



Effect of Groundnut Haulms and Sorghum Chaff Cut Size on Performance and Haematology of Red Sokoto Bucks

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Abstract

The study was aimed at assessing the influence of feed sizes on growth performance and haematology of Red Sokoto bucks. A total of sixteen (four per treatment) bucks were assigned to four different treatment groups designated as T1, T2, T3 and T4. Animals on treatment 1 (T1) were given 15 cm groundnut haulms, ground sorghum chaff and wheat offal, those on T2 were fed 10 cm groundnut haulms, ground sorghum chaff and wheat offal, while T3 were fed 15 cm groundnut haulms, unground sorghum chaff and wheat offal, and T4 animals were fed 10 cm groundnut haulm, unground sorghum chaff and wheat offal. Water was given ad-libitum. The results showed significant differences ($P < 0.05$) in Total Weight Gain (TWG), Average Weight Gain (AWG), Average Daily Gain (ADG), Average Feed Intake (AFI), Total Feed Intake (TFI) and Feed Gain Ratio (FGR). However non-significant differences were observed in Average Final Weight (AFW), Average Daily Intake (ADI), Crude Protein Intake (CPI), Feed intake as percentage of Body weight (FIB) and Dry matter as percentage of Body weight (DIB). The animals on T1 had significantly ($P < 0.05$) higher TWG (2.61 kg) compared to T2, T3 and T4 (0.87, 1.00 and 0.83 kg, respectively). However, feed size did not have any effect on the haematological parameters of the bucks. This results showed that animals on diet T1 which contained 15 cm groundnut haulms and ground sorghum chaff were better in terms of TWG, AWG and ADG than those fed other diets.

Keywords: Cut-Size, Groundnut, haulms, Sorghum, Chaff, Red Sokoto

Introduction

Goats account for 30% of African's ruminant livestock and the population of goats in sub-Saharan Africa is estimated at 147 million (Lebbie, 2004). Sixty-four percent of the goats are found in the arid and semi-arid zones, sub-humid, humid and high lands (Bogoro et al., 1999). The Red Sokoto goat (Maradi) is the most important breed that is widely distributed in Northern Nigeria (Makun et al., 2005) and is estimated to be about half of the total goat population in the country.

The consumption of animal protein especially from red meat is becoming more difficult for most Nigerians in response to the high inflation rate and little disposable income. Production of livestock therefore remains a priority and efforts to increase productivity by reducing problems of

production must continue. One of such problems is the high cost and seasonality of feeds, which have made farmers to gradually adopt the use of crop residues. Goats raised in Nigeria are suited to browsing crop residues, however, utilization of the residues continues to be inefficient (Amadou et al., 2012). Ways of maximizing the use of the available forages resources are therefore an important factor in determining livestock productivity. Other aspects like haematology are also important to health of the livestock because blood counts may be used to suggest certain disease processes when physical examination findings are vague (Jones and Allison, 2007). The significance of determining haematological and biochemical indices of domestic animals has been well documented and changes in parameters have been studied in sheep and

goats (Tambuwal *et al.*, 2002). Blood is an important index of physiological and pathological changes in an organism. It serves as a transport medium which carries the end products of metabolism from the cells to the organs of excretion, oxygen from the lungs to the tissue and the secretion of the endocrine gland throughout the body. This study was therefore conducted to determine the influence of feed sizes on the production performance and haematological parameters of Red Sokoto bucks.

Materials and Methods

Experimental site

The experiment was conducted at the Small Ruminant Research Unit of Abubakar Tafawa Balewa University, Bauchi. Bauchi, a state in North Eastern part of Nigeria, located at geographical coordinates of 10°33' N and 9°31' E. The state lies within the guinea savannah of the ecological zone with an annual rainfall of between 1000 mm and 1300 mm per annum. Relative humidity ranges from about 12% in February to about 68% in August. At the beginning of the rainy season, relative humidity is about 37% (BSG, 2009).

Experimental Animals and their Management

Sixteen animals with average weight of 10.03 kg were prepared and randomly allocated to four diets with four animals per treatment. The animals were sourced from Durun market in Ganjuwa Local Government Area, Bauchi state. On arrival, animals were prophylactically treated with multivitamin and TLA-Tetracycline Long acting antibiotic (1.0 ml/10kg body weight) against bacteria, while Ivermectin and Albendazole were used against ecto and endo parasites. The experimental animals were allowed to adjust to the experimental diet for a period of 14 days before the commencement of data recording. The bucks were weighed prior to commencement of the experiment and their

weight was taken as the initial weight and weekly afterwards using a hanging scale of 100kg capacity. The concentrate diet was offered to the animals based on 3% their body weight, while forage and water were provided *ad libitum* throughout the period of the experiment. Feed intake was measured by recording the quantity of feed (concentrate and forage) offered and quantities refused. Feed conversion ratio was measured by computing the ratio of the dry matter intake to the weight gain of animal. The study lasted for 8 weeks.

