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Effect of Concentrate Supplementation of Lambs Born to Concentrate Supplemented Ewes under Range Conditions of Sudan

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ABSTRACT

This work aimed to study the effect of feedlot performance of weaned lambs born to concentrate supplemented ewes of desert sheep (Hamari sub type) raised on natural range, western Kordofan state, Sudan. Thirty two weaned ram lambs of equal average weight of 25.75 kg and age(milk tooth)were used for the study. All lambs were allowed to graze on pasture during the day. Animals were watered every 2-3 days according to ambient temperature. Lambs were randomly divided into four lambs groups according to their dam's previous feeding program, which was concentrate supplement at a rate of 500 gm./ewe/day. Lambs of group A born to ewes given concentrate one month before mating, one month during mating, and one month before lambing, and lambs of group B were born to ewes given the supplement for one month during mating and one month before lambing, and lambs of group C and D were born to ewes kept on natural grazing only. Each group contained eight lambs. Lambs of group A, B and C were given the same concentrate supplement of their damson ad libitum base for 60 days. Lambs of group D was left on grazing only as a control. Concentrate supplement consisted of sorghum grains 15 %, groundnut cake 20 %, molasses 15 %, and wheat bran 25 %, groundnut hullus 23 %, 1 % salt and 1 % limestone. Lambs were treated against external and internal parasites, and vaccinated against diseases. General health of lambs was closely observed for any deviation. Live weight of lambs was recorded initially and thereafter every fortnight. Daily weight gain, total weight gain, and mortality were also taken. The results indicated that final live weight, total weight gain and daily weight gain were significantly ($p<0.01$) different between supplemented groups and the control. Regression coefficients between body weight and period of fattening were high in all lamb groups. Economical appraisal of fattening lambs showed that the high cost of concentrates affected total variable costs but the high sale prices of supplemented fat lambs reflected positively on profit increase. It was concluded that concentrate supplementation of grazing ewes before and during the breeding period and that for grazing weaned lamb's improved their production and increased their sales revenue. Thus it is recommended to adopt concentrate supplementation of ewes to enhance their lambs feedlot performance and sale revenues.

Keywords: *Feedlot performance, Concentrate supplementation, Hamari sheep, Natural pasture, Sudan.*

INTRODUCTION

Lamb meat is perceived by the consumer as a natural product, a source of proteins and essential amino acids, with its characteristic taste, flavor, color and absence of substances that affect human health and is more accepted by consumers compared to mutton (Alves *et al*, 2014). In addition lambs need short duration to finish, that make feedlot of weaned lambs improve economics of productivity of sheep (Macedo, *et al.* 2000).

Sheep of Sudan are bred mainly for meat production, providing all lamb and mutton for local consumption and export (M A R F, 2016). Sudan desert sheep and their crosses make up about 86 % of the sheep found in the country. In Kordofan States (North, South, and West) of Sudan the major types of desert sheep are namely Hamari and Kabashi (Alraed,

2011)which are raised under nomadic conditions using traditional management systems and grazing on natural pastures. The latter are affected by seasonality of rainfall and during the dry season animals suffer from heat stress, feed shortage and nutrient deficiencies. Travel long distance searching for pasture and water which result in poor reproductive performance of ewes and lamb production (Idris, 2014). Feed supplementation is a strategy to solve this problem (Asma and Yagoub 2016).This work was carried out to study the effect of feedlot performance of weaned lambs born to ewes under range conditions.

Material and Methods

Study Site

The study was conducted at Elnuhood Locality, West Kordofan State, Sudan. The area is located in the semi-desert ecological zone, at latitudes (12-14) O north and longitudes (27-30) O East.

The climate in this area is warm in wet season and hot dry in summer with a highest temperature of 46 C O. The rainy season lasts for four months (July to October), the annual average rainfall is between (450- 550) mm. (EMS, 2015).

The dominant vegetation is a variable mixture of thorny trees, shrubs, herbs, and grasses. The Acacia trees are dominant were Acacia senegal (Hashab) Bascia senegalensis (Mokhait), Sclerocarya birrea (Hummait), Guiara aengegalensis (khubaish) and, Adansonia digitata (Tabldi), The grasses and herbs which predominate include Dactyloctinium aegyptiun (Abu- Asabi), Echnochloacolonum (Difra), Andropogon gayanus (Abu Rakhies) and, Zorniaglockidata (Shiline). Overgrazed areas are dominated by less palatable species such as Eragrostis tremula (Banu), Cenchrus biflorus (Haskaneet),Calotropis procera (ushar), and other grasses and herbaceous species such as Cenchrus setigrus, Chloris gayana, Cassia acutifolia Alexandrian (Senna), and Abutilon spp, (El Neiada).

