International Journal of Theoretical & Applied Sciences, **4**(2): 122-127(2012)

ISSN No. (Print) : 0975-1718
ISSN No. (Online) : 2249-3247

Effect of Feeding Treated Groundnut Hulls with Molasses on Performance of Desert Sheep during Late Summer in Arid Rangelands of Western Sudan

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(Received 2 November, 2012, Accepted 23November, 2012)

ABSTRACT: The study was conducted at Ennhood Desert Sheep Research Station, North Kordofan State, Sudan. The experiment have been carried during late dry summer season for a period of 90 days, to evaluate the effect of feeding urea-treated groundnut hulls and molasses on performance of desert sheep lambs belong to Hamari ecotype. About 60 lambs (thirty males + thirty females), five to seven months age and 23.4 kg average live weight were used; divided into three equal groups: A, B and C each. Urea 5% treated groundnut hulls (UTGH) was ensiled for 30 days. Group (A) received 400gm and group (B) received 200 gm UTGH plus 30% molasses; Group (C) free grazing (the control). Live weights gained were determined. **Data were statistically analyzed using analysis of variance pertaining to factorial arrangement by SPSS version 10.05-computer program. The total body and daily weight gains were significantly ($p<0.001$) different between feeding groups. Males had significantly ($p<0.05$) higher daily weight gain and body weight than females. Feeding supplementation of urea-treated groundnut hull and molasses to grazing desert lambs is efficient for maintenance purposes. More studies are needed to confirm the effects of inclusion of urea-treated groundnut hull and molasses as basal feed on growth characteristics of desert sheep lambs.**

Keywords: Treated groundnut hulls, molasses, desert sheep, arid rangeland

I. INTRODUCTION

Sudan is characterized by vast areas of range and arable land which is either rain-fed or irrigated. The country has a large population of livestock estimated to be around 100 million heads [1]. Over 60% of the estimated figure of sheep of the Sudan is desert sheep which is well known for production of good quality meat for local consumption and export.

The desert sheep are distributed north of latitude 10^0, extending eastward into Eritria and westward into Chad [2]. Desert sheep of the Sudan comprises seven sub-types, namely Kabashi, Hamari, Meidob, Beja, Butana, Gezira and Watish (Mcleory, 1961[3]). The desert sheep is raised mainly under extensive nomadic conditions depending on natural grazing. Fattening of sheep is rarely practiced. Feed resources available in Kordofan states are mixture of Thorny trees, herbs, grasses, agricultural residues (Groundnut hay, sesame stalk and sorghum straw) and agro-industrial by-products (oil seed cakes, groundnut hulls and wheat bran [4].

During the rainy season range pastures supply adequate feed for free grazing animal and provide satisfactory levels of production, but during the long dry season, pasture dries up and the available herbage can't satisfy the maintenance requirements of the livestock; thus reflected in heavy losses of body weight, reduced productivity, decrease lambing rates and increase in mortality rates. The solution of this problem is supplementation of the available hay to maintain survival of the animals. Oil seed cakes and cereal grains can be efficiently used as feed stuff but they are expensive.

Research results clearly demonstrated that there are huge amounts of agricultural and agro-industrial by-products e.g. sorghum straw, groundnut haulm and hulls, wheat bran, bagasse and molasses, that could be efficiently utilized in feeding ruminants contributing up to 11%of the total requirements of the animal unit [5].

In North Kodofan State, groundnut is grown by most of the villagers and sold as cash crop. The expanding milling industry in this region offers large amounts of groundnut hulls, in general it's a poor quality feed stuff, crude protein and energy are 5.7 and 7.3 M J/sKg, respectively [6].

The biological treatment of the groundnut hulls, through ensilage seems to be the best treatment method under condition of the Sudan [7].

The overall objective of this work was to utilize the huge amounts of agro-industrial by-products mainly groundnut hulls as a supplemental feed during dry summer season to improve productivity and reduce the mortality rates of lambs (Hammari sheep) in North Kordofan State.

