

Research Article

EFFECTS OF SUPPLEMENTATION OF DESERT BUCKS ON NATURAL GRAZING WITH BLEPHARIS LINARIIFOLIA PODS ON FEED INTAKE AND PERFORMANCE

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ABSTRACT

This study was conducted with the objective of studying the effects of replacement of sorghum grains with *Blepharis linariifolia* pods in rations on dry matter intake, nutrients digestibility and weight change of Desert bucks. Eighteen un-castrated bucks at six to seven months of age and average weight of 11.250+0.300kg were used in the trial. The animals were divided into three equal groups. They were vaccinated against epidemic diseases in the region and were drenched with anthelmintic (ivermectin) for internal and external parasites control. They were also ear tagged to facilitate identification during the treatments. Two rations were formulated using either sorghum grains or *Blepharis linariifolia* pods at 20% together with, 20% groundnut seed cake 10% molasses, 5% limestone and 14% groundnut shells, 1% salt and 30% wheat bran. The third group was fed on natural grazing only with water provided continuously. The feed intake was estimated daily until the end of the trial period. Then the animals were weighed at the start of the experiment and once a week until the end of the experiment. The experimental feed was analyzed via proximate analysis (AOAC, 2010). In vitro dry matter and the organic matter digestibility was determined according to Telly and Terrie (1967). The experimental design was a complete randomized design and data was analyzed via analysis of variance and the differences among treatment means were detected via LSD test. The results showed that the dry matter intake was significantly higher in group (I) that was on a ration formulated using sorghum grains than the group (II) that was supplemented with a ration where grains were replaced by *Blepharis linariifolia* pods and finally those on the natural pasture only (III). The results showed that the in vitro dry matter and organic matter digestibility was significantly higher in group (II) that was supplemented with a ration containing 20% *Blepharis linariifolia* pods followed by group (I) on the concentrated ration with 20% sorghum grains and finally those on the natural pasture only (III). The weight gains were higher in the group that was supplemented with a ration containing 20% *Blepharis linariifolia* pods followed by those which were supplemented with sorghum grains ration and lastly those on the natural grazing. The study concluded that it is possible to fatten and feed the Desert goats using *Blepharis linariifolia* pods instead of sorghum grains in the rations. It recommended that more research be conducted in understanding the effect of replacement of sorghum grains with *Blepharis linariifolia* pods on the characteristics of meat and carcass characteristics.

Keywords: Desert goats, Nutrition, sorghum grains, *Blepharis linariifolia*.

INTRODUCTION

The livestock sector plays a critical role in the Sudanese economy and in the welfare of the whole population. It yields a flow of essential food, brings in a large amount of foreign exchange from export earnings, is a major means of transport, produces draught power in support of crop production and processing, provides dung for fertilizer and fuel and creates employment. For all these reasons and especially from the equity and livelihood perspective it is an important, indeed a major, component of poverty alleviation (Wilson, 2018). Nutrition is one of the factors on which animal breeders in general and goats in particular rely for making profits where nutrition constitutes more than 70% of the production cost in different production systems (Rashid, 2008). Good feed is the source of nutrients necessary for building the body's tissues and the formation of its products such as meat, milk and hair and compensating for demolition in addition to that it helps to overcome many diseases that cause great loss and reduce production (Rashid, 2008). The scientific development in the field of animal production during the second half of the last century led to the transformation of agriculture from a single type of livelihood to becoming a large stand-alone industry dependent on many biological sciences such as nutrition, genetics,

physiology and the control of various diseases (El Hag *et al.*, 2010). This agricultural industry had the greatest impact in raising productivity, both plant and animal, and this industry moved to the field of reliance on raising several heads of animals on the farm living on the margins of agriculture and farm waste to intensive production operations, and the numbers raised by the farmer or fattened increased to several thousand (Mohammad Mujanur *et al.*, 2015). The reason for this transformation was the availability of information and scientific bases for the producers and their knowledge of modern scientific economic methods. For example, in feeding isolates, they have the ability to select and choose rich feed in terms of quality and nutritional value. They usually choose the parts with high nutritional value from the leaves rich in protein and soft organic matter that can walk considerable distances. Adaptation to rugged areas, and there are many strains that can live in arid mountainous or desert areas, adapted to harsh environmental conditions, and they can graze shrubs and trees at a height of 1-2 meters. Producers are faced with the high prices of the inputs used in the preparation of rations; some of these inputs are competed by humans and animals, such as food grains. Natural pastures are considered a low-cost source, not only in the provision of full fodder, but some plant seeds that can be an alternative to food grains and gain background (Rashid, 2008)

