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The Effects of Feeding Acacia tortilis Pods and Groundnut Cake on Lambs' Performance under Range Conditions in North Kordofan State, Sudan.

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ABSTRACT : This study was conducted in north Kordofan State, Sudan during the dry season with the objectives of studying the effects of supplementary feeding of Acacia tortilis (seal) pods on growth, body measurements and some hematological metabolites and minerals of newly weaned ewe lambs. Sixty ewe lambs of desert sheep were used in this trial, lambs were grouped into three groups, one group was left on natural grazing (NG) as a control; the second was supplemented with groundnut cake (NG+GNSC) 250 g/head/ day, while the third group was supplemented with seyal pods (NG+SP) 250g/head/ day. Water was provided once every two days. Body weight and body measurements were taken at the beginning of experiment and then monthly during the dry season, monthly blood samples were collected for packed cell volume (PCV), hemoglobin (Hb), blood glucose, total protein, Calcium (Ca) and phosphorus analysis. The results of the study indicated that, body weight of ewe lambs were higher supplemented group with seyal pods and to 33.62kg for those supplemented with groundnut seed cake. Body length also increased significantly on NG+GNSC and NG+SP. No significant differences among the three groups of animals on heart girth. Furthermore, no differences were found in blood parameters, but it was observed that Hb concentration had relatively decreased in all animals. The results of this study clearly indicated that seyal pods could be used as a supplement for growing ewe lambs and results obtained were comparable to that of using groundnut cake.
Keywords: Acacia tortilis pods, groundnut Cake, lambs' performance, North Kordofan State, Sudan.

INTRODUCTION

Sudan desert sheep and their crosses make about 80 % of the sheep population in Sudan and mainly predominant north of 12º N (Devendra and Mcleroy 1982), Sheep population was estimated at 48.1 million heads at an annual growth of about 3% (MFEP, 2005), they are raised mainly under harsh dry land farming conditions for meat production (Khalafalla and Sulieman 1992). El Hag et al., (1998) reported that, the nutritional limitation, low nutritive value of the range, high ambient temperature, scarcity of feed and water are have great effect on the production of the sheep in semi arid area of Kordofan state as compared to that in temperate regions. One of the major constraints under rangelands conditions is the unavailability of nutritious grazing resources on a year-round basis, where animals face a prolonged dry season (February-June). This is reflected on seasonality of production, high mortality rates in both young and mature animal and low reproductive performance (El-Hag et al., 1998). The situation is further aggravated by the dominance of annuals (90% of the vegetation) and the disappearance of legumes and perennials (El Wakeel, 1993). Normally farmers provide their animals with different supplements during critical time of feed shortage. Supplements used are mainly oilseed cakes and cereal grains. However, the area is rich with trees and shrubs where pods and foliage could be used as feeds. Acacia tortilis (Seyal) produces large amounts of pods consumable by sheep but no studies have been carried out to evaluate its effects on sheep performance. This study was conducted with an overall objective of studying the effects of supplementing seyal pods to ewe lambs during the dry season. The objective of this study were to study the effects of feeding Acacia tortilis pods on ewe lambs production, and to evaluate the effects of feeding seyal pods on haematological indices , some blood metabolites and minerals .

MATERIAL AND METHODS

The Study Area

This study was conducted in Sheikan locality, North Kordofan State (latitude 11^{o}:15' to 16^{o}:30'N and longitude 27 to32^{o}E), Sudan. Most of north Kordofan lies within arid and semiarid agro-climatic zones, an annual rainfall ranges from 0-75 mm in the north and 500 mm in the south. The dominant over storey vegetation is Acacia tortilis, Acacia senegal, Balanites aegyptiaca, Cadaba farinose, Acacia nubica and Acacia nilotica. The dominant under storey vegetation is Cenchus bilforus, Alysicarpus monifera and Ipomea spp.

