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Performance of Red Sokoto Bucks Grazing Natural Vegetation in North Eastern Nigeria

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Abstract:

A study was conducted to investigate the effects of supplementing rainy season grazing of Red Sokoto bucks (RSB) with two protein sources (cotton seed cake -CSC and groundnuts cake -GNC) and two energy sources (maize bran-MB and wheat offal-WO). 24 RSB were used in a completely randomized design, with four treatments replicated six times. The results showed that daily concentrate intake (DCI) and total concentrate intake (TCI) were significantly ($P<0.001$) affected by the dietary treatments. Daily weight gain - DWG ($P<0.01$) and total weight gain-TWG ($P<0.05$) were significantly different among treatments. However, initial live weight (ILW), final live weight (FLW), feed conversion ratio (FCR) and efficiency of feed conversion (EFC) were not affected across the treatments. Pearson correlation among growth performance parameters showed that DCI was positively related ($P<0.01$) to TCI, DWG, TWG and EFC ($P<0.05$). TCI was also positively related ($P<0.01$) to DWG, TWG. Significant positive correlation ($P<0.01$) was also observed with DWG and TWG, FCR and EFC. In similar vein, TWG was also related to FCR and EFC. FCR was negatively ($P<0.05$; $P<0.01$) related to DCI and TCI and EFC. It was concluded that feeding of GNC/MB significantly improved performance of RSB.

Keywords: Performance, Red Sokoto bucks, cotton seed cake, groundnut cake, grazing, maize bran and wheat offal

1. Introduction

The decrease in the nutritional quality of natural forages during the dry season underscores the importance of supplementary feeding for animals raised under extensive system of management (Abdu et al., 2013). Revision of the present production system to a semi-intensive approach where materials gleaned from natural environment could be supplemented with concentrate formulation, especially during the dry months, could perhaps be one of the intervention areas needed to enhance the performance of these indigenous breeds (Ahamefula and Udo, 2010). Nigeria's livestock which include an estimated 16 million cattle, 35.5 million sheep and 56.5 million goats (FAO, 2012) plays an important role in the economy of the country (Abubakar and Burrah, 2013).

Within the indigenous breeds of goats kept for meat production in Nigeria, Red Sokoto goat is the most widely distributed throughout the various ecological zones, particularly Guinea and Sudano - Sahelian Savannah vegetation belts (Ibrahim et al., 2014). The perennial acute shortage of feed stuffs during the long period of dry season, early part of the rains and the rapid decline in nutritional value with maturity in tropical grasses during the rainy season (2-6% of protein level) lead to losses in weight up to 15% of bodyweight of the animals subsisting on such grasses (Adegbola, 1990). To reduce such weight losses, it requires a research into the possibility of supplementing these grasses consumed by the animals with cheap and available protein source, to ensure proper growth and production of small ruminants in Nigeria. This study is aimed at evaluating the effects of supplementing rainy season grazing of Red Sokoto bucks with two protein sources and two energy sources.

2. Materials and Methods

2.1. Study Area

The study was conducted at the Federal Polytechnic Mubi Teaching and Research Farm in Mubi, Adamawa State Nigeria. Mubi lies on latitude $10^{\circ} 16' 8''$ N of the equator and longitude $13^{\circ} 16' 14''$ E of Greenwich Meridian. (<http://www.newstrackindia.com/information/worldinfo/latitudelongitude/CountryCities/Nigeria/city-mubi-1644396>) Mubi is the second largest to Yola, the state capital. Mubi LGA is located at the northern part of old Sardauna Province which now forms Adamawa north senatorial district as defined by INEC (2006). Mubi region is bounded to the north by Borno state, to the west by Hong and Song LGA and to the south and east by the Republic of Cameroon. It has a land area of about 4,728,77 km² and human population of about 151,000 going by 2006 census projected figure (Ajawara, 2006).