Experimental Diets

Experimental diets were made with Groundnut Haulm (GH) and Sorghum Chaff (SC) of different sizes. Animals in Treatment 1 (T1) were given 15 cm GH and ground SC; T2: 10 cm GH and ground SC; T3: 15 cm GH and unground SC and T4 10cm GH and unground SC. Other ingredients that were added in equal quantities to all the diets are wheat offal, and salt. Table 1 shows the composition and respective sizes of the ingredients for all the treatments.

Blood Sample Analysis

The blood samples were collected from the jugular vein of the bucks using 12 ml gauge (6 cm) needle to draw 10 ml of blood at the 8th week of the study where the point of collection was first cleaned with 70% alcohol. The blood samples were divided into two; first lot (5 ml) was emptied into heparinised packs containing about 40 mg of anti-coagulant components. Packed cell volume (PCV), which is the ratio of volume of cells to the volume of plasma, was determined by the capillary haematocrit centrifuge as described by Coles (1986). White Blood Cell (WBC) was determined by Wintrobe method (Coles, 1986). Differential counts of WBC (neutrophils, eosinophils and lymphocytes) were determined by Giemsa's stain method (Coles, 1986).

Statistical Analysis

All data collected were subjected to Analysis of Variance ANOVA (Steel and Torrie, 1980), using the General Linear Model procedure (GLM) of Statistical Analysis System (SAS, 2005) and significant differences between treatment means were separated by Duncan's Multiple Range Test at $P < 0.05$ (Duncan, 1955).

Results

The chemical composition of diets and ingredients used in the study are shown on Table 2. The recorded value of 14.30% was observed for the crude protein of the experimental diet. Other values recorded include dry matter (98.15 %), ash (22.00 %), ether extract (EE: 11.78%), Acid detergent fibre (52.65%) and neutral detergent fibre (58.67 %). The dry matter (DM) content of the ingredients varied between 86.32% (Wheat Offal) and 96.25% (Groundnut Haulms). Crude protein (CP) content was higher for Groundnut Haulms (13.74 %) and lower for Sorghum Chaff (9.20 %). Acid detergent fiber (55.00 %), Ash (20.00 %) and ether extract (19.87 %) values were higher for Sorghum Chaff and lower for Groundnut Haulm (44.95, 5.38 and 2.34% respectively).

The Performance of Red Sokoto bucks when fed different cut sizes of Groundnut haulms and Sorghum chaff is shown on Table 3. The result showed that the Average Final Weight (AFW), Average Dry matter Intake (ADI), Crude Protein Intake (CPI), Feed intake as % of body weight (FBI) and Dry matter intake as % of body weight (DIB) were non-significantly different in values. On the other hand, Feed gain ratio (FGR), Total Weight Gain (TWG), Average Weight Gain (AWG), Average Daily Gain (ADG), Average Feed Intake (AFI) and Total Feed Intake (TFI) recorded differences between the treatments. The TFI was highest (31.00 Kg) for T3 and lowest (26.70Kg) for T1.

Table 4 shows the Haematological parameters of Red Sokoto Bucks fed Groundnut Haulms (10 and 15 cm) with Sorghum Chaff (ground and unground). None of the parameters recorded a difference between the treatments, an indication that sizes of GH and SC did not affect the blood forming cells of Red Sokoto bucks.

Discussion

The results of the chemical composition of the diet revealed that crude protein content was slightly lower than the values of 15 – 18% recommended by ARC (1990) for growing sheep. Ether extracts (EE) values obtained from the present study were comparable to those reported by Adebawale and Taiwo (1996).

Results of dietary performance are presented on Table 3. There were no significant differences in the average daily gain between treatments 2 and 4, and between treatments 2 and 3. In terms of total weight gain (TWG), treatments 2, 3 and 4 were statistically the same, only treatment 1 is differed and the TWG and AWG of animals on treatment 1 were significantly higher ($p < 0.05$) than the other treatments. Also, treatments 2, 3 and 4 of the AWG are statistically the same, only treatment 1 was different.

