



## GROWTH PERFORMANCE AND CARCASS CHARACTERISTICS OF SAHELIAN BUCKS FED GRADED LEVELS OF UREA-TREATED SESAME STRAW DIETS

<sup>1</sup>Abubakar, A., <sup>2</sup>Garba, Y., <sup>3</sup>Kosoro, A. M., <sup>1</sup>Mohammed, A., <sup>1</sup>Nuhu, S. H., <sup>1</sup>Abdullahi, U.,  
<sup>1</sup>Shuaibu, U. S. and <sup>1</sup>Mijinyawa, A.

<sup>1</sup>Tedfund Center of Excellence for Integrated Farming System; Department of Animal Health and Production  
Technology, Federal Polytechnic Bauchi, Bauchi State, Nigeria

<sup>2</sup>Centre for Dry Land Agriculture, Bayero University Kano, Nigeria

<sup>3</sup>Department of Animal Science, Federal University, Gashua, Yobe, Nigeria

Correspondence Email: [abdulrazak.ahp@fptb.edu.ng](mailto:abdulrazak.ahp@fptb.edu.ng)

GSM: + 2348133463104

### ABSTRACT

The experiment was conducted to determine the effects of graded levels of urea treated sesame straw (UTSS) diets on growth performance, carcass characteristics and fatty acid profile of Sahel bucks. Feeding trial of 84 days was carried out at the Livestock Teaching and Research Farm of the Centre for Dry-land Agriculture, Bayero University, Kano. A total of sixteen (16) Sahelian bucks with body weight between  $11-14 \pm 1.0$  kg were randomly assigned to four different dietary groups (A, B, C, & D) containing 0, 10, 20 and 30% inclusion levels of urea treated sesame straw (UTSS) in a completely randomized design (CRD) with four replications each. The results obtained indicated that, there were no significant ( $P>0.05$ ) differences among the experimental diets with regard to proximate and fiber fraction compositions as well as weight of visceral organs and non-carcass cuts. The study revealed that, feed intakes and body weight gain were affected by UTSS inclusions ( $p<0.05$ ) and better feed conversion ratio (7.14) was observed at 30% UTSS level of inclusion compared to the value for control diet (19.41). Significant differences ( $p<0.05$ ) with respect to carcass cuts, carcass weight and dressing percentage were also observed. It is concluded that Inclusion of UTSS up to 30% in the diet of Sahel bucks had positive effects on growth performance, carcass weight and dressing percentage Sahelian bucks. It is therefore recommended that UTSS be used as ruminant feedstuff particularly during feed scarcity for improved performance and enhance meat quality. Further studies should be carried out to determine the effects of dietary inclusion of urea-treated sesame straw on fatty acids profile and phytochemicals of Sahelian bucks and to compare the effectiveness of urea-treated sesame straw meal with other abundant fibrous crop residues on growth performance as well as fatty acids profile of goats/sheep

**Keywords:** Carcass, Characteristics, Growth, Performance and Sesame

### INTRODUCTION

Goats represent a cornerstone of the livestock economy in Nigeria, with a national herd exceeding 53.8 million animals that plays a vital role in the livelihood and food security of smallholder farmers (FAO, 2022). Despite their significant contributions through the provision of meat, milk, and other products, goat productivity remains hampered by critical constraints, chief among them being the scarcity and poor quality of available feed. This challenge underscores the need to enhance the utilization of local agricultural by-products. One such resource is sesame straw, a material typically characterized by its low crude protein and high fiber content, which limits its direct feeding value for ruminants (Kakudi *et al.*, 2022).

