

EFFECT OF SUPPLEMENTATION, BIRTH TYPE AND SEX ON LAMBS' GROWTH RATE UNDER RANGE CONDITION

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ABSTRACT: Supplementary feeding experiment was carried out with desert ewes and their lambs prior to late pregnancy days and during lactation period at Agricultural Research Station, El-Obeid, North Kordofan, Sudan. The aim of the study was to investigate the effect of supplementation on body weight of lactating ewes and their lambs' growth rate in the dry season. The ewes were allocated to one of four treatment groups, one group was the control (CTL) as in farmer practice. The second, third and fourth groups were supplemented with rations composed of local ingredients, diet 1 composed of groundnut seed cake, Roselle seeds, sorghum and 5% molasses (GRS-5%M), diet 2 composed of groundnut seed cake, Roselle seeds, and sorghum (GRS), and diet 3 composed of groundnut seed cake, Roselle seeds, sorghum and 7.5% molasses (GRS-7.5%M). Ewes and lambs were recorded within 4 h after birth. Lambs weights were recorded weekly before weaning weight (day 60) and till 120 days. The results indicated that, lambs growth rate was highest for supplemented dams before weaning, lambs suckling dams supplemented with GRS-7.5%M recorded heavier ($P < 0.05$) weights, and then followed by GRS and GRS-7.5%M. Lambs suckling dams on control group (CTL) recorded lower ($P < 0.05$) growth rate in 75 days. Ewe's age had effect on lambs weight change, lambs suckling older animals gained weight earlier compared with younger, also the study showed that, male lambs had higher ($P < 0.05$) growth rate than female lambs. Single lambs were significantly heavier than twins before weaning.

Keywords: Supplementation; Late Pregnancy, Desert Ewes, Lambs Growth Rate, Dry Season.

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INTRODUCTION

Sudan desert sheep and their crosses are raised mainly under harsh dry land farming conditions for meat production in western Sudan (Khalafalla and Sulieman, 1992). Sudan desert sheep are entirely dependent on grazing natural rangeland and forest. They prefer short grasses and they have difficulty in eating coarse feedstuff. While they are not credited with browsing on bush, thorn bush and trees. The most critical period for rearing sheep in the semi-desert zone of Sudan is from February to June, when the ambient temperature becomes hot and range grazing is scanty and depleted of nutrients (Cook and Fadlalla, 1987). The nutritional limitation, low nutritive value of the range, high ambient temperature, scarcity of feed and water have great effect on the production of the sheep in semi arid area of Kordofan state (El-Hag, 2001).

This study was undertaken to evaluate the effects of ewes' supplementation, sex and birth type on lambs' daily growth rate before and after weaning in the dry season. The main ultimate objective was to introduce supplementation concept to nomadic herd owners.

MATERIAL AND METHODS

Study area

The study was conducted at Agricultural Research station, El-Obeid, North Kordofan state (latitudes 11°:15'-16°:30' N and longitudes 27°-32° E), Sudan. Most of North Kordofan state lies within arid and semi-arid ecological zones. The average maximum temperature varies between 30 and 35°C during most of the year with peaks above 40°C during hot summer. The rainy season extends from July to October, reaching to peaks in August. The annual rainfall ranges from 75 mm in north and about 500mm in south and with average 280 mm (Technoserve, 1987). The vegetation varies from north to south. In the north grass land and shrubs predominate while bushes and trees are common in the south (Harrison and Jackson 1958; Vogt 1995).

Experimental procedure and feed supplementation

This experiment was carried out in ewes that lambed in the dry season (March-April) when there is not enough feed and the pasture is poor. A total of 290 ewes 2 to 6 years old reared in natural range conditions were selected during late pregnancy days. Ewes were allocated to one of four treatment groups, the control group (n = 37) was kept as in farmer practice without any supplementation (CTL). The second group (n = 86), third (n = 87) and fourth groups (n = 80) were supplemented with rations composed from local ingredients, diet 1 composed of groundnut seed cake, Roselle seeds, sorghum and molasses (GRS-5%M), diet 2 composed of groundnut seed cake, Roselle seeds, and sorghum (GRS), and diet 3 composed of groundnut seed cake, Roselle seeds, sorghum and molasses (GRS-7.5%M). The amount of the diets is illustrated in Table 1 and all the ingredients used in this experiment were grown in the study area and Roselle seed (*Hibiscus sabdariffa*) is a species of *Hibiscus* native to the Old World tropics. All ewes were allowed for 2 weeks as adaptation period before lambing. Experimental animals were maintained on pasture and supplemented with treatments until day 120. During late pregnancy days and after birth animal were offered individually 200 g / head daily in the morning at 6:00 am. The lambs were separated from their mothers after suckling in the morning.

