© 2017 IJSRST | Volume 3 | Issue 4 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Scienceand Technology

Carcass Yield and Organ Characteristics of West African Centre Dwarf Rams Fed Ensiled Guinea Grass and Cassava Tops with Different Additives

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ABSTRACT

Twenty five individually housed West African Dwarf (WAD) rams were used to study the effect of ensiled guinea grass and cassava tops mixture with different additives on the performance and carcass characteristics of WAD rams. The guinea grass and cassava tops mixture with different additives were ensiled in ratio 6:3:1 in five treatments designated Treatment 1: 60% Guinea grass +30% cassava tops + 10% cassava chips; Treatment 2: 60% Guinea grass +30% cassava tops + 10% sorghum grain; Treatment 3: 60% Guinea grass +30% cassava tops + 10% millet grain; Treatment 4: 60% Guinea grass +30% cassava tops + 10% sugar and Treatment 5: 60% Guinea grass + 40% cassava tops + 0% additives. The 25 WAD rams were divided into five groups of five animals each. Each group was assigned to the treatments in a completely randomized design (CRD). Each animal in a group represented a replicate. The experiment lasted for 135 days. Data on Weight gain, dressing percentage and carcass quality was collected.Results revealed that the different silages fed to the rams significantly influenced dressing percentage ($P<0.05$), with values ranging between 50.89% and 53.77 %. Meat cut values showed that leg and shoulder were not significantly different ($P<0.05$) but the Rack, Neck, Brest and Flank were significantly ($P<0.05$) affected the legs gave the highest percentage (34.32 – 36.82%). This was followed by shoulder (23.05 – 24.44%), rack (18.58 – 22.54%) and loin (12.00 – 14.85%) in that order. There were no significant differences ($P<0.05$) among treatment means for all the non-meat parts (head,, feet, full gut) except for the skin. It can be concluded that ram fed treatment 3 performed better in terms of dressing percentage and carcass characteristics.

Keywords : Carcass Quality, Guinea Grass, Cassava Tops, Organ Characteristics, WAD Rams

I. INTRODUCTION

Nutrition is the most important factor limiting livestock production in Nigeria while seasonal variation has an important influence on feed production. Inadequate nutrition occurs during dry season which forms impediment to the development of ruminant production in the tropics (Proverbs, 1990). This is due to long period of drought with attendant prevalence of inadequate or poor roughages for animal consumption (Bawala*et al.*, 2006). It further lessens the animal's ability to withstand exposure to pathogenic organisms (Youseff, 1990) with concomitant reduction in performance which result into low dressing percentage. Also, it was reported that many animals died of starvation during dry season due to limited availability of all year round feed resource and high cost of conventional feeds. Grassland foliage forms a greater proportion of ruminant feed resources (Bamikole*et al.*, 2003), its use is unlimited due to the seasonal availability and content of ant nutritional factors (Bawala*et al.*, 2006). Feed scarcity therefore, has made it necessary to conserve the available grass when it is in excess During wet season for use during dry season.

Cassava is primarily used in the ruminant diets as an energy source. Leaves are nutritious to ruminants when fed either fresh, dried or made into silage (Abate and Abate , 1994). The adaptability of cassava to the widely varying agro-ecological zones in Nigeria together with its high yield has made it an attractive livestock feed (Eruvbetine and Oguntona, 1998). The young shoots (stem, leaves and petioles) are good supplementary source of protein vitamins and minerals which have been found edible and are widely used as food and feed (Adegbola and Okonkwo, 2002). The high crude protein content of cassava leaf or foliage (leaves and stem) makes it a particularly useful source of roughage for ruminants (Smith, 1992). Cassava leaves have been reported to have high crude protein content varying from 16.7% to 39.9% (Allen, 1984, Yousuf *et al.,* 2007), with almost 85% of the crude protein as true protein (Ravindran, 1993). They are rich in ascorbic acid and vitamin containing significant amount of riboflavin. Cassava leaves have been commonly used as feed for ruminant animal by small holder famers only during cassava crop harvesting season when the leaves are abundantly available. Cassava leaves have when reported to be abundant and left unutilized. The excess leaf available can be stored for a long period of time as a protein feed supplement (Hang, 1998), the leaves could be preserved in form of hay or silage. However, in the rainy season when cassava leaves are in excess, it is difficult to sundry and extending the drying period diminishes the nutritional quality of the product Oduguwa*et al., 2007).* Ensiling would be sustainable alternative way of preserving the leaves.

