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Original Article

The Effect of Supplementation of Desert Goats on Sorghum straw with *Ailanthus excelsa* Leaves on Feed Intake, Nutrients Digestibility and Performance in Dilling, South Kordofan, Sudan

Neama Adam Eshag[1], Salah Basour Hammad daheiya[1] Mohamed Adam Mohamed Ali[2] M M Tibin[3] and Jumaa Barram Jadalla[2*]

[1]Department of Animal Production, Faculty of agricultural Sciences, University of Dallanj, Sudan

[2]Department of Animal production, faculty of Natural Resources and Environmental Studies, University of Kordofan, Sudan

[3]Department of Animal production and Range, faculty of Natural Resources and Environmental Studies, University of Peace, Sudan

Abstract

This study was conducted in Dallanj town, South Kordofan, Sudan, (longitudes 9º-12/ N and latitudes 29º -31/) with the objective of evaluating effects of supplementation of goats on sorghum straw with *Ailanthus excelsa* leaves on feed intake, nutrient digestibility and performance. Eighteen bucks of Desert type (6 - 9 months old and weighing 15+ 1.333kg were used. The animals were divided into three similar groups. The first group was offered sorghum straws alone while the second and third groups were fed sorghum straws ad libitum supplemented respectively with 25 and 50 % of daily intake *Ailanthus excelsa* leaves. Water was provided continuously. Feed intake, live body weight changes and hematological indices were monitored for 60 days. The data was considered as a complete randomized design and analyzed via analysis of variance. Differences among treatments means were detected using least significant difference test. The results indicated that goats on sorghum straws supplemented with 50 % *Ailanthus excelsa* leaves consumed significantly (P<0.01) higher amount of feed followed by the group on the straw and 25 % tree leaves and finally those on the sorghum straw alone. The daily feed intake of groups was 400, 700 and 1100g for goats on the straw alone, on the straw and 25 % tree leaves and the straw and 50 % tree leaves, respectively. Similarly, the group that was fed sorghum straw and supplemented with 50% tree leaves showed greater live body weight gain (69g/day) followed by the group on the sorghum straw and 25 % tree leaves (51g/day) and finally those on the sorghum straw exclusively (38g/day). Also it was found that all nutrients digestibility coefficients increased significantly (P<0.01) with supplementation of sorghum straw with the tree leaves. It was

Corresponding Author: Barram Jadalla < jumaaaringola2000@gmail.com >

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concluded that supplementation of goats on low quality roughage with *Ailanthus excelsa* leaves could improve feed intake, nutrients digestibility and bucks performance. Further studies were recommended for using the tree leaves for feeding lactating goats and other ruminant species as well as detection of anti-nutritional factors in the tree leaves and their effects on goats to ensure improvement of the nutritional status of the animals that are dependent on low quality roughage, especially during dry season.
Keywords: Goats nutrition, low quality roughages, Supplementation, Browse trees

INTRODUCTION

Sudan is considered the second largest among Arab and African countrys in terms of animal wealth ownership. The numbers of animals were estimated at 105 million heads of cattle, sheep, goats, camels and 4 million heads of the Equine species (Madani, 2003). This wealth is mainly dependent on the natural rangelands, which provide feed for about 85% of the national herd together with field crops residues. Forage crops, feed of animal origin, agro-industrial by-products and some synthetic feed are other less important feed sources for animals in Sudan (Jadalla, 1995). The natural pastures and cereal crop residues (straws and stovers) provide low quality roughages of low nutritional value though abundant in quantities. Studies have shown that those low quality feed could be improved through proper treatment and through supplementation (El Hag *et al.,* 1997). Tree leaves have shown to be appropriate for such supplementation since the biomass provided is of high quality roughage, inexpensive, available throughout the year and as feed source animals and human are not competed over its use as it is the case of cereal and legume grains.

Goats play an important role in all agricultural systems in Sudan and they have special place in the economy of the study area. They provide meat, milk and can be considered as source of cash from sales of live animals and meat. Feeding goats in the study area is constrained by feed scarcity especially during the dry season, in addition to low quality of roughages available for their feed and lack of proper feeding strategies recommended for the small scale producers. The availability of trees biomass provides chances to improve utilization of the available low quality roughage such as sorghum straw and other cereal crop residues that are produced from traditional subsistent and mechanized commercial farming in the area and secure adequate feed for goats throughout the year. Many indigenous browse trees are known to the area but they are mostly deciduous during the dry season. *Ailanthus excelsa* tree that grows very fast providing large amount of biomass is considered most appropriate source of leaf supplement for goats. Studies in India have shown that *Ailanthus excelsa* leaves are harvested for feeding tethered goats (Vogt, 1995). In Sudan no studies were carried out to evaluate the potential of the tree for providing biomass for feeding livestock or the nutritive value of that biomass since the tree was imported as timber tree.

