

Impact of Solar Heat Load and Sex On Water Intake And Body Weights of Lambs

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Abstract - Forty newly weaned desert lambs; twenty were males and twenty were females was conducted during three months at Elobeid Research Station farm, North Kordofan State. The lambs were divided into two housing conditions; either kept in shade or under direct sunlight to investigate the effect of housing condition and sex on water intake and body weights. Data were analyzed as randomized complete block design in a 2x2 factorial arrangement of treatments, with five replications. The mean of weekly water intake increased significantly ($P<0.05$) with exposure to direct sunlight and insignificantly increased in male lambs. The results indicated that housing conditions insignificantly affected Lambs' body weights moreover, the lambs, body weights insignificantly increased in male lambs.

Keywords- lambs, direct sunlight, shade, water intake, body weight.

1. Introduction

The majority of livestock owners in the Sudan live in semi – arid regions, where animals face low nutritive value pasture and water scarcity. Young animals are more sensitive to water deprivation [1]. High temperature coupled with low relative humidity imposes a lot of water stress on animals and therefore; constitute a great threat to livestock production [2].

Interactive effects of environmental factors on sheep are generally unknown [3]. Additionally, the time course of performance responses to changes in environmental factors has been ignored. Since animal growth is a dynamic process, temporary suppressions of normal growth caused by environmental factors (e.g., thermal and light conditions) may be recovered in a subsequent period through compensatory growth [4].

Thermal heat can substantially lessen the animal's appetite, leading to decreased feed intake [5]. Environmental management can lessen this effect [6].

Environmental modifications such as water applications or shade can be used to provide the animals with means of cooling. The long term effects of shade, especially on performance, are somewhat controversial [7].

No research using shade to determine the effect of solar heat load on performance of lambs has been conducted under North Kordofan semi-arid conditions. Therefore; our objective was to evaluate the effects of shade and sex on

water intake and body weights of Desert sheep lambs in Sudan.

2. Materials and Methods

2.1. Study Area

The experiment was carried out at Elobied Agricultural Research Station Farm, in Sheikan Province, North Kordofan State (Latitudes 11°: 15, to 16°: 30, N and longitudes 27° to 32° E), Sudan. The trial commenced in three months. Table-1 shows the climatic conditions during the experimental period and at every week.

Table-1: Meteorological data during the lambs' trial every two weeks and at the date of measurements

Period	Air temperature °C		Relative Humidity %
	Min	Max	
15. Dec.-30.Dec.	9.3	32.8	30.8
30. Dec.-13.Jan.	12.2	34.7	24.1
13. Jan.-27.Jan.	9.7	32.0	25.1
27. Jan.-10.Feb.	7.3	33.4	23.6
10. Feb.-23.Feb.	10.2	32.3	19.3
23. Feb.-9.Mar.	12.4	38.2	15.1
Date of Measurements			
15.Dec.2007	13.3	31.7	29.2
30.Dec.2007	15.5	32.5	34.5
13.Jan.2008	12.8	27.9	26.2
27.Jan.2008	11.5	23.4	21.0
10.Feb.2008	15.5	33.4	18.4
23.Feb.2008	13.0	26.8	15.9
9.Mar.2008	21.5	38.2	15.1

Source: Elobeid Agricultural Research Station-Sudan.

2.2. Experimental Animals

40 new weaned unshorn Sudan Desert lambs (*Ovis aries*) 4 months old, 19 ± 0.4 kg body weight were used in this trial; twenty were males and the other twenty were females. The lambs were subjected to two housing conditions; either kept in shade or under direct sunlight. The lambs were treated against internal and external parasites with Ivomec administered subcutaneously at 0.5cc per head, and allowed one week adaptation period. Lambs were then divided into two equal groups; one group of males ($n=10$) and female ($n=10$) was randomly allocated to a shaded condition and the other to the direct sunlight. Shaded pens of $2\times 3\text{m}^2$ each were used to accommodate two animals tethered to individual pegs and provided with individual feeding and water troughs, the lambs under direct sunlight were treated equally. Prior to commencing all lambs were received water ad libitum

and given free access to hay and they were offered 200g of supplement per head daily until the end of the trail. The supplement was containing 49.6% sesame seed cake, 49.6% sorghum, 0.5% mineral block and 0.25% common salt.