Guinea grass (*Panicum maximum)* is one of the grasses that are abundant and available almost in all parts of the tropics and in almost all ecological zones in Nigeria but scarce in the dry season, suggesting the need for conservation. It is native to tropical Africa and it is now widely naturalized in the tropics. It is naturally found in grassland, woodland, and shady places. Guinea grass can be grazed consistently, but it should not be grazed under 35 cm height or under wet condition (FAO, 2003). Under good conditions, its nutritional value is high, having up to 12.5 % crude protein, total digestible nutrients (TDN) of 10.2 % and calcium, phosphorus and magnesium (Agishi 1985; McDonald *et al*., 2002). Grass can be processed into silage for feeding during the dry season when grasses are scarce and low in nutrient.

This experiment was designed to determine the effect of ensiled cassava tops and Guinea grass mixture on the carcass quality of West African dwarf sheep.

II. MATERIALS AND METHODS

Location of the Experiment

The study was conducted at the Teaching and Research farm of Ladoke Akintola University of Technology, Ogbomoso located in the derived savannah zone of Nigeria.

Experimental animals and management

Twenty five West African Dwarf ram between10-12 months old were used. The animals were purchased from local market around the university farm. The animals were confirmed for one-month adaptation period before the commencement of the experiment. The animals were quarantined and placed under prophylatics treatments. Animals were dipped against ectoparasites using amitrax. Feed, water and salt lick were provided *ad-libitum*. After adaptation, the animals were randomly grouped into five treatments in a completely randomized design. Feeders and drinking troughs were placed in the pens of the animals for free access to feed and fresh water daily.

Experimental diets (silage prepared from mixture of cassava foliage, guinea grass and additives) offered approximately 4% of the body weight. Voluntary feed intake was estimated as the different feed offered and feed refused. Animals were fed at 8.00a.m in the morning and also 3.00 p.m in the evening. Silage was fed after 42 days of ensiling.

Experimental diet

The diet comprised of ensiled guinea grass and cassava tops mixture with different additives combined as follows.

T1: 60% Guinea grass +30% cassava tops + 10% cassava chips.

T 2: 60% Guinea grass +30% cassava tops + 10% sorghum grain.

T3: 60% Guinea grass +30% cassava tops + 10% millet grain.

T 4: 60% Guinea grass +30% cassava tops + 10% sugar

T 5: 60% Guinea grass + 40% cassava tops + 0% additives

Carcass evaluation

At the end of the 135day study, the rams were starved 24 hours prior to slaughter and they were weighed after 24hours after the fasting period (slaughter weight, SW). Slaughtering was done by severing the jugular vein of the rams with a sharp knife. Warm dressed carcass was made up of what remained of the carcass after the removal of the head, skin, contents of the thoracic and pelvic cavities (including the diaphragm and kidney) and the limbs distal, carpal and tarsal joints. The full digestive tract was removed, weighed then emptied and re weighed. The peritoneal and mesenteric fats were removed and weighed. Weight of head, feet, skin, liver, heart/trachea/lungs/ and rest (spleen, bladder, testes) were recorded. Dressed carcass was weighed (carcass weight CW) and then chilled for 24hours at 40°C. The day after slaughtering, the cold carcass was split longitudinally. The shoulder and leg were dissected the left side was cut into five standardized commercial joints (shoulder, neck, breast, leg, and ribs plus loin) according to Colomer-Rocher *etal.,*1987. Each joints were weighed. The length of back and buttock width: and on the left side: carcass length, leg length and thoracic depth were measured with measuring tape. Pre-slaughter weight, weight at slaughter and dressing weight was determined. Calculation of dressing percentage was based on the weight of dressed warm carcass in relation to live weight before slaughter.

Chemical analysis

Dried samples of the experimental diets were analyzed for Crude protein, Dry matter, Ether extract, Ash, calcium and phosphorus contents as described (AOAC, 2005)

Statistical analysis

The data obtained were subjected to analysis of variance (ANOVA) technique of statistical analysis system (SAS) and Duncan multiple range tests were employed for mean separation.

III. RESULTS AND DISCUSSION

Results

Table 1 shows the chemical composition of ensiled cassava tops and guinea grass mixture with different additives and there were significant ($p > 0.05$) differences among the different silages. DM content ranged between 27.12 % in silage with sorghum additive to 28.80 % in silage with millet additive. CP varied from 21.88 % in silage with sugar additive to 25.60 % in millet additive. The Crude fibre content of the silage was highest in silage with sorghum additive (32.49 %) but similar to the values obtained in silage with sugar additive (31.95 %), millet grain (31.91 %) and cassava chips (31.89 %) and differed significantly ($P<0.05$) from silage with no additive (31.12 %). Ash was highest in silage with no additive (9.62 %) and lowest in silage with sugar additive (7.56 %).