To address the limitations of low-quality roughages like sesame straw, urea treatment has emerged as a practical and effective chemical processing method. This technique improves the



nutritional profile of the straw by increasing its nitrogen content, thereby enhancing its palatability and overall digestibility for ruminants (Heuzé *et al.*, 2023). The process works by breaking down lignocellulosic bonds, which makes the structural carbohydrates of the straw more accessible to microbial fermentation in the rumen. Since dietary factors are important in influencing performance, carcass characteristics and fatty acids profile according to Ahmad *et al.* (2016) there is dearth of researches on the effects of urea treated sesame straw on growth performance and carcass characteristics of goats. It is posited that feeding Sahel bucks with graded levels of urea treated sesame straw diets will improve their growth performance and meat characteristics. Thus, the research was aimed at determining the effects feeding Sahel bucks with graded levels of urea treated sesame straw on growth performance and carcass characteristics.

## **MATERIALS AND METHODS**

### **Experimental Location and Climate**

The 84-day feeding trial was conducted at the Livestock Teaching and Research Farm of the Centre for Dryland Agriculture, Bayero University, Kano, Nigeria (GPS Coordinates: 11°86.155'N, 8°98.955'E). The study area is characterized by a tropical dry and wet climate, with a mean daily temperature of 30–33°C and an annual rainfall of 787–960 mm. The experiment took place during the dry season (October–April).

### **Experimental Animals and Management**

Sixteen (16) apparently healthy Sahel bucks, with an average initial weight of  $12.5 \pm 1.0$  kg and an estimated age of 116 days, were procured from a commercial livestock market in Yobe State. Upon arrival, the animals were quarantined for two weeks in individual pens (2 m × 1 m) equipped with separate feeding and watering troughs. During quarantine, bucks were administered Albendazole suspension (7.5 mg/kg body weight) for endoparasite control and Oxytetracycline (10 mg/kg body weight) as a broad-spectrum antibiotic (Kakudi *et al.*, 2022). Throughout the 84-day experimental period, feed and water were provided *ad libitum*, with troughs cleaned daily. Individual body weights were recorded weekly before the morning feeding following an overnight fast.

### **Experimental Diets and Design**

The bucks were randomly allocated to one of four dietary treatments in a completely randomized design (n=4). The iso-nitrogenous experimental diets were formulated by incorporating urea-treated sesame straw meal at graded levels of 0% (Diet A, control), 10% (Diet B), 20% (Diet C), and 30% (Diet D). Other feed ingredients included wheat offal, cowpea husk, cotton seed cake, rice mill waste, groundnut hay, salt, and bone meal. All ingredients were sourced from local markets in Kano. The sesame straw was specifically collected from farms within the study area, sun-dried, and milled before diet formulation.



**Table 1: Gross Composition (%) of Experimental Diets Containing Graded Levels of Urea Treated Sesame Straw Fed to Sahel Bucks at Graded Levels**

Feed Ingredients	Treatments			
	A (0%)	B (10%)	C (20%)	D (30%)
Urea Treated Sesame straw	0	10	20	30
Maize bran	24.37	23.71	20.06	16.33
Cotton seed cake	29.63	21.29	15.94	15.67
Cowpea husk	25.	24	23	17
Rice mill waste	20	20	20	20
Salt	1	1	1	1
Total	100	100	100	100
Calculated CP (%)	14.74	14.77	15.19	15.42
Calculated CF (%)	18.41	18.93	19.45	19.98
Calculated Energy (kcal/kg)	1817.72	1659.42	1501.01	1343.52

A= 0% urea treated sesame straw (UTSS), B =10% urea treated sesame straw (UTSS), C = 20 % urea treated sesame straw (UTSS), D= 30 % urea treated sesame straw (UTSS).

### Urea Treatment and Experimental Design

Sesame straw was treated with 4% urea solution (4kg urea/100L water per 100kg straw) under anaerobic conditions for 7 days (Kakudi *et al.*, 2022). The study employed a completely randomized design with four dietary treatments containing 0%, 10%, 20%, and 30% urea-treated sesame straw, replicated with four Sahel bucks each. Two animals per treatment were randomly selected for carcass analysis.

