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in

Kyriazopoulos A.P. (ed.), López-Francos A. (ed.), Porqueddu C. (ed.), Sklavou P. (ed.). Ecosystem services and socio-economic benefits of Mediterranean grasslands

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 114

2016
pages 119-122

Effect of drinking salt water on live weight change and grazing behavior of Barbarine sheep during pregnancy and lactation periods

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Abstract. This study had three objectives: (i) estimation of biomass availability of grassland, (ii) assessment of the effect of water salinity on feeding behavior and live weight change ofBarbarine sheep, and (iii) compare between their performance during pregnancy and lactation period. We used seventy lactating ewes, an average 5 years old, randomly assigned to two treatments consisting of water containing different levels of salt (treatment 1 = 0.5 g of NaCl /l of water, C-ewes;treatment 2= 10g NaCl / 1l of water, S-ewes). Pregnant or lactating stressed sheep decreased their body live weight during the 3thmonth of pregnancy and/or lactation. This effects was insignificant (P>0.05). However, drinking salt water increased body live weight only at the end of each physiological status (P<0.05). Feeding behavior was affected by period and the water salinity. During pregnancy and lactation periods, drinking salt water increased the time spending in searching for and consuming herbaceous vegetation.This is noteworthy that drinking salt water decreased the preference of pregnant ewe to graze.

Keywords. Grazing ewes – Behavior – Salt – Water.

Influence de la qualité de l'eau d'abreuvement sur le comportement alimentaire des brebis Barbarines des régions du centre-ouest tunisien selon les différentes phases physiologiques

Résumé. *Dans le but d'étudier l'effet d'un stress salin sur le comportement alimentaire selon les différentes phases physiologiques de brebis alimentées à base de pâturage des régions du centre-ouest tunisien, on a utilisé 70 brebis de la race Barbarine âgées de 5 ans. Les animaux ont été répartis de façon aléatoire en deux groupes et ont reçu soit de l'eau enrichie de sel (10 g NaCl / 1l d'eau) (S) soit de l'eau potable (0,5 g / l) (C) pendant la phase de gestation et de lactation. Le poids vif a varié en fonction de la qualité de l'eau d'abreuvement et de la phase physiologique (P<0,05). Le poids vif a diminué durant les trois premiers mois de gestation suite à l'abreuvement avec de l'eau saline. Après 90 jours, la salinité de l'eau a permis d'améliorer le poids vif des brebis gestantes. Durant la phase de lactation, la variation du poids vif a été indépendante de la qualité de l'eau d'abreuvement (P>0,05). Les brebis recevant de l'eau saline ont passé plus de temps à rechercher et consommer l'herbe durant la phase de gestation et moins de temps pour le pâturage durant la phase de lactation, que celles qui ont reçu de l'eau du robinet (P<0,01). Cependant, la salinité de l'eau n'a pas affecté la consommation d'eau et d'aliments indépendamment de la phase physiologique (P>0,05). Dans ces zones, le pâturage des ovins sur les halophytes ou l'abreuvement avec eau saline ont des avantages tactiques pour la gestion des ressources fourragères dans les exploitations agricoles.*

Mots-clés. *Sel – Brebis – Pâturage – Comportement – Consommation.*

I – Introduction

In the semi-arid zone of East Tunisia, livestock is predominately managed in traditional production systems.The feeding of sheep is based on the exploitation of rangeland resources, which aresubject to large quantitative and qualitative annual and interannual variations. The utilization of these resources for livestock production is based on the indigenous knowledge of

farmers. The farmers have extensive knowledge of many of the interactions existing between animals and their environment, particularly those involved in grazing and shelter-seeking behavior (Komwihangilo *et al.,*2001). Unfortunately, most varietyof forage species may content high level of salt and secondary metabolites which can possibly affect the growth performance of sheep.

The objectives of this study were to compare the behaviour of sheep when grazing and browsing on natural pasture in a semi-arid zone during different physiological status in order to determine the effect of drinking salt water on water and food intakes.

II – Materials and methods

A total of seventy, five year old Barbarine sheep, weighing on average 45 kg, were held at the Livestock Research Centre of National Institute of Agronomic Research at Ouslatia, Tunisia. From the first day of pregnancy, sheep were divided in two groups: experimental sheep drink salt water (10g/l NaCl; S- sheep; n = 35) or control sheep drink fresh potable water, with normal content on salt (0.5g/l NaCl; C-sheep; n = 35). Sheep grazed pastures (about 15 ha of rangeland during the day and were kept in the barn during the night. A supplementation of barley grain and hay were distributed depending on the physiological status and needs.

Ten sampling quadrats (100cm x 100cm) were randomly set in each plot to estimate the biomass yield, according to Huang *et al.,* (2007). Animals were weighted monthly using a digital weighing balance.

During the end month of pregnancy and lactation period, we recorded the behaviour activities on course such as grazing, walking and resting by one observer per animal every 30 min.To determine feed and water intakes*,* sheep from each treatment were housed in individual boxes equipped with feed troughs and drinkers.

All the data were statistically analyzed using Proc Mixed Model of SAS (SAS, 2004) to examine the effect of treatment, period and interaction.

III - Results and discussion

The quantity, nutritive value and digestibility of available herbage varied significantly from late spring to autumn. It was reported by O'Reagain and McMeniman (2002) that selective grazing by ewes on rangelands can lead to large differences between quality of herbage ingested and of herbage offered. Selection for higher quality plants or plant parts is more pronounced and increased herbage quality with increased grazing intensity. Nutrient contents of pasture varied in general between leaves and twigs. Overall these edible parts are relatively high in dry matter and ash but low in nitrogen.