Treatment and Experimental animals

(Acacia tortilis) pods were collected from the seyal trees within the study area at full maturity stage and analyzed prior to experimentation. The supplement was coarsely ground. GNSC was produced every year as result of oil extraction factories within and around El-Obeid town from both mechanical and traditional oil pressers. The product has high market value for it is conversional use and inclusion into feedlots rations for sheep and cattle, and in poultry feeds.

Sixty ewe lambs of desert sheep were used in this trial. Average initial body weight was 23.8 kg (20.6-27.0 kg) at age of six months at the beginning of the experiment. The ewe lambs were grouped into three, each with twenty animals, each of the three groups were randomly assigned to one feed treatment. Lamb group was left on natural grazing (NG) as a control; the second was supplemented with groundnut cake (NG+GNSC) 250 g/head/ day, while the third group was supplemented with seyal pods (NG+SP) 250g/head/ day. The supplements were offered daily at 7:00, before grazing time. Water was provided once every two days.

Data Collection

Body weight, body length and heart girth, were taken monthly during the dry season. Blood samples were collected from the jugular vein at the beginning of the experiment and then monthly until the end of the trial, while blood samples collected for (for packed cell volume (PCV), hemoglobin (Hb), blood glucose, total protein, Calcium (Ca) and phosphorus. PCV was determined using microhaematocrit method (Thomas, 1980). Blood Hb was measured by spectrophotometer (Gorsby et al., 1954), glucose was measured according to GOD-PAP enzymatic method (Tinder, 1969). Atomic absorption spectrophotometer method was used for determination of organic phosphorus and Calcium (Henry and Winkelman, 1974). A proximate analysis was down for feed Samples according to (AOAC, 1990).

Statistical analysis

The data analyzed according to Steel and Torrie (1980). Simple correlation coefficients were also computed among the different performance parameters (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The chemical composition of the natural range grasses and supplements is shown in Table (1). Seyal pods had the highest organic matter content followed by groundnut cake and the lowest organic matter content was found for natural grasses. Groundnut cake had higher crude protein (CP) followed by seyal pods and lastly natural grasses, also groundnut cake had the higher metabolizable energy, followed by seyal pods and natural grasses. Grasses had higher crude fiber (CF). In vitro dry matter (IVDMD) of groundnut cake was higher and followed by seyal pods and natural grasses recorded less IVDMD. Organic matter (IVOMD) digestibility coefficients of Natural Grasses were lowest value than groundnut cake and seyal pods.

Nutrients contained (g) in 250 g of each supplement are shown in Table (2). GNSC supplement provided more than three times CP and almost double EE compared to seyal pods. Seyal pods supplement, on the other hand, provided 3.5 times CF and 1.6 times NFE that of GNSC. However, the ash contents provided by both supplements were almost similar (Table2).

One of the most important constraints to livestock production under rangeland conditions is the unavailability of nutritious grazing on a year-round basis (Cook and Fadlalla, 1987; El-Hag, 1992). The situation is particularly critical during the long dry season that extends from February to June. Rangelands grasses quality drops sharply during this time of the year as shown in table1. Protein is most affected nutrient (Van Soest, 1982) and reaches low levels (below 6%) that cannot sustain normal rumen microbial function (McDonald et al., 2006). One of the major causes for low levels of protein in natural rangelands under tropical conditions is the dominance of annual grasses (> 90%) and absence of perennials (El Wakeel and Abu Sabah, 1993). This is reflected in that

ruminant animals raised on such rangelands do not ingest sufficient nutrients necessary for good performance. It is therefore, imperative, that other feed sources like cakes and tree pods should be used to supplement the deficient nutrients. El-Hag et al., 1998 pointed to the need for provision of good quality supplements to weaned lambs to improve growth in free grazing sheep. Supplements used in this study have higher nutrient contents (Table 1) and higher digestibility coefficients (Table 2) compared with the natural grass stand during the dry season.

Table 1. Chemical composition (%DM-basis) and in vitro digestibility coefficients (%) of the supplements and natural grasses.

