Greener Journal of Agricultural Sciences
Vol. 11(4), pp. 243-249, 2021
ISSN: 2276-7770

https://gjournals.org/GJAS

Biomass Production and Nutritive Value of *Sida alba* (Mugshasha) Fed to Desert Lambs in North Kordofan Sudan.

Musa Ahmed Musa Tibin[1]; Hajir Hamid Hassan[2]; Salah Basar Hammad Dahia[3];Sulieman Eshag Mohamed Abdalla[3]; Salah Abd Elgabar Salah Bukhari[1]; Jumaa Barram Jadalla[4]*

1 Department of Animal Production, Faculty of Natural Resources and Environmental Studies, University of Alsalam Alfula, Sudan.
2 Ministry of Production and Economic Resources, West Kordofan State, Sudan.
3 Department of Animal production, Faculty of Natural Agricultural Sciences, University of Dallanj, Sudan.
*4 Department of Animal Production, Faculty of Natural Resources and Environmental Studies, University of Kordofan.

ARTICLE INFO

Article No.: *120321144*
Type**:** *Research*
Full Text: ***HTML, PHP, EPUB***

Accepted: *11/12/2021*
Published: *31/12/2021*

Corresponding Author
Jumaa B. Jadalla
E-mail: *jumaaaringola2000@gmail.com*

Keywords: *Desert Goats, Sida alba biomass, digestibility, weight change.*

ABSTRACT

This study was carries out aiming at studying the effects of feeding *Sida alba* leaves on feed intake, Nutrients digestibility and live body weight changes of Sudanese Desert lambs. Fifteen Lambs of 4-6 months old and weighing 18±500kg were divided into three groups each with five animals. The animal were weighed, ear tagged and individually penned with water and feed troughs. They were also drenched with anthelmintic for internal and external parasites control and vaccinated against diseases epidemic to the study area. After seven adaptation days the lambs were weighed and once weekly for 8 weeks. Daily feed intake was recorded. The last ten days were devoted for determination of nutrients digestibility coefficients via total feces collection method. Data on feed intake, nutrients digestibility and body weight changes were analyzed via analysis of variance. Differences among means were detected using least significant difference test (LSD). The results indicated that group II that was on natural grazing supplemented with *Sida alba* leaves consumed significantly (p<0.01) greater amount of feed compared to group I that was on the natural grazing only and group III supplemented with a concentrate ration feed intake was 1316,730, 1381,500 and 1207.650g for group I, II and III, respectively. No significant differences (P≥0.05) in digestibility coefficients of all nutrients between group II and III but group I had lower coefficients than II and III. Final and daily body weight was higher in group II and III than group I. The biomass production was estimated being 84.910g/ shrub or 1.697 per hectare based on a square meter space for a plant. It was concluded *Sida alba* leaves could support lambs on low quality grazing. It was recommended that more studies be carried to detect presence of anti nutritional factors such as tannins in *Sida alba* leaves.

INTRODUCTION

Sudan is characterized by multiple climates that have brought about great diversity of livestock where camels are concentrated in the northern belt and cows in the southern and western belts while small ruminants (sheep and goats) spreading in all parts of Sudan.(El Hag *et al.,*2001). In addition to this, the country is endowed with fisheries, poultry and equine species adapted to the climatic conditions. Rainfall ranges in Sudan from almost zero to 75mm in arid areas and to 1000 mm, at least while temperatures ranging between 45 degrees (in summer) and to 10 degrees (in winter).Agricultural land represents more than a third of Sudan area, while actually exploited portion does not exceed 20% of this arable land. Sudan has water resources with a variety of sources, including the possibility of rain water harvesting (Khatir and Jadalla, 2014). The importance of the livestock sector is well recognized by economists and planners. Sudan food supplier animals (cattle, sheep, goats, camels) were estimated at 105 million heads (MARF, 2015). There are as well other animals and wild life. The importance of livestock is attributed to their economic and social contributions

Animal resources in the Sudan that comprised of sheep, goats, cattle camel, poultry and wild game is mainly dependent on the natural rangelands as source of feed. Less important feed sources are crop residues, agro-industrial by-products, feed of animal origin, fodder crops and synthetic feed (El Hag *et al.,*2001). Establishing a competing and sustainable program for exporting live animals and good quality meat is required in order to enable the country to meet the international trade standard this entails a vital effort to improve the livestock production systems based on natural feed sources mainly rangelands (Ali and Suleiman, 1988). It is important for this purpose to impose strict hygienic measures to provide healthy and wholesome meat to fulfill the international requirements and domestic needs. Natural grazing from rangelands provides very good option for this purpose (Khatir and Jadalla, 2014).