2.2. Animals and Their Management

Twenty four (24) Red Sokoto bucks approximately 6-9 months old, with an average weight of 13.99 kg (13.45 to 14.42 kg) were used for the experiment. The animals were purchased from Mubi international cattle market and neighbouring villages. The animals were quarantined for a period of two weeks during which they were given prophylactic treatments. They were dewormed with Ivermectin, against endo-parasites and ecto-parasites and then injected with oxytate-long acting broad spectrum antibiotics. Rectal temperatures of the animals were taken, which ranged between 38.27°C and 39.2°C. During this period of quarantine, the animals were vaccinated against Pestes Des Petits Ruminants (PPR). During the quarantine, the animals were taken out for grazing on natural vegetation in the grazing area of the institution. They were provided with clean drinking water ad libitum. Animals were monitored daily, treatment were administered where necessary. Animals were housed in pens made of concrete floors and sufficient ventilation. Each animal was provided with a feeding/drinking container (Rubber plastic). The pens were cleaned daily. The experiment lasted for 91 days between June/July to September, 2011 (late rainy season).

2.3. Experimental Diets and Animal Feeding

Four supplements containing 15% crude protein were formulated. The supplements designated as I, II, III, IV contained cotton seed cake/ wheat offal (CSC/WO), groundnut cake/maize bran (GNC/MB), groundnut cake/wheat offal (GNC/WO) and cotton seed cake/ maize bran (CSC/MB) respectively. Each animal was offered 200g of the respective supplement every day at about 7:00 am; they were allowed to consume the feed for two hours (7:00 am to 9:00 am). By 9:30 am, they were taken out for grazing natural vegetation at the Polytechnic grazing area (which is about 200 hectares) for about six to seven hours (10:00 am to 4:00 pm). Feed refusals were collected and weighed immediately after the animals were released for grazing. On returning from grazing, they were kept in their individual pens. Species of grass and legume usually found in the grazing area were Pennisetum purpureum, Panicum maximum, Adropogon gayanus, Ipomoea eriocapa, Centrosema pubescens Commelina bengalensis. Clean drinking water was provided ad libitum for the duration of the experiment. Animals were weighed at the beginning of the experiment and weekly thereafter. Ingredients composition and chemical composition of the experimental supplements are shown in Tables 1 and 2.

2.4. Experimental Design

The experiment was conducted in a completely randomized design (Steel and Torrie, 1980) with four treatments replicated six times (six animals per treatment).

2.5. Chemical Analysis

The experimental diets, feed ingredients and grass samples were analyzed for dry matter, crude protein (AOAC, 2005), while ash content was determined by combustion in a furnace at 500°C following the procedure of AOAC (2005). Organic matter was assumed to be the result of subtracting the percentage of ash from 100. Neutral detergent fibre and acid detergent fibre of the samples were determined as prescribed by Van Soest. (1991).

2.6. Statistical Analysis

Data collected were subjected to analysis of variance (balanced ANOVA) method as described by Steel and Torrie (1980) using Statistical Package for Scientists and Engineers -SPSS (2012); where significant difference existed between means. Duncan's multiple range test -DMRT (Duncan, 1955) was used to separate them. Pearson correlation coefficient was used to show relationship between parameters measured.