Treatment 2 recorded highest value (34.57) of feed gain ratio and was significantly different from treatment 1 (11.11). However, non-significant differences were observed in the remaining parameters as shown in the table 3. Even though T1 had a lower feed intake as compared to treatments 2 and 4, significant differences were not observed. The increased feed intake could be due to the fact that roughages of low quality tend to be eaten more by the animals in order to satisfy their need for energy and other nutrients (McDonald *et al.*, 1995). Variation in feed intake between treatments 3 and 1 could be

as a result of individual differences among the experimental animals. One possible explanation for this is that the animals were obtained from different sources with possible differences in management systems. This could have led to individual animal differences as regard their adaptation to the feeding conditions, even though measures were taken to eliminate these differences at the beginning of the experiment.

The average daily gain (ADG) obtained for animals in treatment 1 (46.67g) which were fed 15cm groundnut haulms and ground sorghum chaff was better than the ADG of 30.03g as reported by Sale and Abubakar (2016) when they fed Kano brown bucks with diets containing sugarcane meal. Makama, *et al.*, (2016) reported that ADG (kg/day) was $0.05 \pm$ when they fed growing Red Sokoto bucks with graded levels of dried sweet orange peel meal which is less than the ADG obtained from treatment 4 of this research (13.28g/day). Luka and Kibon (2014) had earlier reported that using groundnut haulm as a basal feed with the mixture of protein and energy supplements in the diets of Red Sokoto goats can increase the dry matter intake of the animals. This is probably because animals needed to consume more of the basal diet to meet their nutritional requirements. Ilori *et al.*, (2013) reported an ADG of between 28, 30, 29 and 28 when they fed different levels of Baobab (*Adansonia digitata*) as supplemented to Wheat Offal in the diet of West African dwarf goats.

The lower value of ADG exhibited by animals in treatment 4 (13.28) which fed 10cm groundnut haulms, not ground sorghum chaff and wheat offal could be associated with the incidence of diarrhea, which has led to loss of weight by animals on the treatment. The average daily gain (ADG) recorded for this experiment (13 – 46g/day) is comparable to what had been reported by Ibrahim *et al.*, (2014) when they

fed Red Sokoto goats with Sabara (*Guiera senegalensis*) leaf meal (32 – 50g/day).

The result of the haematological values is shown in Table 4. The haemoglobin concentration (g/dl), which ranged from 9.5 to 11.8 g/dl is above the range of 8.9 to 10.4 g/dl reported by Hyelda *et al.* (2017). The average value of 8.6 g/dl as reported by Samira *et al.* (2016) is far below the minimum value reported. The higher values could be attributed to the presence of iron in the diets (Kubmarawa *et al.*, 2011). Opara *et al.* (2010) reported a packed cell volume of 28.4% for apparently healthy West African dwarf goats, while for this study, a range (30.0-35.0%) was obtained, which lies within the range of (24.9-38.3%) reported by Hyelda *et al.* (2017). The WBC values ranged between 11.98 to 13.05 $\times 10^9/l$, with T1 having the lower value and T2 having the highest value. These differed from the values (5.7 - 12.0 $\times 10^3/ mm^3$) reported by Ibrahim *et al.* (2018). The higher WBCs may be indicative of activation of defense and immune to infections or toxic substances (Al-Bulushi *et al.*, 2017). Furthermore, the MCH (31.60 -39.88 pg) and MCHC (31.65 - 31.72 g/l) in this study were much higher than values reported by Al-Bulushi *et al.* (2017), though the values were comparable to values reported by Egbe-Nwiyi *et al.*(2000).

Conclusion

In conclusion, cut size of Groundnut haulms and Sorghum Chaff did not influence the haematological values of Red Sokoto bucks. However there was a remarkable difference in Total weight gained between the treatments.

References

- Adebowale, E. A. and Taiwo, A.A. (1996). Utilisation of crop residues and aro industrial by-products as complete diet for West African Dwarf Sheep and Goats. *Nigerian Journal of Animal Production*, (23)1: 153-160.

