Archivos de Zootecnia
Journal website: https://www.uco.es/ucopress/az/index.php/az/
SHORT NOTE

Effect of cassava leaf meal concentrate diets on the performance, haematology and carcass characteristics of West African Dwarf lambs

Odusanya, L.Q.[1]; Fasae, O.A.[1@]; Adewumi, O.O.[1] and James, I.J.[2]

[1]Department of Animal Production and Health. Federal University of Agriculture. Abeokuta. Nigeria.
[2]Department of Animal Physiology. Federal University of Agriculture. Abeokuta. Nigeria.

Additional keywords

Lambs.
Cassava leaves.
Performance.
Haematology.
Carcass.
Organoleptic evaluation.

SUMMARY

An experiment was carried out to evaluate the response of West African Dwarf (WAD) rams (n= 20) with average live weight of 13.7±1.16 kg to varying levels of 0, 10, 20 and 30% cassava (*Manihot esculenta*) leaf (CL) meal concentrate diet in a completely randomized design for a period of 90 days. Data were collected on performance, haematology, carcass and meat sensory characteristics. Results on the performance indices showed that the inclusion of 20% CL meal in the concentrate diet of rams produced the highest (p<0.05) dry matter intake (471.58 g/day), better nutrient digestibility and best feed conversion (9.75) compare to other treatments. Weight gain differed (p<0.05) from 42.67- 48.33 g/day in rams fed 0% and 20% CL meal concentrate diet, respectively. Nitrogen intake and retention differed (p<0.05) with highest values of 19.52 g/day and 12.79 g/day observed in rams fed 30% CL meal concentrate diet, respectively. Analysis of blood parameters showed significant (p<0.05) differences in values obtained for total protein and white blood cells. The carcass traits indicated significant (p<0.05) effect on dressing percentage; while the distribution of the non- carcass component and retail cuts of the meat were similar (p>0.05) irrespective of the dietary treatments. Meat sensory evaluation showed variation (p<0.05) in texture and flavour across the treatments. It was therefore concluded that feeding 20% CL meal based concentrate best improved the production performance in terms of body weight gain, nutrient digestibility and carcass quality of WAD rams.

Efecto de las dietas de concentrado de harina de hoja de yuca sobre el rendimiento, hematología y características de la canal de corderos Enanos de África Occidental

Palabras clave adicionales

Corderos.
Hojas de yuca.
Rendimiento.
Hematología.
Canal.
Evaluación organoléptica.

RESUMEN

Se realizó un experimento para evaluar la respuesta de corderos Enanos de África Occidental (WAD) (n= 20), con un peso vivo promedio de 13,7±1,16 kg, a la ingestión de una dieta concentrada con 0, 10, 20 y 30% de hoja de mandioca (*Manihot esculenta*) (CL), en un diseño completamente al azar durante 90 días. Se recopilaron datos sobre el rendimiento, hematología, canal y características sensoriales de la carne. Los índices productivos mostraron que la inclusión de 20% de harina CL en la dieta concentrada de corderos determinó mayor consumo de materia seca (p<0,05) (471,58 g/día), mejor digestibilidad de nutrientes y mejor conversión alimenticia (9,75) que los otros tratamientos. El aumento de peso varió (p<0,05) de 42,67 a 48,33 g/día en corderos alimentadas con 0% y 20% de dieta concentrada con harina CL, respectivamente. La ingesta y retención de nitrógeno difieren (p<0,05) con los valores más altos de 19,52 g/día y 12,79 g/día respectivamente observados en corderos alimentados con una dieta concentrada con harina CL al 30%. El análisis de los parámetros sanguíneos mostró diferencias significativas (p<0,05) en los valores obtenidos para la proteína total y los glóbulos blancos. En la canal se apreció un efecto significativo (p<0,05) sobre el rendimiento; mientras que la distribución de las piezas no incluidas en la canal y los cortes minoristas de la carne fueron similares (p>0,05) en todos los tratamientos dietéticos. La evaluación sensorial de la carne mostró variación (p<0,05) en textura y sabor como consecuencia de los tratamientos. Por lo tanto, se llegó a la conclusión de que la alimentación con dieta concentrada con 20% de harina CL fue la que produjo el mejor rendimiento productivo en términos de ganancia de peso corporal, digestibilidad de nutrientes y la calidad de la canal de carneros WAD.