3. Results and Discussion

Growth performance of the Red Sokoto bucks is shown in Table 2. The results showed that daily concentrate intake (DCI) was significantly ($P<0.001$) affected by the dietary treatments. The highest significant values were 187.90 and 169.33g/day. These were recorded by bucks fed diet II and III. The DCI which ranged from 152.17 to 189.90g/day are appreciably lower than range of 341.96 to 404.23g/day reported by Shua et al. (2011) and 595.02 to 669.00g/day reported by Ibrahim et al. (2014) for Red Sokoto bucks fed cotton seed cake or urea and Sabara meal respectively. This difference may probable be explained due to differences in management practice, age/weight and composition of the experimental diets used in the two experiments. The result of DCI is completely at variance with report of Njiwe and Olubajo (2014), who obtained a range of DCI of 48.17 to 63.16g/day/ $W^{0.75kg}$ for West Africa dwarf goat fed cassava flour and groundnut cake. This may attributed to the differences of breed and experimental diet used in the two experiments. However the highest DCI recorded by animals fed groundnut cake based diets over cotton seed cake based diets in this study agreed with the findings of Njiwe and Olubajo (2014) who observed high intake in groundnut cake based diets cassava flour based diets. There was a highly significant difference ($P<0.001$) among treatments with total concentrate intake (TCI). Bucks fed GNC/MB recorded a higher mean value of 17.10kg, while those fed CSC/MB recorded a lower mean value of 13.85kg. These mean values were lower than 36.68 to 93.33kg reported by Jokthan et al. (2013) for Yankasa ram fed graded level of broiler litter in replacement of cotton seed cake. This difference may attributed to differences in the species of animals, age/weight and composition of the experimental diets. Initial and final live weights of the bucks were not affected by the dietary treatments. The insignificant difference observed in the present experiment in ILW and FLW agrees with the findings of Ibrahim et al. (2014) who obtained similar result with Red Sokoto bucks fed Sabara meal. Daily weight gain (DWG) and total weight gain (TWG) were significantly ($P<0.01$; $P<0.05$) different among treatments, although all the animals gained weight, which indicated that, the intake of energy and protein were well above maintenance requirements. The result of DWG reported in this study (28.24 to 36.59g/day) is within the range (21.52 to 42.36g/day) reported by Shua (2008) for Red Sokoto bucks grazing natural vegetation and supplemented with CSC or urea. The higher DWG obtained for bucks fed GNC/MB (36.59g/day) is in conformity with the findings of Njiwe and Olubajo (2014) who obtained a higher DWG with ground cake supplement than cassava flour. The diet may probably balance in nutrient and optimally utilized by the bucks

Feed conversion ratio (FCR) and efficiency of feed conversion (EFC) were not significantly affected by the dietary treatments. The FCR figures which ranged between 5.14 and 5.57 are lower than 9.56 and 15.98 reported by Shua et al. (2011) for Red Sokoto bucks fed cotton seed cake or urea. This indicates that the diets in the present study were not efficiently utilized by the bucks. The values of EFC were similar across the treatments, this means that increase in the desired output of the animals was similar across the treatment.

Pearson correlation among growth performance showed that DCI was positively related ($P<0.01$) to TCI ($r=0.99$), DWG ($r=0.81$), TWG ($r=0.81$) and positively related ($P<0.05$) to EFC ($r=0.64$). TCI was positively related ($P<0.01$) to DWG ($r=0.81$), TWG ($r=0.81$). Significant positive correlation ($P<0.01$) were also observed with DWG and TWG ($r=0.99$), FCR ($r=0.78$) and EFC ($r=0.78$). Similar relationship was obtained with TWG with FCR and EFC. Negative correlation was also observed among the parameters. FCR was negatively ($P<0.05$; $P<0.01$) related to DCI ($r=-0.61$) and TCI ($r=-0.60$) and EFC ($r=-0.84$). The significant positive relationship observed by DCI, TWG and FCR with the other parameters indicated that increases in these parameters were followed by a corresponding increase in the other parameters. This finding agreed with the findings of Shua et al. (2011) who obtained similar relationship with Red Sokoto bucks.

4. Conclusion

The performance of the animals in terms of DCI, TCI, DWG and TWG were better improved when the bucks were fed GNC/MB than the other supplements. This suggest that the diet was superb, balanced in nutrient, optimally utilized and the intakes of energy and protein from this diet was above maintenance requirement.

5. Recommendations

Based on this study it could be recommended that GNC/MB being the best formulation could be used for feeding RSB especially when grazing natural vegetation.