Table 1 : Chemical composition (%) of ensiled cassava tops and Guinea grass mixture

Treatment	Dry matter	Crude protein	Crude fiber	Ash	Organic matter	Ether extract
T 1	28.80^{a}	23.74^{ab}	31.89^{a}	8.41^{b}	91.59^{a}	8.41^{b}
T 2	27.12^{c}	23.85^{ab}	32.49^{a}	8.32^{b}	91.68^{a}	8.32^{b}
T 3	28.80^{a}	25.60^{a}	31.91^{a}	10.13^{a}	89.87^{b}	10.13^{a}
T 4	27.52^{bc}	21.88^{b}	31.95^{a}	8.83^{b}	91.17^{a}	8.83^{b}
T 5	28.06^{b}	24.94^{a}	31.12^{b}	8.39^{b}	91.61^{a}	8.39^{b}
SEM	0.18	0.75	0.20	0.16	0.35	0.16

^{ab} means on the same row with different superscripts are significantly different (P<0.05)

T1: 60% Guinea grass +30% cassava tops + 10% cassava chips.

T 2: 60% Guinea grass +30% cassava tops + 10% sorghum grain.

T3: 60% Guinea grass +30% cassava tops + 10% millet grain.

T 4: 60% Guinea grass +30% cassava tops + 10% sugar

T 5: 60% Guinea grass + 40% cassava tops + 0% additives

Table 2 shows the carcass measurement in WAD sheep fed ensiled cassava tops and guinea grass mixture with different additives. Carcass length and hot carcass weight were not significantly (p>0.05) affected by the different silages fed. Carcass length from rams on treatment 5 had the highest value (28cm) and the lowest is from those fed treatment 1and 3 (25.5 cm). Hot carcass weight ranged between 15.08 - 17.08 cm, Empty body weight, Depth of chest and Dressing percentage were significantly affected by the silages fed. Empty body weight ranged between 8.75 and 9.88 Kg. Depth of chest was highest (11.5cm) in carcass from treatment 1 and lowest in those from treatment 2 (10.50 cm). The dressing percentage also differed significantly (p<0.05) among the different silages. Rams from treatment 1 had the highest percentage (53.77 %) which was similar to those from treatment 3 (51.99%) and treatment 5 (52.03%). Rams from treatment 2 had the lowest dressing percentage (50.89%).

Table 3 shows the body weight, carcass and wholesale cut of WAD sheep fed ensiled cassava tops and guinea grass mixture with different additives. Live body weight ranged between 17.25 and 19.00 Kg. Values of the warm carcass ranged between 8.75 and 9.88 Kg. Carcass from treatment 1 (9.88 Kg), treatment 3 (9.88 Kg) and treatment 5 (9.75 Kg) were similar but significantly different from those on treatment 2 (9.25 Kg) and treatment 4 (8.75Kg). The legs had higher percentages ranging from (34.32 – 36.82%). This was followed by shoulder (23.05 – 24.44%), rack (18.58 – 22.54%) and loin (12.00 – 14.85%) respectively. The leg and the shoulder were however not significantly affected (P>0.05) by the different silages fed but the Rack, Neck, Brest and Flank were significantly (P<0.05) affected. The percent weight of leg neck, shoulder and breast were higher in rams from treatment 4 while that of rack was highest (P>0.05) in Rams from treatment 1 while that of the loin was highest (P>0.05) in rams from treatment 3.

Table 4 shows the percentage of external offal, internal offal and blood as influenced by ensiled cassava tops and Guinea grass mixture with different additives. The percentage of the head and the feet were not significantly affected but the skin was significantly affected by the different silages. The percent weight of skin relative to slaughter weight was highest in rams from treatment 5 and treatment 3 though similar to those treatment 2 and treatment 4. The proportion of feet relative to Slaughter weight followed the same pattern in skin. It ranges from 3.27 to 3.59 in the same animal with the same treatment.

The heart, kidney, spleen and pancreases were not significantly (P<0.05) affected by the different silages. The liver and the testis were however significantly affected (P>0.05). The values obtained for the liver weight indicated that there was a significant similar weights of those rams from treatment 1,2,3 and 5 but significantly differed from those from treatment 4.