Information

Cronología del artículo.
Recibido/Received: 27.05.2016
Aceptado/Accepted: 11.07.2016
On-line: 15.10.2017
Correspondencia a los autores/Contact e-mail:
animalexp@yahoo.co.uk

INTRODUCTION

In the humid zone of Nigeria, the West African Dwarf sheep are the predominant trypanotolerant breed of sheep playing a major role in the social economical life of rural farmers, as they produce high protein meat sources and serve as insurance against crop failure (Odeyinka *et al*., 2000). Despite the importance of this sheep breed in the attainment of food security, its

production is limited among other factors by inadequacy of all year round feed availability (NdLovu, 1992). The shortage of feed stuff especially during the dry season as well as the use of concentrate rations which have led to direct competition with man and industries for the same resources has been the major limiting factors for increasing their production. A possible and perhaps the most viable proposition could be the inclusion of non-conventional and less expensive feedstuffs in rations as a way of improving the production performance of these animals.

Cassava *(Manihot esculenta)* is a staple preferred food crop in Nigeria, grown year in year out in many parts of the country. The leaves are readily available as an under-utilized by product after the tuber harvest and have also been found to have the potential of being managed as semi-perennial forage that can be harvested at two months interval to serve as source of feed for ruminants (Preston, 2001). Cassava leaf meal is rich in crude protein, which is a major limiting nutrient to ruminants on fibrous crop residues and agro-industrial wastes and have been found to have high nutrient profile which can effectively speed up the growth of small ruminant production thereby assisting farmers to formulate and process a simple adoptable low cost of feed resources for ruminants during off season (Wanapat *et al*., 1997).

This study is therefore aimed at adopting a suitable feeding system that will allow the incorporation of cassava leaves into concentrate feeds in increasing the production performance of sheep.

MATERIALS AND METHODS

Experimental animals and management

The study was conducted at the Small ruminant unit of the Directorate of University Farms of Federal University of Agriculture, Abeokuta, Ogun state, Nigeria. Twenty West African Dwarf rams aged between 12-15 months, purchased from small holder farmers within the study area were used for the experiment that lasted for 90 days. Prior to the experiment, the animals were quarantined for 30 days during which they were given a prophylactic treatment of terramycin L.A (1 mL/10 kg body weight) and dewormed with albendazole tablets (12.5 g/kg body weight). They were also treated against ectoparasites by bathing them with diazintol solution at 3 mL/litre and peste des petits ruminants vaccine was administered.

Animals were randomLy allotted to four dietary treatments of five replicates each balanced for body weights, in an open sided, well ventilated pen with slatted floors. The animals were allowed to adapt to the experimental diets for two weeks prior to data collection.

Experimental diets

Fresh cassava leaves (TMS 30572) variety were obtained after tuber harvest from an established plot of cassava farm within the University campus, sundried and turned regularly for period of 5 days until the leaves were brittle and thoroughly dried. Four experimental concentrate diets were compounded to include dried cassava leaves at 0, 10, 20 and 30% replaced with palm kernel cake with other ingredients namely maize (22.7%), wheat offal (36.0%), groundnut cake (8.0%), bone meal (2.5%), common salt (0.3%) and premix (0.5%). The concentrate supplements were given to the animals at 4% of their body weight, while chopped fresh Panicum maximum were given as a basal diet to the animals in the evening, *ad libitum*. Water and mineral salt licks were made available to each ram *ad libitum*.

