Seasonal Changes in Stolon Reserves of Bermudagrass Cultivars as Affected by Various Nitrogen Fertilization Schedules

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INTRODUCTION

The use of bermudagrass [*Cynodon dactylon* (L.) Pers.] has been encouraged in the transitional zones of Europe, mainly due to its high water-use efficiency and good recuperative potentials. However, this species presents a period of dormancy in which has reduced or no color, and it is subjected to injury by winter temperatures in transitional environments. Reducing this dormancy period via management strategies or cultivar selection may represent a means to improve the acceptability of bermudagrass in the transition zone.

Traditional management practices that enhance freeze tolerance of bermudagrass have focused on reducing the application of N while increasing those of K in late summer and early fall. In contrast, the results of various studies on late-season N applications indicated no adverse effects both on turf performance and cold hardiness. The influence of late-season N applications to bermudagrass has been investigated in comparison to equal distribution of N throughout the spring and summer. However, the physiological and morphological responses of bermudagrass to N fertilization schedules shifted to the late-season, under the same annual amount of N, have not been tested.

The objectives of this study were to determine the effects of three N fertilization schedules on four seeded bermudagrass cultivars in terms of: i) accumulation of carbohydrates and proteins in stolons and ii) spring green-up.

MATERIALS AND METHODS

Location: Legnaro, Padova (northeastern Italy); Plant Hardiness Zone 8a; 820 mm rainfall/yr.

Soil: Oxyaquic Eutrudept, coarse-silty, mixed, mesic (a silty loam).

Establishment: Plots (3 by 2 m) were seeded in June 2008, at 4.8 g m^{-2} PLS.

Mowing: Weekly at 45 mm height, with clippings removed.

Irrigation: Provided only during the establishment phase.

Cultivars:

PRINCESS-77	**SWI 1014**
RIVIERA	**YUKON**

Fertilization:

A) 6.7 g N m^{-2} in May, June, August

B) 5 g N m^{-2} in May, June, August, October

C) 4 g N m^{-2} in May, June, August, September, October

Data :
- Turf samples collected (Photo 1) monthly from September 2009 to April 2010 and stolons separated for laboratory analyses (Photo 2 & 3).
- Starch, water-soluble carbohydrates (WSC), and crude protein content of stolons determined on a dry matter basis.
- Spring green-up estimated weekly as a green percent ground cover from 15 March to 15 June 2010 and sigmoidal fitting to calculate days of year required to reach 80% of green turfgrass coverage (d80).
- Repeated measure ANOVA to compare treatments.

RESULTS AND DISCUSSION

Results of this study pointed out wide differences among cultivars in terms of stolon carbohydrate content, with 'Riviera' and 'Yukon' having the highest content of starch (Fig. 1) and WSC (Fig. 2). 'Princess-77' was characterized by late green-up (Fig. 3) and low carbohydrate levels (Figs. 1 & 2). Shifts of fertilizer applications until late-season had limited influence on starch of stolons (Fig. 4), but enhanced CP accumulation during acclimation (Fig. 5) and led to an enhanced spring green-up (Fig. 6) regardless of cultivar.

CONCLUSIONS

Delays of N applications until October had limited influence on stolon storage of carbohydrates, while promoted protein accumulation during winter acclimation, suggesting no contraindications for freeze-avoidance. However, the choice of N fertilization schedule appeared of secondary importance compared to cultivar selection to enhance the spring green-up of bermudagrass.

