



Effect of Concentrate Supplementation on Whole Sale Cuts and Sensory Properties of Meat from West African Dwarf Goats

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Abstract

Sixteen (16) male West African dwarf goats were allotted into four (4) dietary treatments with four goats per treatment. They were fed a concentrate diet at 0, 100, 200 and 300g/goat/day and Panicum maximum (Guinea grass) at 300, 200, 100 and 0 g for treatments T1, T2, T3 and T4 respectively. Water was served ad-libitum. At the end of the feeding period, 3 goats from each treatment were slaughtered, bled and dressed and thereafter the meat used for the evaluation of whole sale cuts and sensory properties. The feeding duration was 90 days and samples of the concentrate diets and Panicum maximum were analyzed for their proximate composition using standard methods. The experimental design was a completely randomized design and data obtained were subjected to Analysis of Variance using SPSS version 20. All the values for wholesale cuts showed significant ($P < 0.05$) differences across the treatments. Values for neck ranged from 3.80 – 4.5 %. Similarly all the sensory values were significantly ($P > 0.05$) different and values for overall meat quality ranged from 17.45 – 20.57. It was concluded that Panicum maximum supplemented with a concentrate diet significantly ($P < 0.05$) improved whole sale cuts and sensory properties of meat from West African dwarf goats. Panicum maximum supplemented with concentrate diets were therefore recommended for goat feeding for improved weights of wholesale cuts and sensory properties.

Keywords: Whole Sale Cuts, Sensory, Concentrate, Nutrition, Panicum maximum, West African Dwarf Goats

Introduction

Meat plays a major role in human diets as it supplies required nutrients for growth and maintenance of health (Anjaneyelu *et al.*, 2007). Goat meat (Chevon) serves as a major source of meat in developing countries, even though it is less popular in the Western world. However the perception about goat meat is changing due to the health benefits of the consumption of lean meat with reduced fat and low cholesterol content (Webb, 2014). Carcass fat content is generally low in goat meat; fat accretion is less in the growth process of goats than other ruminants. Goat meat protein also has a high biological value of almost 64% and digestibility coefficient of 97% based on trial

with rats fed 10% protein from goat meat (Casey *et al.* 2003).

The nutrition 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.

Meat is usually first divided into large whole sale cuts (prime cuts) which retailers divide into retail cuts, which are smaller cuts available for sale to consumers. Whole sale cut is the original cuts resulting from the first division of the fore and hind saddle of a goat (De Boer *et al.*, 1974). Examples of primal cuts include shoulder, loin, rib, head, neck, etc. The production of meat from goats is suitable because their feeding do not compete for feed ingredients with humans (Ocheja *et al.*, 2016; 2020; Gboshe and Ukorebi, 2020). Data on effects of forage supplementation with concentrate diets on goat performance abound, but, data on effects of supplementation on carcass characteristics and meat quality are quite scanty, thus making this study expedient.

The study was therefore designed to evaluate the effect of forage supplementation with concentrate feeds on whole sale cuts and sensory properties of meat from West African dwarf goats.

Materials and Methods

Study Area

The feeding trial was carried out at the small ruminants unit of the Teaching and Research

Farm of the Department of Animal Production, Kogi State University, Anyigba. Anyigba lies between Latitude 7^o15'N and 7^o29'N and Longitude 7^o11'E and 7^o32'E with average altitude of 420 metres above sea level. The area lies in the derived guinea savannah zone, with average annual rainfall of 1600 mm and daily temperature ranged from 25 to 35^oC (Ifatimehin *et al.*, 2009).

Experimental Animals Management, Feed Preparation and Experimental Procedure

A total of 16 male West African Dwarf (WAD) goats were sourced from Anyigba and its environs. The goats were weighed and allotted in a Completely Randomized Design (CRD) into four (4) dietary treatments with each treatment having four (4) goats. The concentrate diet (Table 1) was fed at 0 g, 100 g, 200 g and 300 g /goat/day and *Panicum maximum* (Guinea grass) at 300 g, 200 g, 100 g and 0 g/goat/day for T1, T2, T3 and T4, respectively. The grass was wilted for 24 hours to reduce the moisture content. Water was given to the goats *ad libitum*. The experiment lasted for 90 days after an adjustment period of seven (7) days.

