



Effects of supplementation of lactating Desert Goats with kuk (*Acacia sieberiana*) and Kadad (*Dichrostacys cinerea*) pods on Milk Production and quality

Adam Jumaa Hamid Hamdoun¹, Musa Ahmed Musa Tibin¹, Salah Abdelgabar Salah Bukhari¹, Salah Basar Hammad Dahia² and Jumaa Barram Jadalla^{*3}

¹ Department of Animal Production and Range, Faculty of Natural Resources and Environmental Studies, AL Salam University Alfula, Sudan hamdonadam@ gmail. com, usatibin2015@ gmail. com and bukharisalah1968@ gmail. com

²Department of Animal Production, Faculty of Agricultural Sciences, University of Dallanj. salahdahia1888@ gmail. com

^{3*}Department of Animal Production, Faculty of Natural Resources and Environmental Studies, University of Kordofan, Sudan, corresponding author jumaaaringola2000@ gmail. com

ARTICLE INFO

Article No.:071221066

Type: Research

Accepted: 24/07/2021

Published: 03/10/2021

*Corresponding Author

Jumaa Barram Jadalla

E-mail: jumaaaringola2000@ gmail.com

Keywords: goats nutrition;

Acacia sieberiana *Dichrostacys cinerea* milk quantity and quality

Full Text: [HTML](#), [EPUB](#)

ABSTRACT

This study was conducted in Kadam village in West Kordofan State, Sudan with the aim of investigating the effect of supplementation of Desert goats on natural grazing with Kuk (*Acacia sieberiana*) and Kadad (*Dichrostacys cinerea*) pods on milk production and quality. Twenty-four lactating goats in different age were divided into four similar groups, each with six animals. The groups were fed on four diets I, II, III, and IV. Group I was fed a diet of 50% Kadad pods, 25% groundnut cake, 24% sorghum grains and 1% salt. Group II was given a ration that contained 25% kadad pods, 25% kuk, 24%, sorghum grains and 25%, groundnut cake and 1% salt. Group III was fed with a ration consisting of 50% kuk pods, 0% kadad pods, 24% sorghum grain, 25% groundnut cake and 1% salt. The last group of goats (IV) depended on natural pasture alone. The supplements were offered at a rate of 750 g per head per day, and the natural pasture was supplied ad libitum. Daily milk production was recorded from the start of the experiment until the end of the lactation season that was observed for two years. Data were analyzed using for analysis of variance (ANOVA). The results showed significant differences ($P < 0.05$) in the daily production of milk between the four groups in two seasons. Group (I) recorded the highest daily production of milk during the lactation period in two seasons, with the average daily milk production in the first season. The second season (425.8 and 492 ml / day), followed by group (415) (II and 428 ml / day), respectively, while the third group recorded (363.0 III and 411.0 ml / day), respectively. No statistically significant differences ($P \geq 0.05$) were observed between the three groups for which the kadad and kuk were presented. The last group (IV) was significantly lower in daily milk production during the two seasons, and the milk yield was 282.3 and 251.3 ml / day, respectively. The results did not also showed significant differences ($P < 0.05$) in the total milk production among the three groups, while the fourth group had the lowest milk production than groups I, II and III. The study concluded that the use of Kuk and Kadad pods in rations resulted in an increase in milk production of dairy goats during the milk season. It is recommended that more research be conducted in the field of using tree pods in feeding various types of animals raised on natural pastures.