Photo 1: Turf sampling

Photo 2: Sample washing

Photo 3: Stolons sample

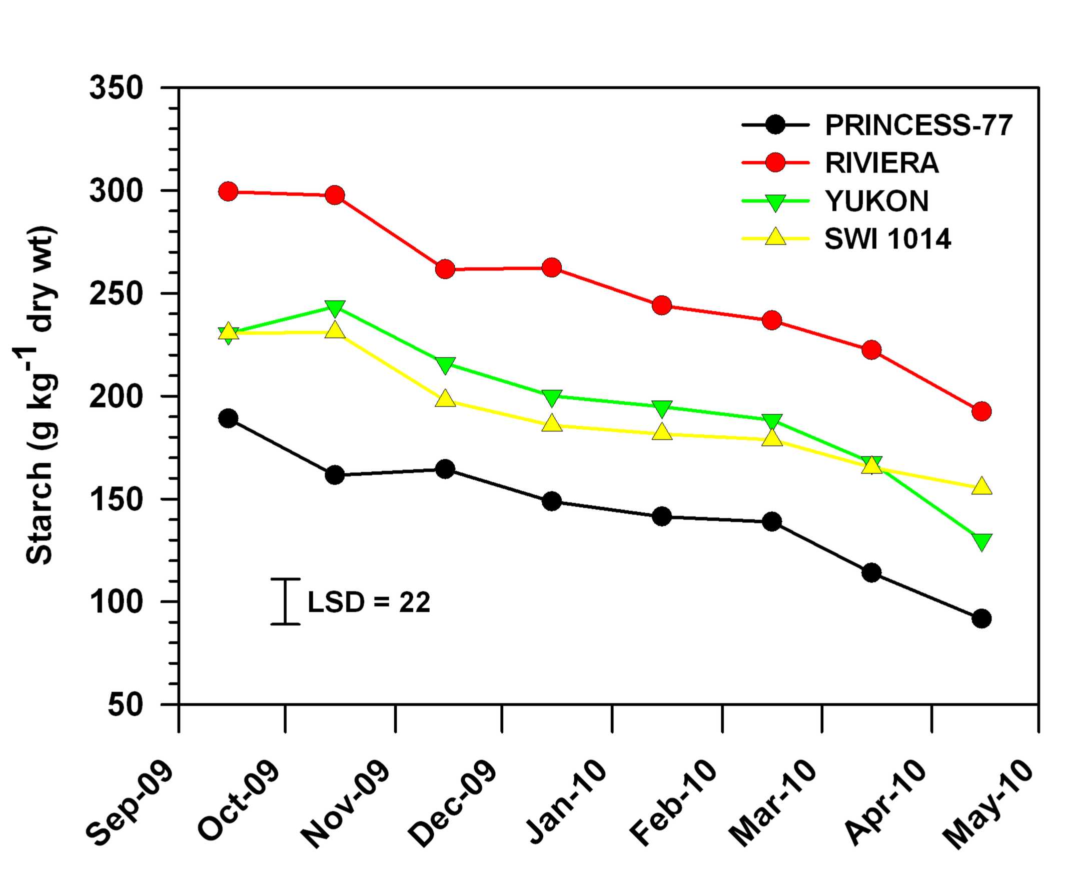

Figure 1: Starch in stolons of bermudagrass cultivars as affected by months. LSD bar indicates differences among treatments at α = 0.05.

