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Performance of Sudanese Desert Lambs Fed Graded Levels of Roselle (*Hibiscus sabdariffa*) Seeds Instead of Groundnut Cake

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Abstract: The present study was conducted to evaluate roselle (*Hibiscus sabdariffa*) seed cake as a possible protein supplement for growing lamb in comparison to groundnut cake. Graded proportion of roselle seed (RS) (0, 10, 20%) which replace Groundnut Cake (GNC) were incorporated in three diets iso-caloric, iso-nitrogenous diets for lambs. Diet A contained 0% Roselle seed while diets B and C obtained 10 and 20% roselle seed respectively. Thirty yearling male lambs of Sudan desert sheep ecotype Kabashi with average body weight of 25.2 kg were used for feeding trial. There was a significant ($p<0.05$) linear increase in feed intake with increasing RS level in the diet, but dietary treatments had no significant effect on average daily gain, feed conversion efficiency and final body weight. In spite of that lambs fed diets containing roselle seed were found to be superior over the control group in the previous parameters.

Key words: Performance, sudanese desert lambs, roselle seed

INTRODUCTION

Sheep in the Sudan is about 50.39 million representing 32.51% of the total livestock population which is approximately 155 million heads. In recent years, Sudanese sheep namely Sudan desert type, has receive great interest as an export commodity to the Arab countries. In, 2006 sheep exports is 1422209 heads (Ministry of Animal and Fish Resources, 2007).

Protein and energy comprise a large proportion of the cost of livestock production. Protein is one of the critical nutrients for young growing animals. Cakes obtained from extraction of oil seeds, from the main source of plant proteins for animal feeding. The demand for such a product for local livestock feeding and export results in a continuous escalation of its prices. Therefore, looking for alternative protein source is essential to alleviate these situations of high protein costs.

The logical solution of this problem can be attained by making full use of the available natural resources (Land, water, lab ours etc.) with production of new crops rich in protein as well as the full utilization of agricultural, animal and agro-industrial by-products not yet exploited in animal nutrition.

Oil seeds together with legume seeds are the most promising crops for protein production. Animal and fish products provide about one- third of the total human dietary protein, whereas plant proteins account for 50-75% of the total need (karakoltsidis and constantinides, 1975).

Roselle (*Hibiscus sabdariffa*). Locally known as karkadeh grows successfully as a cash-crop in western Sudan, appears to have a great food value and pharmaceutical potential not fully exploited (karamall's personal communications). Sudan is known to be the world's major supplier of karkadeh.

The crops is grown mainly for production of calyxes and epicalyces, which are used in jams, sauces, jellies, hot and cold bottled drinks and as food coloring material. The seeds which are the matter of interest in this study are just a by-product of the crop. Their total production is increasing steadily, as a result of increased international demand. The seed has a good potentiality as a new source of vegetable oil and protein (Al-wandawi *et al*.,1984). The seeds are characterized by an acid taste which might limit their use in animal nutrition (Ibrahim *et al*., 1971). Few studied were conducted (Salih and Adel Wahab, 1990; Mohammed and Idris, 1991; El-Toum, 1992 and Bakheit, 1993) on the feeding value of roselle seed meal on broiler and layer performance which showed promising results.

The objective of this study is to evaluate roselle seed as a possible protein and energy supplement for growing and finishing lambs, carcass characteristics and meat quality of lambs were also studied.

MATERIALS AND METHODS

Experimental animals: Thirty male lambs of Sudan desert sheep ecotype kabashi, were purchased from El-sheick Abouzaid livestock market in Umdurman. Animals were selected according to their age (9-12 mouths) and weight which was approximately 25.2 kg. They were transported to the livestock Unit, Faculty of Animal production, University of Khartoum, rested, ear tagged and given an adaptation period of two weeks.

