

## EVALUATION OF GROWTH PERFORMANCE AND APPARENT NUTRIENT DIGESTIBILITY OF OUDA LAMBS FED DIFFERENT CONCENTRATE SUPPLEMENTED WITH GROUNDNUT HAY, KANO STATE NORTH WESTERN NIGERIA

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### **Abstract**

*This study evaluated the growth performance and apparent nutrient digestibility coefficients of Ouda Lambs fed different concentrates. A total 25 lambs (state average weight  $\pm$ SE) were randomly allotted to five different concentrates such as diet A (compounded), diet B (Ricogardo), diet C (Albarka), diet D (Knarda) and diet E (Animal care) using a completely randomized design (CRD). Diet A was formulated to serve as a control diet, while diets B, C, D and E were purchased from feed vendors. Growth performance was monitored for how long? and nutrient digestibility was determined at what period? Results obtained were subjected to one-way (ANOVA). Growth parameters revealed a significantly ( $p < 0.05$ ) highest weight gain (886.10 g/lamb) in the control diet and highest feed conversion efficiency (0.19). The Albarka diet correspondingly revealed a lowest weight gain (795.00 g/lamb); while, Animal care diet had a significantly ( $p < 0.05$ ) highest total feed intake (780.00 g/lamb) with the worst feed conversion ratio (6.43). The CP digestibility was significantly ( $p < 0.05$ ) highest in Ricogardo diet (87.72) and lowest in Albarka diet (85.12). The study revealed that concentrate supplemented with groundnut hay could be used as feed for small ruminants and will give a positive results in terms of intake, performance and nutrients digestibility. It is therefore, recommended that small ruminants can be fed Animal care concentrates supplemented with groundnut hay for enhanced nutrients utilization and growth performance.*

**Key words:** Concentrates, digestibility, growth, sheep, nutrient

### **Introduction**

Ruminants have historically played and will continue to play a valuable role in sustainable agricultural systems (Grandin, 2022). They are particularly effective at converting large quantities of renewable resources from rangeland, pasture, and crop residues or other by-products into edible food for humans (Thompson et al., 2023). Ruminants are vital for global food security and nutrition, as well as for the livelihoods of farmers and those involved along the agrifood chain (Wanapat et al., 2024).

Ruminant animals include cattle, sheep, goats and buffalo and are the largest livestock production system in the world (Rout et al., 2021). Ruminant livestock are extremely important

not only for the production of the highest quantity of animal protein (milk and meat) in human diets, but also for their ability to feed on fibrous feeds that cannot be used as human food (Eisler *et al.*, 2014). The productivity of indigenous sheep breeds is low as compared to temperate breeds, due to limited genetic capacity, environmental factors and poor nutrition as well as disease and parasites, which are the main bottle necks affecting the development of small ruminant production in Sub - Saharan Africa (Ben Salem *et al.*, 2004). The major feed resources for small ruminants in Nigeria are forages from natural pastures, crop residues and agro - industrial by - products. The expansion of cropping areas as a result of growing human population pressure makes crop residue very important especially during the dry season (Alemayehu, 2004).

Ruminant livestock production in the tropics is hindered by unavailability of high-quality feeds (Nurfeta A., 2001) . The tropical grasses usually given to livestock tend to be deficient in protein resulting in decreased productivity (Kosgey and Okeyo, 2007). However, supplementing these tropical grasses with concentrates improved the intake and digestibility of the grasses (Nurfeta A., 2001). Legumes forages have the potential to be utilised as feed supplements due to their higher protein content (Goodchild, A. V., 1990).

Therefore, this study aim to assess the effects of different ruminant concentrates supplemented with groundnut hay on growth performance and nutrient digestibility of Ouda lambs.

## **Material and Methods**

The research was carried out at the Sheep Unit of the Teaching and Research Farm, Audu Bako College of Agriculture, Danbatta, Kano, Nigeria. A total of twenty-five Ouda lambs with an average weight of  $10 \pm \text{SE}$  kg were purchased from Gujungu Market in Ringim Emirate, Jigawa State, Nigeria. The lambs were acclimatised for three weeks using groundnut haulm and wheat offal. They were de-wormed after 72 hours with levamide suspension (2.5 ml/10 kg body weight), and oxytetracycline long-acting was also administered intramuscularly (1 ml/10 kg body weight). Cypermethrin powder was applied to the skin to treat external parasites. The lambs were individually identified with plastic tags on their necks. Each lamb was assigned to an individual cage as the experimental unit. The animals were fed a diet comprising 60% groundnut hay and 40% concentrate (3% of their body weight). Concentrates were given in the morning and groundnut haulm in the evening. Throughout the nine-week study period, the animals were managed under an intensive management system. The experiment aimed to evaluate the effects of feeding concentrate supplement with groundnut hay on intake, digestibility, and performance.