- Al-Bulushi, S., Shawaf, T., and Al-Hasani, A. (2017). Some hematological and biochemical parameters of different goat breeds in Sultanate of Oman "A preliminary study". *Veterinary world*, **10**(4):461–466.
- Amadou, H., Dossa, L. H., and Schlecht, E. (2012). A comparison between urban livestock production strategies in Burkina Faso, Mali and Nigeria in West Africa. *Tropical Animal Health and Production*, 2050, 1631–1642.
- ARC (1990). The Nutrient Requirements for Ruminant Livestock. Technical Review by Agricultural Research council working parties CAB International Wallingford, U.K
- Bogoro S. Niba AT and Butswat ISR (1999). Goats: The threatened species in our backyards: Proceedings of an international seminar promoting sustainable small-scale livestock production toward s reduction of malnutrition and poverty in rural and suburban families in Nigeria. ATBU Bauchi. Pp 155.
- BSG (2009). Bauchi State Government of Nigeria Diary. Published by Bauchi State Government of Nigeria.
- Coles E.H. 1986. Veterinary Clinical Pathology. 4th ed. W.B. Saunders Company, Philadelphia. 486p
- Duncan, D. B. (1955). Multiple range and multiple F test. *Biometrics*.,**11**: 1-42.
- Egbe-Nwiyi T.N., Nwaosu, S.C. and Salami, H.A.(2000). Haematological Values of apparently healthy Sheep And Goats as influenced by age and sex in arid zone of Nigeria. *African Journal of Biomedical Research*, Vol 3; 109 - 115
- Hyelda, A. J., Yahya, M. M., Abakura J. B., and Wafar R. J. (2017). Haematological and Biochemical Parameters of Red Sokoto Goats Fed Desert Date (*Balanites aegyptiaca*) Leaves as Supplement to Urea Treated Maize Stover. *Journal of Advances in Biology and Biotechnology* 15(2): 1-7, 2017
- Ibrahim, A.A., Hudu, S., Tamburawa, M.S., Ashiru, R.M., (2014). Growth performance, nutrient digestibility and haematological parameters of Red Sokoto Goats fed Sabara (*Guiera senegalensis*) leaf meal. *Iranian Journal of Applied Animal Science* **4**, 53–58.
- Ibrahim, T., salisu bakura, A., Hassan, M.R., Yashim, S., Adamu, H.Y., Lamidi, O.S., (2018). Nutrient utilisation and blood chemistry of Red Sokoto bucks fed on diets with different inclusion levels of raw and soaked roselle (*Hibiscus sabdariffa* L.) seeds. *Journal of Agriculture and Rural Development in Tropics and Subtropics*.119, 45–54.
- Ilori, H. B., Salami, S. A., Majoka, M. A., Okunlola, D. O. (2013). Acceptability and Nutrient Digestibility of West African Dwarf Goat Fed Different Dietary Inclusion of Baobab (*Adasoniadigitata*). *IOSR Journal of Agriculture and Veterinary Science*, 6 (3):22-26.
- Jones, M. L., and Allison, R. W. (2007). Evaluation of the ruminant complete blood cell count. *Veterinary Clinics of North America: Food Animal Practice*, 23(3), 377-402.
- Kubmarawa, D., Magomya, A.M., Yebpella, G.G and Adebayo, S.A (2011). Nutrient content and amino acid composition of the leaves of cassia tora and celtes integrifolia. *International Journal of Biochemistry and Bioinformatics*. 1 (9) 222-225

- Lebbie, S.H.B. (2004). Goats under household conditions. *Small Ruminant Research* **51**, 131–136.
- Luka, J.S. and Kibon, A. (2014). Milk production of Red Sokoto Goats fed with Supplements in Bauchi State, Nigeria. *Journal of Agriculture and Food Science*, **2**(8): 258-265.
- Makama, Y.S., Samuel, A., Abdu, T., Bakur, a S., Ishaya, G., Hassan, U. and Rabi, M. (2016). Feed Intake, growth performance and nutrient digestibility in growing Red Sokoto bucks fed diets containing graded level of dried sweet orange peel meal, *Animal Research International*, **13**(1) 2338-2337.
- Makun, H.J., Ajanusi, J.O., Ehoche, O.W., Olorunju, S.A.S. and Otaru, S.M. (2005). Ownership Patterns of goats and goat Milking Practices in Nigeria, *Savanna*, Ahmadu Bello University, **20**(1): 17-29.
- Mc Donald P. Edward R.A and Green halgh J.F.D (1995) **Animal Nutrition** pear son Education Limited, United Kingdom pp 67.
- Opara, M.N., Udevi, N., Okoli, I.C.(2010). Haematological parameters and blood chemistry of apparently healthy West African dwarf goats In Owerri, South Eastern Nigeria. *New York Science Journal*, **3**(8):68-72.
- Sale, G. and Abubakar, A. (201 6). Intake of Fattened Kano brown bucks fed diets containing Sugarcane meal. *International Journal of Innovative Agriculture and Biological Research*, **4**(4): 1-6.
- Samira, A.M., Mohammed, A.R., Anaam, E.O., Sheeba, A., Waleed, M.A. (2016). Biochemical and haematological profile of different breeds of goat maintained under intensive production system. *African Journal of Biotechnology*, **15**(24):1253-1257.
- SAS Institute Inc (2005). SAS/ACCESS 9.4 Interface to ADABAS: Reference. Cary, NC: SAS Institute Inc.
- Steel, R.G.D., Torrie, J.H. (1980). **Principles and procedures of statistics: A biometrical approach**, 2nd Edition, McGraw-Hill, New York, NY. Pp 633.
- Tambuwal, F.M., Agale, B.M., Bangana, A. (2002).Haematological and biochemical values of apparently healthy Red Sokoto goats. Proceeding of 27th Annual Conference of Nigerian Society of Animal Production, March, 17- 21, FUTA, Akure, Nigeria. Pp 50-53.

