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EFFECT OF CONCENTRATE SUPPLEMENTATION OF GROUNDNUT HAY OR LABLAB HAY ON DRY MATTER INTAKE, DIGESTIBILITY AND GROWTH PERFORMANCE OF FATTENING RAMS

A. A. NJIDDA

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ABSTRACT

An experiment was conducted to determine the effect of concentrate supplementation on feed intake, nutrient digestibility and growth performance of fattening rams offered a basal diet of groundnut hay or lablab hay. Sixteen rams aged 18 months with mean live weight of 39 ± 1.0kg were used for the study. The animals were divided into four groups of four rams per group per treatment based on similarity in live weight and were assigned to one of the four dietary treatments. The treatments compared were: Treatment 1 received lablab hay ad-libitum without supplementation, Treatment 2 received lablab hay ad-libitum + 0.5kg concentrate supplement, Treatment 3 received ground hay ad-libitum without supplementation and Treatment 4 received groundnut hay ad-libitum + 0.5kg concentrate supplement in a randomized complete block design. The mean dry matter intake (DMI) were 2.17, 2.13, 2.02 and 1.85kg/day for T_1, T_2, T_3 and T_4 respectively. There were significant difference ($P<0.05$) for DMI. The result reveals significant difference ($P<0.05$) for dry matter digestibility, crude fibre digestibility, crude protein digestibility and ether extract digestibility. The daily live weight gain shows no significant effect ($P>0.05$). The cost analysis shows no significant effect due to supplementation. The result of this study indicated that liberal supplementation of concentrate diet to rams on good quality forage legume has no beneficial effect.

KEY WORDS: Concentrate, supplement, hay, sheep and growth performance

INTRODUCTION

Sheep are important animals in tropical livestock production. Sheep account for approximately 34% of the total population of the world's grazing ruminants. The sub-sahelian region is among the most important sheep producing areas in Nigeria with estimated sheep population of about 2.4 million (RIMS, 1992).

In Northern Nigeria, sheep are kept mostly by agro-pastoralists and managed under traditional methods. During the wet or raining season, flocks are shepherd away from crop fields to natural rangeland surrounding villages or are individually tethered on edges of crop fields along roadsides. Feed lot which entails the feeding of animals under confinement in which high quality feeds are given to the animals with the main objective of fattening young animals within a very short time, is the recent management system in Northern Nigeria. Fattening of rams is a profitable venture, with return of premium to the farmer. The sales of fattened rams during festivals such as Eid-El-Kabir are a potential source of income for the smallholder producers.

Forages from range lands and harvested crop fields are the cheapest and main sources of feed for sheep in Northern Nigeria. Improved animal performance is dependent on the supply of good quality feed throughout the year. The fattening of rams in this zone is affected by the short duration of rainfall and long period of dry season. Poor nutrition especially during the long dry season is one of the major factors militating against livestock production in Northern part of Nigeria. The dry season results in rapid decline in the quality and quantity of forages leading to lower intake and with resultant poor animal performance (Zemmelink, 1973). During the wet season, there is plenty of green pasture available for the animals, thus fattening of ruminant could be done through grazing natural pasture or cut and carry basis. Sheep could be managed and fattened during the dry season using local feeds resources such as dry grains, legume hay, crop residue, bran or oil seed cakes (Mshelbwala, 1996).

The most popular crop residue used by farmers for fattening sheep in Northern Nigeria is groundnut hay. It is used extensively in feeding ruminant animals especially during the dry season to reduce live weight loss (Rains and Thorpe, 1969). Groundnut hay becomes available in large quantities and cheaper at the time of harvest. But become scarce and expensive towards the end of dry period. The need to reduce the high cost of feed for fattening rams has necessitated the search for cheaper and alternative sources of feed, such as forage legumes, browse plants and tree fodder legume, which constitute an important feed resource for ruminants. These feeds are good sources of fermentable nitrogen and of by-pass protein. When fed to animals forage legumes tend to increase the efficiency of feed utilization. Lablab is a dual-purpose forage legume that is rapidly gaining acceptance by agro-pastoral farmers in Northern Nigeria (Tanko, *et al.*, 1990). Lablab has high seed and forage yield as well as good hay curing ability compared with other commonly grown forage legume and is drought resistance (Mbahi, 2001). The bean as meal and forage for livestock feed makes lablab a suitable forage legume (Lucke, 1965).