Research problem

The high prices of concentrated feed in Sudan requires seeking and searching for cheap sources that are locally available and capable of

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providing the animal's requirements. There are many types of wild plants that produce seeds in quantities estimated by the experimenter in animal nutrition, and because of the difficulty of relying on green fodder and food grain seeds to feed goats, the grazing plants producing seeds are a source of reducing the cost of animal feeding. To ensure the proper use of these seeds, it is necessary to evaluate and study these grains and seeds and to test their suitability in feeding animals in general and goats in particular. Seeds of pastoral plants that their best use can ensure a reduction in the cost of feeding. The shortage of concentrated fodder is considered one of the problems facing the breeder, rather it is a common problem for all areas of animal production (Mohamed *et al.*, 2015).

Objectives

Proteins and energy are badly needed for growth and production of different classes of livestock especially goats. Feed with high nutritional value are only secured from ingredients that are costly and sometimes competed for between animals and humans. Many range plants produce large amounts of good nutritive value seeds. *Blepharis linariifolia* is one of these species. The objective is to examine effects of replacement of sorghum grains with *B. linariifolia* on goats performance.

MATERIALS AND METHODS

the study area

North Kordofan State is located between longitudes 20⁰-30⁰ East and latitudes 16-35 North, covering an area of 190,840 square kilometers and includes a number of localities especially Sheikan locality. The climate of the locality is tropical, characterized by high temperature during the summer. The region is affected by the blowing of the southwest wind, which is responsible for the rainfall. It starts in June and the rains decrease as we head to the north and increase as we head to the south (Technoserve, 1987). Cattle and camel herders in South Kordofan move to the locality with the onset of rain in avoidance of insect bites while the settled communities grow crops that suits the area. The soil in the study area varies according to the factors of its formation, and the area includes the following types of soil: Flat sandy dunes, which are stabilized by natural plants and is found in the northern parts of the study area (El Hag *et al.*, 2001). The other type is un-stabilized sandy soil, which is formed in the wind paths. In some places dark clay covers small patches. The vegetation is predominantly shrubs and scattered trees together with grasses, herbs and shrubs. Forest trees include *Acacia nilotica*, *Acacia tortilis*, *Acacia seyal*, *Adansonia digitata* (Baobab) and *Acacia nubica* and *Acacia mellifera*. Dominant grasses and herbs are *Eragrostis tremula*, *Dactyloctenium aegyptium*, *pennisetum pedicellatum*, *Alyscarpus monilifer*, *Cassia tora*, *cassia obtusiflora*, *cassia senna*, *Blepharis linariifolia*, *Solanum dubium* and many others (Khatir and Jadalla, 2014).

Experimental Animals

In this study, eighteen male Desert goats at the age of six to seven months, with an average weight of 11.5 kg were used. The animals were divided into three equal groups individually penned provided by feeding and drinking troughs, ear-tagged facilitate identification during treatments. The animals were vaccinated against diseases endemic to the study area and drenched with Anthelmintic to control internal external parasites. The bucks were fed for ten days as adaptation period and for sixty days on the experimental rations. Feed intake was estimated daily. The animals were weighed at the beginning of the experimental and once weekly to the end of the trial period. The

period of adaptation is necessary to empty the contents of the stomach from the previously eaten feed.

The experimental rations

Blepharis linariifolia pods were collected from the natural rangelands and crushed into fine parts and then added to the ration as a substitute for sorghum grains that are used in the ruminant rations, which consists of the following: wheat bran 30%, groundnut seed cake 20%, *Blepharis linariifolia* pods 10%, molasses 10%, limestone 5%, groundnut shells 14%, salt 1%. The natural grazing was used in the feeding of the first group. The ration with sorghum grains is used to feed small ruminants and the pods were used to replace sorghum. Percentages of feed ingredients used in animal feed are presented below:

Table 1. Percent ingredients in the experimental rations

Feed Ingredients	I	II	III
sorghum grains	0	20	0
GNSC	20	20	0
Wheat bran	30	30	0
Molasse	10	10	0
limestone	5	5	0
groundnut shells	14	14	0
<i>Blepharis linariifolia</i> pods	20	0	0
common salt	1	1	0
natural grazing	0	0	100

The percent ingredients used in rations formulation is presented in table (1) showing replacement of sorghum grains with *Blepharis linariifolia* pods. The rations of small ruminants that were used in the experiment were formed from: wheat bran 30%, sorghum grains 20%, groundnut seed cake 20%, molasses 10%, groundnut shells 14%, limestone 5%, table salt 1%. As for the second ration, sorghum grains were replaced by a similar percentage of *Blepharis linariifolia* pods. As for the third group, it was let on natural pasture alone.