INTRODUCTION

Sudan is the vast agricultural country in Africa. It has over 130 millions heads of livestock. Goats make a valuable contribution especially to the poor people in rural areas in many developing countries. This is due mainly to their efficiency in terms of meat and milk production, low cost of maintenance, a great adaptive feature to harsh environment and their inherent suitability for small-scale production (Celi and While, 2010). Goats play an important role in the livelihood of wide sector in Sudan communities. Goats population is estimated at about 43 million heads, distributed mainly in arid and semi-arid zones (MAR, 2012). Goats play a vital role in rural economy and traditional agricultural production. Goats fulfill multi-purpose in the household nutrition and food security through providing families with proteins of high biological value as form of milk and meat; also they provide skin, hair and manure. The main types of goats in Sudan are Sudan Desert, Nubian and Tagger (Mountain goats) (El-Hag *et al.*, 2012). Goat is foragers and browsers, as opposed to grazers. They usually eat tree bark and leaves of bushes before grasses. Ligneous plants, like trees and shrubs, are an important component of the fodder resources for livestock and wildlife. The fodder value of trees and shrubs leaves, twigs and fruits is often superior to herbaceous plants and grasses. In arid and semiarid zones, browse resources provide the largest part of the protein supply during the dry months (hot summer). Use of improved forages, tree foliage and legumes as supplementary feeds for livestock have been investigate (Aiebuet *al.*2008b).

MATERIALS AND METHODS

Study area

Kaddam village is located at west Kordofan state, Sudan, within latitudes 11° 15' - 16° 30' N and longitudes 27°-32°E, about 850 Km west of Khartoum (Ministry of Agriculture west Kordofan state, 2015).

The area lies within low rainfall savanna in Baggara Repeating Pattern as classified by Harrison and Jackson, (1958). The zone is characterized by wet autumn and relatively cool winter with hot dry summer. The rainy season extends from July to October with a peak in August. Average annual rainfall is 350mm in the north and about 650mm in the southern parts. The temperatures are modified by rain, the highest annual temperatures (42°C) were recorded within a period extending from April to July, while the lowest values (14°C) were recorded during December and January (Meteorology Authority in west Kordofan state, 2015).

Topography and Vegetation

The soil is generally of smoothly undulating clay muddy plain dissected by patches of loamy sands (Gardud) in the southern parts (Personal observations). The most common tree and shrub

species are *Combretium cordofanum* (Habel), *Adansonia digitata* (Tebeldi), *Acacia senegal* (Hashab), *Acacia mellifera* (Kitr), *Acacia nubica* (Laout), *Faidherbia albida* (Haraz), *Albizzia mara* (Arad), *Acacia sieberana* (Kuk), *Dichrostachys cinerea* (Kadad), *Acacia nilotica* (Sunot) and *Boscia senegalensis* (Mokhait). Grasses are mostly annual including, *Dactyloctenium aegyptium* (Abu Asabei), *Cenchrus biflorus* (Hascheent), *Echinochloa colonum* (Difra), *Eragrostis aspera* (Banu), *Andropogon gayanus* (Abu-Rakhies). Herbaceous species are *Zornia glochidiata* (Shilini) and *Ipomea cordiosphilla* (Tabar). Heavily grazed areas are predominantly covered with unpalatable invaders plants such as *Cassia tora* (Kawl), *Cassia occidentales* (Soreib), *Abutilon spp* (El Neida) and *Cassia senna* (Sanamuka) (Khatir and Jadalla, 2014).

The Experimental Animals

Twenty four lactating Sudanese Desert does were used in this study. The animals were divided into four similar groups. Prior to commencement of the trials, the goats were weighed, drenched with a broad spectrum anthelmintic, ear tagged and individually penned. The animals were also vaccinated against diseases endemic to the study area. Watering and feeding troughs were provided in each pen. The feed supplement was offered twice a day after estimating the amount consumed at 7:00 am by subtracting the residual amount from the quantity offered. Water was provided continuously. The animals were at early pregnancy stage and the kids were weighed at birth and once every week to 16 weeks. For season two the goats were mated at the same time and their kids were also weighed similarly. The does were milked twice a day after allowing kids to suckle one teat. The amount of milk was recorded to the end of the lactating period. Body Measurements of length, chest circumference, height at wither and body weight of kids was recorded.

