GRAZING MANAGEMENT OF AN ITALIAN RYEGRASS SWARD WITH DAIRY SHEEP IN THE MEDITERRANEAN ENVIRONMENT

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ABSTRACT

A grazing experiment was conducted in North-West Sardinia with the aim of testing the sward height as a mean to set up an efficient spring management of Italian ryegrass (*Lolium multiflorum* Lam.). Three fields were continuously grazed during spring 1992 by three groups of 12 dairy Sarda ewes, at three different sward heights (SH): 30 - 60 - 90 mm. The target sward height was obtained by continuously adjusting the field sizes. The results showed that the different grazing managements influenced the above ground biomass production and partitioning of the Italian ryegrass and the animal performances. During the vegetative phase, SH was significantly correlated to dry matter production (DM) and Leaf Area Index (LAI) and hence to the milk production and liveweight gains per ewe, while any difference was found taking performance per ha into account. In late spring, during the reproductive development of the ryegrass, SH was not correlated to LAI and hence it was not a good indicator of the animal intake. When grazing annual grass pastures, SH should not be maintained constant for the whole spring grazing period, but should be adjusted according to the sward development to extend the vegetative grazing period as long as possible.

KEYWORDS

Italian ryegrass, continuous grazing, sward height, LAI, dairy sheep.

INTRODUCTION

In many Mediterranean pastoral areas, annual forage grasses are often cultivated to be grazed during winter and spring to complement the production of the natural pasture (Sulas et al., 1995). The spring grazing management of an annual grass pasture in this type of environment is difficult because of its rapid shift from the vegetative to the reproductive phase, that leads to a "flush" of the vegetation in a short period. Italian ryegrass is being increasingly cultivated in the specialised livestock farms, in alternate to the winter cereals (mostly oats) that are more frequent in the mixed cereal-livestock farming systems.

The aim of this study was to set up an efficient grazing management of Italian ryegrass in spring under continuous stocking, to exploit its forage production potential under grazing.

MATERIALS AND METHODS

The experiment was conducted in the spring 1992 (March - May) at Bonassai, NW Sardinia, 40 m a.s.l. on flat, clay-loam, calcareous soils. The climate of the area is Mediterranean, with 3-7 months of drought in spring and summer and relatively mild wet winter (547 mm annual rainfall). An annual pasture of "Barmultra" Italian ryegrass (*Lolium multiflorum* Lam.) was sown in October 1991 and it was grazed continuously by twelve Sarda dairy ewes. Three grazing intensities were compared according to sward height (SH): 30, 60 and 90 mm. The sward was kept at the target height adjusting the instantaneous stocking rate. The field size was increased or decreased when sward height decreased or increased respectively. Outside the experimental area a set of extra-experimental animals mantained the sward heights close to the targets. The ewes grazed from 9/03 to 31/05. The following measurements were taken on the sward:

- SH: weighted plate (30 x 30 cm, 430 g), three times weekly, 150 measures per ha.
- Dry matter (DM) yield, its partitioning into lamina, sheets and stems and dead materials, Leaf Area Index (LAI) (six 25x50 cm ground level samples per ha at three week intervals during the grazing period).
- Animal performances (milk yield, weekly and liveweight gain at two week intervals during the grazing period) and herbage intake on two occasions (Mayes et al., 1986).

The comparison between linear regression equations between SH (independent variable) and sward characteristics (dependent) was performed to test the time x SH interaction during the ryegrass spring development.

RESULTS AND DISCUSSION

The spring drought negatively influenced the duration of the grazing period and of the sward production and characteristics. The effects of the grazing treatment on the total above ground DM yield were always significant according to the height-mass relationship described above, but with a different pattern in early and late spring (Table 1). This was attributed to the increment of DM yield that occurred during spring in treatment 60 and 90 (2.3 to 4.4 and 4.0 to 6.0 t ha^{-1} respectively) associated to the rapid reproductive development of the ryegrass in May, while the heavy grazing of treatment 30 lead to an almost constant DM yield (1.8 - 1.7 t ha^{-1}; Figure 1.a). The reproductive development of the ryegrass that occurred in mid spring caused a substantial change in the phytomass composition of the tall swards, because of the increment of structural tissues and a relative incidence of lamina (Figure 1.b). This is shown by the relationship between LAI and sward height (Table 1): LAI was positively correlated with sward height at the beginning of the spring, when the tall swards were still vegetative, while it was not influenced by the treatment at the end of the spring, when LAI was very low, ranging from 0.5 to 1.0 (Figure 1.a).

The analysis of the animal performance results was restricted to March-April, when all swards could still be considered as vegetative. The milk yield per ewe was significantly higher on treatment 90 (890 g ewe^{-1} day^{-1}) than 30 and 60 (727 and 763 g ewe^{-1} day^{-1}, respectively). The milk production per unit pasture area over the grazing period was similar on all treatments, being 1027 (30), 999 (60) and 953 (90) Kg ha^{-1}, with a higher fat content for the group of ewes grazing treatment 30. The liveweight gains were -6, 66 and 99 g ewe^{-1} day^{-1} for treatment 30, 60 and 90 respectively. The herbage intake resulted significantly higher in treatment 90 and 60 (1606 and 1528 g DM) than in 30 mm sward (1197 g DM).

The results showed that the different continuous grazing management influenced the above ground biomass production and partitioning of the Italian ryegrass in early spring and hence the dairy sheep performances. Treatment 90 was the most productive in terms of forage and individual animal outputs. In this treatment and at a lesser extent in treatment 60 the sward composition and structure developed during the spring grazing period, with a prevalence of lamina tissues at the beginning of spring. In treatment 30, the frequent leaf removal increased the incidence of new lamina tissues over the total biomass, but very low values of LAI and phytomass were observed, also because of the spring drought. Therefore light interception of the

sward 30 was incomplete, and its DM production was far below potential.

During the vegetative phase, SH was linearly related with DM and LAI, that in turn proved to influence animal intake rate and performances as already found by Penning et al. (1991). Therefore SH could be effectively used to set up a correct management of an annual grass pasture in early spring. During the reproductive phase SH was not a good indicator of the sward characteristics, because of the higher incidence of structural tissues on total above ground phytomass of the tall (i.e. 60 and 90) swards.

When dry weather occurs in spring, short sward heights correspond to very low forage production, LAI and growth rate. Therefore in these cases it is advisable to maintain sward height over 50 - 60 mm. If the spring weather is favourable, it may be advisable to progressively reduce SH from the beginning to the end of the spring, i.e. to increase the grazing pressure as the sward develops into the reproductive phase, in order to maintain the vegetative habit of the grass as long as possible.

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Table 1

Linear regression equations between target heights (independent variable, mm) and DM production (t ha^{-1}) or LAI (independent variable) of an Italian ryegrass annual sward at the beginning and end of the spring grazing season. a = intercept; b = regression coefficient; r = linear correlation coefficient.

Dependent variable	EARLY SPRING				LATE SPRING			
	a	b	r	P	a	b	r	P
DM yield	0.32	0.04 ^{b}	0.78	**	0.22	0.07 ^{a}	0.92	**
LAI	- 0.48	0.04 ^{a}	0.85	**	0.39	0.01 ^{b}	0.45	ns

Values with different superscript within rows shows significant differences (P<0.01).
* = P<0.05, ** = P<0.01, *** = P<0.001; ns = P>0.05.

Figure 1

Observed variations of the DM production and LAI (**a**) and DM yield partitioning (**b**) of "Barmultra" Italian ryegrass between the beginning and the end of the spring grazing season.