Management Strategies to Increase Festulolium Productivity and Persistence

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Introduction

A biennial hybrid of *Lolium multiflorum* x *Festuca pratensis (*Festulolium INIA Merlin*)* was released by the National Institute of Agricultural Research of Uruguay (INIA) in 2008. INIA Merlin is a tetraploid cultivar with a long growing season, semi-prostrate habit and high herbage quality (García 2003). These characteristics make it potentially useful to include Festulolium in short and intensive pasture-crop rotation systems. Grazing management can be used to modify growth, sward structure and persistence, and is known to be critical during the second year of production for stability and sustainability of farming systems that include this type of species. The objective of this trial was to measure the effect of different grazing strategies on the productivity and persistence of this novel cultivar.

Methods

The experiment was established on a fine, thermic, mixed, vertic, Argiudoll soil at Palo a Pique Research Station, Treinta y Tres, Uruguay, South America (33°15'12"S, 54°29'46"W). Festulolium INIA Merlin was sown at 20 kg/ha in April 2011. Three defoliation treatments were applied at 21 day-intervals (August to November) to maintain post-grazing residual heights of 5, 10 and 15 cm. Plots were grazed with lambs for short periods (10-12 hours) each time. The experiment had a split-plot block design: main plots were post-grazing residual height (5, 10 and 15 cm) and split plots were grazing treatment (with or without rest periods) from late November 2011 to March 2012. There were 3 replicates and each split plot was 400 m^2. Measurements included sward height, pre- and post-grazing herbage dry weight, leaf area index (LAI), plant and tiller density, tiller diameter (TD, mm), tiller death (DT, %) and seed production. Data was analyzed by the PROC MIXED SAS procedures and means were compared using the LSD test (P<0.05) (SAS Version 9.2).

Herbage growth was measured prior to grazing by cutting 3 quadrats/plot (each 20 cm x 50 cm) and recording sward height at 4 positions/plot. Samples were individually weighed and bulked for analysis. A sub-sample was oven-dried at 60°C for 48 hours, then weighed, and another sub-sample was separated by hand into components (pasture species, dead material and weeds). Ten cores/plot (22.9 cm^2 to 5 cm depth) were randomly taken to assess plant density, tiller number and diameter. Post-grazing LAI was measured every 42 days in 3 quadrats/plot (20 cm x 20 cm) using a LI-3100C Area Meter®. Twenty tillers (1/plant) were marked with rings every 42 days after grazing to determine tiller survival. To measure seed production, 5 soil cores/plot were taken in February 25th 2012 and seed recovered by a process that included hand sieving, air flow and manual separation with the aid of a loupe. Residual effects were examined in the second year.

Results

Overall mean sward heights after grazing were 6.3±0.5 cm, 11.1±0.6 cm and 16.2±1.2 cm for the 5 cm, 10 cm and 15 cm post-grazing residual treatments, respectively. Plant and tiller density was affected over time by defoliation intensity (P<0.001) (Fig. 1). In the second autumn, plant density was 45% higher for the 15 cm treatment, in comparison with the average of 5 cm and 10 cm. Summer rest also improved plant density (P=0.006) by 25%. Compensatory mechanisms maintained a stable tiller population. There were no significant differences among treatments for tiller diameter (mean of 1.75 mm) or death (mean of 48%).

Significant differences (P<0.001) in growth rate (GR) were found in relation to grazing intensity during the third and the fourth grazing cycle in late spring, with 56, 135 and 173 kg DM/ha/day (for the period 26/9 to 17/10) and 77, 149 and 204 kg DM/ha/day (from 17/10 to 7/11) for the 5 cm, 10 cm and 15 cm grazing treatments, respectively.

Residual LAI decreased over time (P<0.0001) from 1.26 to 0.037 between August to March. Post-grazing LAI evaluated on 17/8, 5/10 and 15/11 differed significantly, as a consequence of different grazing targets (5 cm <10 cm <15 cm). However, from late December to March there were no significant differences in post-grazing LAI between treatments, which might be a consequence of the water deficit that occurred. These differences in growth are consistent with other studies where a high LAI is essential for rapid re-growth (Lemaire and Chapman 1996).