Adaptation period: During this period animals were fed sorghum fodder (Abu 70) and a mixture containing equal percentages of the assigned experimental ration *ad-libitum*. The fodder was gradually substituted by rations

mixture during the first 7 days. The ration mixture feeding continued till the end of the adaptation period. Spraying with acaricide solution against ecto-parasites and deworming with Thiabenzole as a drench solution was performed. The Thiabenzole treatment was repeated after 15 days.

Experimental procedure: Immediately after the adaptation period the animals were individually weighed and then divided into three groups of similar number and weight. The three groups were separately penned. Each provided with watering and feeding facilities.

Feeds and feeding: Three iso-caloric, iso-nitrogenous diets containing different levels of roselle seed (A 0%. B 10% and C 20%) were used. The other ingredients were sorghum grain, groundnut cake, wheat bran, groundnut hulls, salt and calcium carbonate. The chemical analysis, ingredient proportion and calculated chemical analysis of roselle seeds and experimental diets are given in Table 1 and 2.

Table 1: Chemical analysis of Karkadeh seed

Composition	Percentage
Crude protein	30.3
Moisture	3.4
Crude fiber	5.1
Fat	11.13
Ash	5.62
Carbohydrate[1]	44.45
Metabolizable Energy (ME)	18.7*

*MJ/Kg DM, [1]calculated according to Ellis (1981)

During the feeding period, animals were fed daily the assigned diets *ad libitum*. The diets were offered in one meal at 8:00 a.m. throughout the study period which extended for 63 days. Green fodder *(Medicago sativa)* was also offered once a week at a rate of one kg/head/week to avoid vitamin A deficiency. Clean water and salt lick were available throughout the experimental period.

Data recorded

Feed intake: Total feed offered and residual for each pen were recorded daily to calculate group and individual feed intake by difference.

Live weight gain: The animals were weighed weekly using a spring balance. The animals were fasted overnight except for water before weighing to reduce the error due to variation in gut fill. The average weekly weight gain of each animal and feed conversion efficiency were calculate

Statistical analysis: Statistical analysis was applied according to Snedecor and Cochran (1980). Least Significant Difference (LSD) was used to differentiate between means.

Table 2: Ingredients proportions and chemical composition of experimental diets

	Diets		
Item	A (control)	B	C
Physical composition (as fed):			
Karkadeh seeds	0	10	20
Sorghum gain	40	32	23
Wheat bran	30	28	20
Groundnut cake	18	10	12
Groundnut hulls	10	13	23
Limestone	1	1	1
Salt	1	1	1
Chemical composition (AM):			
Moisture	3.88	4.73	5.06
Crude protein	19.45	19.55	19.48
Crude fiber	17.3	20.91	25.90
Ether extract	5.32	6.02	6.18
Ash	7.3	8.12	8.18
Calculated metabolizable Energy (MJ/Kg DM)	11.74	11.95	12.29

Metabolizable energy was calculated according to equation cited in Bulletin of Sudanese Animal feed. ME (MJ/Kg DN) = 0.012 CP + 0.031 EE + 0.05 CF + 0.014

RESULTS

Feedlot performance of lambs fed diets containing different levels of roselle: Feedlot performance of experimental lambs are shown in Table 3.

Live weight: The average initial live weight was not significantly different among the treatment groups. Final body weight was also not significantly different among the treatment groups. Group C (20% karkadeh) had the highest final live weight (37.71 kg), group B (10% karkadeh) was intermediate (36.69 kg), whereas group (control) was the lowest (36.04).

Daily live weight gain: Average daily live weight gain was significantly different among the treatment groups. The average daily gain increased linearly as karkadeh seed level increased in the diet. Group C showed the highest daily gain (182.36 g), followed by group B (167.30) and then group A (156.19 g).

Dry matter intake: Feed intake is given in Table 3. Average daily feed intake differed significantly among dietary treatment groups. It increased as the level dietary karkadeh seed increased. Group C consumed significantly ($p<0.05$) more feed than the other two groups.

Feed conversion efficiency: Feed Conversion Efficiency (F.C.E) is also shown in Table 3. The feed conversion efficiency was not significantly different among the treatment group. However, lambs fed diet B had better feed efficiency than the other two groups (A and C).

