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Effects of Crushed Roselle Seed (Karkadeh) (*Hibiscus sabdariffa* L.) Fed at Graded Levels to Sudan Desert Sheep

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ABSTRACT

This experiment was conducted to assess the effects of incorporating roselle seed in ruminants feed. Crushed Roselle Seeds (CRS) meal was used at three levels (0, 15 and 25%), in three isocaloric, isonitrogenous diets (A, B and C, respectively). Thirty-six male lambs of Sudan desert sheep (Hamarri ecotype) were selected at average age of 4-5 months and average body weight of 21.8 kg. The lambs were randomly assigned to three treatments (12 animals each), each treatment was further subdivided into three groups of four animals (replicates). The lambs were fed on the experimental rations for 70 days. The study showed significant differences ($p<0.05$) among the different treatments for Average Final Body Weight Gain (AFBG), Average Total Weight Gain (ATG), Average Daily Feed Intake (ADFI) as percentage of live body weight, Feed Conversion Rate (FCR) and cost of 1 kg dry matter intake wihle there were no significant differences ($p>0.05$) among the different treatments for Average Initial Body Weight (AIW), average daily feed intake and Average Daily Weight Gain (ADG). According to the results, roselle seed meal had no adverse effects on ruminant's performance; it maybe used up to 25% in lambs feeding with satisfactory results. In addition, roselle seed meal could be used as a source of protein for growing lambs and fattening of sheep instead of other oil seeds cakes during the dry seasons and the lack of other protein source.

Key words: Lambs, body weight, feed conversion ratio, daily weight gain

INTRODUCTION

Protein and energy comprise a large proportion of the total cost of livestock production, especially during finishing period. Protein is one of the most critical nutrients for young growing animals. Cakes obtained from extraction of oil seeds, form the main source of plant proteins for animals feeding. In the Sudan, in recent years the areas grown by oil seeds crops are greatly reduced, especially cotton, groundnut, sesame and sunflower. At the same time the export of oil seed cakes increased resulting in shortage and sometime increasing price of oil seed cakes. On the other hand, roselle seeds production has been increased during the last years, making the Sudan a world largest exporter of roselle seeds. Therefore, many investigators suggested that roselle seeds maybe used as an alternative for oil seed cakes as a source of protein. Roselle (*Hibiscus sabdariffa*), locally known as Karkadeh, is grown successfully as a cash crop in Western Sudan. This plant appears to have great nutritive value and pharmaceutical potential. The roselle seeds which are the subject matter of interest in this study, are just a by-product of the crop and its total production is increasing steadily, as a result of increased international demand.

The roselle seeds have a good potentiality as a new source of protein and vegetable oil (Al-Wandawi *et al.*, 1984). Many studies were conducted to investigate the feeding value of roselle seeds meal on broiler, layer and sheep (Salih and Abdel-Wahab, 1990; Mohammed and Idris, 1991; El-Toum, 1992; Bakheit, 1993; Beshir, 1996; Agib, 1999). Roselle (*Hibiscus sabdariffa*) is a herb belonging to the malvaceae family and it is cultivated for leaf, fleshy calyx, seed or fibre (Dalziel,1973). Gaya *et al.* (2009) reported a preliminary phytochemical screening of the ethanolic seed extract of (*Hibiscus sabdariffa*) revealed the presence of alkaloids, anthraquinones, steroids, cardiac glycosides, flavonoids and phlobatanins. They reported that, the lactogenic effect of ethanolic seed extract of (*Hibiscus sabdariffa*) was investigated by administering extract and metoclopramide in albino rats. Okasha *et al.* (2008) reported phytochemical (alkaloids, cardiac glycoside, deoxy sugar, flavonoids, steroidal ring and tannin) concentration were moderate, moderate, low, low, high and low respectively when they study the effect of aqueous (*Hibiscus sabdariffa*) seed extract on serum prolactin level of lactating female albino rats. The author postulated that these effects were related to interference by an extract with spermatogenesis that may have been caused by an estrogenic action of the extract.

The results of these studies indicated the high potentiality of roselle seed meal as animal feed. Accordingly, the general objective of this study is to study the effect of feeding different levels of roselle seeds on lambs performance wihle the specific objective is to evaluate the roselle seeds as a protein source.

MATERIALS AND METHODS

Experimental feeds (rations): The experimental rations include three treatments with three different levels of Crushed Roselle Seeds (CRS) (0, 15 and 25%). Feeds contained in addition to crushed roselle seeds other ingredients: groundnut cake, wheat bran, sorghum grain, molasses, bagasses and urea. The formulations of the experimental rations are shown in Table 1.