Thirty two ram lambs born to ewes on natural pasture. Lambs had an average birth and weaning weights of 4.50, and 25.75 kg respectively, and all had milk teeth. Lambs were ear-tagged and divided randomly into four groups according to their dams previous feeding program. Group (A) and (B) each contained lambs born to supplemented dams, while group (C) and (D) contained lambs born to non-supplemented dams. Lambs were allowed to graze on natural grasses on pasture during the day. A concentrate supplement (table 1), was given early in the morning to group (A), (B), and (C), while group (D) was allowed to graze on natural grasses only as (control). The supplement was given ad libitum, and unconsumed part was weighed daily to give feed intake. Lamb watering frequency was (2-3) days throughout the experimental period which lasted for 60 days.

During the study period lambs were treated with Ivomec, and drenched with Albendazol against external and internal parasites and also vaccinated against diseases as sheep pox, and PPR. General Heath of animals was closely observed for any deviation. Cases of blindness and severe diarrhea were observed and treated.

Live weight of lambs was recorded initially and thereafter every fort night after an overnight fast. Daily weight gain, total weight gain, and mortality were recorded.

Table1. *Ingredient proportions and chemical composition of the concentrate supplement*

Ingredients	percentage
Sorghum grains	15
Groundnut cake	20
Molasses	15
Wheat Bran	25
Groundnut Hulls	23
Salt	1
Limestone	1
Total	100
Calculated Crude Protein (CP) %	18.47
Calculated Metabolizable Energy(ME) (MJ/kg)	10.7
Proximate analysis (%) on dry matter basis:	
Dry matter	95.15
Crude protein	18.51
Crude fiber	7.57
Ether extract	4.65
Ash	8.10
Nitrogen Free Extract	61.27

Result and Discussion

Effect of Concentrate Supplementation on Lamb Feed lot Performance

Effect of feed lot performance of lambs throughout the experimental period is shown in table (2). The average initial weight was not significantly different among lamb groups and was 25.75 kg. Final live weight, total weight gain and daily weight gain showed the same trend and there were highly significant ($p<0.01$)

differences between supplemented groups and the control. The latter group had the lowest final weight and daily weight gain.

The heath of the lambs was greatly affected during the period of fattening. Cases of blindness, diarrhea, and pneumonia were observed and could be due to grazing of withered, bleached non palatable grasses, and drop of ambient temperature. These conditions resulted in decreased feed intake and growth rate of lambs as well as sudden death of one lamb. The growth curve of the four lamb groups given in figure (1) indicated that lambs of group (A) and (B) had the highest growth curves, followed by those of group (C), while group (D) lambs had the lowest growth curve. Lambs given concentrate supplementation grew significantly superior to those left on natural pasture. Effect of concentrate supplementation was the reason, in addition, lambs born to concentrate supplemented ewes group A and B had higher but not significantly so, final live weight, total live weight gain and daily live weight gain than lambs born to non-supplemented ewes group C. This could possibly be due to that lambs of the former groups suffered less from weaning shock and were able to grow post weaning at fast rates (Fraser, 2000).

Table2. *Feed lot performance of fattened lambs born to concentrate supplemented or left on natural grazing Hamari ewes*

Parameter	Lamb group				SE	P Level
	A	B	C	D		
Number of Animals	ND	ND	8	8	8	7
Initial body weight (kg)	0.51	N S	25.75	25.75	25.75	25.75
Final body weight (kg)	0.48	**	26.88 [b]	30.88 [a]	32.50 [a]	31.86 [a]
Total live weight gain (kg)	0.48	**	2.17 [b]	5.13 [a]	6.75 [a]	6.14 [a]
Average daily weight gain (g/head)	0.48	**	36.17 [b]	85.50 [a]	112.50 [a]	102.33 [a]
Total concentrate intake (kg)	ND	ND	0	384	384	384
Daily concentrate intake (g/head)	ND	ND	0	800	800	800
Feedlot period (days)	ND	ND	60	60	60	60

In this and subsequent tables values in the same row having similar superscripts (abc) are not significantly different. ND: No Data.