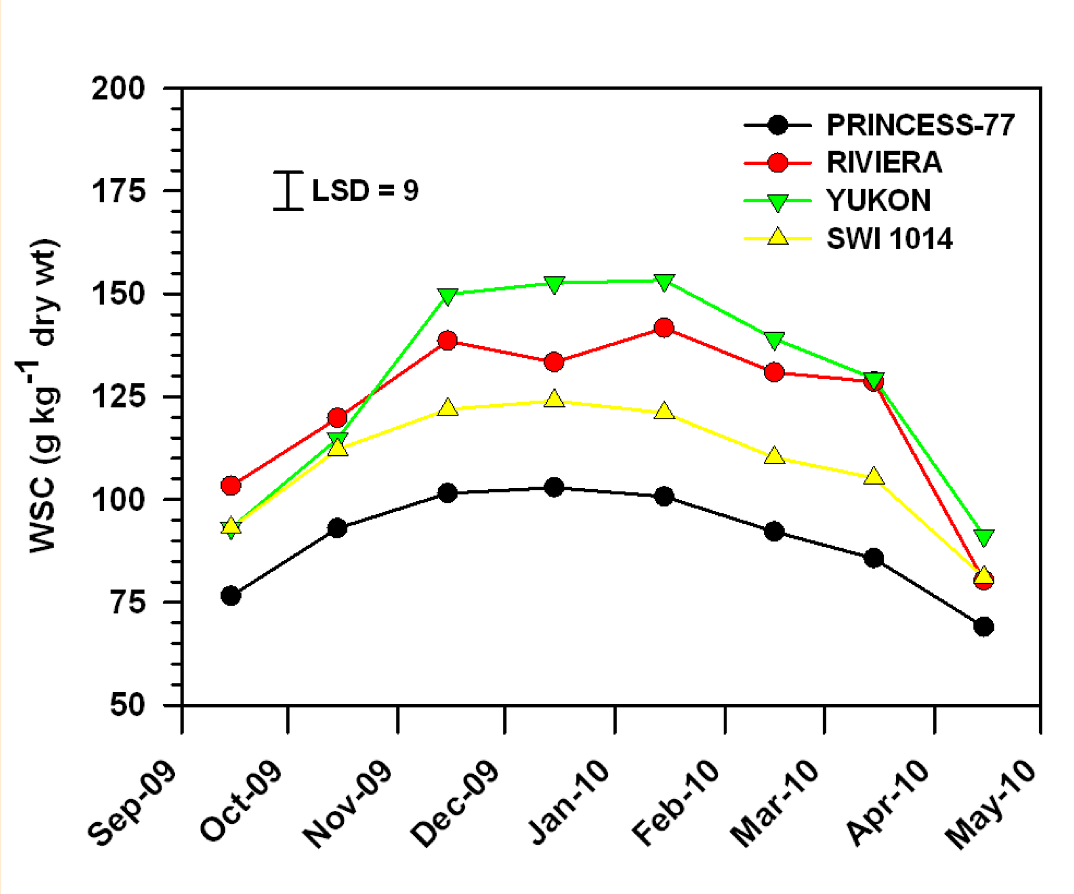

Figure 2: Water-soluble carbohydrates (WSC) in stolons of bermudagrass cultivars as affected by months. LSD bar indicates differences among treatments at α = 0.05.

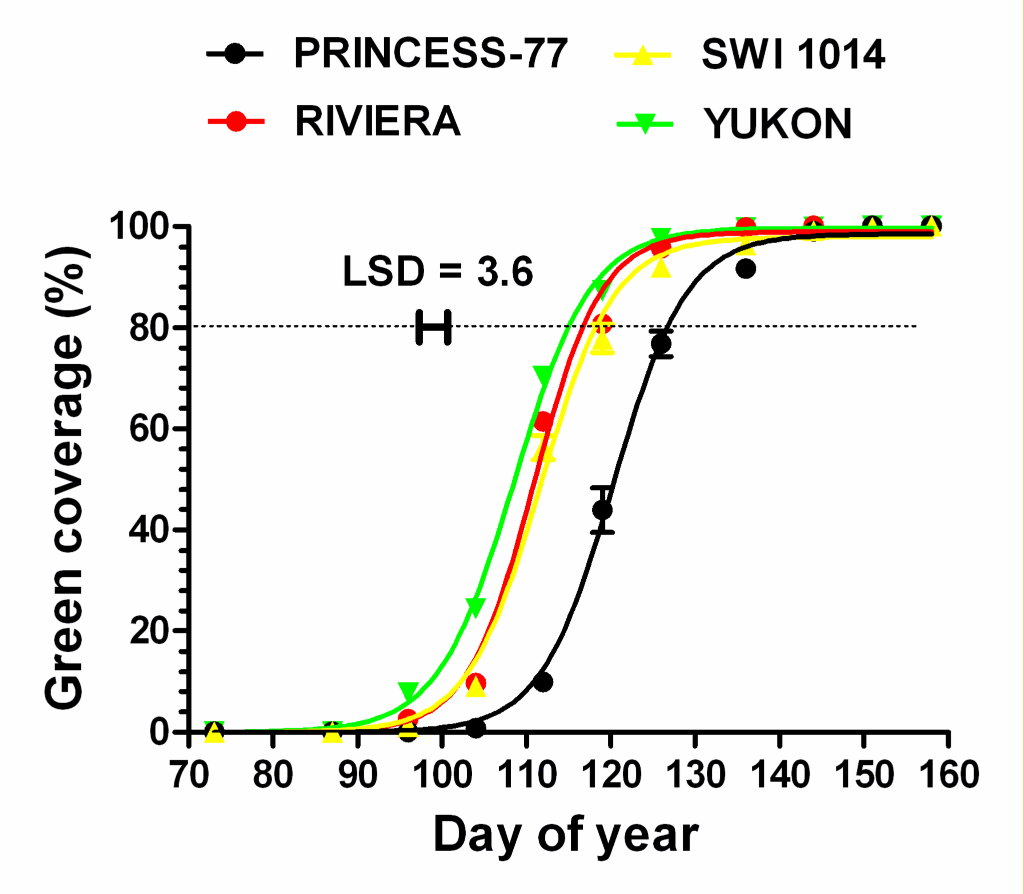

Figure 3: Green-up of bermudagrass cultivars in spring 2010. LSD bar indicates differences between cultivars in days to reach 80% green coverage at α = 0.05.