The Experimental Feed

Four rations were formulated. The percent ingredients used in the rations formulation are presented in table (1). Chemical composition of the ingredients is presented in table (2) while chemical composition of the rations used in feeding the four groups is presented in table (.3). The experiments was conducted to study the effect of feeding locally available tree pods; **kadad** *Dichrostachys cinrea* and **kuk** *Acacia sieberiana* added to groundnut cake, sorghum grains and salt on milk production, body weight and various body measurements of the Desert goats and their kids for two lactation periods. The concentrates were offered at 750 g / head/ day as supplementary ration and natural grazing as basal feed that was offered ad libitum. The experimental animals in Group four (IV) were kept depending on natural pasture only as control group. The feeding trials were carried out during the lactation period through early 120 days of lactation.

Table (1) percent Ingredients used in formulation of the of experimental rations percentage

Feed	Rations			
	I	II	III	IV
Kadad pods	50	25	0	0
Sorghum grain	24	24	24	0
ground nut cake	25	25	25	0
Kuk pods	0	25	50	0
Common salt	1	1	1	0
Total	100	100	100	0

Table (2) Chemical composition of the ingredients used in formulation of experimental rations

Feed	DM	OM	CP	CF	EE	NFE	ASH
Kada pods	93.65	86.95	6.93	29.23	2.20	48.64	6.70
Kuk pods	92.2	87.5	4.4	39.10	1.20	42.83	4.70
Sorghum grains	92.5	85.4	13.48	11.77	5.30	54.85	7.10
Groundnut cake	93.4	89.0	42.18	17.68	7.60	21.54	4.40
Salt							

Table (3) Chemical composition of the rations used feeding the experimental groups

Ration	DM	OM	CP	CF	EE	NFE	ASH
I	92.3	86.22	17.25	21.86	4.27	42.87	6.15
II	91.98	86.36	16.62	24.33	4.02	41.42	5.65
III	91.65	86.50	15.98	26.80	3.77	39.96	5.15
IV	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Salt							

Data collection

Records were taken for daily milk yield, the milk samples collection was started in 7 days postpartum and continued for 4 months (120days) of lactation period during daily interval period within all experimental animals, body weight and various body measurements of born desert goats and their dams were done.

Milk samples collection

Hand milking was applied; the milker usually approaches the doe from left side. He or She put the left leg of the doe between the leg bent and carry the milking bowl by his left hand and use the right hand for milking. Milking was practical twice a day, approximately 12-hours interval; usually the all udder or two teats were milked. To prevent the kids from suckling the kids were cull from their dams. Milking took place twice a day; it was done from 07.00 to 08.00 a.m in the morning and from 05.00 to 06.00 p.m at the evening. The estimates of milk yield were formulated from daily yield (every 24 hours) intervals for the whole milk productions of 120days were secured. milk recorded. Daily milk yield were estimated using different volume of graded cylinder involved 10 ml, 50 ml, 500 and 1000 ml. measuring cylinders. The milk yield was registered in the record of the milk production.

RESULTS AND DISCUSSION

Effect of Supplementation on daily milk production

The effects of supplementation of Desert lactating does on natural grazing with rations formulated using kadad (*Dichrostachys cinerea*) and Kuk (*Acacia sieberiana*) or a mixture of the two pods on milk production is presented in table (1) The result revealed that daily milk yield was higher in group (I) that was fed a ration formulated with kadad at 50% and followed by the group on a ration with 25% kadad and 25% Kuk (II) as well as the group that consumed a ration with 50% kuk(III). The lowest production was recorded from the group that was on the natural grazing alone (IV) for the two seasons. The milk production in season one was 425.8, 415, 363 and 282.3 ml/day for group I, II, III and IV respectively.