The rapidly growing livestock population imposes a continuing pressure on this shrinking range resource. Agricultural areas, mining and urban residential places are expanding on rangeland (Ali and Suleiman,1988). On this limited area, livestock population is concentrated with communal continuous grazing. The eventual result is overgrazing where palatable species are excessively consumed leading to their disappearance. Since no systematic activities are carried out to collect seeds of such nutritive and palatable species, range land will be turned into areas covered with species that are known being of little acceptance to livestock species with low nutrients contents (El Hag *et al.,* 2001).

To recommend for candidate species, those highly good quality and palatable species must be determined, their nutritive value be accessed before being selected for conservation.

The objective of the study

The overall objective of the study is to assist in development of sustainable production systems based on natural grazing from rangelands of the country. The development of such sustainable livestock production systems is essential since the natural resources especially browse trees and shrubs are main feed source in Sudan

Direct objectives of this study is to estimate biomass production from *Sida alba* shrub and its nutritive value, *in vitro* and *in vivo* digestibility and energy value of this draught resist plant for feeding animals and try to domesticate it.

MATERIALS AND METHODS

The study area

This study is conducted in the city of Elobeid, Sheikan locality in North Kordofan state Sudan. The state lies between the longitude (29^{o}-34', 30^{0}-30' East) and the latitudes (12^{o}-25', 13^{o}-30' North) with an area of 8080 km2. This City is the capital of Sheikan locality and North Kordofan State.

Sheikan is characterized by undulating plains, depressions; sand covered with hilly areas and some mountain clusters.

There are three climatic regions that cover North Kordofan State. These are dry, semi-arid dry and low rainfall savanna on sand areas. The long term average rain is between 250-400 mm. The maximum temperature is 40-42 mm and the minimum is 13°C. In the semi-arid region, rainfall is between 300-600 mm and the maximum temperature is 39^{0}C.

The humidity reaches 25% during the dry season. In the autumn, the air humidity reaches 65-67% (Elobeid Meteorology Department office,1999).

Rainfall starts 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. Temperatures and precipitation increase the amount of evaporation in July and August and the highest rainfall recorded in 2010 was 620 mm (Sheikan locality, 2011).

This city is also considered the largest market for gum Arabic, as primary and important market of livestock brought from different parts of western and Southern Sudan in a continuous movement of the presence of different types of animals. There are some food industries and Agro-industrial companies such as vegetable oil production and flour mills (Sheikan locality, 2011). Elobeid Petroleum Refinery is set at 10 km from the city center. In general this city is a main marketing city for the country. Rural areas are farming and livestock producing areas.

There are trees of Hashab (*Acacia senegal*), Marrekk (*Boscia senegalensis*) and Seyal (*Acacia*

tortilis) in the northern regions. Southern and central parts are covered with desert palm (*Balanites aegyptiaca*), Sidr (*Ziziphus spina-christi*), tebeldi (*Adansonia digitata*) habeel (*Combretum cordofanum*), kitr (*Acacia mellifera*), ghobeesh (*Guiera senegalensis*), Haraz (*Faiherbia albida*), Arrad (*Albizzia amara*), Aradaib (*Tamarindus indica*) and many other trees and shrubs species of the zones indicated above. The under storey is dominantly covered with herbs such as *Alysicarpus species* (Fraisha), *Zorniagleo chidiata* (lisaig), *Cassia obtusiflora* (Kawal), *Cassia occidentals* (Soreib), *Amaranethesis flavicans* (Lisaneltair) *, Blepharis inarrifolia* (Beghail) and many others. Grasses dominant in this are *Eragrostis tremula* (bino), *Aristida pallida* (gaw), *Cenchrus biflorus* (Huskaneet khashin)*, C. setigrus* (Huskaneet Naeem) *Pennisetum pedicellatum* (Umdofofo), sida alba (mug Animals) and others, (Khatir and Jadalla, 2014).

