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Effect of water deprivation during last pregnancy and post-partum period on Barbarine ewes performances and lamb's growth

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Abstract. The effect of water restriction was assessed in Barbarine ewes at 15 days of late pregnancy and two months of lactation. Twenty four adult ewes were divided into two groups balanced for age and weight. The control group received water ad libitum and group D received water once every 3 days. Body weight, body condition score (BCS), milk yield and growth rate of lambs were recorded 10, 30, 45 and 60 days after parturition. Colostrum quantities were recorded 0, 2, 15 and 24 hours post partum. Ewes in both groups lost weight along with 2 months after parturition. Live weight decreased from 51.0±1.65 to 42.18±3.25 kg and from 44.71±1.58 to 38.63±3.12 kg respectively in C and D groups. Live weight loss was more important in D group, and was significantly different between d10 and d30 (-3.7±0.57 *vs* -6.3±0.54 kg; P<0.01), while BCS varied similarly in both groups. For respectively lambs in C group and those in R group, daily growth rates were 184.7±12.9 and 162.0±12.9 between d30 and d10, and 190.6±12.8 and 173.8±12.84 between d60 and d30 (P>0.05). Colostrum secretion was not affected with water deprivation whereas control ewes yielded more milk than treated ones on days 30 and 60 post-partum (1487.4±106.2 *vs* 1096.6±106.2 g/24 h and 983.4±70.2 *vs* 639.2±70.2 g/24 h respectively; P<0.01). This study indicates that although water deprivation for three days along with the two post partum months induced a decrease of ewes' live weight and milk production, their lambs did not suffer from these conditions since they performed similarly than lambs of control ewes.

Keywords. Water deprivation – Ewes – Lambs – Milk yield – Growth.

Effet de la privation d'eau pendant la dernière période de gestation et la periode post-partum sur les perfomances des brebis et la croissance des agneaux de race Barbarine

Résumé. *L'effet de la restriction d'eau a été étudié chez des brebis de race Barbarine pendant les 15 derniers jours de gestation et les deux premiers mois de lactation. Vingt quatre brebis ont été réparties en deux groupes équilibrés selon l'âge et le poids vif. Le lot témoin a reçu quotidiennement l'eau à volonté et le lot traité D a reçu l'eau une fois tous les 3 jours. Le poids vif, la note d'état corporel, la production laitière et la croissance des agneaux ont été mesurés à 10, 30, 45 et 60 jours après mise-bas. Les quantités de colostrum sécrétées ont été mesurées à 0, 2, 15 et 24 heures après mise-bas. Les brebis des deux lots ont perdu du poids pendant les deux premiers mois de lactation. Le poids vif décroît de 51,0±1,65 à 42,18±3,25 kg et de 44,71±1,58 à 38,63±3,12 kg respectivement dans les lots témoin et traité. La perte de poids est plus importante dans le groupe traité entre 10 et 30 jours post-partum (-3.7±0.57* vs *-6.3±0.54 kg; P<0.01) alors que la note d'état corporel a évolué de la même manière dans les deux lots. Respectivement dans le groupe C et D, la croissance était de 184,7±12,9 et 162,0±12,9 entre 10 et 30 jours, et 190,6±12,8 et 173,8±12,84 entre 30 et 60 jours (P>0.05). La sécrétion du colostrum n'a pas été affectée par la privation en eau (P>0.05), alors que les brebis du groupe témoin produisent des quantités de lait plus élevées à 30 et 60 jours post-partum (1487,4±106,2 vs 1096,6±106,2 g/24 h et 983,4±70,2* vs *639,2±70,2 g/24 h respectivement; P<0.01). Cette étude montre qu'une privation d'eau pendant 3 jours durant 2 mois après mise bas, affecte le poids vif des brebis et diminue la quantité de lait produite. Cet effet ne semble pas influencer la croissance des agneaux.*

Mots-clés. *Privation d'eau – Brebis – Production laitière – Agneau – Croissance.*

I – Introduction

Barbarine sheep are raised mainly in arid and semi arid zones where water is not available all year around. Grazing capacity of these animals depends on the availability and distribution of water sources. Sheep flocks on native rangelands should walk long distances to find a water source and may spend 2 to 3 days without watering. These animals could have acquired adaptation mechanism helping them to withstand harsh conditions. It is often speculated that Barbarine sheep cope with undernutrition and high temperature (Atti and Bocquier, 1999; Lassoued *et al*., 2008), but their response to water deprivation is not yet investigated. This experiment was performed to study the effect of 3-days water deprivation of Barbarine ewes at the last 2 weeks of pregnancy and 2 months of lactation on their productive performances.

II – Material and methods

The experiment was carried out in the Experimental Station of the National Institute of Agricultural Research (INRAT) at Bou rebiaà (latitude: 36°38' N; longitude: 10°07' E).

Thirty pregnant Barbarine ewes were selected from a flock that was previously synchronised at mating. Animals were divided into 2 groups on the basis of mating date and balanced for weight and age. The control group (C, 58.1±1.98 kg) received daily water ad libitum and the second group is experimental group (D, 57.6±1.89 kg) watering once every 3 days. Animals were housed in individual pens under a common roof.

The experience began in the late of December and continued until the late of February. This period corresponded to 15 days of late pregnancy and two months of lactation.

All ewes received 1 kg/ewe/day of barley straw and 400 g of concentrate corresponding to 140% of their daily MEM requirements. Body weight and body condition score (BCS) were recorded 2 weeks before parturition, 10, 30, 45 and 60 days after parturition. BCS was evaluated according to the method of Russel *et al*. (1969).

Colostrum was collected at parturition, 2, 15 and 24 hours post partum. Milk yield and growth rate of lambs was measured at days 10, 30, 45 and 60 days post-partum.