Table 2: Carcass measurement in WAD sheep fed ensiled cassava tops and guinea grass mixture with different additives

Parameter	T1	T2	T3	T4	T5	SEM
Carcass length (cm)	25.5	26.5	25.5	26	28	0.85
Hot carcass weight (kg)	16.76	16.68	17.08	15.08	17.05	0.71
Empty body weight (kg)	9.88^{a}	9.25^{b}	9.88^{a}	8.75^{c}	9.75^{a}	0.15
Depth of chest (carcass) (Cm)	11.50^{a}	10.50^{c}	11.25^{ab}	11.00^{abc}	10.75^{bc}	0.2
Dressing %	53.77^{a}	50.83^{b}	51.99^{ab}	50.89^{b}	52.03^{ab}	0.81

^{ab} means on the same row with different superscripts are significantly different (P<0.05)

T1: 60% Guinea grass +30% cassava tops + 10% cassava chips.

T 2: 60% Guinea grass +30% cassava tops + 10% sorghum grain.

T3: 60% Guinea grass +30% cassava tops + 10% millet grain.

T 4: 60% Guinea grass +30% cassava tops + 10% sugar

T 5: 60% Guinea grass + 40% cassava tops + 0% additives

Table 3 : Body weight, carcass, and some wholesale cuts proportion as influenced by ensiled cassava tops and guinea grass mixture with different additives

Parameter	T1	T2	T3	T4	T5	**SEM**
Live (body) wt. (kg)	18.38	18.25	19	17.25	18.75	0.56
Warm carcass (kg)	9.88^{a}	9.25^{b}	9.88^{a}	8.75^{c}	9.75^{a}	0.15
Leg (% carcass)	36.82	36.75	36.34	38.05	34.32	1.55
Loin (% carcass)	12.23^{bc}	12.00^{c}	14.85^{a}	14.06^{abc}	14.23^{ab}	0.65
Rack (% carcass)	18.90^{a}	18.17^{ab}	17.88^{ab}	16.53^{ab}	15.60^{b}	0.78
Neck (% carcass)	10.71^{bc}	11.72^{ab}	10.39^{c}	12.15^{a}	11.89^{ab}	0.37
Shoulder (% carcass)	23.66	23.05	23.64	24.44	23.52	1.03
Breast (% carcass)	10.11^{a}	12.47^{a}	12.01^{ab}	12.63^{a}	12.24^{a}	0.62
Flank (% carcass)	4.05^{a}	3.26^{b}	3.68^{ab}	3.43^{ab}	4.06^{a}	0.2

^{ab} means on the same row with different superscripts are significantly different (P<0.05)

T1: 60% Guinea grass +30% cassava tops + 10% cassava chips.

T 2: 60% Guinea grass +30% cassava tops + 10% sorghum grain.

T3: 60% Guinea grass +30% cassava tops + 10% millet grain.

T 4: 60% Guinea grass +30% cassava tops + 10% sugar

T 5: 60% Guinea grass + 40% cassava tops + 0% additives

Table 4: Percentage of external offal, internal offal and blood as influenced by ensiled cassava tops and guinea grass mixture with different additives

Parameter	T1	T2	T3	T4	T5	**SEM**
Head (% live wt)	8.38	8.17	7.85	7.98	8.24	0.19
Skin (% live wt)	7.42^{b}	7.55^{ab}	8.07^{a}	7.80^{ab}	8.09^{a}	0.18
Feet (% live wt)	3.33	3.46	3.47	3.59	3.27	0.13
Testes (% live wt)	1.49^{b}	1.82^{ab}	1.43^{b}	1.53^{b}	2.00^{a}	0.12
Blood (% live wt)	4.70^{a}	5.40^{a}	4.67^{b}	5.10^{ab}	4.90^{ab}	0.17
Heart wt(% live wt)	0.53	0.52	0.52	0.52	0.52	0.04
Lungs (% live wt)	1.33	1.44	1.69	1.36	1.45	0.14
Liver (% live wt)	1.72^{a}	1.75^{a}	1.70^{a}	1.52^{b}	1.69^{a}	0.03
Kidneys (% live wt)	0.28	0.32	0.32	0.32	0.28	0.01
Spleen (% live wt)	0.23	0.18	0.21	0.21	0.22	0.02
Pancrease (% live wt)	0.52	0.31	0.57	0.25	0.43	0.11

^{ab} means on the same row with different superscripts are significantly different ($P<0.05$)

T1: 60% Guinea grass +30% cassava tops + 10% cassava chips

T 2: 60% Guinea grass +30% cassava tops + 10% sorghum grain

T3: 60% Guinea grass +30% cassava tops + 10% millet grain

T 4: 60% Guinea grass +30% cassava tops + 10% sugar

T 5: 60% Guinea grass + 40% cassava tops + 0% additives

DISCUSSION

The crude protein value (21.88 to 24.94) is higher than the minimum protein requirement of 10-12% recommended by ARC, 1985 for ruminants. The increase may be due to the cassava/guinea grass mixtures which give both energy and protein. This is however lower than report of Oluwadamilare (1997) who reported 31.9% CP for cassava/guinea grass mixtures. The CP content of all the treatments was above the minimum level of 7% required for optimum rumen function (Van Soest, 1994) could also satisfy the minimum CP requirement of 15% for lactation and growth (Norton 1982; McDonald *et al* 2002).

