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Original Article

Effect of Management and Supplementation on Reproductive Performance of Hammari Ewes under Range Conditions in North Kordofan State, Sudan

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ABSTRACT

The study was conducted in ElNuhoud locality, West Kordofan State with the objective of studying the effects of pattern of husbandry and Supplementation with concentrate on Desert ewes' fertility, lambs birth weight and their growth rates. The study used 80 Hammari Desert ewes that were randomly divided into four equal groups (each with 20 ewes) weighing. The first group (A) was left to graze on natural pasture from 6 pm to 7: am, stayed under shade from 8: am to 5: pm and watered once every 3 days. The second group (B) was managed as treatment A but watered daily. The third group (C) was kept on natural grazing from 6: pm to 7: am, stayed under shade from 8: am to 5: pm, drank daily and offered concentrates at the rate of 0.5 – 1.0 kg/ewe/day. The ewes in the fourth treatment group (D) was left on the natural grazing from 6-a m to 12:00 (mid-day), stayed under shade for three hours, allowed to graze till midnight and watered once every five days representing control. The results showed that all treatments improved the performance of ewes and lambs with the best performance for group that was offered concentrate supplement (group C). The supplementation of lambs after weaning did not improve their growth rate, so it was concluded that supplementation of lambs is not needed, when the pasture is plentiful and of good quality.

Keywords: Ewes and lambs, Feed supplements, Fertility, Husbandry, Performance

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INTRODUCTION

Sudan is the second largest livestock owning country in Africa. Its animal wealth was estimated in 2007 to be 50.944, 42.987, 41.404 and 4.250 million heads of sheep, goats, cattle and camels, respectively (FAOSTAT 2011). West Kordofan is the homeland of Hammari and Kabashi tribal Desert sheep where their population is estimated at 8.89 million heads representing 41.9% of total animals in the State and 17.4% of national sheep (MARF 2006).

The contribution of the livestock sector in the National Annual Gross Domestic Products (GDP) was estimated at about 22.3% and the animals exported brought about 18.2% of hard currency earnings which represented 38 % of agricultural exports earnings (MAWF 2004).

Natural grazing is the main source of feed for the livestock species in Sudan. Sheep are herded in flocks of about 200 heads. Most females raised are needed as breeding replacements and breeding rams are usually selected with great care with major emphasis on conformation, color and the milk production records of dam.

The breeding season is regulated from February to March and lambing is usually expected during rainy season (July – September) when forages are plentiful and of good quality. Newly born lambs are usually separated from dams in the early morning and kept around the camps "Fareig". The flocks are grazed away up to mid-day when they come back to nurse lambs, have a rest and then graze again to sun set (LADCO 1999). Lambs may be flocked alone or sometimes left to run with dams until weaning at about four months. Sheep watering frequency is 3-5 days during the dry season (LADCO 1999).

During the long dry season (November– June) the natural pastures are source of low quality roughage and concomitantly animal production is sharply dropped (Salih 1987 and El-Hag *et al* 1998). During this period sheep must be supplemented with feed containing higher energy and protein to satisfy their maintenance requirements (Salih 1987 and Jadalla1994).

Data and studies concerning fertility Hammari sheep in Kordofan are still scanty despite the importance of that subtype as the first export sheep. More specifically it was necessary to start work under the following objectives.

To evaluate the reproductive performance of Hammari desert sheep kept under traditional production system or improved management practice.

MATERIALS AND METHODS

Study area

This study was conducted in Mahgour village, ELNuhoud, Province within latitudes 11° 5′ - 13° 75′ N and longitudes 27°-29° 5′ E, about 900 km west of Khartoum. The rainy season extends from July to September with a peak in August. Average annual rainfall is 300 mm in the north and about 400 mm in the south parts. 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 (ELNuhoud Meteorological Station 2007).

The soil is generally of smoothly undulating sandy plain dissected by patches of loamy sands in the southern parts (Ali 2002). Grasses are mostly annual including, *Dactylcotenium aegyptium*, *Cechrus biflorus*, *Echinochloa colonum, Eragrostis aspera, Andropogon gayanus*. (Steven 1988).