The Experimental Animals

Fifteen Desert sheep lambs were used in this study. The animals were divided into three similar groups each with five animals. The animals were individually penned, equipped with feeding and drinking troughs. Prior to commencement of treatments the animals were ear tagged and vaccinated against diseases endemic to the study area. One week is considered adaptation period where the animals were to be adapted for feed and treatments.

The animals were weighed at the beginning of trial, and once every week until the end of the trial to monitor their weight change as effected by type of rations.

Sampling of *Sida alba*

1. For determination of biomass production two methods were followed. The first technique was to estimate biomass from a number of shrubs, determine numbers of branches per a shrub, get weight of leaves per branch, branch and stem diameter were determined to get the amount of biomass produced in several cuts.
2. For biomass estimation also forage amount from unit area was estimated. That was obtained through growing the species in a plot for three months.

The experimental feed

The study was proposed to feed the experimental animals three type of feed, these were:-

A. natural grazing supplemented with small ruminants concentrate

B. natural grazing supplemented with *Sida alba* biomass

C. natural grazing alone

Chemical analysis

The plant biomass was analyzed using proximate analysis, and forage fiber analysis and minerals, *in vitro* and *in vivo* digestibility analysis as described by The Association of the Official Analytical chemists (A O A C, 2000). In Vitro dry matter and organic matter was determined according to Telly and Terrie (1967).

Statistical analysis

The experimental design was a complete randomized design (CRD) that had three treatments and five replicates. The data was analyzed using analysis of variance, (Steel and Torrie (1996). the difference among treatment means were detected using least significance difference (LSD) (Snecedor and Cochran, 1976).

RESULTS AND DISCUSSION

4.1Chemical composition of *Sida alba* leaves

The biomass production of *Sida alba* is presented in table (1). Average dry matter from *Sida alba* (kg / ha) and the average productivity of dry matter per plant in grams/plant is also estimated and shown in same table. Average amount of biomass per a plant was estimated being 75g dry matter from one cut. This gives an estimation of one feddan (4200m^2) that had a stand of 8400 plants at 630 kilogram (1.5ton per hectare). Since this plant is perennial, possibly more biomass could be expected in several cuts throughout the year. The amount of biomass estimated here is comparable to that of results reported by Jadalla *et al.,*(2014) who found that *Ailanthesis excelsa* could produce amount of biomass of 1.75-3 tons /hectare in two cuts a year. Following the other method of estimating biomass, the expected amount of biomass in one cut was 713kg approximately from one feddan (1.697 ton per hectare). Hence this drought tolerant species is of great potential for production of biomass that can supplement grazing ruminants on low quality roughage especially during dry season.

The chemical composition of the *Sida alba* plant (Mugshasha) is shown in Table (1). The proximate analysis results of the biomass harvested from the plant showed that it had 83.2% Dry matter, 72.9% organic matter, 21.3% crude protein 16.23% crude fiber, 33.6% Nitrogen free extract and ether extract 1.75% when sundried and analyzed.

Table (1)The chemical composition of ingredients used in formulating the rations in the trial

FEED	DM	OM	CP	CF	EE	NFE	ASH
GNSC	90.52	79.55	23.3	6.5	4.5	28.55	10.97
Sorghum grains	95.5	92.9	10.9	2.3	3.2	75.31	2.6
Wheat bran	90.78	85.38	16.92	12.5	4	51.96	5.40
Sida alba	83.2	72.9	21.3	16.23	1.75	33.6	10.31
Natural grazing	95.51	88.23	4.11	37.25	1.23	48.10	7.28

GNSC=groundnut seed cake, DM=Dry matter, OM=Organic matter CP=Crude protein, CF=Crude fiber, EE=Ether extract, NFE=Nitrogen free extract.

Chemical composition of ingredients used in formulation of rations usually fed to sheep is also presented in Table (1). Those ingredients were groundnut, sorghum grains, wheat bran and natural grazing.

