

## INFLUENCE OF GMELINA LEAF MEAL ON CARCASS CHARACTERISTICS OF WEST AFRICAN DWARF GOAT DIETS AND ITS INFLUENCE

Onwujiariri, E.B., Jiwuba P.C., and Kadurumba, O.E.

Department of Animal Production Technology, Federal College of Agriculture, P.M.B.7008, Ishiagu, Ebonyi State, Nigeria.

Corresponding author: [eberechukwu557@yahoo.com](mailto:eberechukwu557@yahoo.com)

### ABSTRACT

The effect of 82 days of feeding *Gmelina* leaf meal (GLM) diets on carcass indices of WAD goats were investigated. Thirty-six, 10 to 12 months old WAD goats were divided into four groups of nine and each group was replicated thrice. Four diets  $T_1$ ,  $T_2$ ,  $T_3$ , and  $T_4$ , were formulated to contain GLM at 0%, 12%, 24% and 36% GLM respectively, in a completely randomized design. Each animal received a designated treatment diet in the morning. Feed offered was based on 3.5% body weight per day; the animals in addition were fed a kg wilted chopped *Pennisetum purperum* later in the day as basal diet to enhance rumination and chyme chewing. The GLM result showed high dry matter and energy values. Data on carcass indices indicated that dressing percentage, slaughter, warm carcass, loin and set weights showed better ( $p < 0.05$ ) results for goats on GLM diets compared with the control. However,  $T_1$  produced better ( $p < 0.05$ ) empty gut and feet weights in comparison with the treatment ( $T_2$ ,  $T_3$  and  $T_4$ ) groups. It was therefore concluded that replacement of 36% palm kernel meal with GLM resulted in superior carcass characteristics of WAD goat over the control diet.

**Keywords:** Leaf meal, goats, dressing percentage, cut parts and basal diet.

### INTRODUCTION

The West African dwarf (WAD) goat is the most dominant meat breed in the rainforest and derived savanna zones. This breed is trypano-tolerant with reported high reproductive performance, which has ensured its survivability and multiplication in these zones. The meat from this animal is highly cherished and often commands higher market price than beef, mutton and pork in towns and villages (Jiwuba *et al.*, 2018a). Nutrition have been identified as one major factor affecting the general performance of this breed. Jiwuba *et al.* (2017) attributed inadequate nutrient intake to undermine this goat breed in expressing their full potential; thus the need for a dry season supplementation.

However, Jiwuba *et al.* (2016) have reported the use of leaf meal from tropical plants such as *Gmelina arborea*, to improve animal performance. *Gmelina arborea* is a multi-purpose tree that has considerable fodder yield during the wet and dry seasons; thus suggesting its possible alternative as a dry season feed resource for ruminants. The leaves are highly palatable with tolerable levels of anti-nutrients. It is a well-known tree due to its sapling and medicinal values. The *Gmelina* leaf is rich in protein, energy and mineral content with high

bioactive compounds. The leaves have been reported (Kumaresan *et al.*, 2014) to have high ethno veterinary properties. This experiment was therefore carried out to determine the carcass indices of WAD goats fed *Gmelina arborea* leaf meal containing diets.

### MATERIALS AND METHODS

This research was carried out at Sheep and Goat unit of Federal College of Agriculture Ishiagu, Ivo Local Government Area of Ebonyi State, Nigeria. The College is located at about three Kilometer (3km) away from Ishiagu main town. The *Gmelina* (*Gmelina arborea*) leaves were sourced within the College environs. Fresh, succulent, greenish non-over matured leaves were harvested to ensure lower value of lignin and higher nutrient availability. The leaves were air dried in batches to about 10% moisture before passing through a 10 mm hammer mill and further used in the formulation of the experimental diets. Four diets  $T_1$ ,  $T_2$ ,  $T_3$ , and  $T_4$ , were formulated. The *Gmelina* leaf meal (GLM) was included at the levels of 0%, 12%, 24% and 36% for  $T_1$ ,  $T_2$ ,  $T_3$ , and  $T_4$ , respectively as presented in Table 1.

**Table 1: Composition of the experimental diets for West African Dwarf Goats**

Ingredient	Dietary levels			
	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>	T <sub>4</sub>
Gmelina leaf meal	0.00	12.00	24.00	36.00
Cassava peel meal	45.00	45.00	45.00	45.00
Palm kernel meal	45.00	33.00	21.00	9.00
Ground nut meal	5.00	5.00	5.00	5.00
Molasses	2.00	2.00	2.00	2.00
Bone meal	2.00	2.00	2.00	2.00
Common salt	1.00	1.00	1.00	1.00
<b>Total</b>	<b>100</b>	<b>100</b>	<b>100</b>	<b>100</b>

