Night Grazing System And Watering Regime In Desert Ewes' Performance Affected By Some Supplementary Feeding Strategies

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Abstract - The study was carried out to investigate the effect of grazing management (day and night) and watering regime (every other day and every three days) on physiological and reproductive performance indicators of Sudan Desert sheep (Ovis aries). The trial involved mature ewes at different physiological status (dry, pregnant and lactating) during three consecutive seasons, summer, autumn and winter at Faragalla village, Sheikan Locality in North Kordofan State, Sudan. Meteorological data during the experimental periods were recorded. Sixty ewes were randomly assigned to the following treatments: A = Night grazing + every other day watering regime, B= Night grazing + every three days watering regime, C = Day grazing + every other day watering regime, D = Day grazing + every three days watering regime. All groups of ewes were naturally mated using two healthy rams. The ewes were flushed (receiving the supplement for 45 days at mating time) and steamed-up (receiving the supplement for 45 days pre-lambing). The trial was laid out in a completely randomized design in a 2x2 factorial arrangement of treatments. The highest conception rates were 100% in groups A, C and D while group B had 92.9 %. The average lambing rates in groups A and B were 100 and 92.3% respectively and 78.6% in both group C and D. Groups C and D confirmed highest ewes, mortality rates. Ewes in group D had higher lambs, mortality rate than those in the other groups. Lambs' mortality rates were 12.5%, 8.3%, 8.3% and 16.7% in groups A, B, C and D respectively.

Keywords: Sudan Desert ewes, night grazing, watering regime, feeding strategies.

1. INTRODUCTION

Heat stress seems to be one of the more intriguing factors making difficult animal production of many world areas. In fact the animals can adapt to the hot climate, nevertheless the response mechanisms are helpful for survival but are detrimental to performance [1]. The resulting heat stress adversely affects production (for example, reproductive performance in dairy animals), and hence reduces the total area in which high-yielding livestock can be reared economically. Animals are somewhat able to adapt to higher ambient temperatures with prolonged exposure but production losses will occur [2]; [3].

[4], [5], [6] demonstrated that environmental factors exerted a significant influence on reproductive performance. Environmental temperature plays a big role in regulating the reproductive pattern of farm animals, where unfavorable hot environments adversely affecting various reproductive processes [7]. Sheep are more susceptible than goats to high temperatures and humidity. Stress caused by high environmental temperatures can seriously affect fertility, embryo survival, and fetal development [8].

Temperature affects total grazing time in sheep and cattle. On hot days cattle and sheep do most of their grazing in the early morning and evening and more than usual at night. The timing and duration of grazing are management practices that greatly affect the performance of animals. Accordingly, 24-h grazing showed to improve body condition of animals, reduce heat stress, increase DM intake, digestibility of selected herbage and milk production [9]. Despite of these benefits, manpower constraint, insecurity or damage to crops by animals are conditions that could suggest avoiding night grazing [9]. Danger from predators and hazards for herdsmen and the stock have been reported by [10] and [11] as major problems during night grazing. Other problems reported by the herders included fatigue, labor constraints (i.e., lack of household labor for herding), and insufficient grazing areas [12].

A rise in body temperature is what actually causes reproductive problems. If ewe or doe cannot maintain normal body temperature, ovulation and conception rates decrease and the embryo is less likely to survive when conception does occur. Reproductive traits are responsive to environmental influences, however, and they respond to careful herd reproductive management [8]. High productivity is achieved through the optimization of reproduction of ewes as well as survival and growth of lambs [13].

Luteal inadequacy, resulting from environmental factors such as heat stress or nutrition, has been shown to be a major cause of embryonic loss in sheep [14].

Lamb mortality is regarded as a major constraint to efficient sheep production [15]; [16]. Lamb mortalities are also a major constraint to sheep production in many parts of Africa. Approximately 10-32% lambs die annually

before weaning in tropical and sub-tropical regions of this continent [17].

The best adapted animal to a particular environment is that which succeed in ability of its physical norms-within vital limits in accordance with the conditions of that environment [18]. Under hot climatic conditions, good management should realize comfort and maintain high productive and reproductive efficiency for the animals [19]. [20], summarized the general managerial practices to be followed. These include providing the animals with suitable housing and feeding, disease and parasite control, and heat stress alleviation practices together with amelioration of the environment. In addition, carrying out proper routine managerial practices required at the suitable time is beneficial. Moreover, identifying and minimizing stressful situations allows for greater animal productivity as well as economic benefit for the consumers and producers. However, the impact of stress is difficult to precisely determine, it is imperative that the issue receive more research attention in the interests of optimizing animal welfare and minimizing losses in product yield and quality [21].