Table (2) rations chemical composition an affected by *supplementation with Sida alba* leaves in the ration

Ration	DM	OM	CP	CF	NFE	EE	ASH
I	95.5	88.2	4.11	37.5	48.10	1.2	7.3
II	83.2	72.9	21.3	16.2	33.6	1.7	10.3
III	94.0	91.9	13.2	2.3	73.9	2.5	2.0

I=Natural grazing ,II=Natural grazing plus *sida alba* , III=Natural grazing plus concentrate .

The dry matter was the highest in ration I (95.5) %and (94) %in ration III and (83.2)%in ration II ,Organic matter the high ratio in ration III (91) % and ration I (88.2)% and in ration II (72.9) % ,Crude fiber the high level (37.5) % in ration I, (16.2) % in ration II and (2.3) % in ration III. Nitrogen free extracts (73.9) % in ration III, (48.1) %in ration I and (33.6)% in ration II .Ether extracts the high ratio in ration III (2.5)%, (1.7)%in ration II and (1.3) %in ration I.

Effect of feed lambs with *Sida alba* on dry Matter Intake

The effect of supplementation of Desert sheep lambs on natural grazing with *Sida alba* biomass on their feed intake is shown in table (2). Significant differences ($P \leq 0.01$) in the daily of dry matter intake was observed among the three experimental groups where group (I) that was on natural grazing supplemented with concentrate ration and group (II) fed natural grazing supplemented with *Sida alba* consumed greater amount of feed compared to group (III) that was fed natural grazing only. No significant differences ($P \geq 0.05$) could be observed in feed intake between group I and II. Feed intake for the three group was1316.73, 1381.5, and 1207.65 g / day respectively.

Table (3) performance of desert sheep lambs on natural grazing with *sida alba* biomass supplemented

Parameter	I	II	III	SE
No of animal	5	4	5	-
Days of trial	60	60	60	-
Initial weight	18.4	18	19	0.73193
Final weight	21	21.3	24.4	0.93426
Total weight gain	2.6	3.3	5.4	0.50469
Daily weight gain	0.0428	0.0538	0.5890	0.10185
Daily feed intake	1316.73	1381.5	1207.65	45.1765
Feed conversion ratio				

In vitro Dry Matter and Organic Digestibility

In vitro digestibility of dry matter and organic matter of rations according to the amount of Sida alba is presented in table (3). Ration I that was on natural grazing had DMD 56.45% and DMD at of 59.55% while the second ration natural grazing plus Sida alba with had 65. 67% dry matter digestibility. The third ration (natural grazing alone had 51.45% .there were significant (p0<0.1) among coefficients of the three ration where ration had highest DMD value followed by ration I and the lowest %was for ration III.

Organic matter digestibility also followed the same trend where ration II had highest organic matter digestibility followed by ration I and lowest DMD for ration III. In vitro organic matter digestibility coefficients were 59.55, 68.61 and 54.65% for ration I, II and III respectively.

Table (4). In vitro dry matter and organic Matter digestibility of rations as affected by the level of *Sida alba* leaves hay.

Feed type	Dry matter	Organic matter	SE±
I	56.45	59.55	3.44
II	65.67	68.61	2.16
III	51.45	54.65	4.32

Chemical composition of the rations as affected by supplementation with *Sida alba* leaves is presented in table (2).

Dry matter was similar in ration I and III where ration I was natural grazing only ration III was natural grazing and concentrate .Dry Matter was lowest in ration II that was formulated with natural grazing and *Sida alba* leaves .the value of dry matter were 95.5% ,83.2and 94% for ration I ,II and III respectively .

Organic matter was the highest in ration III (Natural grazing plus concentrate) followed by ration I (natural grazing) and lastly ration III (Natural grazing plus *Sida alba*) .

Crude protein was highest in ration II (22%) where sida alba leaves were added to natural grazing while in ration III at 23.2% CP and was next to ration II and ration I had the lowest value of crude protein .there were significant differences among the ration in crude protein .

Nitrogen free extract (NFE) was the highest in ration III (Natural grazing supplemented with concentrate followed by the natural grazing and lastly that of natural grazing supplemented with *Sida alba* leaves .