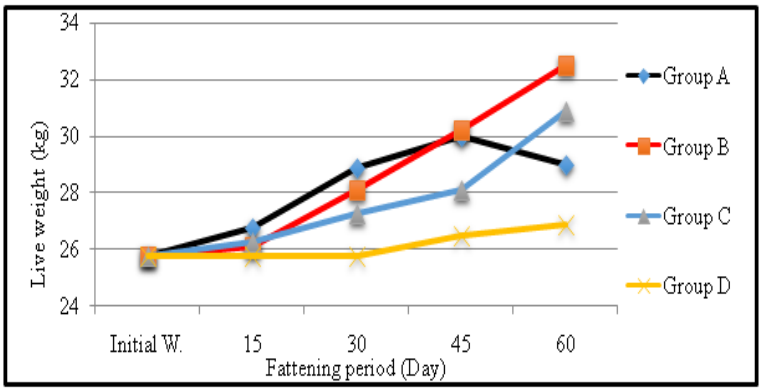

Figure1. *Growth curve of fattened lambs born to concentrate supplemented Hamari ewes or left on natural grazing:*

Group (A) $y = 0.975x + 25.15$ $R^2 = 0.768$ Group (B) $y = 1.762x + 23.26$ $R^2 = 0.959$

Group (C) $y = 1.214x + 24.01$ $R^2 = 0.899$ Group (D) $y = 0.301x + 25.22$ $R^2 = 0.8$

Lambs born to non-supplemented ewes and left to grow on natural pasture without concentrate supplementation had the poorest growth performance in term of final weight, total live weight gain and daily live weight gain possibly due to the residual effect of their poor pre-weaning growth and lack of concentrate supplementation during fattening. Live weight gain achieved by these lamb groups were lower than values reported for the desert sheep in other geographical regions in the country because animals in this study were subjected to combination of stresses such as long journeys in search of pasture and water and high ambient temperature. In addition to that during the experiment the quantity and the nutritive value of the forage was low as the rainy season was poor. Furthermore lamb's heath status was

affected with blindness, diarrhea, and pneumonia.

The poor growth performance of lambs left on natural grazing and not supplemented with concentrate agreed with the findings reported by Asma, and Yagoub (2016) who studied the effect of graded levels of concentrate supplementation on performance and carcass characteristics of natural grazing Sudanese desert lambs. They found that daily weight gain increased with increasing concentrate level. Similarly Ali et al., (2015) found that pen fed Hamari lambs given concentrates at a rate of 250 gm/head/day and roughage ad libitum, grew at a faster rate than their counter parts left on natural pasture.

Allama (1987) studied post weaning performance of lambs of the desert sheep, Dubasi subtype, born to ewes that received different flushing treatments. Lambs were allowed to graze on irrigated pasture during the day, and received concentrate supplement at night. He reported that daily gain was 200-220 gm for lambs born to ewes flushed before and during breeding, 185-195 gm for those born to ewes flushed before breeding only, and 180-195 gm for lambs born to non-flushed ewes. These daily gain values were superior to the findings in this study possibly due to type of pasture, animal age, and type of concentrate diets.

Total live weight gain in the current study reflected daily live weight gain and was significantly ($p<0.01$) higher in the concentrate supplemented groups than in the control group. Between supplemented groups, lambs born to flush ewes had heavier total live weight gain than those born to non-flushed ewes.

During the fattening period the growth rate of some lambs was observed to decrease after 45 day of feeding. This could possibly be related to repeated cases of blindness arising from grazing less palatable plants like (ushar) Calotropis procera which has a toxic latex affecting mainly vision, in addition to occurrence of some digestive disturbances and pneumonia due to sudden drop in ambient temperature (Medros et al., 1989).