Item	Groundnut cake	Seyal Pods	Natural Grasses	SE±
Chemical composition (%DM-basis)				
Dry matter (DM)	95.9	97.6	99.5	3.50^{ns}
Organic matter (OM)	89.1	91.0	86.0	3.36^{ns}
Crude protein (CP)	44.0^{a}	11.6^{b}	1.3^{c}	1.69**
Crude fiber (CF)	6.4^{a}	22.6^{b}	36.8^{c}	1.65*
Nitrogen free extract (NFE)	32.4^{a}	54.1b	45.9^{b}	2.35*
Ether extract (EE)	6.3^{a}	$2.7a^{b}$	2.0^{b}	0.68*
Ash	6.8^{b}	6.6^{b}	13.5^{a}	1.06*
ME (MJ/kg DM)	11.03^{a}	9.19^{ab}	8.68^{b}	0.78*
Digestibility Coefficients (%)				
IVDMD	66.85^{a}	56.20^{b}	39.60^{c}	3.78*
IVOMD	54.59^{a}	55.49^{a}	47.81^{b}	2.60**

^{a,b,c} means in the same row with no letter in the common as significantly different

Table 2. Nutrients offered in supplements (g/250g)

Nutrient	Groundnut cake	Seyal pods
Dry matter (DM)	239.75	224.00
Organic matter (OM)	222.75	227.50
Crude protein (CP)	110.00	29.00
Crude fiber (CF)	16.00	56.50
Nitrogen free extractives (NFE)	81.00	135.25
Ether extract (EE)	15.75	6.75
Ash	17.00	16.50
ME (MJ)	2.76	2.30

Ewe Lambs Weight

Supplementation of ewe lambs with GNSC and Seyal pods had significantly ($P<0.01$) affected on daily weight gains (Table 3). Final ewe lamb weights fed with GNSC recorded higher weight, and ewes on control group recorded less weight, this result agree with ranged Lutfi (1985).

Supplemented ewe lambs had higher growth than that of the free grazing ones at the end of the experimental period. A very high daily growth rate of 0.238 kg/day was reported by Sulieman (1976) for Desert lambs weaned at 16 weeks of age and managed under supplementary feeding on a diet composed of sorghum grains + cotton seed cake + wheat bran + Medicago sativa. A comparable weight gain of 0.084 kg/day was reported by Sulieman et al., (1990). In contrast, a higher daily weight gain of 170 g was reported by Osman (1985), whereas Lutfi (1985) found a daily weight gain in desert sheep lambs at weaning of 152g/day. However, a lower weight of 19.2 kg resulted in lambs given a 16% crude protein concentrate diet at a rate of 0.5 kg/head/day (Rastogi, 2001).

Ewe lambs body measurements

Table 4 showed that, heart girth was higher in animals supplemented with groundnut cake and Seyal pods compared with those on natural grazing, ewe lambs supplemented with groundnut cake had the highest body length, followed by those on Seyal pods, whereas those on natural grazing recorded the lowest value.

Table 3. Effects of supplementation with Seyal pods and GNSC on ewe lambs body weight.

Parameter	Groundnut cake	Seyal Pods	Natural Grasses	SE±
No. of animals	20	20	20	
Days on test	150	150	150	
Weight and Weight Change (kg)				
Average initial body weight	23.2	23.5	25.0	0.98^{ns}
Average final body weight	33.6^{a}	32.8^{b}	29.2^{b}	0.99**
Average change in weight	10.1^{a}	9.6^{b}	4.2^{b}	0.38**
Average daily weight change	0.084^{a}	0.080^{b}	0.035^{b}	0.0128**

^{a,b,c} means in the same row with no letter in the common as significantly different . ns = not significant.