Ether extract (EE) was the highest in natural grazing supplemented with concentrate followed by the ration containing natural grazing plus sida alba .

The lowest EE was that of the natural grazing only .the three feed had 1.2 ,1.7 and 2.5% EE for ration I ,II and III respectively .

Ash in the three rations was 7.3, 10.3 and 2.0 % for natural grazing alone, natural grazing plus *Sida alba* and natural grazing supplemented with concentrate ration.

General performance of the experimental animals

General performance of the Desert sheep lambs on natural grazing with *Sida alba* biomass, supplemented with small ruminants' ration or only natural grazing is presented in Table 4.

The treatments were three where the first one was natural grazing the second supplementation with *Sida Alba* leaves and their one was natural grazing supplemented with concentrate. In each treatment five animals were used. The trial extended for sixty days .The first group consumed 1316.73g and second 1381.50g and the last consumed 1207.65g a day.

The weight change amount to 2.6, 3.3 and 5.4 kg, during the experimental period hence live weight gain during the daily weight gain was 42.8,53.8 and 58.9 g per a day for group I on the natural grazing , group II supplemented with *Sida alba* leaves and the group the group on natural grazing supplemented with concentrate

CONCLUSION

The study concluded that sida alba in rations increase the weight wile reducing the cost of nutrition ,although reduced consumption of sheep for feed ,the feed intake of feed was sufficient to maintain the rates of gain in live weight.

Figure 5.1 flowers and leaves of *Sidaalba*

Figure 5.2.branches of *Sida alba*

RECOMMENDATIONS

It is recommended that *Sida alba* must be collected and purified before use because it is always mixed with sand and trashes.

-advanced analyses to determine content of the plant biomass

-more research to take advantage of the close meal in feeding ruminants and other species to reduce the cost of nutrition

-factor imitating diarrhea in sheep upon ingestion of *Sida alba* biomass be determined -mineral content of the tested plant hay be detected

REFERENCES

AOAC (2002).Official Methods of Analysis, 19th Edition AOAC Inter. Inc. Washington, DC Pp 1219.

El-Hag F M, Fadlalla B and El madih M A1998 Effect of strategic supplementary feeding on ewe productivity under range conditions in North Kordofan, Sudan. Small Ruminant Research 30:67-71.

El-Hag ,F.M., Fadlalla ,B. and Mukhtar , H.K .(2001).some production characteristics of Sudan desert sheep under range condition in north Kordofan ,Sudan .Tropical Amin ..Health and production.33:229-

Elobeid Meteorology Department office,(1999). The annual report on metrological and climatic variables.

Khatir, A.A and J.B. Jadalla (2014).Assessment of rangelands biomass using Remote Sensing and Geographical Information System (GIS) in Kordofan, Sudan. University of Kordofan Journal of Natural Resources and Environmental Studies, UKJNRES, 1(1): 60-70,www.kordofan.edu.sdMARF, 2015

MARF, Ministry of Animal Resources and Fisheries (2015). Department of the animals statistics and Economics, Annual report.

Sheikan locality, (2011). Annual report for the activities and general situation of the locality, North Kordofan State Achievements

Snecedor GW, Cochran WG (1980). The Statistical Methods the Iowa State University Press. USA.

Suleiman, M. and Ali, Darrag Ali (1988). Training Course in Range Management and Rang Improvement. Range and Pasture Administration. Sudan. 47pp.

Telly, J. M. A., R. A.Terry (1967). A Two-Stage Technique For The In Vitro Digestion Of Forage Crops First Published: June 1963 Https://Doi.Org/10.1111/J.1365-2494.1963.Tb00335.X Volume 18, Issue 2 June 1963 Pages 104-111.

Cite this Article: Tibin, MAM; Hassan, HH; Dahia, SBM; Abdalla, SEM; Bukhari, SAES; Jadalla JB (2021). Biomass Production and Nutritive Value of *Sida alba* (Mugshasha) Fed to Desert Lambs in North Kordofan Sudan. *Greener Journal of Agricultural Sciences* 11(4): 243-249.