Regression Coefficients of Live Weight with Fattening Period

Regression coefficients of body weight of lambs and fattening period indicated that body weights were positively correlated with period of fattening in all lambs groups ($R2=0.77$, 0.96, 0.90 and 0.80) for group A, B, C, and D respectively. Group (B) showed the highest relationship followed by group (C and D), while group (A) showed the lowest regression coefficient. Lambs born to concentrate supplemented grazing ewes when given concentrate supplementation post weaning were found to have better growth performance than their counter parts born to non-supplemented ewes. The results revealed that there were positive correlated relationship between body weight and fattening period in all lambs groups. The best relationship was found in lambs of group (B) ($R2 = 0.96$), due to the high growth rate and weight gain of these lambs, then followed by group (C) which had a regression coefficient of ($R2=0.90$), this could possibly be due to the residual effect of the lack of supplemented of their dams which affected the growth of their lambs. Group (D) recorded ($R2=0.80$), as they had low growth rate on natural grazing. The poor relationship ($R2=0.77$) shown in group (A) could possibly be due to the incidence of blindness, diarrhea, and pneumonia which reflected negatively in their growth rate.

Feasibility of Finishing Hamari Lambs

Table (3) presents the economical appraisal of fattening Hamri lambs on natural grazing only or on concentrates supplemented grazing. From the data net profit was calculated. The high cost of concentrates had considerable effects on the total variable costs in supplemented lamb groups. Lambs in the control group depended mainly on natural grazing which resulted in low total cost. The high sale prices of supplemented lambs (700-750) SDG compared to control group (550 SDG) resulted in the high profits of supplemented groups. Lambs in the supplemented groups had a net profit range of 177.5 SDG per head, greater than that of lambs finished on grazing which achieved a profit of 90 SDG per head.

Sheep production in Sudan depends on natural grazing on the open range. The range condition is declining annually due to increased sheep population and human activities and urbanization, in addition to lack of permanent range development programs. This necessitates improvement of sheep nutrition especially in critical dry seasons. Supplementation of natural pasture using agro-industrial by-products available in these regions is expected to improve reproduction and production of these sheep

flocks. Concentrate supplementation of ewes and lambs, improved reproductive and performance of ewes, and lamb growth.

The economic evaluation of concentrate supplementation in finishing lambs indicated that lamb purchase price represented 69.87 % of the total costs, feed represented more than 65.22 % of total variable cost due to the high prices of ingredients as sorghum grain, molasses, and wheat bran. Drugs and medication, transportation, and labor cost were the same in all treatments and represented 34.78 % of the total variable cost. Net profit per lamb was 177.5, 127.5, and 90 SDG for group (A), (B and C) and (D), respectively.

The highest net profits was for lambs born to ewes that received concentrate supplements for two month during breeding and then fed to finish on concentrates, followed by those born to ewes given concentrates for one month during the breeding period and then for lambs born to ewes not given concentrate and then fed to finish on concentrates and the least profit was for lambs born to non-supplemented ewes and left to finish on natural pastures. This could possibly be due to concentrate supplementation improvement effect on growth rate and body condition of these lambs allowing them to sell at higher prices. The respective sale prices were 750,700, and 550 SDG for concentrate finished and grazing finished lambs. Mortality reduced the number of lambs sold in group (A) to 7 which decrease total net profit in this group by 750 SDG.

Table3. *Partial budget analysis of Fattening Hamari lambs*

Item	Supplemented groups						Non Supplemented group (group D)	
	(Group A)		(Group B)		(Group C)			
	Eight lambs	One lamb	Eight lambs	One lamb	Eight lambs	One lamb	Eight lambs	One lamb
Purchase price	3200	400	3200	400	3200	400	3200	400
Totalconcentrate consumed (kg)	0	0	360	45	360	45	348.75	45
Mortality	0		0		0		1	
Concentrate Cost	0	0	900	112.5	900	112.5	871.88	112.50
Medication	80	10	80	10	80	10	80	10
Transportation	240	30	240	30	240	30	210	30
Labor, shepherd	160	20	160	20	160	20	160	20
Total variable cost*	480	60	1380	172.5	1380	172.5	1321.88	172.5
Total cost	3680	460	4580	572.50	4580	572.50	4521.88	572.50
Revenue of sale	4400	550	5600	700	5600	700	5250**	750
Net Profit	720	90	1020	127.5	1020	127.5	728.12	177.5

Price of concentrates (kg) = 2.500 SDG. Average purchase price of lamb = 400 SDG.

Average sale price of lamb =700 SDG for fattened and 550 SDG for non-fattened lamb.

Prices in SDG 2015.

other than animal cost. Only 7 lambs were sold, and one lamb was died.*

CONCLUSION

Can be concluded from this study Concentrate supplementation of grazing ewes and their lambs had improved their production performance, and reflected positively their lambs feedlot performance and sale revenues.