The daily water intake was measured using a measuring cylinder, then calculated every week and recorded.

The lambs, initial body weights were recorded and then, every two weeks until the end of the trial. Weights were recorded using 50 spring balance.

2.3. Statistical analysis

Weekly water intake and body weights were statistically analyzed according to an analysis of variance using the General Linear Models. The main effects in the model were housing conditions (shade VS sunlight) and sex (male VS female).

The data were analyzed using Statistical Package for Several Science (SPSS, 1997), while Microsoft Excel software program was used for graphics (MS Excel, 2007).

3. Results and discussion

3.1. Weekly water intake

Water which represents about 70% of total body weight of growing sheep is the simplest of all substances in food and yet the most important and probably the most neglected of all the nutrients [8]

; [9]; [10]. In the present study, the mean of weekly water intake increased significantly ($p < 0.05$) with exposure to direct sunlight according to the high ambient temperature coupled with low relative humidity (Fig. 1), these findings has been pointed out by many authors, they were reported that type of animal, feed and weather variables especially temperature have influence on water intake [11]; [12]; [10]. [12], showed that water intake increased when ambient temperature increased from 14 to 28°C. Also it has been found that water intake is dependent on ambient temperature, shearing, water quality and availability, salt content on water and feed, and water temperature [13].

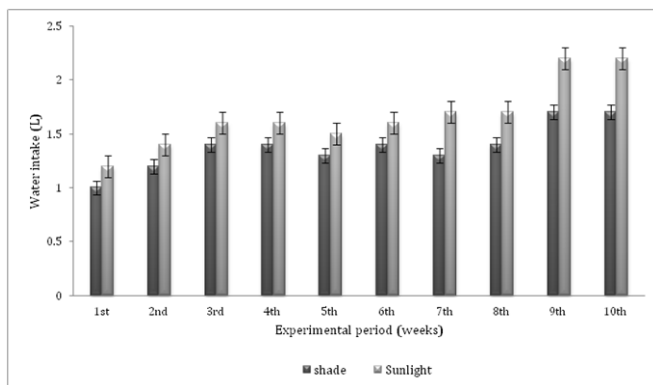


Fig.1.Means \pm SE of weekly water intake (L) of lambs as affected by housing conditions.

The water consumption of sheep is widely variable, depending on age, stage of production and wool cover. Interestingly, in our study, the weekly water intake insignificantly ($P > 0.05$) increased in males lambs. Reasons for this are unclear; but, may be related to the

unaffected physiological states of the females due to their ages. Because there are no similar findings these results may require further investigation. Research in that direction will improve our understanding of management requirements for production and welfare of animals kept under harsh conditions (Fig. 2).

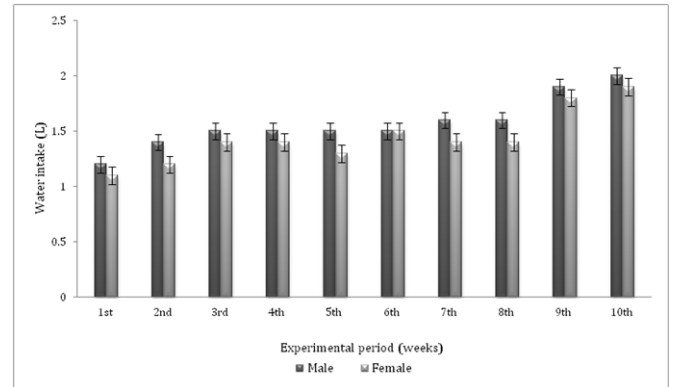


Fig.2. Means \pm SE of weekly water intake (L) of lambs as affected by sex.