The Experimental animals

Eighty ewes and three rams of Sudan Desert sheep subtype Hammari wighing 35-40 kg and 2-3 years of age were used in this study. They were purchased in from the local market. After two weeks' adaptation period, the animals were divided randomly into four groups. Each animal was ear tagged and treated with Ivermectin at rate of 10 mg per 50 kg body weight for internal and external parasites control. The Ivermectin treatment was repeated after 15 days and every 4 month. Animals were vaccinated against the endemic disease in the study area

(Sheep pox, hemorrhagic septicemia and anthrax). During the breeding season (February to March) the rams were allowed to mate the ewes during grazing.
The lambs born to the different ewes groups were allowed to suckle for 4 months. After the period the male lambs were castrated when their weight ranged between 15 to 20 kg and all lambs were treated against parasites and vaccinated like mothers. After weaning the management of lambs was according their ewes treatment over a period of additional two months.

Experimental feeds for parents and lambs

The groups were assigned randomly to one of the following diets:
1-Group (A) was left on natural grazing, (grazed from 6: pm to 7: am,) stayed under shade (Rakuba) from 8: am to 5: Pm and drank water every 3 days.
2-Group (B) was left to graze on natural grazing ,(grazed from 6: pm to 7: am,) stayed under shade (Rakuba) from 8: am to 5: pm and drank water daily.
3-Group(C) was grazed on natural grazing, (grazed from 6: pm to 7: am) stayed in under shade (Rakuba) from 8: am to 5: pm and drank water daily and offered a concentrate at a rate of 0.5- 1kg/ewe/day. While the lambs in the same group were offered concentrate at a rate of 250 g / head / day.
4-Group (D) was left under traditional management as control. They were allowed to graze from early morning to mid-day, rested under shade (Tree) for few hours, returned to grazing again up to midnight. They were watered every five days.

Data collection

The birth weight and the weekly weight of lambs were taken till 6 months using a spring balance of 50 kg capacity.
Reproductive traits were calculated according to Landais and Cissoko (1986) where:
Lambing rate (%) = (number of ewes lambing/number of ewes mated) x 100.
Pregnancy rate (%) = (number of ewes pregnant/number of ewes mated) x 100.
Litter size (%) = (number of lambs/number of ewes lambing) x 100.
Lambs loss (%) = (number of lamb losses /number of ewes mated) x 100.

Chemical analysis

Feed samples of the concentrate in group C were taken for proximate analysis according to the procedures described by the Association of Official Analytical Chemists (AOAC 1998). The chemical composition of the ration is presented in Table 1.

Table 1. Ingredients (%) and proximate analysis of the supplemented diet

	Ingredients (as fed)
Sorghum grain	33%
Groundnut cake	20%
Groundnut hulls	46%
Common salt	1%
Proximate analysis (%) on dry matter basis	
Crude protein (CP)	17.99
Crude fiber (CF)	16.75
Ether extract (EE)	05.60
Nitrogen free extract (NFE)	51.64
Ash	09.28
ME(MJ/kg) calculated	9.5

ME MJ/kg DM=0.012 CP%+0.031 EE%+0.005 CF%+0.014 NFE (Ellis, 1980).

Statistical Analysis

The statistical analysis was conducted using the GLM procedure of SAS (SAS 1994). Chi-square analysis was then used to evaluate reproductive parameters differences. Differences among treatments means were detected using Duncan's multiple range test (Duncan 1955).

Results

Reproductive performance of ewes

Table (2) shows the effect of management on the reproductive performance of the ewes. According to table (2) fertility rates (a) and (b) were similar and significantly ($p< 0.05$) higher in treatments B and C than in A and D the latter treatment had the least fertility rates. Prolificacy rate was significantly ($p< 0.05$) higher in treatment C than in the other treatments. Treatment A also was significantly ($p< 0.05$) higher than treatments B and D while treatment B was significantly ($p< 0.05$) higher than treatment D. Abortion rate was zero in treatment C which was given supplement and watered daily. In treatments A and B abortion was similar (5%); however, treatment D which was kept on grazing and watered every 5 days had the highest rate of abortion which was significantly ($p< 0.05$) greater than in the other treatments.

Table 2: Effects of management on reproductive performance

Parameters	Treatments				
	A	B	C	D	SD
Fertility rate (a) %	95 ^{b}	100 ^{a}	100 ^{a}	50 ^{c}	24.281
Fertility rate (b) %	85 ^{b}	100 ^{a}	100 ^{a}	60 ^{c}	18.875
Prolificacy %	111.8 ^{b}	105 ^{c}	145 ^{a}	83.3 ^{d}	25.558
Abortion %	5 ^{b}	5 ^{b}	0 ^{a}	25 ^{c}	11.547

Means in the same row bearing different superscripts are significantly ($P<0.05$) different
NS: not significant at ($P>0.05$).