Table 1: Experimental rations formulation.

	Treatments		
Item	A (0%)	B (15%)	C (25%)
CRS meal level			
Roselle seed crushed	0.00	15.00	25.00
Ground nut cake	15.00	10.00	0.00
Wheat bran	25.00	25.00	25.00
Sorghum grain	30.00	30.00	30.00
Molasses	14.00	11.19	10.65
Baggase	2.00	4.00	4.00
Urea	0.00	0.81	1.35
Oyster shell	2.00	2.00	2.00
NaCl	2.00	2.00	2.00
Total	100.00	100.00	100.00
Experimental rations chemical composition			
DM	96.20	95.70	96.00
Crude protein "C.P"	19.00	18.40	18.80
Crude fiber "C.F"	8.40	9.20	10.00
Ether extract "E.E"	3.60	4.90	5.20
Ash	10.50	11.90	13.90
ME (MJ kg^{-1} DM)	11.60	11.64	11.80

Experimental animals: Thirty-six male lambs of Sudan desert sheep ecotype Hamari were selected according to their age (4-5 months) and their average body weight (21.54 kg). The animals were vaccinated against anthrax and hemorrhagic septicemia. A day after, they were ear tagged, drenched with (ELbenazol-25) against the internal parasites and treated against the external parasites by using acaricides after being cleaned with soap and water, given prophylacting doses of oxytetracycline. The animals were left for two weeks as adaptation period.

Housing: The experimental animals were housed in semi open pens sides of which were made of corrugated steel, bamboo poles and steel bars of about three meters high and the roof was made of zinc sheet. Each pen was provided with water and feed troughs.

Adaptation period: During this period which extended for two weeks experimental animals were fed on groundnut hay and concentrate rations which shown in Table 1.

Experimental procedure: Immediately after the adaptation period the experimental animals were individually weighed by using small ruminants balance (0-50 kg capacity) and randomly divided into three groups (12 animals each), with similar average body weight, then each group was randomly sub divided into three groups of four animals each (replicates) with similar average body weight (21.54 kg). The nine replicates were randomly assigned to the pens.

Feeding management: The rations were manually mixed with molasses, left to dry by air and then packed in labeled sacks (A, B and C). The rations were given to the lambs daily at 8:00 am and the refusal part was collected in the next morning at 7:00 am, weighed and subtracted from the daily offered amount to calculate the actual feed intake. Roughage (groundnut hay) was available *ad libitum,* green fodder (*Cyndon dactylon*) was also offered once a week at rate of one kg/head so, as to avoid vitamin A deficiency. Clean water and salt licks were available throughout the experimental period. The experiment extended for 70 days.

Data collection

Feed intake: The rations were given to the lambs daily every morning at 8:00 am and the refusal part was collected in the next morning at 7:00 am, weighed and subtracted from the daily offered amount to calculate the actual feed intake.

Body weight: The experimental animals were weekly weighed by using small ruminant's balance (0-50 kg capacity), following an over night fasting body weights were used to calculate the daily weight gain and Feed Conversion Rate (FCR).

The chemical analysis: Samples of rations were used to determine the following: DM, ash, CP, crude fat and crude fiber contents.

The statistical analysis: Data was statistically analyzed by Minitab Program using analysis of variance applicable to randomized complete block designs (Steel and Torrie, 1980) and Duncan multiple range tests to detect difference between means (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Table 2 shows averages of initial weight at 4-5 month of age, final body weight (at about 7 months), total weight gain for 70 days, daily feed intake, daily weight gain and feed conversion ratio.

In this study, initial weight at 4-5 month of age was 21.47-21.63 kg. This is lower than the result reported by Mousa (2011) for body weight in Awassi lambs at same age (26.05-30.66 kg) and by Taasoli and Kafilzadeh (2008) who reported 24.6-24.97 kg.

Final body weight (at about 7 months) in this experiment was 35.10-35.83 kg which is lower than the results depicted by Mousa (2011) in Awassi lambs (36.86-40.06 kg) and by Taasoli and Kafilzadeh (2008) who reported 42.46-49.86 kg. This trait showed significant difference ($p<0.05$) among dietary groups. It increased as the level of Karkadeh increased. This agreed with Beshir and Babiker (2009) for desert sheep.

