

Effect of supplementation with *Zornia glochidiata* (lisaig) Meal on feed intake, nutrients digestibility and live weight change of Sudanese Desert Bucks in Kordofan

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Abstract:

This study was conducted in El Obeid, North Kordofan State, Sudan during March-June 2017, to determine the effect of supplementation with *Zornia glochidiata* meal on voluntary dry matter intake, nutrient digestibility and performance of Sudanese Desert bucks. Twelve (7-9) months old bucks weighing 12.500 ± 0.250 kg were divided into three equal groups. The bucks were housed individually each with drinking and feeding troughs. The animals were ear-tagged, treated against external and internal parasites and vaccinated against diseases endemic to the area. The animals were weighed prior to experimentation and once a week to the end of the experiment of 60 days. Feed and feces were analyzed using proximate analysis. *In vitro* digestibilities as well as apparent nutrients digestibility coefficients were determined. Data on feed intake, nutrient digestibility and weight change were analyzed via analysis of variance. The results showed that voluntary dry matter intake significantly ($P < 0.01$) increased upon supplementation with *Zornia glochidiata* meal. No significant differences ($P > 0.05$) were observed in feed intake when *Z. glochidiata* meal and concentrate ration were compared. *In Vitro* and *In Vivo* digestibility coefficients increased upon supplementation with *Z. glochidiata* in similar manner as the ration conventionally used. The live body weight increased significantly upon intake of *Z.glochidiata* meal and the ration than the basal roughage but slightly greater in the group that consumed the conventionally used ration. It was concluded that *Z. glochidiata* meal could increase intake, digestibility and weight gain as the conventionally used ration. It is recommended that the meal be used for feeding bucks and be tried for supplementing other livestock species.

Key words: goats' nutrition, natural grazing, Zoriaglochidiata

Introduction:

Goats are important animals in the small farming systems as they are the source of milk, meat and skins. Three-quarters of the global population eat goat meat. It comprises 10% of worldwide meat consumption and 60% of red meat. They are easily cared for by farmers and their family members. They do not require much effort or employment and is characterized as a multipurpose animal with characteristic products of milk, meat and hair. Economically, goats can survive on a variety of feed with great efficiency. Genetically they are of very high fertility and prolificacy with high production percentage of twins. Goats are better adapted to the dry harsh conditions than sheep and cattle. For all those merits they are considered most suitable ruminant species that can be reared under climate changes situation though they are mistaken by some as being destructive to the environment since goats are believed to

intensively graze and browse on natural vegetation uprooting seedlings rendering rangelands to erosion and soil and vegetation deterioration (Khatir and Jadalla, 2014). Goats are principally browsers depending on trees and shrubs for their feed. Since soil and vegetation degradation is a result of over grazing and removal of under storey biomass rather than browse from trees and shrubs, hence they are the grazing animals such as sheep and cattle and not browser like goats and camel that must be blamed for soil and vegetation degradation. Contrary goats and camel are expected to reduce degradation. Concerning green house emission, ruminants are responsible for increasing the amount of CH₄ and cattle and other large ruminants are main contributors to this. That is why mono-gastric animals and not ruminants are recommended for production of animal protein. In communities that are governed by a number of religious and social customs and taboos pig and poultry is not always accepted as protein sources. Goats again are the most suitable candidates for food production to such communities.

Goats' rearing is closely related to the agricultural pattern. It is the main species of the animals of the mountainous countries or countries with low standard of living, as they are the first milk animals in addition to their various products such as meat, skin, hair, animal waste and manure. Some mountain people in England use goats as a parasite for young children (Darwish, 1979). Goats are among the best animals that can be reared in the desert, dry and modern reclamation areas for their important role in the independence of natural pasture lands whose topographical or climatic characteristics do not allow them to grow crops independently.

Goats' rearing is constrained mainly by feed shortage. In rural areas where goats are left to scavenge, they are accused of destroying field crops and leading to conflicts among goats' owners and farmers. In towns and cities such as the situation in Elobeid, goats can be housed indoors and fed cut and carried natural grazing or crop residues. Since the two sources can secure only low quality roughage, goats are in need of supplements to meet their nutrients requirements. Goat producers complain of the high feeding cost since they are obliged to supplement their animals with rations that are formulated using grains, oilseed cakes, bran and imported minerals and vitamins sources (Ivanovic et al., 2016). To sustain goats' production it is inevitable to search for locally available low cost and nutritive alternatives for feeding goats.