In season two daily milk production were 492, 428, 411 and 251.3 ml/day for group I, II, III and IV respectively. Similarly total milk production was significantly ($P < 0.05$) higher in the three supplemented groups for the two seasons. Peak daily milk yield in experimental animals was recorded in the first month for the two seasons. The milk production in season one was 608, 598, 573 and 451 ml/day for groups I, II, III and IV respectively. In season two, daily milk production was 700, 639, 598 and 429 ml/day for group I, II, III and IV respectively.

The daily milk yield declined gradually after reaching the peak towards the end of lactation period in 4th month. The milk production in season one was 285, 270, 216 and 160 ml/day for groups I, II, III and IV respectively. In season two daily milk productions were 338, 240, 288 and 141 ml/day for group I, II, III and IV respectively

Table (1) Effect of Supplementation on daily milk production

Treatments	Lactation period(days)				Overall mean
	30	60	90	120	
I ¹	608 ^a	466 ^a	344 ^a	285 ^a	425.8
I ²	700 ^a	517 ^a	413 ^a	338 ^a	492.0
II ¹	598 ^a	459 ^a	333 ^a	270 ^a	415.0
II ²	639 ^a	522 ^a	310 ^b	240 ^b	428.0
III ¹	573 ^a	408 ^a	255 ^b	216 ^b	363.0
III ²	598 ^a	434 ^a	323 ^b	288 ^{ab}	411.0
IV ¹	451 ^b	304 ^b	214 ^b	160 ^c	282.3
IV ²	429 ^b	254 ^b	181 ^c	141 ^c	251.3

Effect of Supplementation on total monthly morning milk production

The effects of supplementation of Desert lactating does on natural grazing with rations formulated using kadam (*Dichrostachys cinerea*) and Kuk (*Acacia sieberiana*) or a mixture of the two pods on milk production is presented in table 4.2. The result showed that total monthly morning milk production was significantly ($P<0.05$) higher in group (I) that was fed a ration formulated with kadam at 50% and followed by the group on a ration with 25% kadam and 25% Kuk (II) as well as the group that consumed a ration with 50% kuk(III). The lowest production was recorded from the group that was on the natural grazing alone (IV) for the two seasons. The total milk production in season one was 6589.8, 6452.1, 5615.6 and 4038.8ml/day for group I, II, III and IV respectively.

In season two, total milk yield was 7942.0, 6823.8, 6616.3 and 4343.8 ml/day for group I, II, III and IV respectively. On the other total milk production was significantly ($P<0.05$) higher in the three supplemented groups for the two seasons.

Peak total milk yield in experimental animals was occurred in the first month for the two seasons. The milk production in season one was 9494.2, 9232.5, 8751.1 and 6794.2ml/day for groups I, II, III and IV respectively, In season two total milk production was 11152, 10080, 9476.7 and 7000.0 ml/day for group I, II, III and IV respectively.

After the peak of total milk production the milk yield was decreased gradually towards the end of lactation period during the last month (120day) for the two seasons. The milk production in season one was 4477.5, 4140.8, 398.3 and 2365 ml/day for groups I, II, III and IV respectively. In season two, milk production was 5478.3, 3956.7, 4746.7 and 2532.5 ml/day for group I, II, III and IV respectively.

Table: (2) Effect of Supplementation on total monthly morning milk production

Treatments	Lactation days				Overall mean	Total milk
	30	60	90	120		
I ¹	9494.2 ^{ab}	7166.7 ^{abc}	5320.8 ^b	4477.5 ^b	6589.8	26459.2
I ²	11152 ^a	8497.5 ^a	6640.0 ^a	5478.3 ^a	7942.0	31492.0
II ¹	9232.5 ^b	7154.2 ^{abc}	5280.8 ^b	4140.8 ^{bc}	6452.1	25808.3
II ²	10080 ^{ab}	8221.7 ^{ab}	5036.7 ^b	3956.7 ^{bc}	6823.8	27570.9
III ¹	8751.7 ^{bc}	6392.5 ^c	3920.0 ^c	3398.3 ^{cd}	5615.6	22462.5
III ²	9476.7 ^{ab}	6953.3 ^{bc}	5288.3 ^b	4746.7 ^{ab}	6616.3	26465.0
IV ¹	6794.2 ^d	4039.2 ^d	2956.7 ^c	2365.0 ^e	4038.8	16155.2
IV ²	7000.0 ^{cd}	4592.5 ^d	3250.0 ^c	2532.5 ^{de}	4343.8	17375.2