Total weight gain for 70 days was 13.30-14.04 kg. This finding is similar to that reported by Mousa (2011) in Awassi lambs for 90 days (13.48-15.65 kg) but higher than the result reported by Beshir *et al.* (2009) for Sudan desert sheep for 45 days (5.30-8.59 kg) and Beshir and Babiker (2009) for desert sheep (9.84-11.49 kg). Total weight gain differed significantly among treatment groups. It increased as the level of karkadeh increased, the maximum gain attained by group C followed by group B and lastly group A. This pattern of linear relationship is in agreement with Beshir and Babiker (2009).

Daily feed intake was 1.60-1.67 kg which is higher than daily feed intake reported by Mousa (2011) in Awassi lambs (1.123-1.186 kg). Higher than the result reported by Khadem *et al.* (2007) who reported 1.06-1.10 kg, Beshir *et al.* (2009) who reported 0.98-1.26 kg, Beshir and Babiker (2009) who reported 1.14-1.35 kg Taasoli and Kafilzadeh (2008) who reported 0.932-1.030 kg. Daily feed intake among dietary groups exhibit no significant differences ($p<0.05$). Feed intake as % of average live body weigh showed a significant difference ($p<0.05$), among the experimental groups (4.75±0.08, 4.53±0.03 and 4.45±0.03%) for A, B and C treatments, respectively. These results agree with those of Beshir (1996) who found that the daily feed intake decreased with increasing of roselle seed meal. On the other hand, Salih and Abdel-Wahab (1990) and Bakheit, (1993) reported an increase in feed intake in poultry as the level of roselle seed meal increased wihle Mohammed and Idris (1991) found a drop in feed intake in poultry, as the level of roselle seed meal increased and they attributed that to acid taste and to high fat content of roselle seed meal.

Table 2: Feedlot performance values of experimental lambs fed different levels of roselle seed meal for 70 days

	Treatments		
Parameters	A (0%)	B (15%)	C (25%)
Ave. initial body weight (kg)	21.47±0.84	21.63±0.63	21.53±0.42
Ave. final body weight (kg)	35.10±0.10^{b}	35.80±0.11^{a}	35.83±0.08^{a}
Ave. total live weight gain (kg)	13.30±0.23^{b}	14.00±0.12^{a}	14.03±0.43^{a}
Daily feed intake, kg (DM/head/day)	1.67±0.04	1.64±0.02	1.60±0.05
Daily feed, intake, as (%) of live body weight	4.75±0.08^{a}	4.53±0.03^{b}	4. 45±.03^{b}
Daily weight gain (kg/head/day)	0.19±0.01	0.20±0.01	0.20±0.01
Feed conversion rate (kg) DMI/kg gain	8.50±0.19	8.13±0.01	8.17±0.02
Cost of 1 kg DM, (SG)	4.00±0.05^{a}	3.70±0.05^{b}	3.60±0.05^{b}

Values are as Mean±SE (n = 12). Values with different letters in each roe show significant different at p = 0.05

Daily weight gain was 0.19-0.20 kg day^{-1} and this is in agreement with the results reported by by Mousa (2011) in Awassi lambs (0.16-0.186 kg), by Beshir *et al.* (2009) who reported 0.11-0.197, Khadem *et al.* (2007) who found 0.176-0.180 kg, Beshir and Babiker (2009) who found 0.156-.0.182 kg and by Taasoli and Kafilzadeh (2008) who reported 0.199-0.155 kg. This trait showed no significant difference ($p<0.05$) among treatments.

Feed conversion ratio (DMI/K gain) was 8.13-8.17 kg which is higher than the results reported by Beshir and Babiker (2009) who reported 6.53-8.95, Khadem *et al.* (2007) who reported 6.26-6.44, Beshir and Babiker (2009) who reported 6.97-7.53, Mousa (2011) in Awassi lambs (6.53-7.37) and by Taasoli and Kafilzadeh (2008) who reported 4.69-7.52. This trait showed no significant difference ($p<0.05$) among treatments.

In this study the results showed a significant difference ($p<0.05$), among the experimental groups for cost of one kg dry matter. Lambs that received no CRS on their ration tended to have high value of price.

CONCLUSION

The inclusion or the use of C.R.S meal for sheep fattening showed a positive effect on the performance as the highest levels of roselle seed meal resulted in high daily gain and feed conversion rate beside. Thus, roselle seed meal may gain grounds in the future as a supplement or growth promotions for sheep fattening.

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