A = left on natural grazing, grazed from 6: pm to 7: am, stayed under shade from 8: am to 5: pm and drank water every 3 days.

B = left to graze on natural grazing, grazed from 6: pm to 7: am, stayed under shade from 8: am to 5: pm and drank water daily.

C = grazed on natural grazing, grazed from 6: pm to 7: am, stayed in under shade from 8: am to 5: pm, drank water daily and offered concentrate at the rate of 0.5- 1kg/ewe/day. The lambs of the same group were offered concentrate at a rate of .250 kg / head / day.

D = left under traditional management as control. They were left to graze from early morning to mid-day, rested under shade for few hours, returned to grazing again up to midnight. They were watered every five days.

Growth rate of lambs

Number of lambs, their birth weight and body weight after weaning (120 days) and at the end of the experimental period is presented in table 3. In the control group D only 10 lambs from 20 ewes were weaned. The concentrate supplementation and daily water access resulted in three times more lambs than in group D and about 50% more compared to group A and B respectively. Lambs borne from ewes of group C had significant ($P<0.05$) heavier body birth weights by 25-73% than those of the other groups. Traditional grazing at day and watering every 5 days showed the lowest birth weight.

After the suckling period and at the end of the experiment (at age of 180 days) lambs of group C were inferior, but only compared to the control group the differences were significant ($P<0.05$) After weaning, when lambs of groups A, B and D were only grazing, they had a higher growth rate than lambs from group C, which were supplemented with 250g concentrate per lamb day. The difference amounted 15% for all groups. Surprisingly and not explainable is the ratio between female and male lambs (1:3). At birth the male lambs were

heavier than the females but at the end of weaning and experiment respectively, no significant differences existed.

The birth type of lamb significant ($p>0.05$) affected the lamb weight and overall performance during the periods monitored. Single lambs recorded significantly ($p> 0.05$) heavier weight then followed by twins and finally the triple lambs.

Table 3. Effect of pre-partum supplementary feeding and age on lamb body weight (mean± S.E) kg

Factor		No. of lambs	Birth weight	120 days	180 days
Treatment	Group A	19 (16M,3F)	3.00±0.28 ^{b}	25.00±1.19 ^{a}	31.30±1.12 ^{a}
	Group B	21 (15M,6 F)	3.20±0.26 ^{b}	26.20±1.97 ^{a}	32.30±1.02 ^{a}
	Group C	29 (20M,9 F)	4.00±0.19 ^{a}	28.00±.79 ^{a}	33.40±0.74 ^{a}
	Control D	10 (9M,1 F)	2.30±0.29 ^{c}	19.50±1.17 ^{b}	25.70±1.08 ^{b}
Sex	Male	60	3.40±0.29 ^{a}	25.60±1.21	30.00±0.89
	Female	19	2.40±0.23 ^{b}	23.90±0.96	31.40±1.12
Type of birth	Single	60	4.30±0.11 ^{a}	28.30±0.43 ^{a}	34.20±0.40 ^{a}
	Twin	8	3.00±0.22 ^{b}	24.80±0.92 ^{b}	31.00±0.86 ^{b}
	Triple	1	2.10±0.50 ^{c}	21.00±2.10 ^{c}	26.80±1.95 ^{c}

abc :Means in the same column bearing different superscripts are significantly ($P<0.05$) different.
NS: not significant at ($P<0.05$). M=Male F=Female

Discussion

Effects of Supplementation with Concentrates and grazing pattern on ewes reproductive performance

The results indicated that reproductive performance represented by fertility; prolificacy and abortion rates were all positively affected by the management systems used in this study. The improvement in the reproductive performance was observed in the supplemented ewes group (treatment C). On the other hand, the non-supplemented group (treatment D) recorded the least fertility, prolificacy and higher abortion rate.