REFERENCES

[1] **Ahmed**, A. B. (2012) Effect of Feeding Urea-treated Groundnut Hulls and Molasses on performance and Carcass Characteristics of Hamari Desert Sheep Lambs M. Sc. Thesis Faculty of Animal Production. University of Khartoum. Sudan.

[2] **Ali,** M,A., M.,, A., Abdella, M. A., Elimam, H. O., Sulieman, M. E., El-Hag, F. M., Neama, A. E., and Jadalla, J. B. (2014). Pre-weaning Body Measurements and Performance of Desert Sheep (Tribal Subtypes Hamari and Kabashi) Lambs of Kordofan Region. Sudan. Mal. J. Anim. Sci. Vol: 17(1): 35-45.

[3] **Allama**, A. A. (1987). Some productive and reproductive traits in Sudandesert sheep. M. Sc. Thesis. Faculty of Vet Science. University of Khartoum. Sudan.

[4] **Alraed**, electronic news paper. (2010). Forage gap: threatening livestock- Editor-in-chief Rashid Abdul Rahim, http:// www.alraedsd. com/porta.

[5] **Alves**, L. G. C., Osório, J. C. S., Fernandes, A. R. M., Ricardo, H. A., and Cunha, C. M. (2014). Produção de carne ovina com foco no consumidor. Enciclopédia Biosfera, Centro Científico Conhecer-Goiânia, 10(18), 2399-2415.

[6] **Asma**, H. M., and Yagoub M. Y. (2016). Effect of Concentrate Supplementation on Performance and Carcass Characteristics of Natural Grazing Sudanese Desert Lambs.J. Agri. Sci. and Eng. Vol. 2, No. 1, 2016, pp. 1-4.

[7] **E M S**, (2015) El Nuhood Meteorological Station, Seasonal rainfall records. Sudan.

[8] **Fraser**, T. G., and Saville, D. J. (2000). Effect of weaning weight in subsequent lamb growth rates. Proceedings of the New Zealand Grassl and Association 62: 75–79.

[9] **Gaili**, E. S. E. and Ali, A. E. (1985). Meat from Sudan desert sheep and goat. Part 1. Carcass yield, offal's and distribution of carcass tissues. Meat Sci., 13:217- 227.

[10] **Idris**, A., Kijora C., El-Hag F. M., Salih, A. M., and. Fadul Elmola S. A. (2014) Climate change adaptation strategies for sheep production in range land of Kordofan Region. W. E. J. Vol: 1 (1): 20-25, Available online at www. worldes saysj.com.

[11] **Jabbar**, M. A., and Anjum, M. I. (2008). Effect of diets with different forage to concentrate ratio for fattening of Lohi lambs. Pakistan Vet. J., 28(3): 150-152**.**

[12] **Jadalla**, J. B., Mekki, D. M., Bukhari, S. A., and Eshag, N. A. (2014). Effects of supplementation of the natural grazing with Roselle seeds on dry mater intake and performance of Desert sheep lambs in West Kordofan, Sudan. Afri. J. Anim. Biomed. Sci., 8(1): 11-16.

[13] **Macedo**, F. A. F., Siqueira, E. R., Martins, E. N., & Macedo, R. M. G. (2000). Qualidade de carcaças de cordeiros Corriedale, Bergamácia x Corriedale e Hampshire Down x Corriedale, terminados em pastagem e confinamento. *RevistaBrasileira de Zootecnia*, *29*, 1520-1527. doi: 10.1590/S1516-359820060007 00025.

[14] **MARF,** (2014, 2016). Ministry of Animal Resources and Fisheries. General Administration for Planning and Animal Resources Economics, Khartoum, Sudan.

[15] **Medros, C.** M., Figueroa, V., Garcia, A. and Mora, L. M. (1989). Use of molasses in animal feed. Sugar industry abstract (1999). Vol: 52(4), P. 672-677.

[16] **Tibin**, M. A. M., Bushara, I., Elemam, M. B., Tibin, I. M., and Jadalla, J. B.(2012) Carcass characteristics of desert sheep under range conditions in north Kordofan state, Sudan. Online J. Anim. F. Res. Vol (2): 439-444.

[17] **Yenesew**, A., Solomon, M. and Azage, T. (2013). Effect of supplementation of grazing sheep with groundnut cake and wheat bran. Wudpecker. J. Agri. Res. Vol. 2 (8), pp. 212 – 217.

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