Live weight and of the ewes and lambs were recorded within 4 h after birth using, weights lambs were recorded weekly before weaning weight (day 60) and till 120 days. Date, type of birth and sex of lamb were recorded. At weaning, lamb survival was calculated for each treatment group.

Analytical procedures:

The analysis is performed to experimental diets according to A.O.A.C. (1995) and Goering and Van Soest (1991). The content of the metabolizable energy (ME, MJ / kg DM) was calculated from table values of energy content of the components.

Statistical analyses

Data on lambs' weight at birth and weekly growth rate changes were analyzed using a least square model with supplement, type of birth and sex as fixed effects and the random error (Harvey 1990). Significant differences among means were tested using Duncan's new multiple range test (Duncan, 1995).

Table 1 - Composition of the diets (%) and Chemical composition (g/kg dry matter) of the supplements and calculated energy content.

Ingredients	Treatments		
	Diet 1 (GRS-5%M)	Diet 2 (GRS)	Diet 3 (GRS-7.5%M)
Molasses	5	–	7.5
Sorghum	29	34	26.5
Roselle seeds	25	25	25
Groundnut seed cake	40	40	40
Common salt	0.75	0.75	0.75
Salt lick	0.25	0.25	0.25
Chemical composition			
Dry matter	923	926	934
Crude protein	381	369	330
Crude fibre	90	98	88
Crude fat	53	65	88
NDF	191	192	205
ADF	141	149	130
ADL	45	44	40
HEMI	51	44	75
CELLU	96	104	90
Ca g / kg DM	24	17	32
P g / kg DM	53.2	54	42
Energy density (Mcal DE/kg DM)	11.25	11.29	11.71
In vitro OM digestibility (%)	73.38	71.53	71.21

NDF: neutral detergent fiber; ADF: acid detergent fiber; ADL: acid detergent lignin; HEMI: hemi cellulose (NDF-ADF); CELLU: cellulose (ADF-ADL). OM; organic matter. GRS-5%M; Ground nut cake, Roselle seeds, Sorghum and 5% Molasses; GRS ;Ground nut cake, Roselle seeds and Sorghum; GRS-7.5%M; Ground nut cake, Roselle seeds, Sorghum and 7.5% Molasses.

RESULTS AND DISCUSSION

The effect of supplementation on lamb's growth rate during dry season was shown in Table 2. Analysis of variance revealed significant differences ($P < 0.05$) in daily growth rate of lambs. Before weaning (0-60 days), lambs growth rate were highest ($P < 0.05$) for supplemented groups. When lactation curve advanced the significant differences among the three treatments began to appear on the growth rate after 60 days post partum. Lambs suckling dams supplemented with GRS-5%M recorded heavier weights, and then followed by GRS and GRS-7.5%M. Lambs suckling dams on control group (CTL) recorded lower growth rate in 75 days. Also the study showed that, there were no significant differences ($P \geq 0.05$) in daily growth rate of lambs from 75-90 days post-partum. Lambs growth rate were highest ($P < 0.05$) for CTL in 120 days post-partum. Over all daily growth rate was highest for GRS-5%M, followed by GRS and GRS-7.5%M, and the control group recorded lower growth rate.

Supplementation of dams during early lactation had significant effect on body weight change. Lambs suckling dams on farmer's practice had lower body weight compared with fed groups, and this may be due to that, dams may not get their enough nutrient requirements to meet mammary growth and milk production. Supplementation of pregnant ewes during late two weeks of gestation may provide adequate energy and protein so they produce more milk yield that reflected on growth rate of their lambs, which supports embryonic and foetal growth and maintenance of animal physiological needs. Similar results were noted by Oeak et al. (2005), Sairanen et al. (2006) and El-Hag et al. (1998). Non supplemented ewes lost more body reserves compared with supplemented groups, same results were recorded by Rafiq et al. (2006), also the dams produce less milk yield.

Supplementation had effect on lamb weight changes. Lambs suckling supplemented dams recorded heavier weights at birth and during the experimental period. Findings of Rafiq et al. (2006) had revealed that lamb's birth weight is significantly and positively correlated with ewe body weight. Similar observation was supported by El-Nasr et al. (1994) and Zahari et al. (1994). These workers reached a conclusion that feeding a balanced concentrate promotes better growth.