## **Experimental Design and Diets**

Twenty-five (25) lambs were randomly allotted in a completely randomised design (CRD) to five different ruminant concentrate as treatment diets; A(control), B(Rico gado), C(Albarka), D(Knarda) and E(Animal care). Diet A was formulated and floor mixed, while B, C, D and E were commercial ruminant concentrates. Each treatment group comprised five lambs and fed with respective diets and groundnut hay as supplement. Mineral lick and water were given *ad libitum* throughout the feeding trial of nine weeks.

### Data Collection

The data collected were daily and weekly feed intake, weekly weight gain (using a portable hanging weighing scale 30kg capacity), total feed consumed, feed conversion ratio and nutrient digestibility.

### Mean Weight Gain (MWG)

This was calculated according to the equation by Olive – Novoa *et al.* (1990):

$$MWWG (g) = \frac{W_f - W_i}{n}$$

Where;  $W_f$  = final lamb weight at the end of the experiment,  $W_i$  = initial lamb weight at the beginning of the experiment,  $n$  = number of weeks (9 weeks).

### Percentage Weight Gain

This was calculated according to the equation by Cheikyula and Ofojekwu (2003):

Percentage weight gain was calculated using the formula:

$$PWG(\%) = \frac{W_f - W_i}{W_i} \times 100$$

Where:  $W_f$  = final weight (g);  $W_i$  (g) = initial weight

### Feed Conversion Ratio (FCR)

This was determined as described by Utne (1979) and also used by Fagbenro *et al.*, (1992) and Tutas *et al.* (2013):

$$FCR = \frac{F}{W_f - W_o}$$

Where;  $F$  = weight of food supplied to lamb during the study period,  $W_f$  = live weight of lamb at the end of the study period and  $W_o$  = live weight of lamb at the beginning of the study period.

### Feed Efficiency (FE)

This was calculated as described by Falayi (2009) as follows:

$$FE = \frac{\text{Weight gain by lambs (g)}}{\text{Weight of feed (g)}} \times 100$$

### Statistical Analysis

Data obtained were subjected to one - way analysis of variance (ANOVA) and significant means were separated using Duncan multiple range test (Steel and Torrie 1980).

### Results and Discussion

Table 1 shows result of feed intake/head/ day of Ouda lamb fed different concentrates supplemented with groundnut hay. The result revealed significant ( $p < 0.05$ ) difference across all treatments in terms of nitrogen free extracts (NFE) and ash intake. Treatments A (control), B (Rico gardo) and C(Albarka) have similar mean values in DM intake and treatments D (Knarda) and E (Animal care) recorded similar intake. Treatment E (Animal care) indicated highest value of protein intake while Treatment A(control), recorded lowest intake. NFE was statistically similar ( $p > 0.05$ ) across all the treatments with treatment E (Animal care) having lowest value, while treatment A(control) exhibited the lowest intake.

The result further revealed that treatment D (Knarda) recorded the maximum mean value of crude fibre (CF) intake, while treatment A (control) had the minimum mean value. Treatment E (Animal care) had the highest mean value of ether extract (EE) intake and treatment A(control) recorded the least mean value. Ash and EE intake were significantly different across all the treatments.

**Table 1: Feed intake per head per day of Ouda ram lambs fed different concentrates supplemented with groundnut hay**

Parameter (insert Unit)	Treatments					LSD
	A	B	C	D	E	
DM intake	580.30 <sup>b</sup>	626.60 <sup>ab</sup>	553.90 <sup>b</sup>	665.70 <sup>a</sup>	686.60 <sup>a</sup>	72.84
CP intake	88.02 <sup>e</sup>	98.88 <sup>d</sup>	93.88 <sup>d</sup>	97.95 <sup>c</sup>	106.41 <sup>a</sup>	0.02
CF intake	64.74 <sup>d</sup>	72.62 <sup>c</sup>	72.63 <sup>c</sup>	85.84 <sup>a</sup>	80.56 <sup>b</sup>	0.02
EE intake	35.62 <sup>e</sup>	46.77 <sup>c</sup>	46.97 <sup>b</sup>	46.47 <sup>d</sup>	57.55 <sup>a</sup>	0.09
Ash intake	65.02 <sup>e</sup>	70.19 <sup>c</sup>	66.88 <sup>d</sup>	70.68 <sup>b</sup>	82.23 <sup>a</sup>	0.03
NFE intake	393.30 <sup>e</sup>	421.0 <sup>c</sup>	398.7 <sup>d</sup>	451.60 <sup>b</sup>	460.70 <sup>a</sup>	0.01