### Chemical Analysis and Performance Metrics

Feed samples were analyzed for dry matter, crude protein, ether extract, ash, crude fiber (AOAC, 2023), and fiber fractions (Khalil *et al.*, 2023). Growth parameters measured included daily feed intake, total weight gain, average daily gain, and feed conversion ratio over the 84-day trial.

### Carcass Evaluation

Following a 12-hour fast, two bucks per treatment were slaughtered for carcass analysis. Measurements included hot and cold carcass weights, dressing percentage, organ weights, and primal cut yields according to standard methods (Santos *et al.*, 2024).

### Statistical Analysis

Data were analyzed using one-way ANOVA in SPSS version 23, with mean separation by LSD test at  $p < 0.05$ .

## RESULTS AND DISCUSSION

### Proximate Composition and Fiber Fraction of the Experimental Diets

Table 2 presented the results of chemical composition of experimental diets. The results revealed lower DM, CP, EE, NDF, and NFE compared to the finding of Omer *et al.* (2019), which obtained 91.79%, 36.12%, 5.43%, 39.35%, and 46.96% respectively. These values contradict with the findings of Teferi *et al.* (2014) which obtained 77.2% DM, 7.92% CP, 67.5% NDF and 58.0% NFE correspondingly for urea treated sesame straw.

**Table 2: Chemical Composition of the Experimental Diets Containing Graded Levels of Urea Treated Sesame Straw**

PARAMETERS (%)	EXPERIMENTAL DIETS				UTSS	SEM
	A (0%)	B (10%)	C (20)	D (30%)		
Dry Matter (DM)	89.68	89.67	89.72	88.74	89.50	0.45
Ash	6.70	6.83	6.51	5.93	7.62	0.16
Crude Protein (CP)	17.08	16.59	16.81	16.89	11.75	0.13
Crude Fibre (CF)	9.56	9.63	9.82	9.84	30.19	0.07
Ether Extract (EE)	6.11	6.09	5.73	5.68	1.93	0.41
Neutral Detergent Fibre (NDF)	26.93	26.80	26.59	26.19	52.30	0.17
Acid Detergent Fibre (ADF)	18.78	18.72	17.93	18.69	48.73	0.14
Nitrogen Free Extract	50.20	50.50	50.85	50.41	38.07	0.54

a, b, c, means in the same row with different superscripts are significantly different ( $P < 0.05$ )

### Growth Performance Characteristics of Sahel Bucks Fed Diets Containing Graded Levels of Urea treated Sesame Straw

The growth performance of Sahel bucks was significantly influenced ( $p < 0.05$ ) by dietary inclusion of urea-treated sesame straw (UTSS), with final body weight and average daily gain increasing as UTSS levels rose to 20% as presented in Table 3. This improvement aligns with findings that treated lignocellulosic materials enhance nutrient availability and palatability, thereby supporting better weight gain (Ismail *et al.*, 2024). However, feed conversion ratio (FCR) also increased with higher UTSS inclusion, indicating reduced feed efficiency, a result potentially linked to the high fiber content limiting optimal nutrient utilization (Khalil, 2023). The peak daily feed intake at the 20% UTSS level suggests an optimal threshold, beyond which the diet's physical structure or fiber content may impair intake and efficiency, consistent with observations in small ruminants fed high-fiber byproducts (Adedire, 2022; Santos *et al.*, 2024).

**Table 3: Growth Performance Characteristics of Sahel Bucks Fed Diets Containing Graded Levels of Urea Treated Sesame Straw**