The objective of the study

The overall objective of this study was to research towards securing new feed sources for the growing livestock population of the country. The improvement of utilization of the available feed resources is also essential. In particular the study aims at:

Studying the effects of supplementation of bucks on sorghum straw with *Ailanthus excelsa* leaves on voluntary dry matter intake.

Studying the effects of supplementation of bucks on sorghum straw with *Ailanthus excelsa* leaves on nutrients digestibility coefficients, total digestible nutrients and energy intake by goats.

Studying the effects of supplementation of bucks on sorghum straw with *Ailanthus excelsa* leaves on some hematological parameters and their general performance.

MATERIALS AND METHODS

The study area

Dilling is located in the northern part of South Kordofan State (latitudes 9º-12' N and longitudes 29 º -31' E) within the savannah low rainfall with annual precipitation ranging between 300-500 mm per year. Maximum temperature values are recorded in summer (45^0 C) and minimum values are in the winter and decline to 20^0 C. Rainfall usually starts in July and ends in October. The northern part of the locality is covered with sandy plains that extend into the Nuba Mountain ranges and valleys interspersed within those plains in the east and some of the cracking clay in the western part o the locality. The main activities practiced by local people is agriculture and animal husbandry, where they raise cattle, sheep, goats and equines. Also the area is considered as a traditional grazing arena for animals coming from North Kordofan during the dry season. Vegetation is rich in species of trees, shrubs, herbs and grasses. Most of these herbs and shrubs are palatable browse (Mechanized Farming Schemes, Dilling, 2009).

The experimental feed

Sorghum straw was provided ad libitum for the experimental animal groups while *Ailanthus excelsa* leaves were supplemented to the second and third group at 25 and 50 % of their voluntary dry matter intake. The tree leaves were offered at 7:00 a m every day and consumed completely before providing sorghum straw. The daily intake of the straw for each animal within the experimental groups was determined before offering feed the second day. Water was provided continuously. A preliminary period of a week was necessary before the start of data collection in order to remove the effects of the previous feed from the gastrointestinal tract, estimate daily voluntary dry matter intake and adapt animals for the treatments. Data on feed intake was collected for 60 days. The last ten days of the trial were allotted for the nutrients digestibility determination.

Experimental animals

Eighteen bucks of Desert type (6-9 months old and 15 kg + 1.333 kg) were used. The animals were divided into three similar groups. Each animal was individually penned, provided with feeding and drinking troughs. The bucks were ear tagged, vaccinated against diseases endemic in the area and were treated with *Ivermectin* 10 % (1cc/50 Kg body wt.) for control of internal and external parasites. Body weight was measured once a week together with blood samples that were needed for the determination of packed cell value (PCV), hemoglobin (Hb), white blood cell counts (TWBCs) and blood glucose.

Chemical analysis

Feed samples were analyzed for the determination of dry matter, DM, organic matter, OM, crude protein, CP, crude fiber, CF, nitrogen free extract, NFE, ether extract, EE and ash through the proximate analytical methods (AOAC, 2000). Flame photometer was used for mineral determination of the tree leaf biomass. Forge fiber was determined via (Van Soest, 1967) procedures. Three to five ml of blood samples were collected from each animal and examined prior experimentation and weekly till the end of the trial for hematological indices test. In the laboratory, the haematocrit centrifuge was used to determine the PCV, Hb was determined by the cyanmt hemoglobin using a calorimeter and the TWBCs was done by the chamber slide to count the number of cells and hence calculating the cell count (X 100) Schalm *et al.,* (1975).

Statistical analysis

The data of the treatments were considered complete randomized design and analyzed using analysis of variance by the aid of SAS v. 9 computer software. The significance of differences among treatment means were detected via least significant difference method as described by Steele and Torrie, (1976).