The specific objectives of the study were:

1. To improve the nutritive value of ground nut hulls by pretreatment with urea and ensilage to formulate a cheap ration
2. To evaluate the effect of feeding urea-treated groundnut hulls and molasses on animal performance

II. MATERIALS AND METHODS

Study area

Location

This study was conducted at Elnuhood Desert Sheep Research Station, 12 kilometers East of Elnuhood town, Elnuhood Locality, North Kordofan State, Sudan. Elnuhood Location lies between latitudes 12-14^{O} north and longitudes 27-30^{0} east, about 800 meters west of Khartoum.

Climate

The area is located within the poor Savannah belt. The climate is warm in wet season, hot dry in summer and cool dry in winter. The rainy season is about four months (mostly from July to October), peaking at August and the annual average rainfall is between 300-400 mm [8].

Topography and vegetation

The soil is generally of smooth undulating sandy plain (Goz) dissected by batches of loamy sand (Gardood or Gurraba) in the southern part. The dominant vegetation is a mixture of thorny trees, shrubs, herbs, and grasses. The *Acacia* trees are dominant in the area where *Acacia senegal* (Hashab) is the most important type from economic point of view, for it produces Gum Arabic which is considered as the best cash crop, *Acacia nilotica* (Sunot), *Acacia nubica* (Laot), *Boscia senegalensis* (Mokhait), *Sclerocarya birrea* (Hummaid), *Guira sengegalensis* (Gubaish), *Albezzia amara* (Arad), *Terminalia browni* (Daroat) and *Combretum cordofanum* (Habiel) are also available.

Grasses include *Dactyloctinium aegyptiun* (Abu-Asabi), *Cenchrus biflorus* (Haskaneet), *Echnochloa colonum* (Difra), *Eragrostis tremula* (Banu), *Andropogon gayanus* (Abu Rakhies), *Zornia glockidata* (Shiline), and *Ipomea cordiosepala* (Tabar), as described by Yehia [4].

Farming system

Crop production in the area

The main crops produced are millet, sorghum, Karkady, watermelons and groundnut. The latter is the main cash crop that produces large amount of groundnut hay and hulls which could be used in large scales for feeding animals.

Animal production

There is a good potential for animal production in North Kordofan State due to the presence of vast natural pastures and agricultural residues and by-products. Ennhood Locality is famous for raising desert sheep especially Hammari subtype, this subtype is the best meat producer for local consumption and export. Estimated sheep population in North Kordofan State is 7.083 million heads [1] of which 2.12 millions are found in Ennhood Locality [9]. Sheep are herded in flocks of 200-300 heads, most females raised as breeding replacement and breeding rams are usually selected with great care with major emphasis on size, confirmation, color and the milk production of dam [10]. The breeding season is regulated to start in February up to March and the lambing is usually expected during the rainy season (July – September) when forages are plentiful [10]. The flocks are usually graze up to mid-day when they come back to nurse lambs, rest and then graze again up to sunset, Livestock and Agricultural Development Co. [11].

During the dry season there are two grazing periods a day. The first grazing period in the early morning and the second in the evening and the latter may extend to midnight. Animals rest during the hot hours of the day. Lambs may be herded alone or sometimes left to run with their dams until evening.

Sheep watering frequency is 3-5days during the dry season and 7-10 days during the wet and cold seasons. Wells and ground tanks are the main water sources during the dry season. Water melon is also commonly used as water source in the dry season.

Grazing animals usually pass through periods of body weight loss due to seasonal variation in pasture quality and quantity. Furthermore, large range areas may be burnt during the dry season causing serious feed shortage and poor nutrition. Therefore, feed may be considered an important limiting factor to sheep production in these areas [11].

Experiment

The experiment was conducted at the Station of Desert Sheep Research, Elnuhood, North Kordofan State, Sudan.

Feeds and Feeding

The ingredients of the experimental diets were given in Table 1 and the chemical compositions were shown in Table 2.

Table 1. Ingredients of the experimental diets.

Ingredient Groups	U T G H gm	Molasses gm
Group (A)	400	120
Group (B)	200	60
Group (C) control	-	-

U T G H: urea-treated groundnut hull

Table 2. Chemical compositions of the experimental diets.