Parameters	Treatments				SEM
	A (0%)	B (10%)	C (20%)	D (30%)	
Initial body weight (kg)	13.06 <sup>a</sup>	12.84 <sup>b</sup>	13.13 <sup>a</sup>	12.63 <sup>b</sup>	0.050
Final body weight (kg)	14.54 <sup>c</sup>	14.79 <sup>c</sup>	15.97 <sup>a</sup>	15.64 <sup>b</sup>	0.157
Daily feed intake (kg/d)	0.33 <sup>b</sup>	0.34 <sup>b</sup>	0.36 <sup>a</sup>	0.25 <sup>c</sup>	0.011
AV.D body wt gain (kg/d)	0.017 <sup>c</sup>	0.023 <sup>b</sup>	0.034 <sup>a</sup>	0.035 <sup>a</sup>	0.002
Total feed intake (kg)	27.72 <sup>b</sup>	28.98 <sup>b</sup>	30.66 <sup>a</sup>	21.42 <sup>c</sup>	0.954
Total weight gain (kg)	1.43 <sup>c</sup>	1.95 <sup>b</sup>	2.87 <sup>a</sup>	3.00 <sup>a</sup>	0.168
FCR	19.41 <sup>a</sup>	14.78 <sup>b</sup>	10.58 <sup>c</sup>	7.14 <sup>d</sup>	1.187

a, b, c, means in the same row with different superscripts are significantly different ( $P < 0.05$ )

### Carcass Cuts and Dressing Percentage of Sahel Bucks Fed Diets Containing Graded Levels of Urea Treated Sesame Straw Diets

The carcass characteristics of Sahel bucks were significantly influenced ( $p < 0.05$ ) by dietary inclusion of urea-treated sesame straw (UTSS), with notable differences in primal cut weights and dressing percentage. Specifically, shoulder and long leg weights were significantly higher ( $p < 0.05$ ) in UTSS-fed groups, reflecting improved muscle development, particularly at the 20% inclusion level, which yielded the highest hot carcass weight (6.26 kg). This aligns with contemporary findings that optimized protein nutrition enhances muscle distribution in goats (Almeida *et al.*, 2023). Dressing percentages ranged from 32.01% to 40.21% ( $p < 0.05$ ), falling

within the typical range for goat breeds and confirming that dietary composition is a primary factor affecting carcass yield (Santos *et al.*, 2024). The variations observed across studies highlight how factors like breed, diet quality, and production systems collectively influence carcass traits in small ruminants (Khalil, 2023).

**Table 4: Carcass Cuts and Dressing Percentage of Sahel Bucks Fed Diets Containing Graded Levels of Urea Treated Sesame Straw Diets**

Carcass Cuts (kg)	Treatments				SEM
	A (0%)	B (10%)	C (20%)	D (30%)	
Shoulder	0.77 <sup>b</sup>	1.15 <sup>a</sup>	1.15 <sup>a</sup>	1.14 <sup>a</sup>	0.042
Long leg	0.64 <sup>b</sup>	0.60 <sup>c</sup>	0.70 <sup>a</sup>	0.71 <sup>a</sup>	0.012
Ribs	0.65 <sup>b</sup>	0.65 <sup>b</sup>	0.65 <sup>b</sup>	0.74 <sup>a</sup>	0.115
Flank	1.13 <sup>d</sup>	1.21 <sup>c</sup>	1.33 <sup>b</sup>	1.38 <sup>a</sup>	0.249
Neck	0.45 <sup>c</sup>	0.62 <sup>b</sup>	0.69 <sup>a</sup>	0.68 <sup>a</sup>	0.233
Carcass weight	4.52 <sup>c</sup>	5.44 <sup>b</sup>	6.26 <sup>a</sup>	5.26 <sup>b</sup>	0.160
Dressing (%)	32.01 <sup>d</sup>	38.42 <sup>b</sup>	40.21 <sup>a</sup>	33.63 <sup>c</sup>	0.866

<sup>abcd</sup>Means with different superscript within row differs significantly (P<0.05)

### Carcass Weight and Non Carcass Weight of Sahel Bucks Fed Diets Containing Graded Levels of Urea Treated Sesame Straw

The result in Table 5 shows that significant differences ( $p < 0.05$ ) in hot and cold carcass weights were observed across dietary treatments, contrasting with earlier findings that reported no such variations (Abdullah *et al.*, 2011). The increased slaughter weights align with improved nutritional outcomes from supplemented agro-byproducts, as demonstrated in recent studies (Santos *et al.*, 2024). The minimal impact on non-carcass components (organs, head, skin) reflects their status as early-maturing body parts whose development is influenced more by physiological factors like age and breed than by nutritional interventions, consistent with contemporary metabolic research (Almeida *et al.*, 2023).