RESULTS AND DISCUSSION

Chemical composition of the *Ailanthus excels* browse biomass

The proximate chemical composition of the leaf biomass of the *Ailanthus excelsa* as affected by the site of growth is presented in table (1). No significant differences (P>0.05) were observed in all nutrients composition that could be attributed to the site of growth where the biomass was sampled despite of the soil and precipitation variations differences. On the other hand Ali, (2011) has found that amount of biomass produced from similar aged *A. excelsa* tree was affected by site of growth due to variations in soils and rainfall. The similarity in chemical composition could be attributed to the high degree of homogeneity of the plants grown where it was imported and propagated at the National Forestry Corporation and distributed all over the country. The chemical composition of *Ailanthus excelsa* is comparable with some fodder crops grown in Sudan. *Medicago sativa(Barseem), Dolichus lablab* (Lubia alaf) and *Phaseolus trilobus* (philipsara) for instance are reported to contain 24, 22 and 20 % CP compared with 20.11-22.25% in *A. excelsa* (Suleiman, 1999).

Table 1: Chemical composition of *Ailanthus excelsa* leaves as affected by site of growth

Sites	DM	OM	CP	C F	EE	NFE	ASH
Elobeid	95.87	83.53	20.41	14.58	2.53	43.12	11.34
Dilling	94.45	82.00	22.11	16.57	2.88	41.59	12.45
Feid Um Aballa	95.17	82.54	22.15	16.67	2.63	42.13	12.63
Singa	95.27	82.76	22.25	17.52	2.73	42.35	12.51

Table 2: Minerals content of *Ailanthus excelsa* leaves (g/kg DM) as affected by site of growth

Site	Ca	Fe	K	Mg	P	B	Co	Cu	Mn	Mo	Zn
Elobeid	160.1	1.01	22.51	3.32	2.50	73.7	0.5	7.1	79.4	0.4	18.2
Dilling	162.1	1.21	23.21	3.72	2.60	65.9	0.8	7.5	78.8	0.5	19.0
Feid UmAballa	161.1	1.31	23.51	3.52	2.40	67.1	0.9	7.4	75.9	0.5	17.9
Singa	163.1	1.50	23.31	3.22	2.70	64.9	1.1	7.8	77.6	0.6	19.3

Table 3: feed intake of Goats as affected by level of ailanthus excels leaves offered Amount *Ailanthus excelsa* leaves

Type feed	0	25	50	SE
Sorghum straw	500	450	600	-
Ailanthus excels leaves	0	250	500	-
Total intake	500	700	1100	-

Table 4: Nutrients Composition of the basal feed used in the study

Feed type	DM	CP	CF	Ca	P	NE m	NE g	NE maintenance	TDN
Sorghum straw	93	4.5	34.6	0.2	0.2	0.86	0.4	0.9	44.0
A.excelsa leaves	95	7.3	32.2	0.45	0.9	01.23	1.11	1.34	56-61

Effects of supplementation with *Ailanthus excelsa* leaf biomass on dry matter intake (TDN) of bucks

Supplementation of goats on sorghum straw with *Ailanthus excelsa* leaves on dry matter intake of buck is presented in table (3). The daily dry matter intake of bucks increased from

500g/d when fed sorghum straw alone to 700 and 1100g/d when 250 and 500 g of the tree leaves offered to each animal n the first and second goat groups respectively. The increased dry matter intake could be attributed to the improvement of rumen ecosystem that was necessary for the growth of micro-organisms and increased nutrients digestibility quick removal of the digesta fro the gut. The results described in this study are similar to those mentioned by McDonald *et al.,* (1996) who observed that supplementation of low quality roughages with green foliage could help in increasing the bacterial population. Butterworth and Mosi (1985) found that total VDMI of sheep increased from 21g /kg W $^{0.75}$ when offered un-supplemented low quality roughage to 24, 25 and 28 g /kg W $^{0.75}$ upon supplementation with 19, 34 and 44 % legume hay showing that increasing percentages of legume hay could increase total dry matter intake.

The effects of supplementation of bucks on sorghum straw with *A. excelsa* browse biomass on nutrients digestibility coefficients is presented in table (4). All Nutrients digestibility coefficients increased significantly (P<0.01) with supplementation of sorghum straw with the tree browse biomass. It was also observed that increasing level of supplementation subsequently increased digestibility of nutrients. DMD of sorghum straw increased from 50% when offered alone to 57 and 68 when the leaf browse biomass offered was 250 and 500 /head /day. Similarly OMD, CPD, NFE, CF and EED increased with supplementation. The results reported in this study are similar to those reported by Jadalla (1995) who has shown that supplementation of the dry season grazing with groundnut haulms could increase total feed intake and nutrients digestibility coefficients of all nutrients. Preston and Leng (1987) also reported that tree browse biomass could increase nutrients digestibility coefficient of the low quality roughages and they added that tree biomass was appropriate for development of feed strategies for holders of small livestock herds.