Information on the free ranging Sudan Desert sheep performance under different grazing systems and water regime is lacking. This study was designed to investigate the effect of night and day grazing and two different watering regimes on Sudan Desert sheep ewes' performance.

2. MATERIALS AND METHODS

2.1 STUDY AREA

The study was carried out in Faragalla village, Sheikan province in North Kordofan State, Sudan. It is located in the arid semi-desert ecological zone, between latitudes 12°:25 - 30°: 45´N and longitudes 29°:35´ - 3°:30´ E. Metrological data and calculated THI during the experimental periods are shown in Tables: 1.

Table 1. Meteorological data during the experimental period and calculated THI

Period	Air Temperature (ºC)		Relative Humidity (RH %)	Precipitation (mm)	THI
	Min.	Max.			
1st.period	12.3	40.9	13.0	_	23.3**
2nd.period	15.7	41.8	10.7	_	24.8**
3rd.period	23.6	42.4	21.9	_	28.5***
4th.period	20.8	38.9	39.1	0.6	27.0***
5th.period	19.1	35.3	68.2	102.0	25.9***
6th.period	19.4	34.5	71.3	104.3	25.9***
7th.period	19.3	36.3	26.7	60.7	24.7**
8th.period	20.6	38.3	36.4	_	26.3***
9th.period	13.6	38.2	24.7	_	23.3**
10th.period	09.3	34.9	28.5	_	20.4*
11th.period	09.6	34.7	26.4	_	20.4*
12th.period	09.2	33.4	21.3	_	19.6*
13.period	12.3	40.4	12.5	_	24.2**

Source: Elobeid Agriculture Research Station.

Scale: <22.2* = absence of heat stress; 22.2 to <23.3 = moderate heat stress; 23.3 to < 25.6** =severe heat stress and 25.6 and more*** = extreme severe heat stress (Marai et al., 2001).

2.2 ANIMALS AND PROCEDURE

The study was conducted during three consecutive seasons; summer, rainy and winter. Sixty (60) Sudan Desert ewes (1-5 years old and weighting 42.3± 0.7) were ear tagged and treated with an anthelmintic (Ivomectin®) administered s/c at 1.0 cc/head., the dose was repeated after two weeks, injected with ox tetracycline as anti-coccidial treatment, vaccinated against epidemic diseases and allowed two weeks adaptation to the experimental treatments. Ewes were weighed after an overnight fast and then divided into two equal groups in such a way that the different ages and weights were evenly distributed through each group. Each group was subdivided into two subgroups of fifteen ewes each. The four subgroups were randomly assigned to the following treatments:

A = Night grazing + every other day watering regime.

B = Night grazing + every three days watering regime.

C = Day grazing + every other day watering regime.

D = Day grazing + every three days watering regime.

2.3 DATA RECORDED

2.3.1 REPRODUCTIVE DATA

Reproductive data recorded included number of ewes that conceived and conception rates, number of ewes that lambed and lambing rates, number of ewes that aborted and abortion rates, number of ewes that gave single births and single birth rates, number of ewes that gave twin births and twinning birth rates and number of ewes that died and mortality rates. These rates were calculated according to the following formulae (Schoenian and Burfening, 1990):

Conception rate = (No. of pregnant ewes/No. of serviced ewes) x 100.

Lambing rate = (No. of lambed ewes/No. of pregnant ewes) x 100.

Abortion rate = (No. of aborted ewes/No. of pregnant ewes) x 100.

Single birth rate = (No. of ewes that gave single births/ No. of lambed ewes) x 100.

Twinning birth rate = (No. of ewes that gave twin births/ No. of lambed ewes) x 100.

Mortality rate = (No. of ewes that died/No. of ewes) x 100.

Lambs mortality rates were recorded.

2.4 EXPERIMENTAL DESIGN AND STATISTICAL ANALYSES

The mature ewes' trial was laid out in a completely randomized design (CRD) in a 2x2 factorial arrangement of treatments. The two factors were the grazing management with two levels; night grazing versus day grazing, and watering regime; every other day versus every three days watering, and data on lambs weights were statistically analyzed according (Steele and Torrie, 1980).

Counts on ewes that conceived, lambed, aborted or died, those giving birth twins or singles and lambs that died were statistically analyzed using χ^2.

General linear models using SPSS (Statistical Package for Several Sciences) software program was used for the statistical analyses (SPSS, Inc., 1997) while Microsoft Excel software program was used for graphical presentations (MS Excel, 2007).