Ingredients (%)	Supplements			
	I CSC/WO	II GNC/WO	III GNC/MB	IV CSC/MB
Cotton seed cake	15.40	0.00	0.00	28.98
Groundnut cake	0.00	17.52	24.04	0.00
Wheat offal	83.35	81.23	0.00	0.00
Maize bran	0.00	0.00	74.71	69.77
Bone meal	1.00	1.00	1.00	1.00
Salt lick	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

Table 1: Ingredients Composition of Supplement Fed to Red Sokoto Bucks (RSB) Grazing Natural Vegetation in Rainy Season
CSC= Cotton Seed Cake, GNC= Groundnut Cake, WO= Wheat Offal, MB= Maize Bran

Parameters	Supplements				Basal feed
	I CSC/WO	II GNC/WO	III GNC/MB	IV CSC/MB	Grass sample
Dry matter	95.08	94.23	93.04	94.47	88.06
Organic matter	86.60	88.61	87.50	86.22	85.84
Crude protein	15.18	14.93	15.30	14.78	7.46
Ash	13.40	11.39	12.50	13.78	14.16
Neutral detergent fibre	35.49	34.89	33.14	35.60	36.12
Acid detergent fibre	29.01	28.13	27.43	27.97	26.03
Hemicelluloses	6.48	6.76	5.71	7.63	10.09

Table 2: Chemical Composition of the Supplements and Grass Sample Grazed by Red Sokoto Bucks
CSC= Cotton Seed Cake, GNC= Groundnut Cake, WO= Wheat Offal, MB= Maize Bran

Parameters	Supplements				SEM	LOS
	I CSC/WO	II GNC/MB	III GNC/WO	IV CSC/MB		
Daily concentrate intake (g/day)	157.17 ^c	187.90 ^a	169.33 ^b	152.17 ^c	4.35	***
Total concentrate intake (kg)	14.30 ^c	17.10 ^a	15.41 ^b	13.85 ^c	0.39	***
Initial live weight (kg)	14.05	14.42	13.45	14.05	0.83	NS
Final live weight (kg)	16.62	17.75	16.42	16.68	0.84	NS
Daily weight gain (g/day)	28.24 ^c	36.59 ^a	32.64 ^b	28.90 ^c	1.71	**
Total weight gain (kg)	2.57 ^c	3.33 ^a	2.97 ^b	2.63 ^c	0.17	*
Feed conversion ratio	5.57	5.14	5.19	5.27	0.23	NS
Efficiency of feed conversion	0.18	0.19	0.19	0.19	2.11	NS

Table 3: Growth Performance of RSB Grazing Natural Vegetation and Supplemented with Two Protein Sources and Two Energy Sources

a, b, c Means within Row with Different Superscripts Are Significantly Different (***= P<0.001, **= P<0.01, *=P<0.05), CSC=Cotton Seed Cake, WO=Wheat Offal, GNC= Groundnut Cake, MB=Maize Bran, SEM=Standard Error of Means LOS= Level of Significance and NS=Not Significant

	DCI	TCI	ILW	FLW	DWG	TWG	FCR	EFC
DCI	1.00							
TCI	0.99**	1.00						
ILW	0.04	0.03	1.00					
FLW	0.29	0.29	0.95**	1.00				
DWG	0.81**	0.81**	0.03	0.34	1.00			
TWG	0.81**	0.81**	0.02	0.35	0.99**	1.00		
FCR	-0.61*	-0.60*	0.19	-0.07	0.78**	0.78**	1.00	
EFC	0.64*	0.64*	0.09	0.33	0.78**	0.77**	-0.84**	1.00

Table 4: Pearson Correlation among Growth Performance of RSB Grazing Natural Vegetation and Supplemented with Two Proteins and Two Energy Sources

*=P<0.05 **= P<0.01, DCI = Daily Supplement Intake, TCI = Total Concentrate Intake, ILW= Initial Live Weight, FLW=Final Live Weight, DWG= Daily Weight Gain TWG=Total Weight Gain, FCR = Feed Conversion Ratio, EFC= Efficiency of Feed Conversion

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