Dams' age had significant ($P < 0.05$) effect on lambs growth rate (Table 3). The results showed that, lambs suckling dams their age more than 5 years began to gain more weight in the first 15 days of lactation, compared with animals less than 5 years. After weaning (60-75 days) the growth rate improved for the lambs born from dams whose age is less than 5 years. Ewe's age had effect on lambs weight change, older animals gained weight earlier compared with younger ones. These findings highlight that, nutritional status of older ewes mobilizes their body weight more than younger ewe and lactation curve may be affected with dam's age. These findings showed that, lambs from younger ewes would be lighter than lambs from the older ewes. These findings highlight that, lambs from supplemented dams were suckling more milk than lambs born from control ewes. Similar results reported by Nnadi et al. (2006) and Njoya et al. (2005).

The effects of lamb sex had no significant ($P > 0.05$) effects on lambs' daily growth rate. Male lambs had higher growth rate during the experimental period than female lambs (table 4). Type of birth had a highly significant ($P < 0.05$) effect on lamb growth rate before and after weaning birth (table 4). Single lambs were significantly heavier than twins from 15 days to 105 day post-partum.

The birth type had no significant effect ($P > 0.05$) on growth of the lambs before the first two weeks of the lactation and 120 days post-partum. Single lambs were heavier than twins at birth and in the most experimental period. Lactation might have been inadequate in ewes with multiple births to satisfy all the lambs. Single lambs are suckling more milk than twins, for this reason single lamb had faster growth rate than twins. The results are supported by many researches obtained by Macit et al. (2002); Macit et al. (2001); Analla et al. (1998); Cloete et al. (2007); Boujenane and kansari (2002); Rastogi (2001); Njoya et al. (2005), Tuah and Baah (1985). These results disagree with El-Toum (2005) and Ngere and Aboagye (1981), the authors found that, live weights of single and twin were similar.

The study showed that, the interaction between birth type and sex had significant effect ($P < 0.05$) on daily lambs, growth rate over all the period (Table 4). Female single and male single were recorded higher growth rate than female twin and male twin respectively.

The fluctuation of lamb's weight during the last weeks may be due to the result of decrease in milk yield. Male and female single lambs were slightly heavier than male and female twins. This result was in line with findings of El-Toum (2005). The current results explained that, birth type had more effect on lamb's weight than sex. It is logic that, single lambs grew faster than twins, because twins lambs consumed lower milk than singles. However many researchers have reported a significant influence of type of birth with single born lambs being heavier than their twins (Sandford et al. 1982; Sulieman et al. 1990

Table 2 - The effect of supplementary rations on lambs growth rate (g/day)

Treatment \ Day	0-15 day	15-30 day	30-45 day	45-60 day	60-75 day	75-90 day	90-105 day	105-120 day	Over all (0-120)
GRS-5%M	242.6± 6.6 ^a	249.4±10.8 ^a	212.0±9.1 ^a	224.8±7.5 ^a	226.0±7.5 ^a	197.3±7.5 ^{NS}	232.5±11.7 ^a	171.2±6.4 ^b	207.6±2.2 ^a
GRS	239.3±7.2 ^a	255.8±6.5 ^a	222.8±6.5 ^a	221.3±9.5 ^a	205.2± 5.8 ^b	199.5± 7.0 ^{NS}	195.0± 5.9 ^b	170.1± 5.6 ^b	195.8± 2.1 ^b
GRS-7.5%M	233.9±4.9 ^a	241.0±5.0 ^{ab}	225.0±6.6 ^a	238.8±8.0 ^a	196.8± 5.5 ^b	180.9± 4.7 ^{NS}	210.9± 8.6 ^a	155.5± 4.3 ^b	200.3± 2.3 ^{ab}
CTL	211.1±6.4 ^b	204.3±12.2 ^b	178.1±8.0 ^b	191.6± 9.9 ^b	187.7±11.0 ^b	186.0± 7.2 ^{NS}	190.3± 11.7 ^b	208.2± 24.2 ^a	182.0± 5.5 ^{b c}

^{abcd} Means in the same column bearing different superscripts are significantly ($P<0.05$) different; GRS-5%M; Ground nut cake, Roselle seeds, Sorghum and 5% Molasses; GRS ;Ground nut cake, Roselle seeds and Sorghum; GRS-7.5%M ;Ground nut cake, Roselle seeds, Sorghum and 7.5% Molasses; CTL: Control

Table 2 - The effect of dam age's on lambs growth rate (g/day)