Table 1: Composition of Concentrate Diet (Dry matter %)

Nutrients	Composition
Bambara nut offal	48.00
Cereal Spent Grains	48.00
Bone Meal	3.00
Table Salt	1.00
Total	100

At the end of the experiment, three (3) goats each were slaughtered from each treatment, eviscerated and dressed. The head, neck, belly, shoulder, thigh, rib and back were cut off, weighed and thereafter used to determine the whole sale cuts after conversion to percentage of slaughter weight. Four (4) pieces of meat each weighing 20 g were cut from the same

thigh of three (3) goats slaughtered from each treatments (i.e Twelve (12) pieces of meat for each treatment [twelve replicates]. The pieces of meat were cut in different shapes to facilitate identification as follows:

- T1 - Round
- T2 - Triangular
- T3 - Square

T4 - Rectangle

Cooking was done at the same time in the same pot. Assessment by a trained taste panel was done simultaneously. Each questionnaire was labelled as (T1, T2, T3 and T4); there were twelve trained panelists. Each panelist tasted the cooked meat from each of the 4 treatments, (four assessments/panelist) and completed the questionnaire provided. There were a total of 48 assessments (1x4x12). The questionnaires were rated on a scale of 1-5 for each parameter as earlier described by Ocheja *et al.* (2016):

- (i) Very good – 5
- (ii) Good – 4
- (iii) Moderate – 3
- (iv) Fair – 2
- (v) Poor - 1

Thereafter the scores for each replicate were added together and divided by 12 to get the mean score for each parameter/treatment. The total mean score for the five (5) parameters were added together to determine the overall meat quality.

Experimental Design and Statistical Analysis

The experimental design was a Completely Randomized Design (CRD). Data collected were subjected to a one way analysis of variance (ANOVA); means with significant differences were separated by Least Significant Differences (LSD) using SPSS (2010)

Chemical Analysis

Samples of the concentrate diets and *Panicum maximum* were analyzed for their proximate composition using standard procedure as outlined by AOAC (1995)

Results and Discussion

Proximate Composition of Supplement Diet (Dry Matter %) and *Panicum maximum*

The proximate composition of supplement diet and the *Panicum maximum* are presented in Table 2

Table 2. Proximate Composition of Supplement Diet (Dry Matter %) and *Panicum maximum*

	Concentrate	Diet	<i>Panicum maximum</i>
Crude Protein	19.65		12.25
Crude Fibre	15.50		21.50
Ether extracts	5.50		3.65
Ash	7.65		20.20
Nitrogen free extracts	51.70		39.85

Wholesale Cuts of Experimental Goats

The wholesale cuts of the experimental Goat meat is presented in Table 3. All the wholesale cut parameters determined were significantly (P<0.05) different. The values for the supplemented treatments (T2 and T3) were higher than those of the un-supplemented treatments (T1 and T4). This result showed that goats performed better when fed with forages and concentrate diets as against forage or

concentrate diets only. Gboshe and Ukorebi (2020) reported no significant difference (P<0.05) in the values for whole sale cuts for West African dwarf goats fed cassava peels and sugar cane peels based diets. Oguche *et al.*(2018) obtained significant (P>0.05) differences in the values for thigh, shoulder, ribs ,back and belly and non-significance (P<0.05) for head and neck for West African dwarf goats fed cashew nutshell based diets.