Table 1: Ingredients Sizes and Composition of Experimental Diets

Ingredients	(%)	T1	T2	T3	T4
Groundnut Haulms	(14.00)	15cm	10cm	15cm	10cm
Sorghum Chaff	(56.00)	Ground	Ground	Unground	Unground
Wheat offal	(29.50)	Bran	Bran	Bran	Bran
Salt	(0.50)	Powder	Powder	Powder	Powder

Table 2: Chemical composition of Ingredients and Experimental diets

Parameters (%)	Experimental diet	Groundnut Haulms	Sorghum Chaff	Wheat Offals
DM	98.15	96.25	93.12	86.32
Ash	22.00	5.38	19.87	7.88
CP	14.30	13.74	9.20	12.23
EE	11.78	2.34	20.00	13.11
ADF	52.65	44.95	55.00	53.70
NDF	58.67	62.02	62.00	52.22

DM=Dry Matter, CP=Crude Protein, EE=Ether Extract, ADF=Acid Detergent Fiber, NDF=Nutrient Detergent Fiber

Table 3: Performance of Red Sokoto bucks when fed different cut sizes of Groundnut haulms and Sorghum chaff

Parameters	Treatments				±SE
	T1	T2	T3	T4	
AWI (kg)	10.33	9.47	11.00	9.33	1.85
AFW(kg)	13.07	1.33	12.00	10.17	1.82
TWG(kg)	2.61 ^b	0.87 ^a	1.00 ^a	0.83 ^a	0.45
AWG (g/wk)	326.67 ^b	108.33 ^a	125.00 ^a	92.92 ^a	56.81
ADG (g/day)	46.67 ^b	15.48 ^a	17.86 ^a	13.28 ^a	8.11
AFI (kg)	470.24 ^a	499.40 ^a	553.57 ^b	492.02 ^a	18.96
TFI (kg)	26.70 ^a	27.97 ^a	31.00 ^b	27.55 ^a	1.07
ADI (g/day)	461.54	423.49	543.33	483.90	50.69
CPI (%)	67.24	69.03	79.16	55.03	10.51
FBI	2.05	2.40	2.74	2.11	0.48
DIB	35.45	41.66	47.88	48.82	8.83
FGR	11.11 ^a	34.57 ^b	33.36 ^b	36.18 ^b	8.54

^{a,b} : Means with different superscript are significantly different (p<0.05); AWI=Average initial weight, AFW=Average final weight, TWG=Total weight gain, AWG=Average weight gain, ADG=Average daily gain, AFG=Average feed intake, TFI=Total feed intake, ADI=Average dry matter intake, CPI=Crude protein intake, FBI=Feed intake as % of body weight, DIB=Dry matter intake as % of body weight, FGR=Feed gain ratio.

Table 4: Haematological parameters of Red Sokoto Bucks fed Groundnut Haulms (10 and 15 cm) with Sorghum Chaff (Ground and Uground)

Parameters	T1	T2	T3	T4	SEM	LOS
PVC (%)	33.67	30.00	35.00	32.00	4.01	NS
RBC (×10 ¹² /l)	2.81	3.00	2.95	2.95	0.12	NS
WBC (×10 ⁹ /l)	11.98	13.05	12.65	12.95	1.44	NS
Hb (g/dl)	10.68	9.50	11.08	10.14	1.26	NS
MCV (fl)	120.00	110.67	120.00	110.00	16.56	NS
MCH (pg)	39.88	31.60	38.00	34.35	5.52	NS
MCHC (g/l)	31.72	31.65	31.66	31.68	0.05	NS

PCV=Packed Cell Volume; RBC=Red Blood Cell; WBC=White Blood Cell; Hb=Hemoglobin; MCV=Mean Corpuscular Volume; MCH=Mean Corpuscular Hemoglobin; MCHC=Mean Corpuscular Hemoglobin Concentration.