Age \ Day	0-15 day	15-30 day	30-45 day	45-60 day	60-75 day	75-90 day	90-105 day	105-120 day	Over all (0-120)
3≥ years	224.3± 5.0 ^b	234.0± 7.8 ^{NS}	212.5± 6.5 ^{NS}	230.7± 9.0 ^{NS}	210.1± 6.2 ^{ab}	193.9± 6.1 ^{NS}	207.5± 6.1 ^{NS}	166.5± 5.0 ^b	197.1± 2.0 ^{NS}
4-5 <years	236.0± 6.6 ^{ab}	233.0± 7.9 ^{NS}	222.2± 7.5 ^{NS}	225.2± 10.0 ^{NS}	217.9±7.9 ^a	192.5± 5.6 ^{NS}	208.3± 8.5 ^{NS}	187.6 ± 11.1 ^a	199.4± 3.5 ^{NS}
5 <years	244.4± 5.9 ^a	244.7± 7.6 ^{NS}	212.5± 6.7 ^{NS}	217.6± 5.4 ^{NS}	195.3±4.3 ^b	190.9± 6.3 ^{NS}	210.8± 6.3 ^{NS}	160.2± 3.9 ^b	199.4± 1.5 ^{NS}

^{abcd} Means in the same column bearing different superscripts are significantly ($P<0.05$) different.

Table 4 - The effect of sex and birth type on lambs growth rate (g/day)

Items	0-15 day	15-30 day	30-45 day	45-60 day	60-75 day	75-90 day	90-105 day	105-120 day	Over all (0-120)
Sex									
Female	234.0± 6.4 ^{NS}	219.8± 8.0 ^{NS}	203.4± 6.5 ^{NS}	212.8± 8.4 ^{NS}	206.0± 6.5 ^{NS}	183.5± 6.4 ^{NS}	212.1± 8.6 ^{NS}	173.0 ± 7.5 ^{NS}	195.3± 2.5 ^{NS}
Male	232.3± 6.5 ^{NS}	225.2± 6.6 ^{NS}	217.0± 6.6 ^{NS}	217.5± 6.5 ^{NS}	201.5± 6.6 ^{NS}	188.5± 6.6 ^{NS}	212.6± 8.8 ^{NS}	170.1± 7.7 ^{NS}	198.2± 2.5 ^{NS}
Birth type									
Single	236.5± 3.8 ^{NS}	245.6± 4.8 ^a	220.6± 3.9 ^a	227.5± 5.0 ^a	207.2± 3.9 ^a	195.1± 3.9 ^a	203.5± 5.2 ^b	170.7± 4.5 ^{NS}	199.4± 1.5 ^{NS}
Twin	229.7± 8.3 ^{NS}	199.4± 10.4 ^b	199.7± 8.4 ^b	203.2± 10.0 ^b	200.4± 8.4 ^b	177.0± 8.3 ^b	230.2 ± 11.1 ^a	172.4± 9.7 ^{NS}	194.1± 3.2 ^{NS}
Interaction									
Sex X birth type									
Female single	235.8± 5.6 ^{NS}	242.1± 7.1 ^a	212.7± 5.7 ^a	215.4± 7.3 ^{NS}	199.5± 5.7 ^{NS}	188.6± 5.6 ^a	193.6± 7.5 ^b	173.6± 6.6 ^{NS}	197.2± 202 ^a
Female twin	232.1± 11.5 ^{NS}	197.5± 14.5 ^b	194.0± 11.6 ^b	210.3± 15.0 ^{NS}	212.5± 11.6 ^{NS}	178.4± 11.5 ^b	248.6± 15.4 ^a	172.4± 13.5 ^{NS}	193.3± 4.4 ^b
Male single	237.3± 5.3 ^a	249.1± 6.6 ^a	228.5± 5.3 ^a	238.9± 6.9 ^a	214.8± 5.3 ^a	201.5± 5.3 ^a	213.4± 4.1 ^{NS}	167.8± 6.2 ^{NS}	201.6± 2.0 ^a
Male twin	227.3±11.9 ^b	201.3± 15.0 ^b	205.4± 12.1 ^b	196.0± 15.6 ^b	188.2± 12.1 ^b	175.5±12.0 ^b	211.8± 16.0 ^{NS}	172.3± 4.0 ^{NS}	194.9± 4.6 ^b

^{ab} Means in the same column bearing different superscripts are significantly ($P<0.05$) different.

CONCLUSION AND RECOMMENDATION

The results of the present study indicated the importance of the nutritional status of the dams during lactation on the body weight changes of dams and their lambs. Accordingly, it is considered necessary to develop nutritional strategies, using locally available concentrate feeds, for supplementary feeding of grazing ewes that lambed in the dry season in order ensure adequate body weight at late gestation and after lambing, and so satisfy the different nutrient requirements. These strategies should consider the seasonal availability and nutritive quality of the natural pasture.

Recommendations

It is recommended that, Supplementation dams during lactation should be undertaking using groundnut seed cake, Roselle seeds or other relevant local ingredients. Supplementation of lactating ewes was necessary in dry season.

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Competing interests

The authors declare that they have no competing interests.

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