MATERIALS AND METHODS

Animals and Treatments

Sixteen Balami rams aged 18 months with mean live weight of 39.00 ± 1.0kg were used for the study. The rams were bought from livestock market in Maiduguri. The animals were divided into four groups of four rams each based on live weight and each group of four rams were assigned to one of the four dietary treatments in a randomized complete block design.

The treatment diets are:

Treatment 1	=	lablab hay ad-libitum without supplement
Treatment 2	=	lablab hay ad-libitum plus 0.5kg concentrate Supplement
Treatment 3	=	groundnut hay ad-libitum without supplement
Treatment 4	=	groundnut hay ad-libitum plus 0.5kg concentrate Supplement

Each group was offered water and mineral salt lick ad libitum.

Groundnut hay was bought from farmers after harvest and was allowed to dry on the farm and chopped before feeding to the animals. Lablab was harvested at flowering stage. After harvest, the forage was allowed to dry then chopped before feeding. Components of the concentrate mixture contained wheat bran, cotton seed cake, bone meal and table salt.

A. A. Njidda, Department of Agricultural Science and Technology, Ramat Polytechnic P.M.B 1070, Maiduguri – Nigeria

Feeding and Management

Prior to the experiment, the animals were dewormed against endo-parasite with (Albendazole bolus) and were allowed a 10 day period during which basal diet was offered to them.

At the commencement of the experiment, animals were offered the experimental diets. They were housed in pens with concrete walls and floor. The floor was cleaned daily. The supplement and the basal diets were weighed daily and offered twice at 8:00am and 3:00pm. The experiment lasted for 3 months (12 weeks). Sub-samples of feed offered daily were collected for chemical analysis. Live weights of the animals were measured at weekly intervals.

Digestibility Trial

At the end of the feeding trial, one ram from each treatment were randomly selected and maced in metal metabolism cages. Feed, faces and urine were collected separately. Digestibility of feeds were determined using the formula given below:

$$\text{Apparent digestibility} = \frac{\text{DM feed consumed} - \text{DM faecal output} \times 100}{\text{DM feed consumed}}$$

Total faecal output was collected from each animal in the last 7 days of the experiment. Sub samples of faeces were collected for chemical analysis.

Chemical Analysis

The feed and faecal samples were ground to pass through a 1mm sieve and analyzed in triplicate for dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), nitrogen free extract (NFE) and total ash according to the methods of A.O.A.C. (2002).

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) based on complete randomized block design (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Chemical Composition of the Experimental Feeds

The Composition of the experimental diet is shown in Table 1, while the result of the proximate composition of the experimental diet is shown in Table 2. The dry matter (DM) content ranged from 91.1% (concentrate) to 93.22% (groundnut hay). The crude fibre in lablab was higher than in groundnut hay and concentrate diet. This value is lower than the range of 27.8% - 28% reported by Norton and Poppi (1995). Crude fibre content of legumes increases with maturity of the crop at harvest (Minson, 1990). Concentrate supplement was higher in crude protein, ether extract and ash, but nitrogen free extract was higher in groundnut and lablab hays. Ash content recorded for this study is close to the values (6.01) reported by Mbahi (2001) for groundnut hay. Ash contents of leguminous crops vary due to the nutritional status of the soils on which they are grown and the variety as well. Ash content of lablab for this study is lower than results reported by Murphy, (1998).