Chemical Analysis

The *Blepharis linariifolia* pods were chemically analyzed using AOAC (2000) methods of proximate analysis, Van Soest (1994) fiber analysis, tannin, saponin and phytate as potential nutrients present in *Blepharis linariifolia* seeds are needed, and in vitro dry matter and organic matter digestibility was determined according to Tilley and Terrie (1967) method.

Table 2. Chemical composition of the ingredients used in the rations formulation

Ingredients	Nutrients						
	DM	OM	CP	CF	EE	NFE	ASH
Sorghum grains	90.00	6.5	9.2	1.6	3.8	63.3	1.2
GNSC	90.52	79.55	35	6.5	4.5	33.55	10.97
Wheat bran	88	82	15.7	11.5	4	49.9	6
Molasse	76	67.4	5	0	0.8	61.6	8.1
limestone	95	0	0	0	0	0	95
groundnut shells	90	83.2	5.6	47.8	6.8	23.9	6.8
<i>Blepharis linariifolia</i>	94.9	87.3	4.4	25	12.9	15.5	7.
common salt	97	0	0	0	0	0	97

Statistical analysis

The experimental data was analyzed using analysis as outline by Snecedor and Cochran, (1976) and the differences among treatment means were detected via least significant difference test (LSD) according to Steel and Torrie (1996).

RESULTS AND DISCUSSION

Effect of consumption of a ration containing *Blepharis linariifolia* pods on dry matter intake of goats is presented in table (3). The dry matter

intake of the male Desert goats was higher in the group that consumed the ration formulated using sorghum grains that is conventionally prepared for small ruminants fattening ration containing 20% sorghum grains (539g/d), and those on the ration containing 20% *Blepharis linariifolia* pods also consumed substantial amount(532g/d) but lower than the first ration. There are significant differences between them (P<0.05) (I) and (II), followed by the group that was left on the natural pasture (III). The intake of this group was significantly lower (P < 0.05). The feed intake was 639, 632 and 511 g/d for group (I), (II) and (III), respectively.

Table 3. Effects of inclusion of *Blepharis linariifolia* pods in rations on feed intake of bucks

rations	I	II	III
with sorghum grains	200	-	-
with <i>Blepharis linariifolia</i> pod	-	200	-
natural grazing	439	432	511
total	639^a	632^a	511^b

The effect of intake of a ration containing *Blepharis linariifolia* pods instead of sorghum grains on in vitro dry matter and organic matter digestibility is presented in table (4). The effect of inclusion of *Blepharis linariifolia* pods in the ration has increase in vitro dry matter and organic digestibility. The IVDMD increased from 65.65 upon ingestion of a ration of *Blepharis linariifolia* to 69.55% when the ration formulated using sorghum grains. Natural grazing had lowest IVDMD that was 48.61%. The results indicated that the in vitro dry matter digestibility upon replacement of sorghum with *Blepharis linariifolia* pods in group (II) was a good indication of that this ingredient might be alternative to sorghum grains that is competed for between animals and humans. The in vitro organic matter digestibility (IVOMD) also showed similar trend that was observed in IVDMD. It was superior when the ration contained *Blepharis linariifolia* pods than sorghum grains while intake of the natural grazing alone had the lowest IVOMD. The digestibility coefficients were 71.45, 57.67 and 52.45 for the group a ration with *Blepharis linariifolia* pods, sorghum grains and the natural grazing alone, respectively.

Table 4. The effect of inclusion of *Blepharis linariifolia* pods in ration on In vitro Dry matter and organic digestibility

ration type	dry matter	Organic matter	SE+
I	65.65	57.67	2.46
II	69.55	71.45	4.46
III	48.61	52.45	3.46

I sorghum grains ration II = *Blepharis linariifolia* pods ration = III natural grazing alone

Table 5. Chemical composition of the ration

RATIONS	DM	DM	CP	CF	EE	NFE	ASH
I	92.2	92.2	18.2	7.7	4.7	54.3	5.3
II	93.8	93.8	19	12.7	4.6	47.1	6.9
III	94.9	94.9	25	15.5	4.4	12.9	7.6

I sorghum grains ration II = *Blepharis linariifolia* pods ration = III natural grazing alone