Data collection

Data on daily feed and feed refusals were collected, and the difference was calculated to determine the feed intake. The weight of each animal was taken with a spring balance scale at the beginning of the experiment and subsequently on a weekly basis to monitor their weight changes in response to the dietary treatments. Feed conversion ratio was calculated by dividing the weight gain with the total feed consumed by the animals.

After the growth trails, the rams were transferred into individual metabolic crates for the digestibility and nitrogen balance trials which allowed separate collection of total faecal and urine output. The quantity of feed offered, feed refusal, faeces and urine were determined for each sheep in the last 7-days of the trial, after 14-days of dietary adjustment period to the cages. Ten percent of the faeces and urine from each ram was collected on daily basis pooled over a 7-day period, faeces were oven dried at 60^{o}C to a constant weight and subjected to chemical analysis (AOAC, 1995). Nitrogen loss from urine were prevented by introducing 1mLof sulphuric acid (H_2SO_4) into a well-labeled urine collection bottle and stored in a refrigerator prior to analysis.

At the termination of the digestibility experiment, blood was obtained from the jugular vein of the animals into sample bottles containing ethylene diamine tetra-acetic acid. Red blood cell and white blood cell counts were determined using a haemocytometer. The packed cell volume was estimated by the microhaematocrit method and the haemoglobin concentration by the cyanmethaemoglobin method (Jain, 1986). Sodium and potassium concentrations were measured using the flame photometer; calcium and phosphorus were determined using atomic absorption spectrophotometer. Total protein was estimated by the biuret reaction while urea concentrations were determined according to Harrison (1977).

Carcass characteristics and meat sensory evaluation

At the end of digestibility trial, the animals were starved for 24 hours weighed and slaughtered as described by Adu and Brinkman (1981). The carcass was eviscerated and the gastro intestinal tract with organs were carefully excised and weighed. The empty body weight (EBW) was determined by subtracting the gut fill from the slaughter weight, hot carcass weight was determined by subtracting the gastro intestinal tract content from the empty body weight and the dressing percentage was calculated by dividing the live weight

Table I. Chemical composition (%) of the experimental diets (Composición química (%) de las dietas experimentales).

Parameters	0 % CL	10 % CL	20 % CL	30 % CL	CL
Dry matter	85.66	85.42	84.59	83.78	89.94
Crude protein	18.31	19.63	20.74	20.96	21.15
Ether extract	7.53	7.34	6.45	6.21	6.10
Ash	6.36	6.75	6.89	7.13	7.45
Neutral detergent fibre	45.92	50.21	53.48	55.67	60.20
Acid detergent fibre	26.74	30.12	30.48	32.45	45.20
Acid detergent lignin	11.67	14.16	14.37	15.09	15.78
Tannin	0.02	1.75	2.00	2.50	2.96
Hydrocyanic acid	-	5.25	7.95	10.71	14.53

CL: Cassava leaf.

by the carcass weight multiply by 100. The carcasses were cut into retail parts (shoulder, rack, loin and legs) and each part was weighed. Meat and bone were also separated by weight.

For the sensory evaluation, about 100g of samples of meat from the loin of each ram in each treatment was collected after de-boning, cut into chops of equal sizes and packed in a transparent double layered polythene bags and tagged for identification. They were cooked in water bath for 30 minutes, and allowed to cool under room temperature before serving to ten trained panelists to score each sample for flavour, tenderness, juiciness and overall degree of acceptability. The evaluators scored each sample on a nine-point hedonic scale (AMSA, 1978) for colour, juiciness, flavour, texture and tenderness. Overall acceptability was scored on a three-point scale (1= least acceptable, 2= more acceptable and 3= most acceptable) (Iwe, 2002). Cooking loss was determined by subtracting post cook weight from precook weight divided by precook weight multiply by 100. Meat pH was determined using digital pH meter.

Table II. Performance indices of West African Dwarf sheep fed on varying levels of cassava leaf meal concentrate diet (Índices productivos de corderos Enanos de África Occidental alimentados con dieta concentrada incluyendo diferentes niveles de harina de hoja de yuca).