Thirty six (36) WAD goats of about 10 – 12 months of age were selected from the College herd for this experiment. The goats were randomly divided into four groups of nine animals each with three goats constituting a replicate. The groups were randomly assigned the four experimental diets (T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, and T<sub>4</sub>) in a completely randomized design (CRD). The animals were housed individually in a well-ventilated cement floored pens equipped with feeders and drinkers. Each animal received a designated treatment diet in the morning (8am) for 82 days. Feed offered was based on 3.5% body weight per day; the animals in addition were fed 1kg wilted chopped *Pennisetum purpureum* later in the day (5pm). Regular access to fresh drinking water was made available. After the 82 days feeding trial, one goat from each replicate was starved of feed for 24 hours and weighed prior to slaughter. The goats were cut at the throat, and then slaughtered by severing the heads at its articulation with the atlas bone. After dressing, the carcasses were weighed to determine the warm carcass weight. This represented the weight of the goats after removal of head, skin, thoracic, abdominal and pelvic contents and the limb distal to the joints. The dressing out percentages were calculated by dividing the warm carcass weight by the live weight prior to slaughter and multiplied by 100%. Other carcass components, organ, guts and muscles were weighed as well. The warm carcasses were divided into two with a saw through the spinal column. The left halves were cut into various parts. The leg/thigh was severed from the attachment of the femur to the acetabulum. The loin consisted of the lumber region plus a pair of ribs and the ends (9 spare ribs and the belly) of six abdominal ribs. The shoulder consisted of the scapula, humerus, radius, ulna, carpals while the sets are made up of the breast and the neck. Each of the cut parts were weighed and doubled in each case before being expressed as a percentage of warm carcass weight. All the sample of feed and test ingredients were analyzed for their proximate composition using the method of AOAC (2000). Gross energy was calculated using accordingly. The results were analyzed using the Statistical Package for Social Sciences Window 17.0. One -way analysis of variance (ANOVA) was

employed to determine the means and standard error. Treatment means were separated using Duncan's new multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

The proximate composition of the test diets and Gmelinal leaf meal are presented in Table 2. The dry matter (DM) of the experimental diets failed to follow a particular trend. The DM ranged between 91.26 and 91.36% with T<sub>1</sub> having the highest value (91.36%) and T<sub>3</sub> the lowest (91.26%). The crude protein (CP) increased progressively with incremental levels of GLM with the highest value of 14.88% recorded for T<sub>4</sub> with a corresponding lowest value of 12.92% recorded for T<sub>1</sub>. The crude fibre (CF) and ash maintained a particular trend like the CP increasing with an increasing level of GLM. The ether extract (EE) and nitrogen free extract (NFE) and gross energy (GE) values failed to follow a specific trend, increasing or decreasing with increasing levels of GLM. The DM range of 91.26–91.36% recorded in this study compared well with the range of 91.32-91.74% and 89.95-91.44% reported by Jiwuba et al. (2018a) for WAD goats fed yellow root cassava peel-centrosema leaf meal and Jiwuba et al. (2018b) for WAD goats fed cassava root sieviate - cassava leaf meal based diets respectively. The CP and GE values in this study falls within the requirement for goats as recommended by NRC (1981). The CF range of 16.18-18% obtained in this study followed a particular trend, increasing with increasing levels of GLM in the diets. The values however, compared with 16.83-18.63% for WAD goats fed *Moringa oleifera* leaf meal in their diets as reported by Jiwuba et al. (2017). Adequate supply of dietary fibre tends to increase chyme chewing, salivation, reduces digestive problems, and promotes intestinal motility (Jiwuba, 2018) in ruminants. The ash values of 4.22-4.98% followed a particular pattern increasing with increasing levels of GLM; hence indicating that high mineral profile of GLM. The results of the proximate analysis of the GLM favourably compared with the reports of Abdu et al. (2012) and Jiwuba et al. (2016) for the same leaf meal.

**Table 2: Proximate composition Test diets and Gmelina leaf meal (on percentage DM)**

Nutrients (%)	Treatments				GLM
	T <sub>1</sub> (0)	T <sub>2</sub> (12)	T <sub>3</sub> (24)	T <sub>4</sub> (36)	
Dry matter	91.36	91.32	91.26	91.34	93.9
Crude protein	12.93	13.66	13.88	14.88	18.32
Crude fibre	16.18	16.94	17.16	18.12	15.18
Ash	4.22	4.78	4.92	4.98	3.96
Ether Extract	3.88	3.10	3.96	4.22	1.16
Nitrogen free extract	54.15	51.84	51.34	49.14	55.28
Gross energy (MJ/kg)	4.07	4.08	4.07	4.11	4.12