Data were analysed using the procedure ANOVA for SAS (SAS, 1989).

III – Results and discussion

The evolution of the body weight of the ewes is reported in Fig. 1.

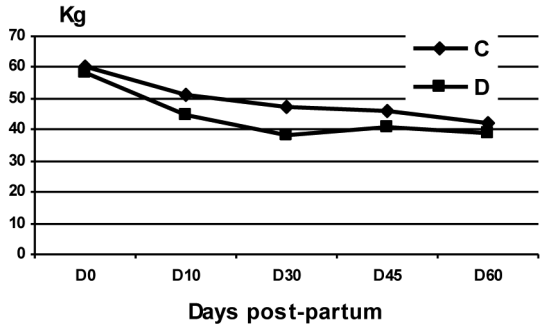

Fig. 1. Body weight changes of lactating ewes subjected to water depriving.

Throughout the first month of lactation, the ewes lost weight. Since 10 days post-partum, live weight decreased from 51.0±1.65 to 42.18±3.25 kg and from 44.71±1.58 to 38.63±3.12 kg. Live weight loss was more important in D group, and was significantly different between d10 and d30 [-3.7±0.57 (7%) *vs* -6.3±0.54 (14%); P<0.01].

The evolution of body condition score (BCS) during the experiment (Fig. 2) showed that 2 weeks before the parturition, the body condition score was low [1.88±0.49 (C) and 1.75±0.62 (D)]. The body condition of all ewes decreased similarly. The variation of body condition score (BCS) was similar in both groups.

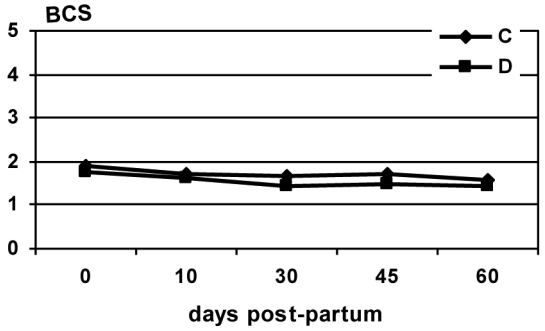

Fig. 2. Changes in body condition score of lactating ewes subjected to water depriving.

Weight loss observed in all animals are attributed to ewes' physiological status indicating that for both treatment groups, the dietary energy supply was lower than energy requirements during early lactation. In early lactation there is an adipose tissue mobilization caused by the "physiological under-nutrition" or an energy deficit (Annison *et al*., 1984). The NRC (1985) suggested a live weight loss of 2.3% for lactating ewes with singles on adequate levels of nutrition.

However the weight loss was significantly greater in water deprived ewes compared to the control ones between d10 and d30 post-partum. Weight loss caused by water restriction is in the range of values reported in the literature for ewes and goats subjected to different restriction frequencies (Jaber *et al*., 2004; Hamadeh *et al*., 2006; Casamassima *et al*., 2008). Water restriction was found to increase diet digestibility as consequence of increased retention time of the digesta in the rumen giving more time for microbial digestion (Balch and campling, 1965). The lower body weight observed in D Group could be due to body water loss (El-Hadi, 1986; Li *et al*., 2000; Parker *et al*., 2003), because water is needed for an adequate rumination and digestion as noted by Cole (1995) in lactating sheep or to the decrease of feed intake (Ummuna *et al*., 1981; Jaber *et al*., 2004).

At birth, lamb's live weight averaged 3.49±0.13 kg and 3.45±0.13 kg for respectively lambs born in C group and those in D group (P>0.05). Corresponding figures for daily growth rates were 184.7±12.9 g and 162.0±12.9 g between d30 and d10, 190.6±12.8 g and 173.8±12.84 g between d60 and d30 (P>0.05).

Colostrum yields varied between 85.8 g and 160.5 g (Table 1). Similar values were obtained by Pattinson *et al*. (1995). There is an increase of colostrum production between 2 and 24 hours. Although the difference failed to reach significance (P>0.05), water restriction reduced colostrum yield (122.5±48.6 g) as compared to the control group (160.5±63.7 g).

Table 1. Evolution of colostrum production (g) during 24 hours after parturition of ewes subjected to water depriving

	0 h	12 h	15 h	24 h
Control	130.3 ± 49.1	96.1 ± 29.0	132.5 ± 70.4	160.5 ± 63.7
Deprived	114.3 ± 69.1	85.8 ± 35.0	115.4 ± 42.9	122.5 ± 16.4

Water deprivation during the first 2 months of lactation reduced milk production (P<0.01) on days 30 and 60 post-partum (Table 2).

Table 2. Effect of water deprivation on milk yield

	D10	D30	D45	D60
Control	1280.1 ± 559.2[a]	1487.4 ± 436.4[a]	1191.7 ± 355.3[a]	983.4 ± 228.8[a]
Deprived	1074.4 ± 420.1[a]	1096.6 ± 282.8[b]	1107.7 ± 235.9[a]	639.2 ± 256.9[b]

[a,b] Means in the same column with different superscripts are significantly different (P<0.05).

Our results are in line with those reported by Aganga (1992) and show that a 72 h water deprivation reduced milk yield in lactating ewes by more than 50%. Although lactating ewes require the double of the amount of water consumed by non-lactating ewes and consumed more water than ewes in other physiological states, Aganga (1992) and Casamassima *et al.* (2008) did not obtain a significant difference in milk yield in Comisana sheep intensively reared and submitted to different protocol of restriction daily water. These authors hypothesized that water restriction improves digestion in the rumen and gut and may allow a milk production similar to that of animals having free access to water.

IV – Conclusion

This study showed that although a 3 days water restriction decreased liveweight and milk production in Barbarine ewes, but the growth rate of their lambs was not affected along with 60 days *post partum*.

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