DISCUSSION

Feedlot performance

Feed intake: It is evident from performance data (Table 3) that feed intake tended to increase significantly

Table 3: Feed-lot performance of lambs fed experimental diets

	Treatment group				
Item	A	B	C	S.E	L.S
Number of animals	10	10	10	-	-
Initial body Weight (kg)	26.25	26.15	26.22	0.32	NS
Final body Weight (kg)	36.25	36.69	37.71	0.87	NS
Feedlot period (days)	63	63	63	-	-
Total live weight gain (kg)	9.84	10.54	11.49	0.69	NS
Daily weight gain (g/head/day)	156.19	167.30	182.36	10.88	NS
Total DMI (kg/head/day)	1.14[b]	1.16[b]	1.35[a]	0.03	*
Feed conversion efficiency (kg DMI/kg gain)	7.52	6.97	7.53	0.41	NS

In this and subsequent Tables:
L.S = Level of significance S.E = Standard error of the treatment means NS = Not significantly different
* = significantly different at 0.05 ** = significantly different at 0.01 *** = significantly different at 0.001
Means with the same superscripts are not significantly different

($p<0.05$) with increasing roselle seed dietary level. This might be due increased crude fiber content of the diet (Table 2). The improved final body weight and average daily gain of lambs fed on diet C (20% karkadeh) over those fed on the other two diets B (10% karkadeh) and A (control) might be explained by the increase in feed intake associated with diet C. There is not reported literature yet in the use of roselle seed or cake for ruminants. The only available data concerned poultry. Salih and Adel Wahab (1990) and Bakheit (1993) reported an increase in feed intake when they fed diets containing roselle seed meal to poultry, however. Mohammed and Idris (1991) found a drop in feed intake in poultry and attributed it to acid taste of roselle seed meal. There varieties in feed intake could be due to differences in species used and to differences in roselle varieties which were reported to differ in their taste of bitterness.

Body gain: The overall live weight gain from an initial weight of about 26.2 kg to a slaughter weight of about 37 kg was not significantly different among the treatment groups. Similarly the average daily live weight gain was not significantly different among the treatment groups, but it tended to increase with increasing roselle seed dietary levels. The improved growth rate in the study was possibly due to increased dry matter intake.

The average daily gain of Sudan desert lambs in this study was superior to that reported in literature by different workers in Sudan who used oil cakes in formulating their feeding diets. El-khidir (1989) reported an average daily gain of 121 and 117 g per day for desert sheep fed molasses urea block plus oil seed cake and concentrate respectively. The average daily gain reported in this study agreed with that reported by Ahmed and Suleiman (1988) and Mansour *et al.* (1988) for Sudan desert sheep fed 10% and 15% blood meal. Sulieman and Amin (1980) and Allam (1987) reported daily gain for Sudan desert sheep of 237 and 215 g per day which was superior to that reported in this study. These differences in daily live weight gain might be due to differences in age and type of diets as well as due to differences of ecotypes of animals used.

Feed conversion efficiency: In this study Sudan desert lambs fed three diets containing 0 , 10. 20% karkadeh seed, ate 7.52, 6.97, 7.53 kg of dry matter of feed to gain 1 kg of live weight respectively. These finding agreed with that of El-khidir (1989) for Sudan desert sheep fed an a high energy diet. These feed conversion efficiently values were lower than the respective values (6.7 and 5.8) reported by Ahmed and Suleiman (1988) for Sudan desert sheep (Shugor ecotype) fed on two rations containing either cotton seed cake or blood meal. Here ration composition differences as well as ecotype differences might be implicated.

Gaili and Ali (1985) reported a feed conversion efficiency of 5.9 for Sudan desert sheep which was superior to those reported in this study. The values obtained in the present study for this parameter indicated that karkadeh seed was utilized to the same extent or even better by growing lambs compared to other protein sources utilized in the previous studies.

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