3.2. Body weights

Growth rate of lambs, particularly during the early stages of growth, is strongly influenced by breed (genotype), milk yield of the ewe, the environment under which the animals are maintained including the availability of adequate feed supply in terms of both quantity and quality [14]; [15]; [16]; [17]. In another study [18], it has been reported that pre-weaning growth performance is also influenced by birth weight. The results obtained in the present study indicate that housing conditions insignificantly ($P > 0.05$) affected on lambs, body weights (Fig.3), the similar performance of the lambs either kept under shade condition or sunlight could be attributed to their adaptation to the harsh environment stresses particularly due to the same feed sources and health challenge, or could be attributed to unshorn animals on both groups of housing conditions similarly to some investigators who reported that sheep with long wool were reported to be less sensitive to solar heating than newly shorn animals [19]; [20]. In general, it is considered that, if sheep did not reach their mature live weight, they will grow faster if provided with a better diet. In practice however, since the feed supply, particularly in the tropics is not constant throughout the year, growth rate of animals shows seasonal variation. This is more evident in the dry tropics where the growth curve for lambs is typically irregular due to losing and gaining of body weight [16].

Another important criterion that affects the live weight and growth intensity of lambs is sex. Many authors confirmed that sex has an important effect on the growth: [21], [22], [23], [24]. The findings of the present study seem to indicate that the body weights of lambs insignificantly ($P > 0.05$) increased in males lambs (Fig.4). Although the

results were not significant but these findings were agreements with several investigators whom reported that, the difference in growth performance between male and female lambs observed before weaning and increased after weaning [25].

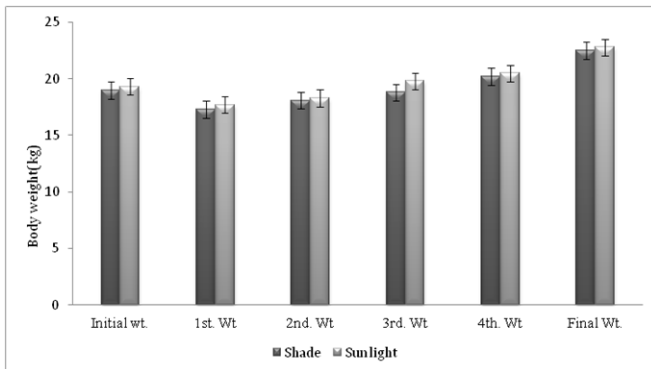


Fig.3. Means ±SE of body weights of lambs (kg) as affected by housing conditions.

Investigations of the effect of sex on live weight of lambs at 60 days of age showed that the differences between males and females were statistically differences ($P \leq 0.05-0.01$). Differences in live weight and weight gains between the males and females at 15, 30 and 45 days of age were not significant. [24] reported that rams of the Awassi breed had significantly higher weaning weights and significantly higher average daily weight gain compared with females.

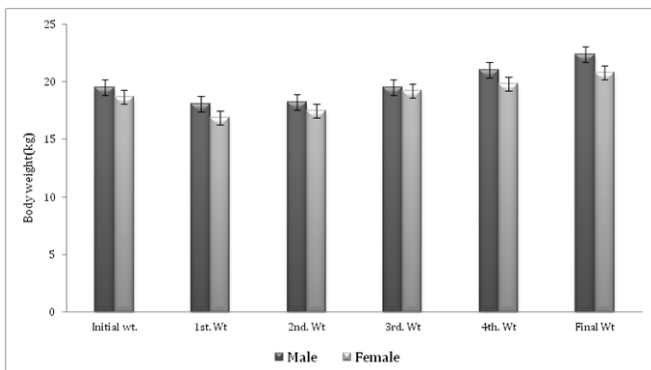


Fig.4. Means ±SE of body weights of lambs (kg) as affected by sex.

4. CONCLUSION

Provision of shade for growing lambs during the day time would also help in counteracting excessive heat burdens under direct sunlight particularly during the hot dry summer months. Sex of lamb seemed to exert a relative effect on lamb growth and performance as reflected in comparatively higher weight and water consumption of male lambs.

Further research work is needed to differentiate between seasonal short-term and long-term adaptation mechanisms in Desert sheep lambs.

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