Chemical analysis (% of DM) Feeds	DM	CP	CF	EE	Ash
Untreated groundnut hull	95.1	5.45	61.1	1.23	12.37
Urea- treated groundnut hull	88.6	16.31	55.2	1.88	10.25
Molasses	74.4	3.1	-	-	-

Ensilage procedure

Two tons of crushed groundnut hulls were bought from miller in Elnuhood town as well as two sacks (100kg) of urea purchased from the market.

A pit of 4×2×1 meters length, width and depth was dug and lined by plastic sheet. Urea was dissolved in water and added to the crushed groundnut hulls in a percentage of 5%. The ensiled material was manually compressed layer by layer and covered by plastic sheet and 20 centimeters layer of soil.

After 30 days the silo was opened and the needed quantity of the silage was exposed to the sunlight so as to reduce the moisture and finally the silage is ready for consumption by animals.

Experimental animals

Sixty Sudanese desert lambs Hammri, thirty males and thirty females, of equal ages and weights with average 6 months and 23.4 kg respectively were used in this study. The lambs were selected from the herd owned by the Station of Desert Sheep Research, Elnuhood. The lambs were given experimental diet for adaptation period for fifteen days, during this period the animals were treated with Ivomec drench against external and internal parasites, dipped in diluted cypermethrine and provided with salt lick plus vitamins (VITADIN). At the end of the adaptation period the animals were individually weighed after an overnight fasting to give the initial weights.

The lambs were divided randomly into three feeding system groups of twenty lambs (10 males+10 females) for each. The lambs were identified and ear-tagged. All the animals were kept in the same area and grazed together in the yard of the Station during the whole night and apart of the day, at 10:00 o'clock a.m. the lambs were kept in shades for rest and lunching of experimental animals, they were set to graze at 6:00 o'clock p.m. Group (A) was fed 400gm silage +30% molasses, group (B) was fed 200gm silage +30%molasess and group (C) grazed the natural pasture and considered as the control. The experiment continued for 90 days in dry season (March- May 2010).

Data recording

Live weight data

Live weights of the lambs were recorded every week in the morning after an overnight fast except for water to minimize error due to variation in gut fills. A spring balance of maximum load 50kg was used. The weight gain of the live animal is obtained by subtracting the initial body weight from the final body weight. A completely randomized block design of (3 × 2) factorial arrangement was used in the study. Data were statistically analyzed using analysis of variance pertaining to factorial arrangement by SPSS version 10.05-computer program.

III. RESULTS

Feedlot performance

The health of the animals was generally good and no mortality was recorded.

Live body weights

The effects of three different dietary groups on feedlot performance and live weight gain of the experimental lambs are shown in Table 3 and Table 4. The average initial body weights were 25.13, 24.78 and 24.99 kg for group A, B and C, respectively. These weights were not significantly different among dietary groups. Within the sex also they are not significantly different; their values were 25.65 and 24.27 kg for male and female. Average final body weights were 27.41, 26.24 and 25.45 kg for group A, B and C respectively, they were not significantly different among feeding groups. Group A has the highest weight followed by group B, and group C recorded the lowest weight. But within sexes they were significantly different ($P < 0.05$), male weight 27.40 kg was higher than that of females 25.33 kg.

Table 3. Effect of feeding urea-treated groundnut hulls and molasses on body weight.

Parameter	Feeding treatments Mean ± SE			LS
	A	B	C	
Feedlot period (days)	90	90	90	-
Number of animals	20	20	20	-
Initial Live Wt. (kg)	25.13±0.74	24.76± 0.74	24.99± 0.74	NS
Final Live Wt. (kg)	27.41± 0.77	26.24± 0.77	25.45±0.77	NS
Daily gain (gm)	25.42± 2.43^{a}	16.39± 2.43^{b}	5.14± 2.43^{c}	***
Total body gain (kg)	2.29±0.22 ^{a}	1.48±0.22 ^{b}	0.46± 0.22 ^{c}	***

SE: standard error, LS: Least significance
NS: Not Significant ***: significant at ($p<0.001$)
a,b: Mean within the same column followed by different superscripts are significantly ($P<0.05$) different.