Management and supplementation of pregnant ewes during late gestation is to provide adequate energy and protein to support embryonic and fetal growth. Ewes in treatment C were found to have enough energy and protein. This might have affected to embryo growth and lambing. On the other hand, ewes on ntural grazing only (treatment D) lambed earlier than the other treatments. Hence lambs born in this treatment were lighter in weight as their dams had suffered from the shortage of the basic nutrients in late pregnancy days due to low quality of pasture available. Similar results were obtained by Njoya *et al*., (2005) who reported that protein supplementation to ewes grazing low quality pasture improved their body weight and reproductive performance and the fertility increased with ewes' weight at mating. Lamb birth weight increased ($P< 0.001$) with supplementation and also ewes weight at lambing. Supplementation increased ($P<0.05$) lambs' weight at weaning and reduced the mortality' rate ($P< 0.001$). Short periods of nutrient supplement before and during mating had been known to affect ovulation rate along with increased follicle size and/or number (Ramirez-Restrepo *et al*., 2005). Flushing is a practice of feeding ewes which are in lean condition additional feed supplement for a few weeks prior to mating to improve their body condition and reproductive performance. Rizzoli *et al*., (1976) observed an increase in ovulation rate in ewes fed lupin grain at 0.5 kg/ewe/day for two weeks before mating with continued feeding through the breeding period (20 days). Alliston *et al*., (1979) showed that when Welsh Mountain ewes of good condition were flushed before and during mating by offering them 21 g concentrate/kg body weight /day and access to high energy feed blocks and hay ad-libitum, flushed ewes gained 17% and the control 7% in weight during pre-mating

and joining period. Flushing had no significant effect on conception rate or reproductive performance. They concluded that no effect of flushing was detected in the reproductive performance of Welsh Mountain ewes in good condition at mating, but when flushing was applied to ewes in moderately thin condition it lead to an increase in twin birth. This finding was in agreement with the results reported by Gunn *et al*., (1979) who showed that in a flock of Scottish black face ewes of good potentiality and in moderately poor condition, high (48 gm dried grass and 15 g hay/kg body weight /head/day), and medium (8 gm dried grass and 10 gm hay/kg body weight /head/day) level of nutrition resulted in lambing rates of 1.37 and 1.03 for high and medium levels of nutrition respectively. Gunn *et al*., (1969) reported that the level of feed intake prior to and at mating had no effect on the number of lambs born to ewes which were moderately fat, but did have a significant effect on the number of lambs born to ewes in poor condition. It was concluded that when flushing was applied to ewes in poor condition it resulted in an increase in body weight and number of lambs born per ewe, but to ewes in good condition flushing resulted in an increase of ovulations without change in body weight. Recently, Njoya, *et al*., (2005) indicated that, protein supplementation during mating period improved ewes' body weight at lambing and the fertility rate. Lassoued *et al*., (2004) indicated that, higher levels of nutrition prior to and during mating were associated with improved reproductive performance.

Feed supplementation to pregnant ewes during late gestation is to provide adequate energy and protein to support embryonic and faetus growth, maintenance of animal physiological needs, mammary gland growth, colostroum and milk yield (Oeak *et al*., 2005). Eighty percent of faetus growth occurs during the last 60 days of pregnancy leading to a significant increase in nutrient requirements of the ewes (Dawason *et al*., 1999). Therefore, lamb survival is related to nutrition of ewes during late gestation (60 days) (Binns *et al*., 2002).

A comparison among the control group (treatment D) and treatment A indicated that night grazing and shade during day reduced heat stress, increased feed intake and improved animal performance. This result was in line with Mufarrih (1991) and Dixon el al (1999) who reported that moderate heat stress reduced feed intake and growth in young sheep. Bayer *el al*., (1987) noticed that night grazing in cattle was important especially in dry season, when available forage was low and quality was poor, for improved animal performance. Also Ayantunde *el al*., (2000) indicated that night grazing in cows was an important herd management strategy that could lead to improved animal production.

Access to water every three days (treatment A) to daily watering (treatment B) plus the same husbandry conditions (night grazing, daily shade) improved pregnancy rate and lambing rates. This could be a result of higher feed intake due to enough water. Alamer and Al-Hozab (2003) reported that the effect of water deprivation on Awassi and Najdi sheep decreased their feed intake from the first day of deprivation.

The effect of dams' level of nutrition and husbandry on lambs' growth rate

Sex and type of birth

The male lambs in this experiment were about 30% heavier than the females (3.4 and 2.4 kg respectively. Significant differences in birth weight are also described for Desert sheep by many authors (Naire 1995, Rodriguez *et al* 1999, Analla *et al*., 1998, Cloete *et al*., 2007, Boujenane and Kansari 2002, Macit *et al.,* 2001). But the differences in birth weight between males and females were only 5-10%. The differences in the distribution between males and females (60 and 19 resp.) in our experiment indicate the higher survival rate of male fetus and lambs as described by Analla *et al* (1998). The male: female ratio in groups A, B, C and D in our experiment was 5.3, 3.5, 3.2 and 9.0 to 1 respectively.