Parameters	0 % CL	10 % CL	20 % CL	30 % CL	SEM±
Dry matter intake (g/day)					
Concentrate intake	263.99^{c}	279.22^{c}	354.37^{a}	310.41^{b}	19.11
Grass intake	170.59^{a}	166.78^{a}	117.21^{c}	149.26^{b}	8.22
Total DM intake	434.58^{c}	446.00^{bc}	471.58^{a}	459.67^{b}	24.02
Initial body weight (kg)	13.70	14.08	14.00	13.92	0.96
Final body weight (kg)	17.54^{b}	17.64^{b}	18.35^{a}	17.94^{ab}	1.05
Total weight gain (kg)	3.84^{b}	3.56^{b}	4.35^{a}	4.02^{ab}	0.39
Weight gain (g/day)	42.67^{b}	39.56^{b}	48.33^{a}	44.67^{ab}	4.85
Weight gain ($W^{0.75kg}$)	16.70^{b}	15.77^{b}	18.33^{a}	17.28^{ab}	1.02
Feed conversion ratio	10.18^{b}	11.27^{a}	9.75^{b}	10.29^{b}	0.81

^{abc}Means with different superscripts along the same row are significantly different ($p<0.05$).
CL: Cassava leaf.

Statistical analysis

Data collected were based on completely randomized design and subjected to analysis of variance using statistical package (SAS, 2010). Where treatment effects were significant ($p<0.05$), means for the trial were separated using Duncan Multiple Range Test within the same package (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical composition of the diets fed to the experimental rams is shown in **table I**. The composition of cassava leaf (CL) meal varied slightly from values earlier reports (Alli-Ballogun *et al*., 2003; Fasuyi, 2005) which may be related to differences in cultivars, stage of maturity, sampling procedures as well as time of harvesting. The dry matter content of CL concentrate diet ranged from 83.78 - 85.66% which was lower than values reported by Oni *et al*. (2012) and Adenkola *et al*. (2007) in diets containing dried CL fed to West African Dwarf (WAD) goats and sheep, respectively. The crude protein content varied as it increased from 18.31 - 20.96 % with an increasing level of CL meal in the diets, with values consistent with that observed by Oluremi and Ngi (2006) in cassava leaf diets fed to goats. The ether extract was similar to the range of 4.0 -15.2 reported by Anaeto *et al*. (2013) in cassava leaf and peels fed to WAD sheep. The values for dietary neutral detergent fibre were lower than 60% guaranteed for safe forage intake by sheep (Meissner *et al*., 1991), suggesting the potential of the diets in enhancing rumination in the fore-stomach of the animals.

The results of the performance characteristics of WAD sheep fed CL meal based concentrate is presented in **table II**. DM intake was improved with the inclusion of 20 and 30% CL in the concentrate diet with values ranging from 434.58 - 471.58 g/day observed in rams fed 0 and 20% CL meal concentrate, respectively. Weight gain values ranged from 39.56 to 48.33 g/day across treatments. The variation could therefore be attributed to the chemical constituents and nutrient in

Table III. Apparent nutrient digestibility (%) of cassava leaf meal concentrate diet supplied to West African Dwarf sheep (Digestibilidad aparente de nutrientes (%) de una dieta concentrada incluyendo diferentes niveles de harina de hoja de yuca, en corderos Enanos de África Occidental).