Table 1: Composition of concentrate supplement

Ingredients	% Inclusion
Wheat offal	70
Cotton seed cake	27
Bone meal	2
Table salt	1
Total	100

Table 2: Chemical composition of experimental feeds

Feeds	Dry Matter	Crude Protein	Crude Fibre	Ether Extract	Ash	Nitrogen Free extract
Groundnut hay	93.65	9.65	25.51	1.89	5.67	57.28
Lablab hay	91.52	14.08	27.12	1.83	5.51	51.50
Concentrate	91.10	18.16	22.68	3.45	9.92	45.79

Feed Intake

The result of the mean dry matter intake (DMI) is shown in Table 3. Total feed intake was not significantly different (P>0.05) among treatment groups, although animals on groundnut hay supplement tend to consume less forage. However, forage intake was significantly (P>0.05) higher in unsupplemented groups. Higher intake of the basal diet by the unsupplemented groups suggests that forage legumes can sustain ruminant animals without concentrate supplementation. The observation made in this study agrees with the work of Kay (1979) who reported no significant difference in feed intake of rams when forage legume with a high level of crude protein was supplemented with a concentrate. Similarly, Jakmola and Pathank (1981) reported that mean voluntary intake of sheep fed lablab was satisfactory, indicating good palatability of lablab at vegetative stage of growth. Hendrickson *et al.* (1981) recorded a high dry matter intake when sheep were fed with forage legumes.

Table 3: Dry matter intake and growth rate of rams offered either groundnut hay or lablab with or without concentrate supplement

Parameters (Kg)	TREATMENTS				SEM
	Lablab without supplement	Lablab with supplement	Groundnut without supplement	Groundnut without supplement	
Supplement intake (kg) DM/day)	-	0.91	-	0.75	0.03^{NS}
Hay intake (kg DM/day)	21.7^{a}	1.23^{b}	2.02^{a}	1.10^{b}	0.27*
Total feed intake (kg DM/day)	2.17	2.13	2.02	1.85	0.17^{NS}
Substitution rate (kg/kg)	0.94	-	0.92	-	-
Initial live weight (kg)	39.87	39.25	39.63	39.13	-
Weekly weight gain (kg)	19.8	20.7	19.8	19.8	0.02^{NS}
Daily weight gain (kg)	0.22	0.23	0.22	0.22	0.004^{NS}
Total weight gain (kg)	10.92^{b}	11.16^{a}	10.80^{b}	10.80^{b}	0.13*

a, b, c = means in the same row bearing different superscripts differ significantly (P<0.05); *=Significant (P<0.05)
NS = Not Significant (P>0.05)

Live Weight Change

There was significant (P<0.05) difference among treatments for total live weight change. Higher gain was obtained in lablab-supplemented group while a similar gain was obtained in all other groups (Table 5).

The better performance of lablab supplement group was similar to the findings of Umunna *et al.* (1995) who fed oat

hay with lablab hay on voluntary in take of sheep and Ndlovu and Sibanda (1996) who fed dolichos lablab (lablab purpureus) and Acacia tortili's pods to goat. However, daily weight gain of 0.22kg per head per day obtained from this experiment is higher than the 0.13kg per head per day reported by Mubi (2002) when groundnut hay was offered to sheep. Also Kaka (2000) obtained lower result when groundnut hay was offered to sheep. This supplement provides energy and protein, which are critical for the growth rate of sheep. It stimulates growth due to supplies of nitrogen co-factors, minerals and vitamins required by the rumen microbes (Reed *et al*, 1988; Galal *et al.*, 1981). The result of this present study tend to support the contention that supplement provision of supplement when the basal diet is of good quality forage legume has no beneficial effect on growth rate of ruminant (Nyaki, 1981 and Massae, 1984).