Zornia glohidiata is a legume naturally growing species on range lands in different ecological zones in Sudan. It grows most abundantly on low rainfall savanna of Kordofan including North Kordofan State. During its vegetative and flowering stages of growth, the plant is avoided by herders for their experience that this causes detrimental bloat in ruminants. This enables the species to produce large amount of seeds that fall on the ground and stick on animals to be carried as far as the nomadic animals can travel securing a good means for dispersal. On other hand it was observed that seeds are collected, purified and given to sheep and goats during the dry season when the natural grazing and cereal crops residues and only low quality roughage. The seeds are specially offered to off breeding season pregnant ewes and emaciated kids and lambs that are kept around the village (Jadalla et al., (2012).

The overall objective of the study is to contribute towards the development of sustainable animal production systems based on available resources. In particular, the specific objective is to study the effect of supplementation with *Zornia glohidiata*. On Voluntary dry matter intake effect of the Desert goats bucks. the *in vitro* and *in vivo* digestion of nutrients and The performance of desert goats bucks

Materials and Methods:

The study area:

This study was carried out in El obeid, North Kordofan (longitude 29-34, 30-30 East) and the latitudes 12-25, 13-30 North) with *Zornia glochidiata* being collected from 2017 natural vegetation in West Kordofan and brought to the University of Kordofan. North Kordofan State lies within are arid, semi-arid and low rainfall savanna on sand. The long term average rain is between 250-400 mm. The maximum temperature is 40-42C and the minimum is 13 ° C. In the semi-arid region, rainfall is between 300-600 mm and the maximum temperature is 39⁰ Celsius. The humidity reaches 11.75% during the dry season. In the rainy season, the air humidity reaches 65-67% (Elobeid Meteorology Department office,1999).Rainfall as sporadic showers in May and becomes regular from June to October.It usually heavier in July and reaches peak in August before declining in September to reach its lower pattern in October. Temperatures are modified by rain at this time though it is hot and humid in general. Temperature and precipitation drops from the amount of evaporation in July and August and the highest rainfall recorded in 2010 was 620 mm (Sheikan locality, 2011).

The experimental Animals:

Twelve (7-9) months old bucks with an average initial weight of 12.500 ± 0.250 kg were used in this study. The animals were divided into three equal groups. They were housed individually provided with feeding and drinking troughs.Prior to commencement of treatments the bucks were ear tagged to facilitate identification. They were vaccinated against sheep pox, PPR and Anthrax as the main diseases endemic to the study area. The bucks were also drenched with a broad spectrum anthelmintics for the treatment of internal and external parasites. The groups were randomly assigned to three feed types. The first group was offered sorghum straw as sole diet ad libitum. The second group was offered sorghum ad libitum supplemented with 250g/d/head *Zornia glochidiata* while the last group was provided with basal diet of sorghum straw plus 250g of concentrate ration conventionally prepared for fattening goat bucks. The supplements were provided at 6:00 a m and consumed completely before offering the basal diet at libitum. The basal feed intake was obtained daily by subtracting the remained amount from the quantity offered the day before. Drinking water was providedcontinuously. Minor cases were treated using antimicrobial agents. The animals were initially weighed and once every week to the end of the experimental period of ten week.The last ten days were considered digestibility period were feces voided were collected and sampled for analysis and estimation of the digestibility coefficients. Rumen liquor was used to estimate *in vitro* dry matter and organic matter digestibility.

Chemical analysis:

An approximate analysis of *Zornia glochidiata*,sorghum strawand fecal samples was performed according to the methods described by AOAC (2000).

Table(1).Proximate chemical composition of feed ingredients used in the study (%)

Type of feed	Dry matter	Organic matter	Crude protein	Crudefiber	NFE	Ether extract	ASH
Z. glochidiata	95	87	29	21	32	5	8
Sorghum straw	96	85	7	43	34	1	11

NFE= Nitrogen Free Extract

Table(2). Nutrients' apparent digestibility of Sorghum straw, *Zornia glochidiata*andStraw + Z. *glochidiata*

Nutrients	Sorghum straw	<i>Zornia glochidiata</i>	Straw +z. <i>glochidiata</i>	SE
Dry Matter	45.34	75.21	65.35	3.4±
matter Organic	49.15	77.33	67.37	1.5±

crude protein	55.16	73.38	70.28	5.4±
crude fiber	55.39	71.26	70.29	2.5±
ether extract	34.27	73.32	45.25	4.5±
Nitrogen-free extract	60.33	78.29	77.18	5.6±

Table(3). In vitro dry matter and organic matter digestibility of the experimental feed.