Seed production was significantly affected by defoliation intensity (P=0.05) and by summer management (P=0.004). The number of seeds/m^2

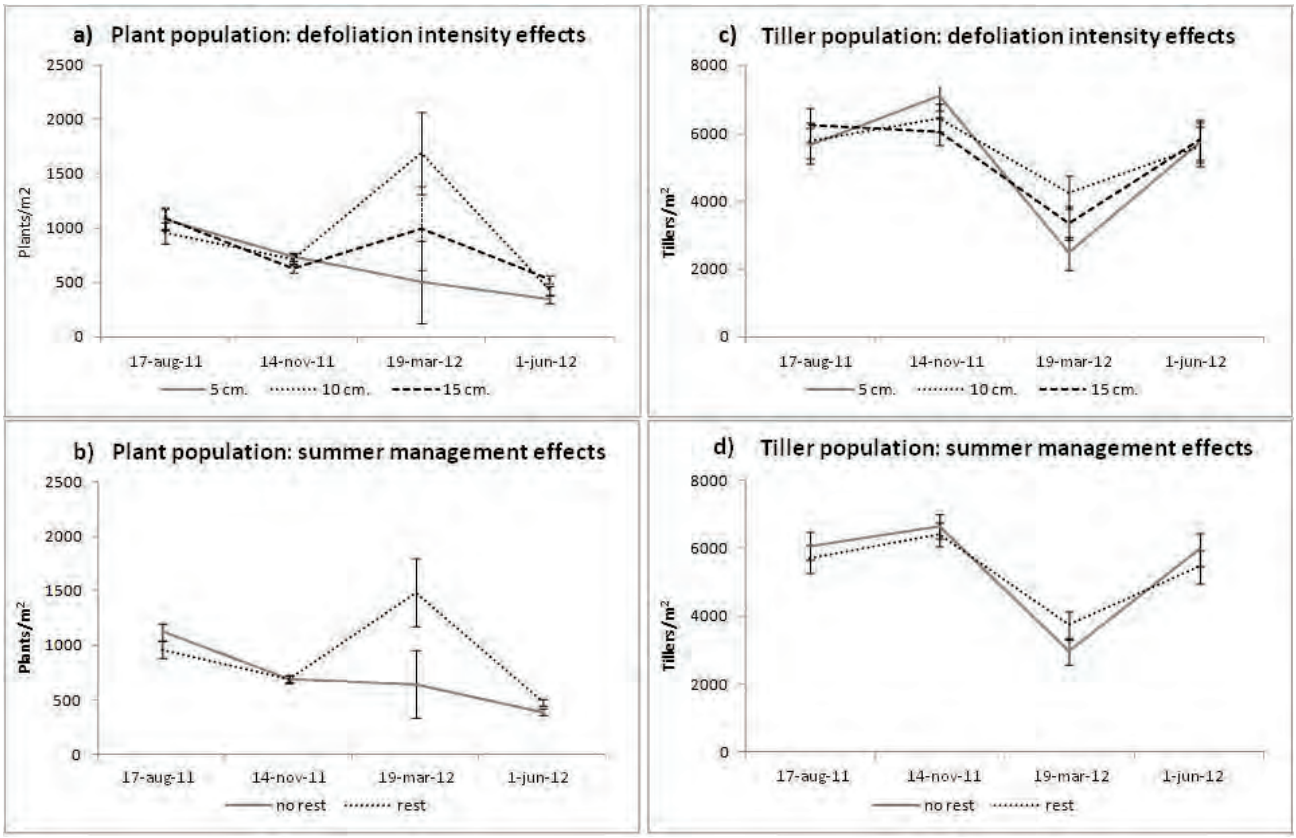

Figure 1. Plant and tiller density of *Festulolium* INIA Merlin in response to grazing height

increased from 2839 to 11278 when paddocks were managed to leave high (15 cm) compared to low (5 cm) post-grazing residuals, while summer rest increased the number of seeds/m^2 4-fold. However, seed yield (mean of 5.81 g/m^2) was not affected by defoliation intensity, but increased 3.1 times in response to summer rest (P=0.0125).

Conclusion

To improve the productivity and plant density of Festulolium INIA Merlin, recommended management should include a reduction in grazing intensity, to promote spring production, and a summer rest, in order to increase seed production. More studies are necessary to develop appropriate management strategies to get the optimum balance between animal production and persistence in Festulolium pasture phases.

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