Nutrient Digestibility

The result of the nutrient digestibility is shown in Table 4. There was significant difference (P<0.05) in all nutrient digestibility among treatment groups. A range of 58.01 – 70.07% dry matter digestibility was obtained for all the treatment groups. Supplementation with groundnut hay depressed nutrients digestibility when compared to other treatment groups. The digestibility obtained in this study is higher than the values reported by (Minson, 1977; Minson *et al.*, 1981) when sheep were fed lablab forage in Australia. However, Murphy (1998) recorded a higher DM digestibility of 76% when sheep were fed lablab forage in Canada. Work carried out in Maiduguri where sheep were offered groundnut hay with liberal supplementation reported similar dry matter digestibility (Mubi, 2001; Kaka 2000). There were significant differences (P<0.05) among treatment groups in crude fibre digestibility. Crude fibre digestibility of lablab-unsupplemented groups recorded a higher digestibility (73%) than any other treatment groups and lower digestibility (62%) was obtained for groundnut hay supplemented. This difference is as a result of differences in hay intake, which suggest that rams on lablab were able to digest hay more than rams on groundnut hay. This supports the contention of Umunna *et al.*, (1995) who reported that rumen ammonia concentration and fibre digestibility in sheep fed lablab with supplement were improved. However, the results obtained for fibre digestibility in this study are higher than a range of 41-67% reported by Kaka (2000). The difference could be due to nutritional status of the hay used. Ether extract digestibility was in the range of 44.58 – 52.48 for all treatment groups. Ether extract digestibility in animals offered lablab supplement was significantly (P<0.05) higher than those on groundnut hay groups. The differences in digestibility might be attributable to the variation in ether extract of plant components (Van Soest, 1982).

Table 4:Nutrient digestibility of the experimental diet

Nutrients %	Lablab sole	Lablab Suppl.	Groundnut hay sole	Groundnut hay suppl.	SEM
Dry matter digestibility	71.07^{a}	70.51^{a}	67.44^{ab}	58.01^{b}	2.23*
Crude fibre digestibility	73.18^{a}	63.31^{b}	68.85^{ab}	62.06^{b}	3.46*
Crude protein digestibility	66.67^{a}	64.73^{a}	65.05^{a}	56.57^{b}	3.29^{NS}
Ether extract digestibility	52.48^{a}	51.44^{a}	44.58^{b}	44.73^{b}	3.38*

a, b, c = means in the same row bearing different superscripts differ significantly (P<0.05); *=Significant (P<0.05)
NS = Not Significant (P>0.05)

ECONOMIC ANALYSIS

Results of the cost benefits analysis of ran fattening using lablab and groundnut hay with or without supplementation is summarized in Table 5. The results indicated total cost of feed per animal was lowest on lablab-unsupplemented treatment (₦206.70) and highest on groundnut hay unsupplemented (₦4, 545). The mean cost of daily feed intake ranged from ₦2.30 to ₦33.79 for all the experimental diets. Cost of feed per kilogram gain was highest on groundnut hay unsupplemented (₦438.28) and lowest on lablab unsupplemented (₦7.62). Profit margin was higher in lablab-unsupplemented group, followed by lablab-supplemented group, with slight increase on groundnut hay unsupplemented and with supplement. The similarity in total output is because the fattened rams were sold in bulk during Sallah festival. It is not advantageous but has no economic lost during the study.

Table 5: Cost benefit analysis of fattening rams using groundnut or lablab hay with or without supplementation

PARAMETER	Lablab sole	Lablab Suppl.	Groundnut hay sole	Groundnut hay suppl.
Initial body weight (Kg)	39.87	39.25	39.63	39.13
Final body weight (Kg)	67.00	55.00	50.50	48.80
Total feed cost/animal (₦)	206.70	2313.25	4545	3040.65
Feed Cost/head / day (₦)	2.30	25.70	50.50	33.79
Mean Feed Intake / head / day	2.17	2.13	2.02	1.85
Total feed Intake/animal (Kg)	195.30	191.70	181.80	166.50
Total cost of feed per Kg gain	7.62	146.87	438.28	342.80
Initial cost of rams (₦)	31,500	31,500	31,500	31,500
Total input (₦)	32506.70	34613.25	36545.00	35340.00
Total output (₦)	60,000	60,000	60,000	60,000
Profit margin (₦)	27493.30	25386.75	23155.00	24660.00

CONCLUSION

From the results, it clearly shows that animals offered lablab sole and groundnut sole recorded an improved feed intake, live weight gain and nutrient digestibility. Supplementation did not increase the cost of input in formulation of the concentration diet. Therefore, it is imperative that fattening programme with liberal supplementation of concentrate diet to rams on good quality forage has no advantage. The result also shows that supplementation with groundnut hay as basal diet depress nutrient digestibility.

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