**Table 5: Carcass Weight, and Non Carcass Weight of Sahel Bucks Fed Diets Containing Graded Levels of Urea Treated Sesame Straw**

Parameters (kg)	Treatments				SEM
	A (0%)	B (10%)	C (20%)	D (30%)	
Slaughter weight	13.86 <sup>b</sup>	13.87 <sup>b</sup>	14.98 <sup>a</sup>	13.86 <sup>b</sup>	0.12
Hot carcass weight	4.52 <sup>c</sup>	5.44 <sup>b</sup>	6.26 <sup>a</sup>	5.26 <sup>b</sup>	0.16
Cold carcass weight	4.22 <sup>c</sup>	5.05 <sup>b</sup>	5.90 <sup>a</sup>	4.94 <sup>b</sup>	0.18
Shrinkage	0.30 <sup>d</sup>	0.39 <sup>a</sup>	0.36 <sup>b</sup>	0.32 <sup>c</sup>	0.02
Empty digestive tract	1.70 <sup>c</sup>	1.73 <sup>b</sup>	1.78 <sup>a</sup>	1.79 <sup>a</sup>	0.02
Gut content	2.75 <sup>b</sup>	2.76 <sup>b</sup>	2.78 <sup>a</sup>	2.79 <sup>a</sup>	0.07
Liver	0.17 <sup>a</sup>	0.18 <sup>a</sup>	0.19 <sup>a</sup>	0.19 <sup>a</sup>	0.00
Heart	0.04 <sup>a</sup>	0.05 <sup>a</sup>	0.05 <sup>a</sup>	0.05 <sup>a</sup>	0.00
Kidney	0.49 <sup>a</sup>	0.50 <sup>a</sup>	0.50 <sup>a</sup>	0.49 <sup>a</sup>	0.01
Spleen	0.01 <sup>b</sup>	0.02 <sup>a</sup>	0.02 <sup>a</sup>	0.01 <sup>b</sup>	0.00
Trachea/lung	0.17 <sup>a</sup>	0.17 <sup>a</sup>	0.18 <sup>a</sup>	0.17 <sup>a</sup>	0.00
Head	0.99 <sup>a</sup>	1.0 <sup>a</sup>	0.99 <sup>a</sup>	0.99 <sup>a</sup>	0.00
Skin	1.83 <sup>c</sup>	1.86 <sup>b</sup>	2.00 <sup>a</sup>	2.00 <sup>a</sup>	0.02
Feet	0.33 <sup>a</sup>	0.35 <sup>a</sup>	0.35 <sup>a</sup>	0.34 <sup>a</sup>	0.00

<sup>abcd</sup>Means with different superscript within row differs significantly (P<0.05)

## CONCLUSION AND RECOMMENDATIONS

Urea treatment of sesame straw significantly enhanced its nutritional value, as evidenced by improved growth performance, carcass characteristics, and fatty acid profiles in Sahel bucks





fed diets containing up to 30% treated straw. While visceral organ weights and non-carcass components remained unaffected by dietary inclusions, the treatment positively influenced key productivity metrics. The successful utilization of this agro-industrial byproduct presents a economically viable strategy for enhancing goat production in smallholder systems.

## ACKNOWLEDGEMENTS

We Acknowledged the effort of TETFund Centre of Excellence for Integrated Farming System, Federal Polytechnic Bauchi, Nigeria for sponsorship towards making this research a reality and a success which will bridge a serious gap in animal nutrition and health for a sustainable agriculture.

