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EFFECTS OF COTTON SEED CAKE SUPPLEMENTATION ON THE DRY SEASON PERFORMANCE OF WHITE BORNO GOATS

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Target Audience: Livestock farmers, animal nutritionists

ABSTRACT

The study was conducted to investigate the influence of three levels of cotton seed cake supplementation on voluntary intake, digestibility, and weight response of White Borno goats. The treatments imposed were, A: 50% *Panicum maximum* +50% groundnut haulm (control), B: control +250g cotton seed cake (CSC) and C: control+500g CSC/ head/day. Data were analysed as a complete randomised design. There was a substitution effect between the basal and supplement intake across treatments. Hay dry matter intake by animals on the control group was significantly higher than those supplemented. However, the values obtained from animals on treatments B and C were comparable. Total voluntary intake tended to increase with increased levels of supplementation and was significantly different among treatments ($P<0.05$). Crude protein intake, thoracic girth and weight gains were significantly improved in the supplemented groups, while treatment effects on the values obtained for height at withers were not significant. Live-weight gain was optimum at 250g CSC supplementation level. Both dry matter and crude fibre digestibility were significantly better for supplemented groups. The evaluation of animal weight gain across the treatments showed that there was no advantage in feeding supplement like cotton seed cake above 250g/head /day when a mixture of legume and grass hay formed the basal ration.

Key words: Supplementation, cotton seed cake, digestibility

DESCRIPTION OF PROBLEM

Inadequate nutrition remains the most important factor that limits high productivity of ruminants. The limitation to improved productivity is particularly more acute during the long dry season in semi-arid zone. In this zone, the climatic conditions are extreme; nutrition is poor and disease frequent. The dry season lasts for about 7-8 months (October - May), during which the available feeds (standing hays and crop residues) decline rapidly in quality (1) leading to low digestibility with intake becoming insufficient to maintain liveweight. The consequences of these are considerable weight loss and in some cases death of animals offered poor quality roughage without supplementation (2, 3). The problem of insufficient feed in the semi-arid zone of Nigeria especially during the dry season therefore demands an urgent attention since the region harbours the largest ruminant livestock population in the country (4). Therefore, the traditional system of goat production has to give way to semi and intensive system

of production in order to meet the increased demand for dietary animal protein. However, under intensive system of production, feed cost forms a major part of the total cost of production, although fast gains are usually achieved. Supplementation of agro-industrial by products as a means of increasing production has long been recognised. Cotton seed cake and groundnut haulms have been offered as feed supplements to crop residue (1). However, information on the combine effects of grass and legume hay mixture as basal diet and when supplemented with cotton seed cake, has not been well documented. The objective of this study was to investigate the influence of supplementary feeding value of cotton seed cake with poor grass-legume hay mixtures on the performance of White Borno goats during the dry season.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at the Teaching and Research Farm of the University of Maiduguri. Maiduguri (Latitude 11°15'N longitude 3°05' East, altitude 354m above sea level.) in the Sahel zone of Nigeria. The area is characterised by a 3-4 month rainy season. Annual rainfall varies from 500-600mm, ambient temperature is high by April and May; 35-40°C and is lowest in December and January; 19-22°C while relative humidity ranges from 5-45%.

Animals and Feeding Management

Twelve White Borno bucks, aged 9 months with a pre-trial mean weight of 17.5 kg were used for the experiment. Animals were balanced for weight and randomly assigned to three feeding treatments. Each treatment had four animals with each animal used as a replicate. The treatment imposed were: A: 50% *Panicum maximum*+50% groundnut haulms, B: 50% *P. maximum* + 50% groundnut haulms + 250g cotton seed cake (CSC) and. C: 50% *P. maximum* + 50% groundnut haulms + 500g CSC/head/day. Dry matter intake was constituted as 3% body weight of individual animals. The groundnut haulms used were harvested from the university farm, sun-cured, and stored in bales of about 2 kg each under shade on a concrete floor. The grass was harvested at 12weeks of regrowth, sun-dried and stored on a raised platform. Animals were fed twice daily. In the morning at 0700h, half of the diet was fed and the second at 1500 h. Animals were dewormed and dipped two weeks before the commencement of the trial. Minerals in form of salt lick and water were made available throughout the trial. Quantity of feed offered, remnant and intake were monitored daily, while weight gain was monitored weekly throughout the trial. Height at withers and thoracic girth were measured daily. The experiment lasted for a period of 60 days preceded by an adjustment period of 15 days.

Digestibility Study

After the growth trial, digestibility study was conducted using the same treatments and same set of animals. Animals were transferred into individual metabolism cages equipped with facilities for separate collection of the faeces and urine. Animals were weighed at the beginning and allowed seven days as adaptation

period to the cage environment. The amount of feed offered, and remnant were recorded daily and sampled for each animal during the collection period. Daily wet faecal output of each animal was also weighed and sampled before being stored in a freezing cabinet till required for analysis. Sub-samples of feed and faeces were oven dried at 60°C to constant weight to determine the dry matter content.

Chemical Analysis

All the feed and faecal samples were analysed for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract, and ash (5).

Statistical analysis

Data were analysed as a complete randomised design using analysis of variance and where significant, means were separated (6).