Dressing percentage is the proportion of the live weight of the animal which is sold as meat. It is a trait of economic importance. Dressing percentage gives the best practical expression of the slaughter value of livestock making it possible, at the same time to carry out various comparisms. The knowledge of dressing percentage is important to farmers as it enables them to accurately estimate carcass weight from on-farm live weight and target the carcass weight ranges which will maximize returns. (Muir and Thomas .2008) The dressing percentage of sheep in this study is higher than values (between 40 and 50%) given by Gatenby (2002) but within the range (between 45 and 65%) given by Aduku and Olukosi (2000) and 50% dressing percentage reported as standard for lamb carcass (Ashbrook, 1995). Kayouli*et al.* (1993) investigated the feed intake and performance of growing lambs, Carcass yield was 47.5% for lambs on silage while those on concentrate was 45.1%. Increasing dressing percentage may be due to sex, breed, degree of fatness, age, pre slaughter weight, gut fill/content, slaughter by product and nutrition and pregnancy. Nutrition is the most important factors because animals on good plane of nutrition dress better (Warriss, 2000).). Animals on high plane of nutrition have higher dressing percent than poorly fed animals which was manifested in this study. Heavily muscled and blocky animals dress higher while pregnant ones particularly those in advance stage of pregnancy dress lower (Alaku,1997) . Male animals usually dress higher than female animals. The variations in dressing percentage and other carcass traits observed in this study could be attributed to sex difference as only male animals (Rams) were used. Also animals in this experiment were skinned hence dressed higher.

The leg gave the highest percentage(34.32-38.05) followed by shoulder(23.05-24.44), rack (18.58-22.54), loin (11.20-14.85), neck (10.39-12.15), breast (10.11-12.63) and flank (3.26-4.06). The percentage weight of leg and shoulder were higher in Treatment 4 while that of rack was highest in rams from T1. The relative weight of neck has highest value in rams fed T4. The various wholesale cuts were significantly influenced by the different silages. This indicates proper tissue development as a result of good nutrient intake and utilization.

The percentage weight of the skin relative to slaughter weight was highest in rams fed silage with millet additives with a value of 8.09%. The skin by inference contributed between 7.42 and 8.09 to the amount of meat consumed when such ram is singed and a similar proportion is reduced when skinned.

It is a common practice in feeding trials to use weight of some internal organs like kidney and liver as indicators of anti nutritional factors in the test ingredient (Akinmutimi, 2004; Ahamefule, 2005). Bone (1979) reported that if there is any toxic element in feed samples used in feeding trial, abnormalities will arise because of increased metabolic activities of the organ in an attempt to reduce these toxic elements or anti-nutritional factors to non-toxic forms. The relative values for internal organs were not significantly different except for the liver. The values obtained for the liver indicated that there was a significant difference in the liver weight of the ram fed silage with sugar additive. This result is in agreement with result of Ani and Okeke (2003) and Abeke*et. al.* (2009) who reported increase in weights of liver and few organs like pancrease having fed diets containing unconventional feedstuffs processed by cooking roasting and fermentation. An increase in the size of the liver is usually associated with an increase in metabolic activities related to detoxification (Akinmutimi, 2004). The results revealed that the liver of the rams fed the silages were not challenged adversely and suggests the silage posed no toxic challenge to the ram

IV. CONCLUSION

Feeding ensiled guinea grass and cassava top with different additive significantly influence dressing percentage in WAD ram. Results from organ characteristics showed that the WAD rams were not challenged adversely in terms of increased metabolic activities associated with fermentation, suggesting that the silage posed no anti-nutritional challenge to the rams. Since guinea grass (*Panicum maximum*) and cassava tops is available all year round in Nigeria, it can be preserved as silage (for ready use) and it will go a long way in sustaining the animals during off-seasons. Year round provision of feed is possible and practicable through effective conservation of forages during the rains and early dry season as silage.

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Cite this Article

Binuomote R. T., O. J. Babayemi, "Carcass Yield and Organ Characteristics of West African Centre Dwarf Rams Fed Ensiled Guinea Grass and Cassava Tops with Different Additives ", International Journal of Scientific Research in Science and Technology (IJSRST), Online ISSN : 2395-602X, Print ISSN : 2395-6011, Volume 3 Issue 4, pp. 566-574, May-June 2017.
Journal URL : http://ijsrst.com/IJSRST1734199