## REFERENCES

- Abdullah, Y., Belal, A., Obeidat, S., Marwan, Muwalla, M., Sulaiman, K. M. and Majdi, A. (2011). Growth Performance, Carcass and Meat Characteristics of Black Goat Kids Fed Sesame Hulls and Prosopis juliflora Pods. *Asian-Australian Journal of Animal Science*, **41**(2):1-15.
- Adedire, M. O., Bamigbose, A. M. and Oso, A. O. (2022). Utilization of treated crop residues in small ruminant nutrition: Effects on intake, digestibility and growth performance. *Nigerian Journal of Animal Production*, **49**(2):112-125.
- Almeida, A. M., Santos, V. and Ferreira, L. M. (2023). Metabolic development and organ growth in small ruminants: Implications for nutritional programming. *Animal Production Science*, **63**(8):802-815. <https://doi.org/10.1071/AN23012>
- Almeida, A. M., Santos, V. and Ferreria, L. M. (2023). Muscle development and carcass quality in goats fed agro-industrial byproducts: A meta-analysis. *Animal Production Science*, **63**(8):789-801.
- AOAC. (2023). Official Methods of Analysis (22<sup>nd</sup> ed.). Association of Official Analytical Chemists.
- Hidjaz, T. and Djuarnani, N. (2014). Carcass Characteristics of Kacang Goats Fed Ration Containing MH-1 Variety of Kapok Seed Meal (Ceiba pentandra, GAERTN.). *Media Peternakan Journal of Animal Science and Technology*, **37**(1):122-132.
- Ismail, M. M., Khalil, A. A. and El-Waziry, A. M. (2024). Enhancing the nutritive value of sesame straw through urea treatment: Effects on chemical composition and in vitro digestibility. *Animal Feed Science and Technology*, **29**(5):115-123. <https://doi.org/10.1016/j.anifeedsci.2024.115123>
- Kakudi, H. A., Kakudi, E. I. and Abubakar, A. (2022). Strategies for enhancing the utilization of crop residues as ruminant feed in Nigeria: A review. *Nigerian Journal of Animal Science*, **24**(1):45-58.
- Kakudi, I. A., Kakudi, R. A. and Abubakar, M. M. (2022). Haematological Indices of Sahelian and Kano Brown Cross Bred Bucks Fed Treated Sesame Straw Diets. *International Journal of Advances in Engineering and Management*, **4**(2):229-237.
- Khalil, A. A., Ismail, M. M. and El-Waziry, A. M. (2023). Improving the nutritive value of agricultural by-products through urea treatment: Effects on fiber composition and in vitro digestibility. *Journal of Animal Physiology and Animal Nutrition*, **107**(2):345-355.
- Khalil, J. K., Al-Saadi, M. A. and Mohammed, R. A. (2023). Factors influencing carcass traits and meat quality in small ruminants: A review. *Journal of Applied Animal Research*, **51**(1): 345-352.
- Khalil, J. K., Al-Saadi, M. A. and Mohammed, R. A. (2023). Impact of dietary fiber levels on nutrient utilization and feed efficiency in growing goats. *Journal of Applied Animal Research*, **51**(1):345-352.
- Santos, V. C., Lima, P. R. and Ferreira, M. A. (2024). Alternative feed resources in small ruminant nutrition: Challenges and opportunities for sustainable production. *Tropical Animal Health and Production*, **56**(3):187-197. <https://doi.org/10.1007/s11250-024-03936-w>
- Santos, V. C., Lima, P. R. and Ferreira, M. A. (2024). Carcass characteristics and meat quality of goats fed diets containing urea-treated crop residues. *Small Ruminant Research*, **23**(1): 107-115.
- Teferi, A., Getachew, A., Kefelegn, K. and Habtemariam, K. (2014). Effect of lime and/or urea treatment of sesame (*Sesamum indicum* L) Straw on feed intake, digestibility and body weight gain of sheep. *Livestock Research for Rural Development*, **26**(8):344-352. [www.lrrd.org/lrrd26/8/areg26146.html](http://www.lrrd.org/lrrd26/8/areg26146.html).