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Abstract. Sheep dairy production depends on many factors such as rearing system, the nature of forage and the supplementation level. Hence, the objective of this study was the evaluation of the milk production and quality of *Sicilo-Sarde* ewes raised in feedlot or grazing green barley and perennial ryegrass. Sheep were divided into 4 groups. The stall (ST) group received ad-libitum hay and silage with 500g of concentrate. Two groups were grazed on green barley (B) and one on rye-grass (RG). Grazing was managed rotationally with a stocking rate of 25 ewes/ha. The RG group and one of the B groups (B-CC) were supplemented with 300g concentrate; the last group did not receive concentrate (B-C0). The average biomass production was 3.43 and 2.03 tons of dry matter (DM) per hectare for green barley and ryegrass, respectively. Total and daily milk production of ewes was significantly (P <0.001) higher for pasture groups than for the ST group. The daily milk yield was 349, 599, 647 and 592 ml/ewe, for ST, B-C0, B-CC and RG, respectively. Milk fat and protein content were significantly higher for ST than for the grazing groups (P <0.001), while fat and protein yields were higher for grazing groups than for the ST (47 vs. 32 g/d, respectively). As a conclusion, grazing improves milk production with a lower concentrate supply.

Keywords. Dairy ewes – Grazing – Feedlot – Milk production.

Production laitière de brebis conduites en bergerie ou pâturant de l'orge en vert ou du ray-grass

Résumé. *La production ovine laitière dépend de plusieurs facteurs tels que le mode de conduite, la nature du fourrage et le niveau de supplémentation. L'objectif de ce travail était l'étude de la production laitière quantitative et qualitative des brebis Sicilo-sarde à l'auge ou en pâturage. Un troupeau de brebis de race Sicilo-sarde a été réparti en 4 lots homogènes, un lot en bergerie recevant foin et ensilage à volonté, 2 lots pâturant l'un de l'orge en vert et l'autre du ray-grass avec un chargement de 25 brebis par ha. La conduite du pâturage était en rotation. Le pâturage de l'orge en vert s'est prolongé du 22 décembre au 16 Mars (durée totale 86 jours), celui du ray-grass du 22 décembre au 5 avril (durée totale 106 jours). La complémentation a été de 500g d'aliment concentré dans le lot de bergerie (Berg), de 300 g dans le lot de ray-grass (RG) et un des lots d'orge (O-CC) et de 0 g dans l'autre lot d'orge (O-C0). La production de biomasse était en moyenne de 3,43 et 2,03 tonnes de MS/ha respectivement pour l'orge et le ray-grass. La production laitière des brebis a été significativement (P<0,001) plus élevée au pâturage pour les deux espèces fourragères qu'en bergerie alors qu'elle n'a pas été affectée par la complémentation sur l'orge en vert. La production laitière journalière était de 349, 599, 647 et 592 ml, respectivement, en Berg, O-C0, O-CC et RG. Le lait produit en bergerie était significativement plus riche en MG et en MP que celui produit au pâturage, alors que la quantité totale de MG et MP était plus élevée au pâturage qu'en bergerie (47 vs 32 g/j, respectivement). Ainsi, le pâturage permet une meilleure production laitière avec un plus faible apport d'aliment concentré.*

Mots-clés*. Brebis laitières – Pâturage – Bergerie – Production laitière.*

I – Introduction

In Tunisia, dairy sheep farming uses mainly the *Sicilio-Sarde* breed, which is exploited for milk and meat production. Dairy sheep farms are located almost exclusively in the sub-humid region of the country (*Beja* and *Bizerte*) where climatic conditions are favorable for grassland and forage pro-

duction (Atti and Rouissi, 2003). However, the feeding management of dairy sheep remains extensive and traditional : lactating ewes are fed on fallows, stubbles and crop residues with low supplementation in concentrated feed. In big farms, dairy ewes are either fed on hay and silage, or on grazed green barley. In both cases, concentrate supplementation is important, whatever the level of milk production or the forage ration (Toukebri, 1998). Improving the productivity of this breed requires a thorough knowledge of its production potential in the local environment. Among the factors likely to influence milk production of ewes, feeding can be considered as the most important. The objective of this work was to study the quantitative and qualitative milk production of *Sicilo-Sarde* ewes fed in stall or in direct grazing green barley or ryegrass pastures.

II – Material and methods

The study was conducted in winter-spring, at the dairy experimental farm "*Lafareg, Beja*" of the National Institute of Agronomic Researches of Tunisia (INRAT). This trial lasted almost four months (22 December – 5 April).