<sup>a,b,...c</sup>Means along the same row with different superscripts are significantly different ( $p < 0.05$ )

Table 2 shows result of nutrients digestibility of Ouda lambs fed concentrates supplemented with groundnut hay. Treatment A(Control) recorded highest mean value for dry matter (DM) digestibility (77.17%) followed by treatment E (Animal care) (76.85%). The crude protein (CP) digestibility was significantly ( $p < 0.05$ ) different in all the treatments with treatment B (Rico gardo) having the highest value and lowest in treatment C(Albarka). Treatments A (Control), C (Albarka) and D (Knarda) were statistically similar ( $p > 0.05$ ) in crude fibre (CF) digestibility with treatment C (Albarka) recording a significantly ( $p < 0.05$ ) lowest mean value. In terms of CF digestibility, treatment B (Rico gardo) recorded the highest mean value of (70.18%) and lowest in treatment C(Albarka) with 68.18%. The result further revealed that EE digestibility was higher in treatment A (58.25%,) lower in E (52.60%). The result further showed that ash digestibility was higher in treatment (Animal care) with a value of 77.91% and lowest in treatment A (68.26%).

**Table 2: Nutrient digestibility of Ouda lambs fed different concentrates supplemented with groundnut hay**

Digestible Nutrient (%)	Treatments					LSD
	A	B	C	D	E	
DM	77.17 <sup>a</sup>	76.05 <sup>c</sup>	74.42 <sup>e</sup>	75.49 <sup>d</sup>	76.85 <sup>b</sup>	0.27
CP	85.94 <sup>d</sup>	87.72 <sup>a</sup>	85.12 <sup>e</sup>	86.70 <sup>c</sup>	87.16 <sup>b</sup>	0.02
CF	69.47 <sup>ab</sup>	70.18 <sup>a</sup>	68.18 <sup>bc</sup>	69.48 <sup>ab</sup>	67.34 <sup>c</sup>	1.77
EE	58.25 <sup>a</sup>	53.30 <sup>b</sup>	58.10 <sup>a</sup>	53.20 <sup>b</sup>	52.60 <sup>c</sup>	0.39
ASH	68.26 <sup>e</sup>	72.15 <sup>c</sup>	69.10 <sup>d</sup>	75.45 <sup>b</sup>	77.91 <sup>a</sup>	0.68
NFE	72.13 <sup>b</sup>	70.16 <sup>d</sup>	71.09 <sup>c</sup>	73.45 <sup>a</sup>	72.36 <sup>b</sup>	0.88

<sup>a,b,c</sup>Means along the same row with different superscripts are significantly different ( $p < 0.05$ )

DM: Dry matter, Crude protein, Crude fibre, Ether extract, Nitrogen free extract

Table 3 shows growth performance and feed utilization of Ouda lambs fed different concentrate supplemented with groundnut hay. The result revealed a significantly ( $p < 0.05$ ) highest weight gain 7.94 g/lamb in treatment A (control) with lowest value 7.14 g/lamb in treatment C (Albarka). Correspondingly, highest weekly weight gain (886.1 g/lamb) and lowest mean value (795.00 g/lamb) in treatment C were recorded respectively. The result however, indicated a significantly ( $p < 0.05$ ) lowest total average feed intake 650.10g in treatment A, which also recorded highest weight gain with lowest feed conversion ratio and highest feed efficiency (0.19). Meanwhile, treatment E had a significantly ( $p < 0.05$ ) highest total average feed intake (780.00g) and highest in feed conversion ratio (6.43).