Feed type	Dry matter	Organic matter	SE
<i>Zornia glochiata</i>	68.36	73.23	±4.33
The ddraw	46.28	51.56	± 3.45
<i>Zornia glochidiata</i> and the straw	76.11	78.45	± 2.25

Table (4). Effects of supplementation with *Zornia glochidiata* meal performance of the Desert goat bucks.

The parameters	I	II	III	SE
No of animals	4	4	4	-
Weeks on trial	60	60	60	-
Initial weight	12.500	12.500	12.500	-
Final weight	17.000	18.200	19.100	±3.65
Total feed intake(k g/60d)	34.980	45.000	45.960	±3.42
Daily feed intake	583	750	766	±5.22
Weight change g/d	75	95	110	±4.45

I=Sorghum straw II=*Zornia glochidiata* III=sorghumstrawplus *zornia glochidiata*

Results and Discussion:

The voluntary dry matter intake of bucks was found to be the highest in the group that was supplemented with *Zornia glochidiata* meal (750g/ day) compared to 583 g for the group was on sorghum straw only and 766g/d for the group on the straw supplemented with conventional fattening ration group. The increased VDMI upon supplementation with *Zornia glochidiata* meal might be attributed to increased rate of passage of the digesta as the meal improved the rumen ecosystem and increased nutrients digestibility. This is consistent with what McDonald et al.,(1998) have suggested that high protein leads to faster digestion in ruminants and increased consumption of food. Concentrates sometimes lead to decreased fiber digestibility, but this is significant when these concentrates are high in starch such as food grains.

In vitro dry matter and organic matter digestibility indicated that the coefficients increased with supplementation with *Zornia glochidiata* meal. The in vitro digestibility of the meal itself was high suggesting that the feed may be free of anti nutritional factors but that must be verified through advanced analysis. The higher digestibility coefficients upon supplementation might be attributed to higher protein, EE and NFE, the nutrients needed by the microorganisms to grow faster and dissolve the fibrous biomass. The organic matter was also higher in meal and the supplemented sorghum straw with meal or the conventional ration than the straw alone. The nutrients in vitro digestibility coefficients were 45, 68.36, at 75 and 72% respectively when the straw was incubated alone, with the *Z. glochidiata*

meal, concentrate ration or the meal alone. The apparent digestibility indicated that high-protein, nitrogen free extract and crude fat compared with straw alone. These results are similar to the results reported by Mohammed (2015) who showed that supplementation with *Dichrostachys* pods led to a significant increase in the dry matter consumed and increased the digestibility of nutrients in the feed and also led to a significant increase in total and daily weight gain of Desert bucks.

Supplementation of desert buck son sorghum straw led to increased live weight at the end of the experimental period hence daily weight gain. The increase in weight upon this treatment was similar to that of the conventional ration. The bucks gained 75, 98, and 110g/d when fed the sorghum straw alone, supplemented with *Zornia glochidiata* meal and the conventional fattening rations respectively. The increased weight gain upon supplementation might be attributed to increased feed intake and digestibility coefficients upon supplementation with *Zornia glochidiata* meal as the case of the rations conventionally used. The feed ingredient nutrients content, especially the crude protein and ether extract and nitrogen free extract and the last two sources of energy are necessary for growth and fattening. These results are similar to those reported by Mohammed (2015), who conducted an experiment by feeding the Desert goats with *Dichrostachys glomerata* pods and found that supplementation with protein and energy rich pods led to increased consumption of feed, the digestibility of nutrients and the weight gain. Feeding goats on sorghum straw with good quality fodder such as the leaves of *Ailanthus excelsa*, (Dahia, 2013) or *Acacia melifera* leaves (Najla, 2013) or any protein rich biomass could lead to a significant increase in the weight of the desert goats.

Conclusion:

It was concluded that supplementation of Desert goat bucks with *Zornia glochidiata* meal was sufficient to provide the animals with the required nutrients to increase and gain weight. The daily gain attained by using *Zornia glochidiata* meal was similar to that of the conventionally used rations for fattening Desert bucks. The cost of kilogram of the meal at the time of the study was three Sudanese pounds compared to eight pound (SDG). It is recommended that further studies be conducted on *Zornia glochidiata* use in all livestock feeding and be also tried in poultry feeding.

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