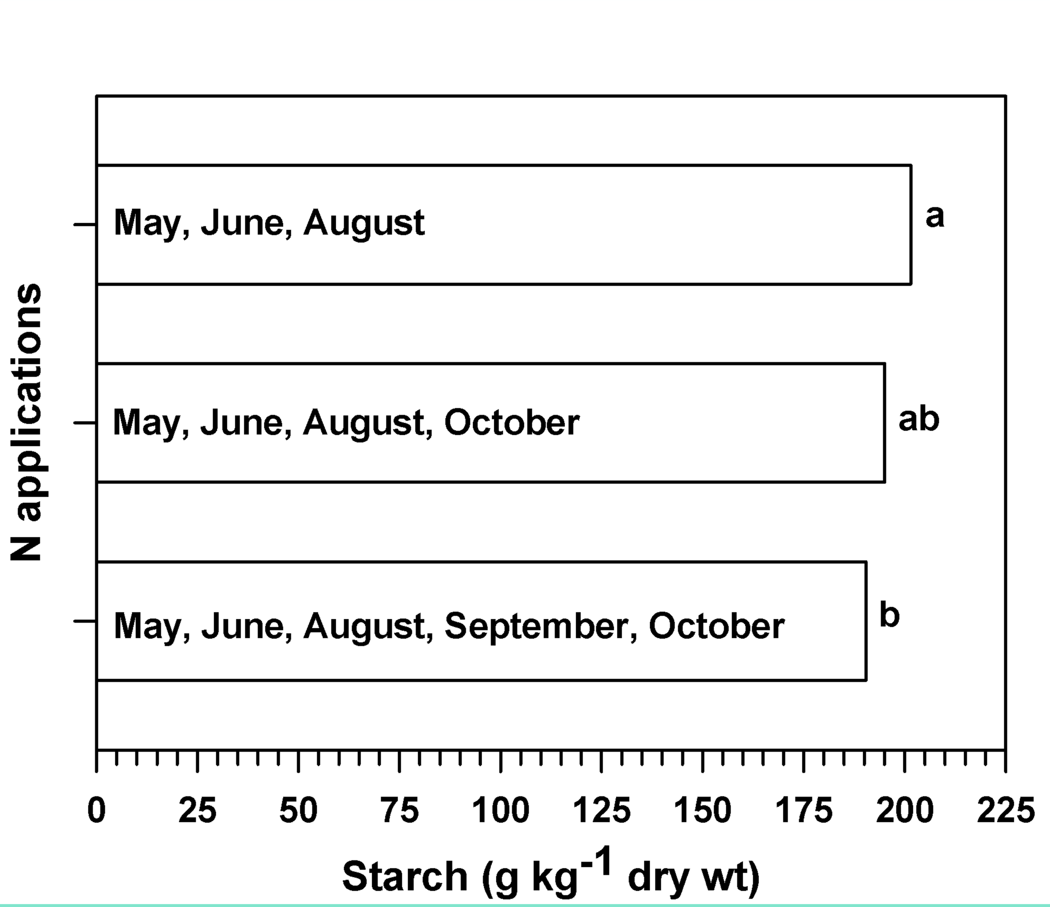

Figure 4: Starch in stolons of bermudagrass as affected by N fertilization schedules. Different letters denote differences between treatments at α = 0.05.