Sheep from the salt treatment showed an increase body weight between days 90 and 150 of pregnancy and a decrease body weight between days 30 and 90 of lactation compared to whose from control treatment ($P < 0.05$; Fig. 1). Most grazing experiments with sheep on saltbush (*Atriplex*) reported an initial period of rapid weight gain, followed by slower gain and eventually weight loss (Parsons *et al.,* 2002). The rapid initial gain is mostly attributed to body water accumulation associated with the salt diet (Warren *et al.,*1995). Seynaeve *et al.* (2000) reported a weight loss was indifferent to the dietary salt levels during gestation and lactation of sows.

Sheep drinking salt water spent most of their time searching for and walking more than for consuming herbaceous vegetation ($P < 0.05$) (Table 1). Feeding behaviour was affected by physiological status. Ben Salem *et al.* (2004) showed that supplementing kids in native scrubland with olive cake-based feed blocks or with a mixture of small amounts of *A. nummularia* L. foliage and cactus pads had no effect on their behaviour in the rangeland.

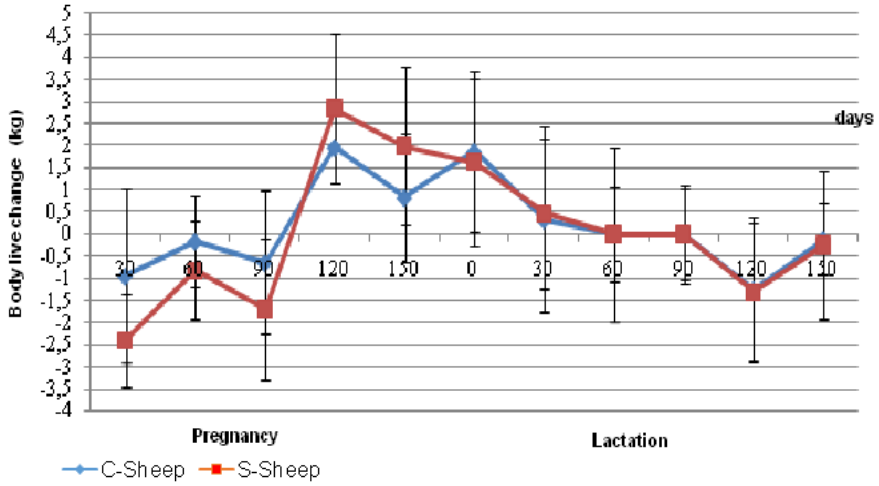

Fig. 1. Effect of drinking salt water on body live change during pregnancy and lactation periods.

Table 1. Effect of drinking salt water on feeding behaviour during pregnancy and lactation period

Behavioral activities	Physiological status	Water type		Average	Water	Period	Interaction
		F	HS				
Grazing time (%, TT)	Pregnancy	34.8	37.7	36.3	ns	*	ns
	Lactation	55.6	43.4	49.5			
Walking time (%TT)	Pregnancy	41.3	33.4	37.4	*	**	*
	Lactation	31.9	41.9	36.9			
Resting time (%TT)	Pregnancy	17.3	14.8	16.1	ns	ns	ns
	Lactation	12.4	14.6	13.5			

TT: total time; F: fresh water (0.5% NaCl); HS: salt water (10% NaCl); *P<0.05, **P<0.01.

No treatment effects were observed in water and food intakes neither on pregnant nor on lactating ewes (P >0.05) (Table 2). These results agree with other researchers who studied the effect of saline water in Argentinean sheep (Revelli *et al*., 2005) and cattle (Bahman *et al*., 1993). This trend is similar to reports on ewes fed *Sorghum stover* (Godwin and Williams, 1986) and Omani ewes fed non-conventional diets and *Rhodes grass* (Mahgoub *et al.,* 2008) and Omani ewes fed salt-tolerant sorghum (Al-Khalasi *et al.,* 2010).

IV – Conclusion

High salt consumption induces one major homeostatic response: a decrease in food intake on pasture marked by an increase in time spending in searching for and walking without any change in water intake and body weight.

Acknowledgments

This work was supported by an INRAT's livestock, laboratory and farm. We would like to express our gratitude to all people who help to realize this research.

Table 2. Effect of drinking salt water on water and food intakes during pregnancy and lactation period

Parameters	Physiological status	Water type		Average	Water	Period	Interaction
		F	HS				
Water intake							
l/d	Pregnancy	5.76	5.43	5.60	ns	**	ns
	Lactation	3.94	3.95				
l/kg W 0.75	Pregnancy	0.34	0.32	0.33	ns	***	ns
	Lactation	0.093	0.13				
l/kg DM intake	Pregnancy	0.17	0.16	0.17	ns	***	*
	Lactation	1.52	1.53				
Feed intake							
Hay intake (kg DM/d)	Pregnancy	0.93	1.42	1.18	ns	ns	ns
	Lactation	1.98	1.88				
Concentrate intake (kg DM/d)	Pregnancy	0.45	0.57	0.51	ns	ns	ns
	Lactation	0.6	0.69				
Total (kg DM/d)	Pregnancy	1.37	2.00	1.69	ns	*	ns
	Lactation	2.58	2.57				
kg/kg $W^{0.75}$	Pregnancy	0.13	0.14	0.13	ns	ns	ns
	Lactation	0.062	0.063				

F: fresh water (0.5% NaCl); HS: salt water (10% NaCl); *P<0.05, ***P<0.001.

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