Table 4. Effect of sex on performance of desert sheep (Hammari) lambs.

Parameter	Sex Mean ± SE		LS
	Male	Female	
Initial Live Wt. (kg)	25.65±0.6	24.27±0.57	NS
Final live Wt. (kg)	27.40±0.6	25.33±0.57	*
Daily gain (gm)	19.44±1.98	11.85±1.98	**
Total body gain (kg)	1.75±0.18	1.07±0.18	**

SE: standard error, LS: Least significance, NS: Not Significant
*: significant at (P<0.05) **: significant at (P<0.01

The total weight gains were significantly different (P < 0.001) for dietary groups, 2.29, 1.48 and 0.46 kg for groups A, B and C, respectively. Among sexes total weight gains were significantly different (P < 0.01). Males gained 1.75 kg and female gained 1.07 kg. Daily weight gains of the dietary groups A, B and C were 25.42, 16.39 and 5.14 gm, respectively; they were significantly (P < 0.001) higher in group A followed by group B then group C. For sexes daily weight gains were significantly different (P < 0.01) males 19.44 gm recorded the highest weights than females 11.85 gm.

IV. DISCUSSION

Growth performance and live weight gain of desert lambs

Table (3) and Table (4) showed the live weights, the average initial body weights were 25.13, 24.76 and 24.99 kg respectively for the three feeding groups A, B and C. For sex groups they were 25.65 kg for males and 24.27 kg for females. These weights were not significantly different (p>0.05). This will allow a fair comparison between feeding groups and also between sex groups. The average final weights gain were not significantly (p>0.05) different between feeding groups , animals in group A(27.41 kg) had higher gain than animals in group B (26.24 kg) and group C (25.45 kg). This result is in agreement with Bashir [12] who found that, the final body weights were no significantly different between feeding groups of lambs. The present results indicated that this parameter increases as the quantity of the treated groundnut hull and molasses increase. Among sex groups males (27.40 kg) had significantly (p<0.05) higher final weights than females, the present finding is in agreement with Mc Laugherty *et al*., [13]) who reported that young lambs grew rapidly but rams grew more faster (p<0.05) than ewes and withers, the finding also in line with Mohamed [10] who found that, the final live weight was significantly (p<0.05) greater for rams than for ewe lambs.

The average total weight gains were highly significantly (p<0.001) different between feeding groups and the recorded values were 2.29, 1.48 and 0.46 kg for animals in group A, B and C, respectively. Similar finding was reported by Nour [14] who found that, addition of nitrogen increased feed consumption as well as rate of weight gain and this suggested that the superiority of the traditional ration used in Sudan on the rate of weight gain and protein content. Also the present result is in line with Alverz and Combelles [15] who reported that, supplementations grazing ruminant with nitrogen source would increase rate of fermentation and digestion, enhance feed consumption and microbial protein yield. Among sex groups the average total weight gains in males had significant (p<0.01) higher total weight gains than in females.

The average daily weight gains between feeding groups were highly significantly (p<0.001) different, their values were 25.42, 16.39 gm and 5.14 gm for animals in group A, B and C, respectively. This result is in agreement with the finding of Mohamed [10] who found that, the final live weight was significantly (p<0.05) greater for rams than ewe lambs. This result is lower than that reported by Nour [14] who found a daily gain of 46.3 gm for desert lamb fed treated groundnut hull. This may be due to the fact that he used a true protein source e.g. groundnut cake. Among sexes the average daily weight gains of male (19.44 gm) had significantly (p<0.01) heavier weights than females (11.85 gm). This finding is in agreement with Macit *et al*., [16] who found that the sex of lamb had a highly significantly (p<0.01) effect on daily weight gain. Male lambs were significantly (p<0.01) heavier than female lambs.

V. RECOMMENDATIONS

-Supplementation of urea-treated groundnut hull and molasses to grazing desert lambs is efficient for maintenance purposes. More studies, however, are needed to confirm the effects of inclusion of urea-treated groundnut hull and molasses as basal feed on growth and carcass characteristics of desert sheep lambs.

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