**Table 3: Growth performance and feed utilization of Ouda lambs fed different concentrate supplemented with groundnut hay**

Parameter	Treatment					LSD
	A	B	C	D	E	
Initial weight (kg)	10.02 <sup>a</sup>	10.00 <sup>a</sup>	10.04 <sup>a</sup>	10.04 <sup>a</sup>	10.02 <sup>a</sup>	0.01
Final weight (kg)	17.96	17.84	17.18	16.89	17.56	0.09
Weight gain (kg)	7.94	7.84	7.14	6.85	7.54	0.09
Average daily growth gain (g/day)	126.60 <sup>b</sup>	124.50 <sup>c</sup>	113.60 <sup>a</sup>	108.80 <sup>c</sup>	119.68 <sup>d</sup>	1.35
Weekly weight gain (g)	886.1 <sup>a</sup>	871.70 <sup>b</sup>	795.00 <sup>d</sup>	838.90 <sup>c</sup>	848.3 <sup>c</sup>	9.45
Average forage intake g/day	350.00 <sup>d</sup>	370.00 <sup>c</sup>	350.00 <sup>d</sup>	390.10 <sup>b</sup>	410.00 <sup>a</sup>	0.09
Average concentrate intake g/day	300.10 <sup>d</sup>	340.10 <sup>b</sup>	330.10 <sup>c</sup>	370.20 <sup>a</sup>	370.10 <sup>a</sup>	0.22
Total average feed intake g/day	650.10 <sup>C</sup>	710.10 <sup>b</sup>	665.10 <sup>C</sup>	760.30 <sup>a</sup>	780.00 <sup>a</sup>	26.32
Feed conversion ratio (FCR)	5.15 <sup>e</sup>	5.71 <sup>d</sup>	5.86 <sup>c</sup>	6.35 <sup>b</sup>	6.43 <sup>a</sup>	0.01
Feed efficiency (FE)	0.19 <sup>a</sup>	0.18 <sup>b</sup>	0.17 <sup>b</sup>	0.16 <sup>c</sup>	0.16 <sup>c</sup>	0.23

<sup>a,b,c,d</sup>Means along the same row with different superscripts are significantly different ( $p < 0.05$ )

### Discussion

The dry matter intake in this study ranged from 580.30-686.60 g/h/d which was higher than the values reported by Ibrahim *et al.* (2016), who reported a range of 92.2% to 95.6% for growing mixed sheep breeds (Ouda and Yankasa) fed dried leaves of four different browse plants. The result recorded higher concentrate intake in treatments D (370.29g/d) and E (370.10g/d) and least value in treatment A (300.10g/d). This result agrees with the finding of Nocef (1986), on performance of dairy cows fed hay before and after concentrate supplementation that ruminants

tend to consume more feed with higher palatability. Crude protein intake of this study ranged from 88.02-106.41 g/d which is contrary to the finding of Sultan *et al* (2012) who reported a range of 45.5-75.75 g/d for Black Bengal goats. The difference may be due to species effect and environmental condition, but it is in line with the finding of Aruwayo and Maigandi (2013), who reported a range of 89.12-133.38 g/d for neem seed cake/kernel as protein source in ruminant diets. The crude fibre intake of this study was contrary with the report of Olesegun *et al.* (2016) for West African dwarf goats.

The crude protein digestibility values were in range 85.94 - 87.72%, which were comparable with the range 91.62 – 95.57% reported by Maigandi and Abubakar (2004) for Red Sokoto goats. The digestible crude fibre was between 67.34 and 70.18%; implying that the crude fibre fractions were quite degradable and the values in the present study were moderately higher compared to the values reported by Njidda *et al.* (2008).

Highest value of final weight gain was significantly ( $p < 0.05$ ) recorded in treatment A (17.96) and lowest in D (16.89). These results were lower than that of Fatheia *et al* (2012), who recorded a range of 120g to 137g growth rates on Rahmani lambs fed with some legumes and/or grass silage. The average daily weight gain was higher in treatment A (126.60g) and lower in D (108.80g). These results disagree with the findings of Aruwayo and Maigandi (2013), who reported average daily gain (ADG) of 72.76 – 104.79 g/d.

The present result significantly ( $p < 0.05$ ) reported higher forage intake in E (410.00g/d) and lower values in A (350.00) and C (350.00) respectively. Higher concentrates intake were recorded in D (370.2g/h) and E (370.10g/h) respectively. While the feed conversion ratio was recorded to be higher in treatment E (6.43) and lower in treatment A(5.15). The feed conversion ratio was comparable to the report of Karim (1997) that under mutton production programme with intensive feeding, high concentrate complete feed provided better gain and feed efficiency.

## Conclusion

The study revealed that concentrate supplemented with groundnut hay could be used as feed for small ruminants and will give a positive result in terms of intake, performance and nutrients digestibility.

## Recommendation

From the results recorded it is therefore, recommended that small ruminants can be fed Animal care concentrates supplemented with groundnut hay for enhanced nutrients utilization and growth performance.

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