Similarly Oguche *et.al.*(2017) reported significant ($P>0.05$) differences in the values for head, neck, thigh, ribs and back and no significant ($P<0.05$) difference in the values

for shoulder and belly for West African Dwarf goats fed some browse plants. These discrepancies can be attributed to differences in the concentrates and forages fed to the goats

Table 3: Whole Sale Cuts of Carcass of Experimental Goats. (% of Slaughter weights)

	T ₁	T ₂	T ₃	T ₄	SEM
Head	7.45 ^b	8.00 ^a	8.08 ^a	7.60 ^b	0.22
Neck	3.80 ^b	4.55 ^a	4.50 ^a	3.85 ^b	0.28
Thigh	8.25 ^b	10.00 ^a	9.80 ^a	8.20 ^b	0.35
Shoulder	8.00 ^b	8.50 ^a	8.50 ^a	7.90 ^b	0.24
Back	10.10 ^b	10.50 ^a	10.60 ^a	10.05 ^b	0.19
Belly	3.75 ^a	3.80 ^a	3.85 ^a	3.50 ^b	0.14
Rib	5.05 ^c	5.60 ^b	6.10 ^a	5.00 ^c	0.25

a, b, c=Treatment means on the same row with different superscripts differ significantly ($p>0.05$).

SEM=Standard Error of Means.

T1(0 g Concentrate and 300g Guinea grass)

T2 (100 g Concentrate and 200g Guinea grass)

T3(200 g Concentrate and 100 g Guinea grass)

T4 (300 g Concentrate and 0 g Guinea grass)

Sensory Properties of Experimental Goat Meat

The sensory properties of the meat from the experimental Goats are presented in Table 4.

All the values for the sensory properties evaluated were significantly ($P>0.05$) different, T2 (100 g concentrate and 200 g guinea grass) and T3 (200 g concentrate and 100 g guinea grass) had better values for all the sensory parameters than T1 (0 g concentrate and 300g guinea grass) and T4 (300g concentrate and 0 g guinea grass). This could be attributed to supplementation of the feeds of the goats. Ocheja *et.al.*(2016) reported significant ($P>0.05$) values for juiciness, tenderness, leanness, palatability and overall meat quality, and non-significance ($P<0.05$) for flavor, with West African dwarf goats fed diets containing graded levels of steam-treated cashew nutshell. Oguche *et al.* (2017), reported significant ($P>0.05$) differences in values for tenderness, flavor, and palatability, while the values for juiciness, leanness and overall meat quality were not significant ($P<0.05$) for West African dwarf goats fed

some browse species. These differences may be due to differences in the composition of the concentrate diets as well as the browse. The values of 17.45 – 20.57 obtained for overall meat quality was lower than 19.63 – 20.38 reported by Oguche *et.al.* (2017), but at par with 17.50 – 22.50 reported by Ocheja *et.al.* (2016).

Conclusion

The results showed that Guinea grass (*Panicum maximum*) or concentrate alone cannot enhance wholesale cuts or sensory properties of meat from West African Dwarf goats. Therefore, feeding concentrate and grass (*Panicum maximum*) in a ratio of 100:200 or 200:100 grams, respectively improved the wholesale cuts and sensory properties of the meat. Forage supplementation with concentrate feeds as against forage only or concentrate only is recommended in the feeding of West African dwarf goats for improved weights of wholesale cuts and sensory properties.



Table 4: Sensory properties of the Meat of the Experimental Goats

	T ₁	T ₂	T ₃	T ₄	SEM
Juiciness	3.35 ^b	4.18 ^a	4.25 ^a	3.55 ^b	0.14
Tenderness	3.60 ^b	3.90 ^a	3.92 ^a	3.70 ^b	0.18
Flavour	3.65 ^b	4.40 ^a	4.50 ^a	3.55 ^b	0.32
Leanness	3.45 ^b	3.85 ^a	3.90 ^a	3.2 ^b	0.25
Palatability	3.55 ^c	3.70 ^b	4.00 ^a	3.40 ^c	0.12
Overall meat quality	17.60 ^b	20.03 ^a	20.57 ^a	17.45 ^b	0.35

a, b, c – Treatment means on the same row with different superscripts differ significantly (p>0.05).

SEM=Standard Error of Means

T1(0 g Concentrate and 300g Guinea grass)

T2 (100 g Concentrate and 200g Guinea grass)

T3(200 g Concentrate and 100 g Guinea grass)

T4 (300 g Concentrate and 0 g Guinea grass)

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