3. RESULTS

3.1 EWES' REPRODUCTIVE PERFORMANCE

Grazing management and watering regime had no significant main effect ($p>0.05$) on ewes, reproductive performance (Table: 2). Comparatively highest conception rates (100%) were in groups A (night grazing receiving water every other day); C (day grazing receiving water every other day) and D (day grazing receiving water every 3 days) whereas the lowest rate (92.9%) was recorded in group B (night grazing receiving water every 3 days) illustrated 92.9 %. No ewe aborted in group A while abortion rate in group B was 7.7% and the highest abortion rates (21.4%) were in groups C and D. Lambing rates were comparatively highest for group A (100.0%), followed by group B (92.3%) and lowest (78.6%) for both group C and D. The highest twining rates (9.1%) were recorded in groups C and D followed by groups B (8.3%) and A (6.7%). The highest ewe mortality rate was recorded for group D (21.4%) and the lowest was for group A (6.7%), with group B and C recording intermediate mortality rates of 7.3 and 14.3%, respectively (Table: 2).

3.2 LAMBS' MORTALITY RATE

Effect of ewes treatments on lambs' mortality rate are set out in (Table: 2). Ewes in group D had slightly higher lamb mortality rate than those in the other groups. Respective lamb mortality rates for the four groups were 12.5, 8.3, 8.3 and 16.7%.

TABLE 2. Effects of grazing management and watering regime on desert ewes' reproductive performance

Parameters	**Night grazing**		**Day grazing**		**χ^2df = 3value**
	Watering every other day (A)	Watering every 3 days (B)	Watering every other day (C)	Watering every 3 days (D)	
Total No. of Ewes	15	14	14	14	
No. that conceived	15	13	14	14	
Conception rate%	100	92.9	100	100	3.1^{NS}
No. that lambed	15	12	11	11	
Lambing rate%	100	92.3	78.6	78.6	6.0^{NS}
No. that aborted	0.0	1	3	3	
Abortion rate%	0.0	7.7	21.4	21.4	6.0^{NS}
Twining birth rate%	6.7	8.3	9.1	9.1	0.7^{NS}
Single birth rate%	93.3	91.7	90.9	90.9	0.7^{NS}
No. that died	1	1	2	3	
Mortality rate%	6.7	7.1	14.3	21.4	1.9^{NS}
Total No. of lambs	16	12	12	12	
No. that died	2	1	1	2	
Lambs' mortality rate%	12.5	8.3	8.3	16.7	0.6^{NS}

^{NS}, Not Significant $P>0.05$

4. DISCUSSION

4.1 EWES' REPRODUCTIVE PERFORMANCE

Grazing management and watering regime had no main effects on Desert ewes reproductive performance (Table: 2), with comparatively higher conception rates (100.0%) for ewes belonging to groups A, C and D in comparison with group B (92.3). Ewes mating in this study had been during the normal breeding season (February-March) for Desert sheep in North Kordofan, a strategy adopted by farmers to coincide lambing with the rainy season [22]. Several investigators have observed that conception rate was lowest for ewes mated either during the winter [23] or during February and June mating seasons [22]. This may be attributed to that these animals are well adapted animals to this environment [18]; through developing various adaptive mechanisms that enable them to survive and reproduce under the arid and semiarid conditions of extreme heat and water stress [24]. Ewes in these trials had received flushing and steaming up supplementary feeding that could have improved their reproductive performance [25]. Nonetheless, the lower lambing rates on both C and D groups (Table: 2) maybe as a result of a

higher prenatal mortality rate. Factors usually associated with increased prenatal mortality (e.g., birth weight) did not seem to have lasting negative effects among the groups of animals in the current study.

Day grazing had comparatively the highest main effect on ewes' abortion rates compared with night grazing (Table: 2). In ewes subjected to high ambient temperatures, embryonic death may be related to upset of the nucleic-acid metabolism in the zygote at certain stages of development, occurrence of hormonal imbalance in progesterone, thyroid and glucocrticoid hormones [26], that affect uterine environment and reduce blood supply [27]. [14], reported that although factors causing early embryonic mortality in sheep are not well established, there is some evidence suggesting the involvement of luteal inadequacy, resulting from environmental factors such as heat stress or nutrition, could be a major cause of embryonic loss in sheep.

Low twinning rates are expected from night grazing groups (Table: 2). However, twining rates obtained in this study were within the ranges reported in the literature for Desert sheep [28].

4.2 LAMBS' MORTALITY RATE

Lamb mortality is regarded as a major constraint to efficient sheep production [15]; [16]. Mortality is a complex trait affected by the lambs' weakness and by dam rearing ability [29]. Major benefits of night grazing (Table: 2) include good body condition, herd growth, increased milk production, prevention of diseases and reduction in herd mortality [12]. A large number of factors, from birth weight to climate, are known to affect lamb mortality [30].

5. CONCLUSION

In my estimation, this study needs further research accompanied by economic feasibility that supports complementary feeding strategies can be an alternative to night grazing and thus avoid the problems that arise, especially with regard to friction between farmers and pastoralists.

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