1. Animals and diets

100 lactating Sicilo-Sarde ewes (10 weeks of lactation) were divided into 4 groups. The stall-fed (ST) group received ad-libitum hay and silage with 500g of concentrate. Two groups were conducted on green barley (B) and one on ray-grass (RG), grazing at a stocking rate of 25 ewes/ha. The RG group and one B group (B-CC) were supplemented with 300g of concentrate; the last group did not receive concentrate (B-C0).The pasture assigned to each group was divided in different paddocks. When the grazing height became as low as 7 cm, ewes changed paddock and so forth.

2. Milk control and analysis

Ewes were milked daily at 07:30 and 16:30 during all the experimental period. Individual milk yield was recorded weekly during the whole observation period and individual milk samples (20 ml) were kept cool (4°C) and analyzed for milk fat (F) and protein (P) using a MilkoScan 4000 (FOSS ELECTRIC, Integrated Milk Testing) at the breeding center of Livestock and Pasture Office in *Sidi-Thabet*.

III – Results and discussion

1. Biomass production

During the experimental period, green barley sown in late October, was exploited relatively early in the season (December 22) with a biomass production of about 3.43t of dry matter (DM) / ha allowing only two passages. Ryegrass had a fairly low production compared to barley (2.03t DM/ha), allowed more than two passages and was characterized by a very high biomass in late April (5.67 t DM / ha).

2. Milk yield and composition

The average milk yield and fat and protein contents observed during the experimental period are reported in Table 1.The daily milk yield was significantly ($P < 0.001$) affected by the rearing system, averaging 613 vs. 363 ml/d for ewes fed at pasture or in stall, respectively.

Considering the forage species, milk yield was slightly higher for barley (623 ml/d) than for ryegrass (592 ml/d), but the difference was not significant. This result (higher milk yield for green cereal compared to typical forage species) is similar to those of Atti and Rouissi (2003) who compared barley to vetch but does not agree with those of Gafsi (2003) who compared oats to phalaris. Among

groups grazing green barley, even though the milk yield was lower for the group without concentrate supplementation (599 ml/d vs 647 ml/d), the difference was not significant. When grass availability is ggod, the response to supplementation is low (Delaby *et al.,* 2003). Therefore, the supplementation of *Sicilo-sarde* sheep at pasture does not always affect milk production (Ligios *et al.,* 2002, Atti and Rouissi, 2003).

The milk produced by stall-fed ewes contained significantly higher fat (P <0.001) and protein (P <0.001) than that produced at pasture (Table 1). This can be explained by the higher concentrate supplementation in stall: an increased concentrate level causes at all stages of lactation a significant increase in the fat and protein levels (Bocquier *et al.,* 2002).The effect of dilution (Othmane *et al*., 2002) associated to a greater milk production in grazing groups compared to ST could also explain this result. However, milk fat and protein yields (in gram per day) were higher in both grazing groups than in ST (Table 1).

Table 1. Average milk yield and composition of dairy ewes (ST: The stall-fed group received ad-libitum hay and silage with 500g of concentrate; B-C0: the group that grazed on green barley (B) and did not received concentrate; B-CC: the group that grazed on green barley (B) and complemented with 300g of concentrate; RG: the group that grazed on rye-grass (RG) and complemented with 300g of concentrate)

	ST	B-C0	B-CC	RG	P
Milk yield (ml/day)	363^b	599^a	647^a	592^a	***
Fat (g/kg)	$86,8^a$	$75,5^b$	76^b	$76,9^b$	***
Fat (g/day)	32^b	45^a	49^a	46^a	***
Protein (g/kg)	$56,5^a$	$53,8^b$	$53,9^b$	$51,7^b$	***
Protein (g/day)	21^b	32^a	35^a	31^a	***

***p<0.001.

IV – Conclusions

Ewes fed at pasture consumed less concentrate but produced more milk than stall-fed sheep. According to the forage species, milk production was similar for green barley and ryegrass pastures. With green barley, at this stocking rate and for this level of milk production, concentrate supplementation was not required for *Sicilo-Sarde* ewes. We can encourage the management of dairy sheep on ryegrass, provided that the supplementation is well adjusted. The latter must be used in a suitable way, according to pasture type, biomass availability, level of milk production. During the rainy days where the ewes do not go out at pasture, conserved feed should compensate for the forage shortage.

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