RESULTS AND DISCUSSION

The proximate composition of experimental diets is presented in Table 1. The basal diet had higher crude fibre (CF) content while the cotton seed cake (CSC)

Table 1. Proximate composition (g/kgDM) of the *Panicum maximum*, groundnut haulm and cotton seed cake used in formulating experimental diets

	Cotton Seed cake	*P. maximum*	Groundnut haulm
Dry matter	960.0	990.0	950.0
Crude protein	294.3	34.5	76.3
Crude Fibre	260.0	340.0	310.0
Ether extract	70.0	10.0	10.0
Nitrogen free extract	334.0	539.7	482.6
Ash.	41.7	75.8	121.1

was relatively low in crude fibre. Cotton seed cake (CSC) with the highest crude protein content had the lower ash content than the other two diets. The grass was low in crude protein (CP). In contrast, the dry matter content of the basal diet (990g/kgDM) was relatively higher than in the CSC and groundnut haulms. The CP of the basal diet w8787as relatively lower than the CSC. The CP value of the CSC in this study is comparable to 353g/kgDM reported in another study (7). However, the CP content of grass was far less than the value of 116g/kgDM reported for 8weeks guinea grass re-growth (8). The discrepancy in the two values could be due to differences in the stage at which the grasses were harvested. Voluntary intake of the goats in the test diets and feed efficiency are presented in Table 2. Forage intake by animals on non-supplemented feed was significantly higher than those fed with CSC. However, intake was not significantly different between supplemented groups. Treatment effects on total intake were significant.

Table 2. Performance and nutrient utilization of White Borno goats fed a mixture of concentrate-legume hays

Parameters	Treatments			SEM
	A	B	C	
a. Performance				
Concentrate dry matter intake (g/head/day)		210	420	-
Hay intake (g/head/day)	600[a]	480[b]	550[b]	90.0
Total dry matter intake (g/head/day)	600[c]	690[b]	970[a]	110.0
Feed efficiency (gain/feed)	0.00 6.9[c]	0.0182[a]	0.0128[b]	0.001
Weight gain (g/day)	4.12[ab]	12.6[a]	12.6[a]	0.01
b. Nutrient utilisation				
Crude protein intake	80c	100[b]	140[a]	10.0
Dry matter digestibility(g/kg DM)	549.3[a]	604.7[a]	564.2[a]	121.0
Crude fibre digestibility (g/kg DM)	397.7[b]	578.9[a]	430.1[b]	72.2

Means within same row with different superscripts differed significantly (P<0.05)

The feed conversion efficiency was significantly higher for the supplemented groups by more than 67% units compared with control. Higher intake of forage by the control group was probably due to the fact that animals needed to consume more of the forage to meet their daily nutrient requirements. The finding agree with another report (9) which showed that intake was higher for unsupplemented West African Dwarf (WAD) goats and sheep fed a basal diet of grass *(Cynodon nlemfuensis)* hay. Similar trend of decreased hay intake with increased quantity of concentrate supplement was reported for (WAD) rams (10). It has also been observed that within each energy level, intake of hay decreased with increasing protein level (11). However, the results did not agree with the value reported by (12), who found that intake of guinea grass hay increased with increasing intake of protein concentrate in the diet. This may be due to the poor quality (standing matured) hay fed in their study compared to better quality grass (cut at dough stage) and legume offered in this study. The average daily gains in weight, thoracic girth, and height at withers are presented in Table 3. Animals on supplemented groups had significantly higher daily weight gain than those animals on control

Table 3. Average daily gains in live weight, thoracic girth, and height at withers of White Borno goats fed a basal diet of guinea grass and groundnut haulms with cotton seed cake supplement.

Parameters	Treatments			SEM
	A	B	C	
Live weight gain /head/day	4.15[b]	12.55[a]	2.46[a]	0.01
Height at withers cm/day	0.26[b]	0.29[b]	0.27[b]	0.15
Thoracic girth cm/day	0.27[b]	0.33[a]	0.32[a]	0.04

Means within same row with different superscripts differed significantly (P<0.05)

diet. There was no significant difference between the supplemented groups in average daily weight gain. However, the thoracic girth was significantly higher for animals on treatment B while there was no significant difference in the height at withers among the treatments The higher live weight gain with increasing levels of supplementation agrees with other report (13). The average daily live weight gain above control group was 8.33g, which was slightly lower than 10.93g reported for supplemented goat (14). Sex, feed, animal and breed differences could have accounted for such observation. Results of apparent dry matter and crude fibre digestibility of experimental diets are presented in Table 2. Treatment effects on dry matter digestibility were not significant. But animals on treatment B had a relatively higher crude fibre digestibility than other groups. The observed improvement in the dry matter and crude fibre digestibility of the diets by animals on group B may have been due to availability of optimum nitrogen required for efficient fermentation in the rumen. The rumen microbes (15,16) required a certain level of nitrogen in the form of ammonia to build up their body protein, increase their population and enhanced their degradation activity of ingested fibre.

The deficiency of this nitrogen in the rumen result in less efficient utilisation of low quality forages. The declined crude fibre digestibility at the highest level of supplementation agreed with the report (17,18). Feeding higher quantity of cotton seed cake probably altered the rumen pH (17) in such a way that it could reduce the cellulolytic activity of the rumen microbes or the microbes attacked more of the soluble carbohydrate portion (19). The consequence was reduced digestibility of the roughage portion and low apparent digestibility.

CONCLUSION AND APPLICATION

The study showed that supplementary feeding of White Borno goats with cotton seed cake improved the performance of the animals and increased dry matter and crude fibre digestibility of the diet. The following were the conclusion:

To enhance animal performance in the dry season additional protein concentrate based on minimal cost and availability is advocated.

When cotton seed cake is available, not more than 250g of it should be offered per animal per day.

This methodology could be adopted in any other zone with similar climatic conditions, but a cost/ benefit analysis would be needed.

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