Parameters	0 % CL	10 % CL	20 % CL	30 % CL	SEM±
Dry matter	67.88	72.91	67.65	68.05	2.38
Crude protein	61.41^{b}	67.51^{ab}	69.60^{a}	69.90^{a}	1.58
Ether extract	54.11^{b}	60.45^{ab}	62.24^{ab}	65.71^{a}	2.86
Ash	60.68	61.91	60.94	60.41	3.54
Neutral detergent fibre	59.72	59.58	61.07	61.47	2.54
Acid detergent fibre	58.88^{b}	58.96^{b}	62.21^{a}	62.93^{a}	3.50
Acid detergent lignin	51.28	52.53	53.52	51.82	2.51

^{ab}Means with different superscripts along the same row are significantly different ($p<0.05$).
CL: Cassava leaf.

the diet. The higher weight gain observed in 20 %CL treatment suggests that higher levels of CL in the diet had positive effect on the animals which in turn improved their weight gain. The weight gain (g/day) observed in this study were similar to 39.70 -55.2 g/day earlier reported by Alli-Balogun *et al*. (2003) for sheep fed cassava concentrate diet but higher than 21.43 - 43.86 g/day reported by Sowande *et al*. (2007) for WAD sheep fed concentrate graded levels of wheat offal and maize. The reduction in total weight gain of sheep fed diet containing 30 % CL as compared with sheep fed 20% CL meal which may be attributed to the lower feed intake suggests that inclusion of CL up to 30% in the concentrate diet may contain higher residual level of anti-nutritional factors that can negatively influence the nutritional permeability in the gut walls of the sheep (Oddy and Sainz, 2002). Feed conversion ratio as observed in the results of this study showed significant differences across dietary treatments with diets containing 20% CL meal having the best which ranked the same with rams fed 0 and 30% CL meal diets. Higher FCR values of 12 -13 were reported by Fasae *et al*. (2011) in WAD sheep fed maize and cassava hay.

The results of the apparent nutrient digestibility of CL meal concentrate in WAD sheep is presented in **table III**. The digestibility of nutrient was relatively high across the treatments which could occur as a result of the available nitrogen present in the diets that enhance the activities of microorganisms in the rumen of the sheep. Digestion in the rumen is dependent on the activities of microorganisms that require energy, nitrogen, minerals and a suitable medium to enable the microbes perform well (Ranjhan, 2001). The crude protein digestibility increased ($p<0.05$) with increasing supplementation of CL. Improved digestibility coefficient in the present study may be attributed to inclusion level of CL in the concentrate diets which might have increased more protein availability to rumen microorganism to catalyze the digestion process, thereby improving the overall performance of the sheep (Klopffenstein, 2001).

The results of nitrogen balance by WAD sheep fed cassava leaf meal based concentrate are presented in **table IV**. Sheep fed 30% CL meal concentrate had the highest ($p<0.05$) value for nitrogen intake (19.52 g), which were similar to values reported by Adegun (2014) for West African Dwarf sheep fed Moringaoleifera and Gliricidiasepium fodder as supplement to basal diets of cassava peels and Panicum maximum. The lower nitrogen intake observed in sheep fed control diet could be due to low level of crude protein. However, nitrogen retention increased ($p<0.05$) for sheep fed varying levels of CL meal based concentrate diet, supporting the notion that nitrogen retention increased with protein supplementation (Mupanywa *et al*., 2000).

Table IV. Nitrogen balance by West African Dwarf sheep fed on cassava leaf meal concentrate diet (Balance de nitrógeno en corderos Enanos de África Occidental alimentados con dieta concentrada incluyendo diferentes niveles de harina de hoja de yuca).

Parameters	0 % CL	10 % CL	20 % CL	30 % CL	SEM±
Nitrogen intake (g/day)	14.08^{c}	16.76^{bc}	17.90^{ab}	19.52^{a}	1.05
Nitrogen excretion (g/day)					
Faeces	6.57^{a}	5.67^{b}	5.25^{b}	6.44^{a}	0.36
Urine	0.28^{a}	0.20^{a}	0.18^{b}	0.29^{a}	0.01
Total nitrogen output (g/day)	6.85^{a}	5.87^{b}	5.43^{b}	6.73^{a}	0.43
Nitrogen retention (g/day)	7.23^{b}	11.89^{ab}	12.47^{a}	12.79^{a}	0.91
Nitrogen utilization (%)	51.35^{b}	64.94^{ab}	69.66^{a}	65.52^{ab}	3.28

^{abc}Means with different superscripts along the same row are significantly different ($p<0.05$).
CL: Cassava leaf.