Final body length of ewe lambs on natural grazing, supplemented with ground nut cake and other group supplemented with seyal pods were 67.20, 70.60 and 69.10 cm, respectively Table (4). These results were in line with Mansour et al., (1992), and Suleiman et al., (1990). Supplementary feeding of ewe lambs seemed to exert no effect (P>0.05) on body measurements (Table 4), indicating that body measurements have minimal incremental increase compared to weight gain (Owen, 1975). Similarly, Sulieman et al. (1990) observed that heart girth was the most variable live measurement since it reflects condition in the animal, whereas chest depth, body length and height at withers are skeletal measurements and are less variable than heart girth.

Table 4. Effects of supplementation with seyal pods and GNSC on ewe lambs body measurements

Item	Groundnut cake	Seyal Pods	Natural Grasses	SE±
Body Measurements (cm)				
Initial heart girth	68.40	67.20	66.55	0.348 ^{ns}
Final heart girth	71.45	71.00	70.05	0.51^{ns}
Total change in heart girth	8.04	5.28	5.19	1.65^{ns}
Daily change in heart girth	0.054	0.035	0.035	0.011^{ns}
Initial body length	64.85	64.25	63.60	0.550^{ns}
Final body length	70.60^{a}	69.10^{ab}	67.20^{b}	0.750**
Total change in body length	3.88	3.78	3.68	0.560**
Daily change in body length	0.026	0.025	0.024	0.0037

^{a,b,c} means in the same row with no letter in the common as significantly different . ns = not significant.

Ewe Lambs Hematological Indices and Some Blood Metabolites

Hematological indices and some blood metabolites are shown in Table (5). PCV%, total blood protein and plasma phosphorus were not differing among the three ewes lamb groups. However.PCV, plasma calcium and blood glucose were significantly difference among the three ewes lamb groups, blood glucose and plasma calcium levels were relatively highest for groundnut lambs and relatively lowest for those on control (natural grazing).

Supplementary feeding of ewe lambs had no significant effect (P>0.05) on hematological indices and blood metabolites studied (Table 5). Singh and Shinde (1997) studying metabolic profiles in lactating goats, found that blood glucose and total protein had increased with increasing protein supplementation. In contrast, Payne and Payne (1987) stated that metabolic profile tests were less helpful in monitoring purely nutritional status.

Table 5. Effects of supplementation on some hematological indices and some blood metabolites of ewe lambs

Parameter	Groundnut cake	Seyal pods	Natural grazing	SE±
Hematological indices				
Packed cell volume (PCV %)				
Initial value	38.٦٤	38.٦٤	38.٦٤	1.81 ^{ns}
Final value	34.51 ^{a}	33.38 ^{a}	24.16 ^{b}	3.72
Haemoglobin (Hb, mg/dl)				
Initial value	11.87	11.87	11.87	1.51^{ns}
Final value	10.76^{a}	10.10^{a}	7.20^{b}	1.06*
Blood metabolites:				
Total blood protein (mg/dl)				
Initial value	8.5	8.5	8.5	0.80^{ns}
Final value	9.0 ^{a}	6.14 ^{b}	5.61 ^{c}	1.58^{ns}
Blood glucose (mg/dl)				
Initial value	38.26	38.26	38.26	5.81^{ns}
Final value	43.04 ^{a}	33.04 ^{b}	23.98 ^{c}	11.98
Plasma minerals levels:				
Plasma phosphorus (mg/100 ml)				
Initial value	5.37	5.37	5.37	0.50 ^{ns}
Final value	5.78	4.42	3.65	1.05 ^{ns}
Plasma calcium levels (%)				
Initial value	10.02	10.02	10.02	0.48 ^{ns}
Final value	6.65	5.94	3.25	1.24 ^{ns}

^{ns} = not significant (P > 0.05), * = significant (P < 0.05).

CONCLUSIONS

THE RESULTS INDICATED THAT

Ground nut cake and tree pods provide good quality feed resources that can bridge the protein deficiency during the long dry season in North Kordofan and similar areas, also Supplementary feeding of ewe lambs resulted in higher body weight and weight gain.

Early weaning (3-4 months of age) and supplementation with good quality supplements will improve growth and consequently lead to earlier entry in the production process.

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