Samples of the experimental diets , cassava peels meal and neem leaves were analyzed for their proximate composition using the method outlined by AOAC (2000).

2.5 Experimental Procedure

The Bucks were randomly allocated into four (4) treatments each treatment had four (4) replicates. Treatment one (T_1) contained 0.00% level of cassava peel meals; treatment two (T_2) was 5.00% level of cassava peel meals; treatment three (T_3) was 10.00% level of cassava peel meals and Treatment four (T_4) was 15.00% level of cassava peel meals.

The neem leaves were offered at 300g/buck/.day , followed by the concentrateat 250 g /buck /day 2hours later and the left over were also weighed and subtracted from the quantity of feed that was served to determine the feed intake of the animal. The experiment lasted for fifty (50) days, after an adjustment period of 7 days

At the beginning of the experiment, the goats were weighed and subsequently on a weekly basis. The initial live weights of the Bucks was subtracted from the final live weight to determine the total weight gain

Weighing of the bucks took place in the morning (7.00 - 9.00am) prior to feeding each week. Both values were used to determine Feed Conversion Ratio (FCR).

2.7 Organ Weights and Carcass Evaluation

On the last day of the feeding trial three bucks were randomly selected . fasted for 18hrs with free access to water and slaughtered , bled eviscerated and dressed, . The live weights and slaughter weights were recorded. The organs (lungs , kidney, liver, heart and spleen were removed and weighed, the whole sale cuts (head, neck, thigh, loin, belly , legs , shoulder) were cut off and weighed, and converted to % of slaughter weights, the by-products (horns, hooves , belly fat, full gut, empty gut, gut content, blood) were cut off/collected and weighed and recorded as actual weights by the live weight and dividing by 100. The meat : bone ratio was determined by removing the flesh from the thigh of each goat and weighing and also weighing the bones and dividing the weight of the flesh by that of the bones.

The dressing percentage was calculated by dividing the dressed weight by the live weight and multiplying by 100

2.7 Experimental Design and Statistical Analysis

The experimental design was a complete randomized design (CRD), data obtained were subjected to a one–way analysis of variance (ANOVA) Means with significant differences were separated using Least Significant Differences (LSD) with the aid of Statistical Package identified as Statistical Package for Social Science (SPSS) version 23, 2015 edition.

.3.0 RESULTS AND DISCUSSION

3.1 Proximate Composition of Concentrate diets, Neem Leaves and Cassava Peels Meal

Proximate composition of experimental diets, cassava peel meal (CPM) and neem leaves is presented in Table 2. The crude protein values of about 18% for the experimental diets fell within the values of 12.00-18.00% recommended for growing ruminants in the tropics (NRC, 1996) and also above the critical values of 8% required to provide adequate ammonia for normal rumen functions (Lakpini, 2002.

The crude fibre (CF), and Nitrogen free extract (NFE) were within recommended values (Lakpini *et al*, 2002). The low levels of NFE in the neem leaves will be compensated for by the high value of NFE in the CPM

The ash content of the experimental diets were within the recommended values reported by (Arigbede *et al,* 2012).

Table 2: Proximate Composition of Concentrate diet Neem Leaves and Cassava Peel Meal (%DM)

(%DM Nutrient)	T_1	T_2	T_3	T_4	Neem Leaves	Cassava Peel Meal
Crude Protein	18.3	18.1	18.05	18	9.4	6.5
Crude Fibre	12.8	12.85	12.89	12.9	19.01	10.42
NFE	61.2	60.36	60.96	60.51	59.69	71.98
Ether Extract	3.5	3.1	3	3	2.5	2.8
Ash	4.2	4.95	5.1	5.59	9.4	8.3

3.2 Organs Weights of the Experimental Bucks

Organs weight of Red Sokoto Bucks fed diets containing graded levels of cassava peel meals (CPM) is presented in Table 3 The non-significant of the values ($p>0.05$) for the weight of all the organs shows that graded level of cassava peel meal evaluated did not significantly influence the weights of all the organs considered. Internal organs such as the liver and heart would vary by enlargement if the diet contained poisonous substances. Since there were no significant differences it implies that the cassava peel meal is safe for the Bucks. The kidney on the other hand is an excretory organ.