The effect of feeding a ration formulated using *Blepharis linariifolia* pods in place of sorghum grains on live weight body weight change of the male goats is presented in table (6) summarizing general performance of the experimental bucks. The change in live weight of male Desert goats was similar when they were fed a ration containing *Blepharis linariifolia* pods compared to those consuming a ration formulated using sorghum grains, a feed ingredient usually used in

rations traditionally used for fattening small ruminants, while feeding goats with natural pasture, resulted in the lowest live body weight change. The experiment indicated that the first and second group did not differ significantly (P < 0.05), while the group eating natural pasture only had lower weight gain than the first and second groups. With regard to the general performance of the experimental groups, the results for that are presented in the table (6) where the rate of change in the weight gained at the end of the trial period, which extended for six weeks (42 days) is shown. The weight gains of the bucks in the group eating natural pasture were significantly lower, and they gained during the mentioned period less than the two groups (I) and (II), respectively. The weight gain during this period reached 3.85 kg, 400 kg, 1.5 kg, respectively, to give an average increase in daily weight of 95, 92 and 36 g/day for the group on the traditional ration, *Blepharis linariifolia* pods ration and natural pasture.

Table 6. General performance of the experimental animal groups as affected by inclusion of *Blepharis linariifolia* pods in the rations

PARAMETERS	I	II	III	SE
No of animals	3	3	3	
duration	42	42	42	
initial weight	11.500	11.500	11.500	
final weight	15.500	15.350	13.000	
weight gain	4.000	3.850	1500	
daily weight gain	95	91.67	35.71	

I sorghum grains ration II = *Blepharis linariifolia* pods ration = III natural grazing alone

Results have indicated that the dry matter intake was the highest when the bucks were supplemented with the ration containing sorghum grains followed by the group that was fed a ration where *Blepharis linariifolia* pods replaced sorghum grains and feeding bucks with the natural grazing only showed the lowest dry matter intake. The higher feed intake of goats on a ration of sorghum grains might be attributed to higher crude protein and palatability of the feed provided. The dry matter intake of the group on a ration with *Blepharis linariifolia* pods also consumed substantial amount of feed but was slightly lower than the first group. The group on natural grazing consume lower amount of dry matter. The feed intake was 639, 632 and 511g/day for group (I), (II) and (III), respectively. The natural grazing is poor in its nutrients content and high in its fiber. McDonald *et al.*, (2010) reported that feed intake decreased if the feed contains a high percentage of fiber. For the first group of the ration containing *Blepharis linariifolia* pods like the first ration sorghum grains the intake was high due to decreased fiber and increased crude protein and later higher digestibility. Effect of intake of rations containing *Blepharis linariifolia* pods on in vitro dry matter and organic matter digestibility showed increased IVDMD and IVOMD for the group on the ration of *Blepharis linariifolia* pods than the sorghum grains and the natural grazing. High starch ingredients such as sorghum grains suppress cellulolytic bacteria and decreases digestibility (Minson, 1979). The natural grazing was low in protein and its high crude fiber decreased digestibility. That explained the decreased dry matter digestibility. Effect of intake of a ration containing *Blepharis linariifolia* in replacement of sorghum grains on live body weight change of goats is presented also on table (6). The live weight change of Desert goat bucks as a result of being fed a ration containing *Blepharis linariifolia* compared to those consuming a ration traditionally used for fattening small ruminants especially bucks and the intake of the natural grazing as control treatment have shown Desert buck has increased similarly as well. Despite of higher feed intake of the group on the sorghum grains the digestibility was better for the group on the ration of *Blepharis linariifolia*. As the result the second group also increased in weight gain. The third group on the

natural grazing only gained small weight gain compared to the first group since the natural grazing is a low quality roughage and was unable to secure nutrients for better weight gains. The experiment indicated that the first and second group did not differ significantly ($P < 0.05$) in the average change in weight gained at the end of the experiment period that extended for six weeks (42 days). The overall performance of the experimental animals the Desert goats have shown that *Blepharis linariifolia* pods could replace sorghum grains giving similar results. Hence the Desert goat groups with an initial average of 11,500 plus or minus 0.350 have gained similar weight when offered either ration with sorghum grains or *Blepharis linariifolia* pods. It could be concluded that the replacement of sorghum grains in the traditional ration with *Blepharis linariifolia* pods led to an decrease in the intake of dry matter but improved digestibility and weight gain at the end. Small animals need energy rations rich in nutrients for the purpose of growth and building their bodies, which is the basis for economic meat production in different types of agricultural animals. Therefore, *Blepharis linariifolia* pods are good in terms of chemical and nutritional composition. They can be replaced with sorghum grains in ruminant rations to reduce cost and make maximum use of the plant pods. *Blepharis linariifolia* pods can provide these needs for male goats and increase their weight.

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