Only in the supplementation group C twins and one triple were observed. The highest birth weight and weaning weight (120 days) in this group indicated the height milk yield of ewes

due to the feed supplementation during the whole weaning period as a result of the good condition of the ewes compared to supplementation only during flushing and at late pregnancy for the same breed (Idris, 2008) the number of twins increased by 20 %.

The birth weights of lambs were 4.3 kg for singles, 3.0 kg for twins and 2.1 kg for triples. The same results but with lower differences were observed by London and Weniger (1996) and Bennett *et al* (1991).

Differences in litter size were significant among all treatments and it was found that the litter size was highest in treatment C followed by A, then B and D which had the least litter size. Also Prolificacy rate in winter season was significantly ($p< 0.05$) higher for the supplemented treatment compared to the other three treatments. Treatment C had the highest prolificacy rate followed by treatment B, treatment A and D that represented nomadic practice or control. On the other hand Prolificacy rate was higher for the supplemented treatment (C), followed by those on natural grazing and daily watering (B). The treatment on the natural grazing that was watered every three days was similar to the group that was watered every five day in their prolificacy (A and B which was 100%).These results were in line with some authors as Suither *et al*., (1971) who found that 10 pounds increase in live weight of ewes resulted in 2.9% increase in lambs and 3.2% increase in twins born, and concluded that there was a positive correlation between pre-mating live weight and lambing performance. These results were also in line with Mufarrih (1991) who noticed that the desert ewes grazing at night and lying in the shade during the day could produce twins and triplets. Litter size in this experiment was not influenced by grazing time. Thomson *et al*., (1988) reported that heavier ewes showed more frequent oestrus cycles, and a higher lambing rate and more twining. Furthermore, the modest live weight gains prior to mating appeared to have enhanced fertility. Lindsay *et al.,* (1975) studied the effect of body weight on ewe performance. They found a significant relationship between lambs born/100 ewes mated and body weight of dams at joining. In their experiment for every additional 3.7 lambs/100 ewes lambing there was an increase of 5 kg in body weight. On the other hand Curll *et al*., (1975) indicated that ewes which weighed 58 kg at mating produced 152 lambs per 100 ewes compared with a lambing percentage of 107 by ewes that weighed 44 kg. They concluded that there was a positive relationship between ewe body weight at joining and the lambing rate. Increased number of lambs borne was attributed to increased rate of twining.

In many studies, the improvement of reproductive performance by night grazing was described. Soto *el al*., (1998) reported that the main effect of heat stress in sheep was on reproductive efficiency during the first 17 days of pregnancy and the use of shade to be beneficial to improve the pregnancy rate in sheep flocks. Marai *el al*., (2006) noticed that exposure of the pregnant ewe during mid and late gestation to warm ambient temperatures, greatly reduced the total embryo cell number and placentome size. Similarly, the results in this study indicated an increase in lambing rate, birth weight and number of lambs, when sheep were kept in shade during the day to avoid heat stress.

Abortion rates were also decreased in the supplemented treatment compared with the control (nomadic practice). Non supplemented ewes recorded the highest abortion rate. The differences in the abortion rates between the two studies might be due to differences in the season of the study reflected in ambient temperature and quantity and quality of range grasses.

Desert sheep are apt to suffering from nutritional deficiencies and loss of body weight during the dry season. The pasture is scarce and dominated by fibrous low nutritive value plants. This is generally reflected in slower growth rate, reduced maturity and decreased productive and reproductive performance. Therefore, it would be of great importance to correct these seasonal nutritional inadequacies in order to enhance productivity of the desert sheep. These results agreed with some authors who reported that the direct effects of poor nutrition were

reflected in reduced conception, embryonic losses, reduced lambing rates and high ewe mortality (Diskin and Niswender, 1989).

Although night grazing has many positive effects, some problems were also reported by some authors. The limiting factor of practicing grazing at night studied by Ayantunde *el al.*, (2000) were labor constraints, small herd size, strangeness, laziness and seasonal migration of adult men. However this could not be a problem in our study area. Bayer (1986) and Coppock *el a*l., (1988) reported that the major problems during night grazing would be difficulty in staying awake at night and risk of damage to crops. Similarly, this could be a problem in our study area.