Similarities or non-significance in the values of the heart indicates that the kidney performed its normal functions, thus the excretory functions of the bucks were not impaired. (Ngi 2012).

This result ranks with the result obtained by Okpanachi *et al* (2016) who recorded no significant differences in yearling west Africa Dwarf Goats fed graded levels of cashew pulp meal based diets. Also frandson, *et al* 2002, stated that variation in the size of heart is a sign of abnormal blood circulation. The non- enlargement of other visceral organs such as lungs, liver heart, kidney, spleen, is an indication that the peel meal does not have any negative effect on the development of the whole cuts and is therefore safe for goats feeding and could be incorporated as feed ingredients for their feeding which can be useful for increasing meat production.

Table 3: Organs Weight of Red Sokoto Bucks Fed Diets Containing Graded Levels of Cassava Peel Meals (CPM) (% of Slaughter Weights)

Parameters (%)	T1	T2	T3	T4	SEM
Heart	0.37	0.37	0.57	0.66	2.011
Lungs	1.43	1.46	1.68	1.70	71.00
Liver	2.04	2.04	2.12	2.15	6.500
Spleen	0.10	0.10	0.15	0.16	0.616
Kidney	0.42	0.45	0.48	0.48	1.247

SEM = Standard error of the mean

3.3 Carcass yield of Red Sokoto Bucks fed diets containing graded level of cassava peels meal

Carcass yield of Red Sokoto Bucks fed diets containing graded level of cassava peels meals (CPM) is presented in Table 4. The values for the dressing percentage were significant ($P<0.05$). This results were generally similar to the values obtained for tropical breeds by several authors (Steel 1996), Devendra and Mc Leroy 1982. These results also agreed with the fact that dressing percentage increases with increasing slaughter age, feed weight, breed and sex. Devendra and Mc Leroy (1982) reported that on balanced diets, most tropical sheep and goats dress out at 40-55%. Since practically, all of the by products are consumed as food with some parts and organs selling at a higher price than carcass meat, dressing percentage are less important in the tropics than in the temperate zone. Similarly meat to bone ratio showed that the relatively high but comparable bone to lean ratio observed for the Bucks in treatment 3 and 4 in this study was a sign of poor feed conversion into meat in the Bucks in these treatments. High feed conversion ratio usually indicate poor ability

of the animal to maximize feed intake by failure to optimally utilize feed (nutrients) for meat production.

Bucks in treatments 1 and 2 had the least bone to lean ratio which is evidence of high feed conversion efficiency in the treatments. The report from this study was not in line with the report of Ari *et al* (2017), and Luet *et al.*, (2005), who reported that cassava meal inclusion in the diets of Red Sokoto Bucks had better performance, in addition, they were more efficient in the conversion of feed to flesh.

Table 4. Carcass Yield of Red Sokoto Bucks fed diets containing graded level of cassava peels meals (CPM).

Parameters %	T1	T2	T3	T4	SEM
Live Weights	9.40	9.10	8.10	8.20	0.25
Slaughter weight (kg)	9.2^{a}	9.1^{a}	7.8^{b}	8.0^{b}	0.21
Dressing %	50.0^{b}	52.4^{a}	47.3^{c}	46.7^{c}	0.09
Bone/meat ratio	1.50^{b}	1.50^{b}	1.89^{ab}	2.30^{a}	0.11

a, b, c = Means on the same row with difference superscripts differ significantly (P<0.05).

SEM = Standard error of the mean.

3.4 Whole Sale Cuts of Experimental Bucks

Whole sale cuts of experimental Bucks is presented in Table 5 .There were significanct (p>0.05) differences for head, neck, flanks, hind tigh, front tigh and loin, . This results was not in line with that reported by Gboshe and Ukorebi (2020) who reported whole sale cuts for West African dwarf goats fed graded level of cassava peel meal (CPM).

Similarly Oguche *et al* (2017) reported significant (p>0.05) differences in the values for head, neck, tighs and back loin which is in line with the results of this study in treatments 1 and 2.

whole sale cut increases with increasing age, feed consumed, weight gained and Sex. Devendra and Mc Leroy (1982) reported that on balance diets most tropical Sheep and Goats dress out at 40-50%.