Table V. Haematological and serum biochemistry parameters of West African Dwarf sheep fed on cassava leaf meal concentrate diet (Parámetros hematológicos y bioquímica sérica de corderos Enanos de África Occidental alimentados con dieta concentrada incluyendo diferentes niveles de harina de hoja de yuca).

Parameters	0% CL	10% CL	20% CL	30% CL	SEM±
Packed cell volume (%)	33.05	34.33	34.00	31.34	1.62
Haemoglobin (g/dL)	12.00	11.90	11.53	10.77	0.70
Red blood cell (10^{12}/L)	12.00	13.30	13.40	11.00	0.89
White blood cell (10^{9}/L)	11.93[a]	7.55[b]	12.63[a]	10.33[b]	1.02
Total protein (g/dL)	8.45[b]	8.37[b]	10.59[a]	10.90[a]	0.14
Urea (gm/dL)	20.00	18.50	18.88	19.22	0.72
Phosphorus (mol/L)	8.47	7.10	8.50	7.80	0.81
Calcium (mol/L)	10.99	11.20	10.63	11.43	0.84
Potassium (mol/L)	6.47	6.17	6.50	5.43	1.28
Sodium (mol/L)	150.33	149.33	151.00	149.67	2.11

[ab]Means with different superscripts along the same row are significantly different ($p<0.05$).
CL: Cassava leaf.

This implies that, the diets had higher potentials in contributing nitrogen to the animals. The increased and positive nitrogen retention percentage observed across CL meal diets might be ascribed to higher protein digestibility which led to higher utilization of nitrogen from microbial protein, suggesting that the nitrogen was well tolerated and utilized by the rams.

The results of haematological and serum biochemical parameters of West African Dwarf sheep fed cassava leaf meal based concentrate is presented in **table V**. All parameters observed were within the normal range for clinically healthy WAD rams (Taiwo and Ogunsami, 2003; Daramola *et al*., 2005; Opara *et al*., 2010). The normal PCV values indicate that the experimental diets were good enough to maintain good health of the animals. The haemoglobin values show the potential of the dietary treatments of being capable of supporting high oxygen carrying capacity blood in the sheep. The white blood cells count, though influenced ($p<0.05$) across treatments was within the normal range for sheep (Etim *et al*., 2014). The serum biochemical parameters differed ($p<0.05$) across dietary treatments. The serum protein compare favourably with values reported for WAD sheep by Fasae *et al*. (2011). The values of serum electrolytes of sodium, potassium, phosphorus and chlorine fell within the normal range (Borjesson *et al*., 2000) for healthy sheep. Haematological and biochemical profiles have been reported as the basis of investigating the production efficiency and monitoring of animal health status against incidence of diseases (Campbell *et al*., 2003). The results obtained in this present study suggest that supplementation of CL in the diet of sheep do not pose any health implications.

The carcass characteristics and retail cuts of WAD sheep fed CL meal concentrate is presented in **table VI**. There were variations ($p<0.05$) in the dressing percentage with values similar to those reported by Fasae *et al*. (2014) in traditionally managed WAD sheep but higher than 42.61 - 44.93 % reported by Yousefi *et al*.

Table VI. Carcass characteristics and retail cuts of meat from West African Dwarf sheep fed on cassava leaf meal concentrate diet (Características de la canal y cortes minoristas de carne de corderos Enanos de África Occidental alimentados con dieta concentrada incluyendo diferentes niveles de harina de hoja de yuca).