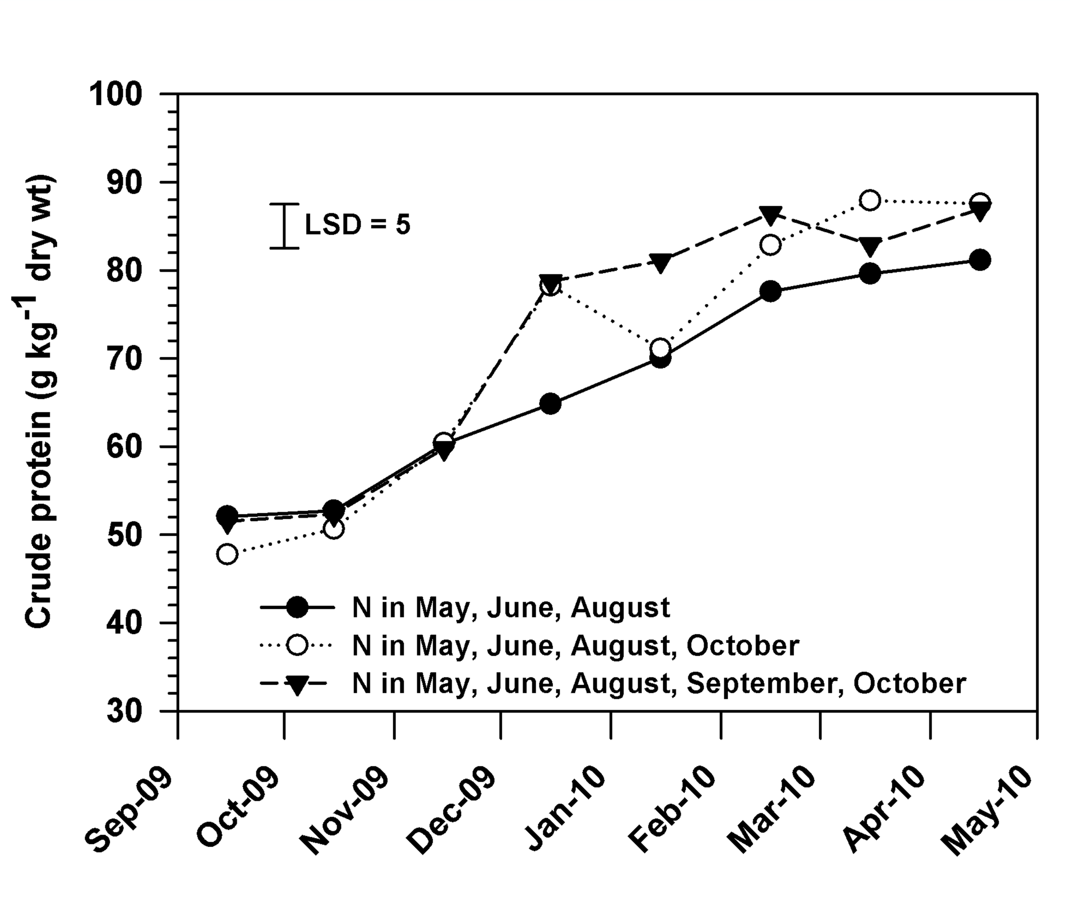

Figure 5: Crude protein in stolons of bermudagrass as affected by N fertilization schedules and months. LSD bar indicates differences among treatments at α = 0.05.

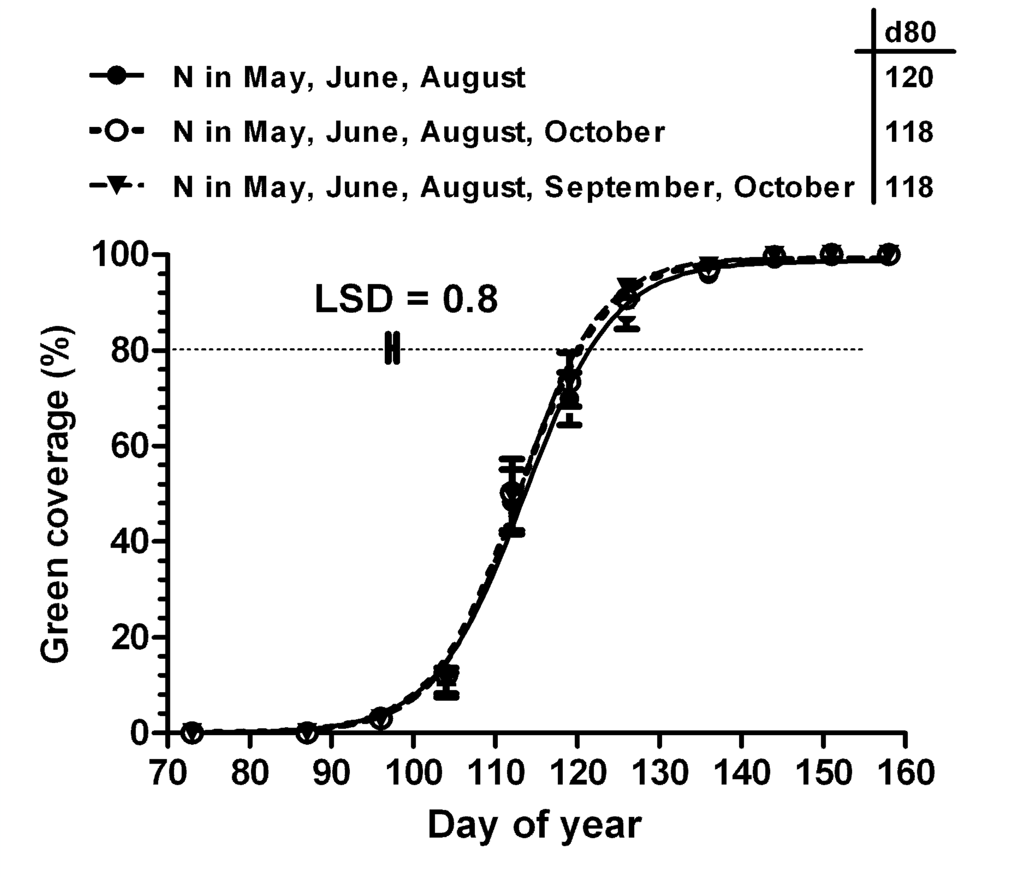

Figure 6: Influence of N fertilization schedules on spring green-up. LSD bar indicates differences in days to reach 80% green coverage (d80) at α = 0.05.