GLM- Gmelina leaf meal

Diets had significant ( $p < 0.05$ ) effects on slaughter weight, warm carcass weight, dressing percentage, set, loin, empty gut and feet (Table 3). T<sub>4</sub> had the highest slaughter weight which significantly ( $p < 0.05$ ) differed from other treatments. The high slaughter weight ( $p < 0.05$ ) may be attributed to high energy and protein value of T<sub>4</sub> which may have triggered better utilization of the diet thus resulted to higher slaughter weight of the animals fed the diet. T<sub>1</sub> showed significantly ( $p < 0.05$ ) lower warm weight in comparison to other treatments. This may be attributed to lower slaughter weight reported for T<sub>1</sub> in this study. The warm carcass weights are nevertheless in agreement with the findings of Odoemelam *et al.* (2014) and Jiwuba *et al.* (2018a, b) who reported significant values for warm carcass weights in WAD goats. The values obtained in this study is higher than 3.73 to 6.34 kg and 4.43-7.17 kg Jiwuba *et al.* (2018a, b) respectively, but fell within the range of 2.9-9.81 kg reported by Marichal *et al.* (2003). The dressing percentage obtained in this study, fell within 32.94 to 55.35% (Odoemelam *et al.*, 2014; Ifut *et al.*, 2015; Ukanwoko and Okpechi, 2015; Jiwuba *et al.*, 2018a, b) baseline reported for WAD goats. This is an indication that the diets were

nourishing and supported lean meat deposition across the treatment groups. The effect of nutrition on dressing percentage cannot be over emphasis since changes in goat diets may improve both the quantity and quality of the chevon as a final product. The influence of nutrition, have been reported (Odoemelam *et al.*, 2014; Ukanwoko and Okpechi, 2015; Jiwuba *et al.*, 2018a, b) to positively influence dressing percentages in WAD goats. The meat cut is an important factor in evaluation of meat yield of goat (Jiwuba *et al.*, 2018b). T<sub>4</sub> showed a superior set and loin weights, which may suggests that T<sub>4</sub> diet influenced the development of these cut parts better than other treatment groups. The improved meat cut parts at T<sub>4</sub> may be attributed to higher available energy of the diet. T<sub>1</sub> showed significantly ( $p < 0.05$ ) superior empty gut value in comparison to T<sub>3</sub> and T<sub>4</sub> goats. The result is however in disagreement with the findings of Odoemelam *et al.* (2014) and (Jiwuba *et al.*, 2018a, b) who reported no diet effect on empty gut of WAD goats. Similarly, T<sub>1</sub> showed ( $p < 0.05$ ) improved feet weight when compared with T<sub>2</sub> and T<sub>4</sub>. This may indicated that T<sub>1</sub> might have supported the development of feet among the experimental animals fed the respective diet.

**Table 3: Carcass and Organ Evaluation of West African Dwarf Goat Fed Gmelina Leaf Meal**

Parameters	T1 (0%)	T2 (12%)	T3 (24%)	T4 (36%)	SEM
Live weight at slaughter (kg)	13.70 <sup>c</sup>	15.80 <sup>b</sup>	15.65 <sup>b</sup>	17.85 <sup>a</sup>	4.44
Warm carcass weight (kg)	6.03 <sup>c</sup>	7.29 <sup>b</sup>	7.72 <sup>ab</sup>	8.65 <sup>a</sup>	3.46
Dressing percentage %	44.01 <sup>c</sup>	46.65 <sup>b</sup>	49.33 <sup>a</sup>	48.46 <sup>a</sup>	7.06
<b>Meat cuts (%)</b>					
Set	16.36 <sup>ab</sup>	16.07 <sup>b</sup>	17.72 <sup>ab</sup>	18.65 <sup>a</sup>	3.42
Shoulder	7.44	7.84	7.30	8.35	0.23
Loin	23.66 <sup>b</sup>	24.31 <sup>b</sup>	24.51 <sup>b</sup>	27.14 <sup>a</sup>	3.44
End	4.01	4.07	4.11	4.03	0.23
Leg	18.44	18.84	18.30	19.35	4.23
<b>Offal weights (%)</b>					
Head	10.70	10.91	11.20	10.95	0.74
Empty gut	8.07 <sup>a</sup>	6.85 <sup>ab</sup>	6.23 <sup>b</sup>	6.83 <sup>b</sup>	0.27
Feet	2.60 <sup>a</sup>	2.38 <sup>b</sup>	2.44 <sup>ab</sup>	2.15 <sup>c</sup>	0.19
<b>Organ weights (%)</b>					
Liver	1.84	1.39	1.50	2.27	0.18
Kidney	0.41	0.40	0.37	0.63	0.05
Lungs	0.75	0.87	0.86	0.78	0.10
Heart	0.47	0.58	0.64	0.56	0.04
Spleen	0.20	0.17	0.16	0.25	0.04

Testicles	1.13	1.10	1.14	1.09	0.14
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<sup>a-c</sup> Means with similar superscripts along the same row are not significantly ( $P > 0.05$ ) different

## CONCLUSION

Conclusively, the incorporation of *Gmelina* leaf meal warm dressing percentage, carcass, loin and set weights and therefore recommended for enhanced goat meat production.

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