Prairie grass: an alternative to perennial ryegrass in subtropical pastures

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ABSTRACT

The present study was undertaken to compare the effect of temperature, and defoliation interval and height on the regrowth of prairie grass and perennial ryegrass. Results show the greater tolerance of prairie grass to higher temperatures resulting in substantially greater production provided the defoliation interval is extended to allow reserve water soluble carbohydrates (WSC) to be replenished. As a consequence, prairie grass maintained higher leaf and root growth as well as retaining higher levels of WSC reserves compared with perennial ryegrass.

Introduction

In the subtropical dairy region of eastern Australia, high-yielding temperate grasses (>25 t dry matter (DM)/ha/year) (5), commonly *Lolium* spp., provide forage from late autumn to mid spring. Perennial ryegrass (*Lolium perenne* L.) pastures, however, do not persist for more than 3 years; hence short-term biennial ryegrass (*L. multiflorum* L.) re-established annually is more commonly sown (5).

Recent studies (6,2) have indicated that defoliation management of perennial ryegrass has a large influence on its productivity and survival over the hot and humid subtropical summer. These studies found that defoliating perennial ryegrass at the 3-leaves/tller stage of regrowth, compared with the 1-leaf/tiller stage, optimised growth and persistency and this was associated with plants having larger tillers and a more extensive root system.

Prairie grass (*Bromus willdenowii* Kunth.) is an alternate temperate perennial grass which has been shown to be high-yielding, persistent and highly palatable in grazing experiments in this climate (3,8). Previous studies (9,1) have indicated that prairie grass requires infrequent and lax defoliation for maximum productivity and persistence.

The present study was undertaken to compare the effect of temperature, and defoliation interval and height on the regrowth of prairie grass and perennial ryegrass.

Materials and method

In a controlled temperature glasshouse at Wollongbar Agricultural Institute, New South Wales (NSW), individual plants of Matua prairie grass and Dobson perennial ryegrass were grown in 2 mini-swards with one half as prairie grass and the other as ryegrass. From 13 weeks after sowing to the completion of the experiment, one mini-sward was maintained at a day/night temperature of 18/10^{o}C and the other at 25/15^{o}C. These temperatures were selected as they represent winter and early spring conditions on the subtropical north coast of NSW

During the treatment period prairie grass was defoliated 4 times at the time taken to regrow 1 new leaf per tiller (1-leaf stage), twice at the 2-leaf stage, or once at the 4-leaf stage to 60, 90 or 120 mm stubble height. Similarly, ryegrass was defoliated 3 times at the 1-leaf stage, once at the 1-leaf stage then once at the 2-leaf stage, or once at the 3-leaf stage to 30, 60, or 90 m stubble height. The defoliation intervals were estimated in terms of the number of fully expanded new leaves per tiller to make the results more generally applicable.

Four plants from each treatment combination were destructively harvested to obtain leaf, stubble and root DM, stubble water soluble carbohydrate (WSC) and number of tillers per plant at the commencement,

mid-point, and completion of a full regrowth cycle (4- and 3-leaf stage for prairie grass and ryegrass, respectively) immediately following the treatment period.

Results

Temperature but not defoliation interval or height affected the leaf appearance interval. The mean leaf appearance interval for prairie grass and ryegrass was 9 and 12 days at the lower temperature and 8 and 11 days at the higher temperature, respectively which resulted in harvest times for both grasses coinciding.

Prairie grass was more adversely affected by frequent defoliation than ryegrass. The combination of high temperature and frequent defoliation reduced regrowth rates of prairie grass and ryegrass by 66 and 54%, stubble DM/tiller by 50 and 11%, root DM/ tiller by 62 and 45 %, and stubble WSC (mg/plant) by 52 and 21%, respectively when compared to infrequent defoliation at the low temperature.

In contrast, ryegrass was more affected by defoliation height than prairie grass, particularly at the high temperature. Close defoliation and high temperature reduced regrowth rates of perennial ryegrass and prairie grass by 35 and 25%, root DM/tiller by 18 and 0%, and stubble WSC (mg/plant) by 84 and 36%, respectively when compared to a more lax defoliation at the low temperature.

Defoliating prairie grass at the 4-leaf stage maximised the rate of leaf regrowth (146 *v*. 57 mg DM/plant.day^{-1}), root DM (366 *v.* 108 mg DM/tiller) and stubble WSC (1715 v. 1160 mg WSC/plant) with the lower values recorded for the 1-leaf stage interval.

Discussion

The combination of temperature and defoliation interval had the greatest influence on regrowth of prairie grass and ryegrass. Defoliation height became important when associated with a high temperature regime and frequent defoliation. Overall, ryegrass was more sensitive to high temperature than prairie grass and this was particularly true as the defoliation interval or height was reduced.

An optimal defoliation interval of 4-leaves per tiller for prairie grass and 3-leaves per tiller for ryegrass, maximised DM yield and root growth, permitted full replenishment of stubble WSC reserves as well as optimising tiller number and, confirms previous glasshouse studies (7,4).

References

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