Effect of ewe level of nutrition and grazing pattern on lamb birth weight

The lamb birth weights were 4.3 Kg for singles, 3 Kg for twins and 2.1Kg for triples, respectively. These results have indicated that lambs birth weights were significantly ($P<0.05$) higher for the treatments that were born for dams that received supplements, watered every day and rested under shade at the day compared with the other three treatments. This result was in line with the findings of El-Hag *et al*., (1998) who reported that supplementation during mating and late gestation had a significant effect on lamb birth weight. Treatment C supplemented ewe had heavier lambs at birth than non-supplemented control. Supplementations of pregnant ewes during late gestation are to provide adequate energy and protein to support embryonic and fetal growth, maintenance of animal physiological needs, mammary gland growth, colostroum and milk yield. This explanation was in line with the findings of Oeak *et al*., (2005). Eighty percent of fetal growth occurs during the last 60 days of pregnancy leading to a significant increase in nutrient requirements of the ewes (Dawason *et al*., 1999).

The restriction of grazing at the day before and during pregnancy reduced heat stress on dams. The results obtained in this study were in agreement with Lassoued *et al*., (2004) who reported that higher levels of nutrition prior to and during mating were associated with improved reproductive performance in accordance with the literature reported for several sheep breeds. Lambing rates were affected by the dietary treatment. Njoya *et al*., (2005) revealed that protein supplementation consisted of feeding 200 g cottonseed meal per ewe per day increased ewes' body weight at lambing ($P< 0.001$) and the fertility rate ($P< 0.05$). Inadequate feed intake during late pregnancy had been found to cause a reduction in birth weight, mammary gland development and milk production. These factors influenced lamb growth rate. Similar results were obtained by Williams (1985) who reported that, lambs born to underfed dam during late pregnancy and early lactation, reached late to puberty age than lambs born by well fed mothers. Comparing the results found by Boujenane and kansari. (2002) with this study, Sudan desert lambs had heavier weights than D'man. It was also observed that, Sudan desert lambs recorded similar body weight (at birth, 30 and 60 days of age) compared with Merino sheep that were rearing in nomadic production system. However at 90 days of age, Merino lambs were heavier than the desert lambs. These variations might be due to management factors, climatic factors, and nutrition or animal factors.

Weaning performance

At the end of the weaning period after 120 days the weight of lambs were significant higher for all experimental groups compared to the control group D. The lamb growth rates in groups A, B, C and D was 176.1, 187.6, 189.4 and 154.9, respectively. These results were higher than reported by Ali (2002) who reported that the average weaning weight was 24.33 and 24.25 kg for Hammari and Kabashi subtypes and daily gain 144 and 152 kg, respectively. Supplementation of pregnant ewes during late gestation may provide adequate energy and protein to support maintenance of animal physiological needs, mammary gland growth,

colostrums and milk yield (Oeak *et al* 2005). Weaning weight of lambs in this study were 28 kg for single, 24 kg for twins and 21 kg for triples, respectively. Some authors reported that the sex of lamb caused variations in the weaning weight. The differences in weaning weight between males and females were highly significant. El Tahir (2002) studied the effect of sex of lamb on weaning weight in West African Dwarf sheep. He found that the weaning weight for male 11.0 and 9.97 kg for female. On the other hand Ali (2002) reported that weight at weaning at 120 days was 24.33 and 24.25 kg for Hammari and Kabashi subtypes, respectively.

Post weaning performance

The growth rate after weaning (120-180 days) in groups A, B, C and D was 105, 101, 90 and 103 g /d, respectively. Supplemented group (C) showed lower growth rate compared with other three groups. The concentrate supplementation after weaning did not improve the lambs growth rate, so it can be concluded, that feed supplementation to lambs is not need, when the pasture is plentiful and of good quality. But in our experiment the compensation was not complete.

The higher growth rate of the un supplemented lambs can be explained by a compensatory growth after the insufficient milk yield during weaning. Readon and Lambourne (1966) found that sheep under restricted feeding from 3 to 9 months old showed compensatory growth after re-alimentation. Also Hopkins and Tulloh (1985) reported similar results; where they restricted sheep feeding after birth and observed compensatory growth.

Weight and growth are important aspects of overall productivity, especially where meat is the main product. Heavier birth weights provide lambs with a good start in life rapid growth pre- and post-weaning period, ensuring resistance to diseases as well as early maturity (Suleiman *et al* 1990).

CONCLUSIONS

The study concluded that supplementary feeding of desert ewes with concentrates could increase their opportunity for twins, decrease abortion percentage, give best weight at birth weight and weaning as well as and growth rates of lambs. It was recommended that husbandry pattern be changed to avoid heat stress and supplementary feeding be followed to improve ewe's productivity and lambs performance on the natural grazing. Watering every day improved feed intake, milk yield of ewes and reduce heat stress.

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