Low whole sale cuts reported in treatments 3 and 4 in this study showed poor feed consumption, low utilization of nutrients in formulated feed, low feed conversion ratio and poor level of cassava peel meal utilizations in treatments 3 and 4 respectively Steel (1996).

Table 5 Whole sale cuts of experimental Bucks (% of slaughter weights).

Parameters (%)	T1	T2	T3	T4	SEM
Head	7.61^{a}	7.69^{a}	7.14^{c}	6.88^{c}	0.019
Neck	6.30^{a}	5.13^{b}	4.73^{b}	4.13^{c}	0.025
Flanks	8.15^{a}	6.59^{b}	6.15^{c}	5.00^{c}	0.039
Front thigh	9.24^{a}	8.33^{b}	8.24^{c}	7.88^{c}	0.026
Hind thigh	8.79^{a}	8.48^{a}	8.33^{b}	6.25^{c}	0.033
Loin	7.14^{a}	6.52^{a}	5.77^{b}	5.00^{b}	0.03

a, b, c = Means on the same row with difference superscripts differ significantly ($P<0.05$).
SEM = Standard error of the mean.

3.5 By-Product Profile of the Experimental Animals.

The weights of by products of the experimental goats is presented in Table 6

Value for all the by-products evaluated were all significantly ($P >0.05$) different, the abdominal fat values ranged from (0.00-13.75g). The value did not follow any particular trend. The result was a tvariance with that obtained by Abalaka *et al* (2021) who reported non-significance ($p > 0.05$) in the value of all by-producst determined, the result was also different from that of Ocheja, *et al* (2019) who reported non-significance ($P> 0.05$) for all the by-products evaluated except for skin (which however, was not determined in this study), for west African dwarf goat fed diets containing graded levels of cashew nut shell. The full gut weight proportion ranged from 2100 – 2875.00g and volume of blood 493.8 – 1757.mls were higher than those reported by Abalakaa *et al* (2021) for West African dwarf goat fed *Panicum maximum* supplemented with Bambara nut meal based concentrat diest. Similarly, Ozum and Anya, (2018) obtained significannt ($p > 0.05$) differences in the weights of the by-producst of the carcass of West African dwarf goat fed with cassava peels meal and African yam beans based concentrat diet. These discrepancies could be due to difference in concentrate diets and forage fed to goats.

Table 6: Weights of by Products of Red Sokoto Goat fed Diets containing Graded Level of Cassava Peel Meal as Supplement to Neem Leaves.

By Products	T_1	T_2	T_3	T_4	SEM
Full guts (g)	2500.00^b	2875.00^a	2100.00^d	2550.00^c	93.75
Empty guts (g)	1150.00^b	1200.00^a	850.00^c	775.00^d	95.073
Belly fats (g)	13.75a	10.30^b	2.20^c	0.00^d	1.872
Horns (g)	8.20^b	7.83^c	8.38^a	6.50^d	0.325
Hooves (g)	23.23^c	26.00^b	29.08a	6.50^d	2.413
Digits (g)	5.85^b	6.43^a	5.60^b	5.40^b	0.162
Legs (g)	500.00^a	425.00^b	350.00^c	425.00^b	23.273
Volume of Blood (ML)	1754.50^b	1757.80^a	775.00^c	493.80^d	338.58

a,b,c,d: Means within the row with different superscript are significantly difference ($P < 0.05$)
SEM: Standard Error of means

4.0 CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

Cassava peels meal in concentrate diets for Red Sokoto goats had no adverse effect on the performance of red sokoto goats at 10% level of inclusion. Inclusion of cassava peel meal of graded levels of supplement diets for Red sokoto goats significanttly ($P<0.05$) lnfluenced the weight of the by-products, whole sale cuts and carcass yield , but the weights of the organs were not influenced

4.2 Recommendations

Cassava peels meal can be used in supplement diets for Red Sokoto goat at 10% level of inclusion

. Further research using other classes and breeds of goat as well as species of ruminants was also recommended

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