I II III IV treatments 1, 2 seasons

Effect of Supplementation on total monthly evening milk production

The effects of supplementation of Desert lactating does on natural grazing with rations formulated using kadam (*Dichrostachys cinerea*) mean), Kuk (*Acacia sieberiana*) or a mixture of the two pods on milk production is presented in table (3) The result revealed that total monthly evening milk production was higher in group (I) that was fed a ration formulated

with kadam at 50% and followed by the group on a ration with 25% kadam and 25% Kuk (II) as well as the group that consumed a ration with 50% kuk(III). The lowest production was recorded from the group that was on the natural grazing alone (IV) for the two seasons. The total evening milk production in season one was 6144.4, 5984.5, 5281.5 and 3598.3ml/day for group I, II, III and IV respectively.

In season two total evening milk productions was 6859.1, 5935.8, 5693.5 and 4010.4 ml/day for

group I, II, III and IV respectively. Similarly total evening milk production was significantly ($P<0.05$) higher in the three supplemented groups for the two seasons.

Peak total milk yield in experimental animals was occurred in the first month for the two seasons. The milk production in season one was 8737.5, 8707.5, 8416.7 and 6534.2 ml/day for groups I, II, III and IV respectively, In season two total milk production

was 9842.5, 9085.8, 8440.0 and 6076.7 ml/day for group I, II, III and IV respectively.

After that milk yield declined gradually towards the end of lactation period. The milk production in season one was 4073.3, 3950, 3139.2 and 1841.7 ml/day for groups I, II, III and IV respectively. In season two, daily milk productions was 4645, 3233.3, 3892.3 and 2284.2 ml/day for group I, II, III and IV respectively.

Table: (3) Effect of Supplementation on total monthly evening milk production

Treatments	Lactation period (days)				Overall mean	Total
	30	60	90	120		
I ¹	8737.5 ^a	6792.5 ^{ab}	4974.2 ^{ab}	4073.3 ^a	6144.4	24577.6
I ²	9842.5 ^a	7218.7 ^a	5730.0 ^a	4645.0 ^a	6859.1	27436.4
II ¹	8707.5 ^a	6623.3 ^{ab}	4657.2 ^{bc}	3950.0 ^{ab}	5984.5	23938.0
II ²	9085.8 ^a	7159.2 ^{ab}	4265.0 ^{bc}	3233.3 ^{bc}	5935.8	23743.2
III ¹	8416.7 ^a	5850.0 ^{bc}	3720.0 ^{cd}	3139.2 ^c	5281.5	21126.0
III ²	8440.0 ^a	6058.3 ^{ab}	4383.3 ^{bc}	3892.3 ^{abc}	5693.5	22774.0
IV ¹	6534.2 ^b	3559.0 ^d	2458.3 ^e	1841.7 ^d	3598.3	14393.2
IV ²	6076.7 ^b	4508.3 ^{cd}	3172.5 ^{de}	2284.2 ^d	4010.4	16041.6

I II III IV treatments 1, 2 seasons

Effect of Supplementation on Total Milk Production

The effects of supplementation of Desert lactating does on natural grazing with rations formulated using kadad (*Dichrostachys cinerea*) and Kuk (*Acacia sieberiana*) or a mixture of the two pods of previously mentioned trees on milk production is presented in table (4) The result recoded that total milk production was higher in group (I) that was fed a ration formulated with kadad at 50% and followed by the group on a ration with 25% kadad and 25% Kuk (II) as well as the group that consumed a ration with 50% kuk (III). The lowest production was obtained from the group that was on the natural grazing alone (IV) for the two seasons. The total milk production in season one was 12759.2, 12446.8, 10897.1 and 7688.3 ml/season for group I, II, III and IV respectively.