Table 5: Nutrients digestibility coefficients and TDN of the sorghum straw offered to bucks as affected by supplementation with *Ailanthus excelsa* leaf biomass

Nutrients	I	II	III	SE
DM	45	57	68	2.1
OM	47	51	55	11.2
CP	23	44	51	12.4
CF	45	59	65	7.1
EE	56	63	67	5.6
NFE	33	49	55	8.7
TDN	44	56	61	5.4

Table 5: Hematological indices of Desert goats as affected by rations and sex

Factors	N0 of animals	Hb%	PCV	TWBCs
Over all mean	18	49.43	0.26	4192.2
Over all SE±		± 0.848	± 0.002	± 74.5
Rations				
Sorghum straw (ST)	6	44.52	0.024	4060
ST +25%AE	6	45.49	0.25	4055.6
ST +50% AE	6	59.06	0.27	4493.3
SE ± rations		± 1.469**	± 0.003**	± 129.09NS

Hb% hemoglobin, PCV packed cell volume, TWBCs total white blood cells.
**= Significant at (p < 0.01) NS= not significant.

Hematological indices as affected by supplementation with *Ailanthus excelsa* leaf biomass

The hematological indices of the experimental animals are shown in Table 5. Hb% and PCV were highly significantly ($p < 0.001$) affected by inclusion of *Ailanthus excelsa* leaf biomass in bucks' basal feed (sorghum straw). The improvement could be attributed to increased feed intake, nutrients digestibility and TDN intake. Intake of *A. excelsa* biomass that was rich in minerals also improved mineral_balance and improved general body metabolism. The value of Hb% was comparatively higher (59.06) for animals that received 50% supplement diet. On the other hand the value of TWBCs were not significantly ($P<0.05$) affected by the different rations.

CONCLUSION

It was concluded that supplementation of goats on low quality roughage with *Ailanthus excelsa* leaves could improve feed intake, nutrients digestibility and bucks performance. Further studies were recommended for using the tree leaves for feeding lactating goats and other ruminant species as well as detection of anti-nutritional factors in the tree leaves and their effects on goats to ensure improvement of the nutritional status of the animals that are dependent on low quality roughage, especially during dry season.

References

Ali, S. A. M.(2011).The Relation Between Browse Biomass and some Tree Growth Parameters in *Ailanthus excels* in Kordofan, Sudan. A M SC thesis Faculty of Natural Resources and Environmental Studies, U of K Elobeid

AOAC (1990). Official methods of analysis (13th ed.). Association of official Analytical chemists (AOAC). Washington D.C., U.S.A.

Butterworth, M.H., and Mosi, A. K. (1985). The voluntary Intake and Digestibilty Diets Containing Different Proportions of teff straw and Trifoluim tembense hay when fed to sheep. Journal of tropical Animal production volume 10.

Jadalla, J.B. (1995). Effects of Supplementation of the Dry Season Grazing with Ground nut Haulms on Nutrients Utilization and Sheep Performance

Madani, M.A. (2003). Animal Wealth and Animal production in Sudan 2nd edition Khartoum University Press. (in Arabic)

McDonald, P.; Edwards, R.A. and Greenalgh, J. F.D. (1996). Animal Nutrition. Fifth edition, Oliver and Boyd, PP 699.

Schalm, O.W., Jain, N.C., and Carroll, E.J. (1975). Veterinary hematology ,3rd edition Lea and Febiger, Philadelphia. 321pp.

Steel, R. G. D., & Torrie, J. H. (1976). Introduction to statistics. McGraw-Hill.

Suleiman, J.H. (1999). Use of water melon by-products in Desert sheep finishing diets thesis. University of Kordofan.

Van Soest, D.J. (1963). The use of detergents in the analysis of fibre and lignin. Journal of AOAC,46:928

Vogt, Kees (1996). Common Trees and Shrubs of Dry land of the Sudan. SOS, and NFC Sudan