Carcass components	0 % CL	10 % CL	20 % CL	30 % CL	SEM±
Slaughtered weight (kg)	16.94	17.04	17.85	17.44	1.38
Empty body weight (kg)	13.54	13.84	14.70	14.95	1.06
Hot carcass weight (kg)	10.04	9.95	10.24	10.51	0.30
Dressing percentage (%)	45.20[b]	45.70[b]	47.30[a]	47.10[a]	2.89
Retail cuts (kg)					
Leg and loin	12.88	12.15	12.87	11.94	0.62
Shoulder	10.46	10.00	10.00	9.99	0.25
Rack	11.14	11.79	12.00	10.96	1.11
Neck	5.34	4.08	4.81	4.81	1.35
Meat to bone ratio	6.24	6.47	6.55	6.81	1.30

[ab]Means with different superscripts along the same row are significantly different ($p<0.05$).
CL: Cassava leaf.

Table VII. Sensory characteristics of meat from loin of West African Dwarf sheep fed on cassava leaf meal concentrate diet (Características sensoriales de la carne de lomo de corderos Enanos de África Occidental alimentados con dieta concentrada incluyendo diferentes niveles de harina de hoja de yuca).

Parameters	0 % CL	10 % CL	20 % CL	30 % CL	SEM±
Texture	6.25[b]	6.45[b]	6.75[ab]	7.55[a]	0.05
Colour	6.55	6.70	6.70	7.05	0.38
Juiciness	6.50	6.65	7.00	7.10	0.51
Flavour	6.00[b]	6.30[ab]	6.35[ab]	6.60[a]	0.14
Tenderness	5.85	6.25	6.55	6.60	0.36
Overall acceptability	6.95	7.00	7.05	7.25	0.65
Cooking loss (%)	14.15	13.20	13.35	14.00	0.08
pH	6.10	6.00	5.90	6.00	0.22

[ab]Means with different superscripts along the same row are significantly different ($p<0.05$).
CL: Cassava leaf.

(2012) in traditional Fat-Tailed Iranian sheep. However, higher dressing percentage values compared to the results of this study were observed by Sen *et al*. (2001) and Alkoriet *et al*. (2007) for sheep managed under zero grazing which could be attributed to management system, nutrition, slaughter weight and breed of the sheep.

The proportion of different cuts reflects the different rate of development among animals. The leg and loin cuts of the total weight across the treatments is closely similar to the range observed by Madhavi *et al*. (2006) for Nellore sheep and Fasae *et al*. (2014) for WAD sheep. Based on proportions, there were no differences ($p>0.05$) observed in the retail cuts of the experimental animals, showing that the diet had no effect on the meat component among the dietary treatments. The non-significant difference in meat-to-bone ratio of the rams in the present study might be an indication of uniform rate of meat and bone deposition in the experimental rams.

The mean scores for the sensory characteristics of mutton from WAD sheep fed CL meal concentrate diets are presented in **table VII**. Panelists rated colour, juiciness, tenderness and overall acceptability of the meat the same ($p>0.05$) across the treatments. This might be related to the similarity in the age and slaughter weights of the experimental rams.

Similarity in the pH values observed in this present studies corroborate the report of Archimede *et al*. (2008) for Ovine Martinik lambs fed various of tropical forage to concentrate under intensive conditions. The non-significant difference observed in the overall acceptability of the meat clearly shows that they were all rated high by the panelists. The significant difference observed in flavour and texture of meat across the dietary treatments may be attributed to the impacts of different varying levels of CL in the diets on sheep meat. Watkins *et al*. (2013) noted that diet fed to sheep affects the amount of intramuscular fat and its fatty acid composition in the meat, which has a direct effect on meat texture as well as flavour, and its release during eating.

CONCLUSION

Based on the results of this study, the inclusion of 20% cassava leaf meal in concentrate diet is recommended for better output in terms of weight gain, feed conversion ratio, nutrient digestibility and improved dressing percentage as well as sensory quality of meat from West African Dwarf sheep. Cassava leaf meal can therefore be adopted as a potential source of feed stuff for feeding of sheep especially in the smallholder production system.

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