In season two total milk productions were 14747.5, 12828.7, 12310.2 and 8302.8 ml/season for

group I, II, III and IV respectively. Similarly total milk production was significantly ($P<0.05$) higher in the three supplemented groups for the two seasons. Peak total milk yield in experimental animals was occurred in the first month for the two seasons. The milk production in season one was 18232.0, 17940.0, 17168.0 and 13534.0 ml/season for groups I, II, III and IV respectively, In season two total milk production was 20994, 19166.0, 17917.0 and 12871 ml/season for group I, II, III and IV respectively.

After that milk yield was declined gradually towards the end of lactation period during last month (120day) for the two seasons. The milk production in season one was 8550.8, 8090.8, 6537.5 and 4206.7 ml/season for groups I, II, III and IV respectively. In season two daily milk productions was 10123, 7190, 8640 and 4816.7 ml/day for group I, II, III and IV respectively.

Table (4) Effect of Supplementation on total milk production

Treatments	Lactation period (days)				Overall mean
	30	60	90	120	
I ¹	18232 ^{ab}	13959.0 ^{ab}	10295.0 ^{ab}	8550.8 ^{ab}	12759.2
I ²	20994.0 ^a	15503.0 ^a	12370.0 ^a	10123.0 ^a	14747.5
II ¹	17940.0 ^{ab}	13778.0 ^{ab}	9978.3 ^b	8090.8 ^{bc}	12446.8
II ²	19166.0 ^{ab}	15657.0 ^a	9301.7 ^{bc}	7190.0 ^{bc}	12828.7
III ¹	17168.0 ^b	12243.0 ^b	7640.0 ^{cd}	6537.5 ^c	10897.1
III ²	17917.0 ^{ab}	13012 ^{ab}	9671.7 ^{bc}	8640.0 ^{ab}	12310.2
IV ¹	13534.0 ^c	7598.2 ^c	5415.0 ^e	4206.7 ^d	7688.30
IV ²	12871.0 ^c	9100.8 ^c	6422.5 ^{de}	4816.7 ^d	8302.80

I II III IV treatments 1, 2 seasons

REFERENCES

- Ajebu, N., Adugna T., Eik, L. O. and Sundstøl, F., (2008b). The supplementary value of different parts of enset (*Ensete ventricosum*) to sheep fed wheat straw and *Desmodium intortum* hay. *Lives Sci.* 119: 22-30.
- El-Hag, F. M.; Khatir, A. A., El-Jack, F.H., Mekki, M. A. and Mohamed, M. D. (2012). Livestock breeds characterization in the Western Sudan Resource Management Program (WSRMP) area. A study done for IFAD-WSRMP, Federal Ministry of Agriculture, El-Obeid, Sudan. 145 pp.
- Ministry of Agriculture west Kordofan state, 2015
- Celi, P. & P.J. White (2012) .Dairy Goat Farming in Australia: Current Challenges and Future Developments. Proceedings of the First Asia Dairy Goat Conference. April 9 – 12, 2012 Corus Hotel Kuala Lumpur, Malaysia
- Ministry of Animal Resources and Fishery, MAR, (2012). Annual report on national livestock and animal wealth census Khartoum, Sudan.
- Meteorology Authority in west Kordofan state (2015). Animal report.

Cite this Article: Hamdoun AJH; Tibin MAM; Bukhari SAS; Dahia SBH; Jadalla JB (2021). Effects of supplementation of lactating Desert Goats with kuk (*Acacia sieberiana*) and Kadad (*Dichrostacys cinerea*) pods on Milk Production and quality. *Greener Journal of Agricultural Sciences* 11(3): 139-144.