

## Tissue damage and nutritive value of warm-season grasses following a freeze

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**Introduction** Bahiagrass (*Paspalum notatum* Flugge) is a major forage for livestock in the subtropics of the U.S.A. However, it is subject to freeze damage with minimal winter regrowth, and is generally considered a poor grass for stockpiling due to poor quality of the residue. Bahiagrass genotypes have been found showing a range of leaf freezing tolerance in the field (-3<sup>0</sup> C) (Blount et al., 2001). Other C<sub>4</sub> grasses have been reported to have genotype-specific tolerances to below-freezing temperatures ranging from -3 to -10<sup>0</sup> C (Sakai & Larcher, 1987). This research was begun to try to understand the processes that take place following freeze injury to bahiagrass. Three grasses native to the Midwest, big bluestem (*Andropogon gerardii* Vitman cv Alamo), Indiangrass (*Sorghastrum nutans* (L.) Nash cv Lometa), and switchgrass (*Panicum virgatum* L. cv Kaw) and commonly used for stockpiling were used for comparison.

**Materials and methods** Randomized complete block design of 6 genotypes was established in north Florida in rows of eight single plants. Three bahiagrass cultivars ('Argentine', 'Pensacola' and 'Tifton 9'), with Argentine being the commercial cold-sensitive cultivar, were compared to several native grasses. Plots were fertilized twice, staged on 1 July 2003 to 6.08 cm for bahiagrass and 15.24 cm for native grasses, and allowed to grow thereafter to stockpile dry matter until a killing frost would occur. Harvests included a pre-freeze event baseline (16 Nov 2003), freeze event -3.3C (30 Nov 2003) followed by harvest at 3, 7, 14, and 28 d post-freeze. Harvested material was dried at 80°C and separated into leaf and stem. Leaf tissue cold tolerance (LTCT) was rated after 28 d using the USDA G.R.I.N. scale (1= no damage or 100% green leaf, 9= total top growth damaged or 0% green leaf). Crude protein (CP) and neutral detergent fiber (NDF) were determined on all samples using NIRS calibrated with 20% of the samples.

**Results** Single plant yield and percent leaf were different among genotypes (Table 1). Switchgrass had the highest yield and bahiagrass had the highest leaf percent. Leaf yield was more similar, but switchgrass produced more than twice as much leaf of any other cultivar. Tifton 9 showed the most resistance to freeze damage whereas the native grass cultivars and Argentine bahiagrass were completely damaged. Crude protein of native grasses and Argentine declined dramatically following the freeze (Fig. 1). Tifton 9 increased slightly in CP concentration and remained above 8%. At this level, Tifton 9 would provide maintenance protein for dry beef cows during the winter. Pensacola would be marginal. Neutral detergent fiber increased following the freeze for all grasses except Tifton 9, but more dramatically for switchgrass and Argentine.

**Conclusions** Midwest native species can accumulate tremendous amounts of dry forage in the subtropical U.S.A. for stockpiling but requires protein supplement. While bahiagrass has the reputation of being very poor in quality after a freeze, this study suggests at least one variety (Tifton 9) maintains quality quite well following a freeze and may not require additional supplement for non-lactating cows.

### References

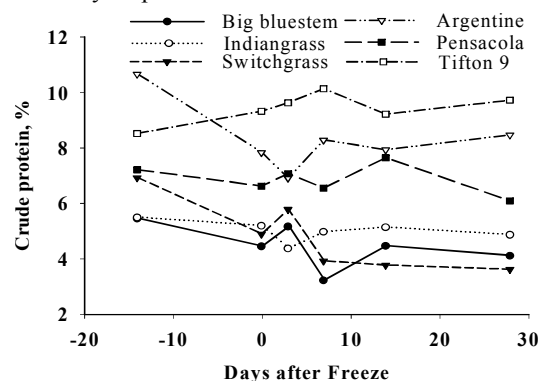
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**Table 1** Yield, leaf percent, and cold damage for six cultivars of C<sub>4</sub> grasses

Cultivar	Yield <sup>a</sup> , g DM plant <sup>-1</sup>	Leaf <sup>a</sup> , %	LTCT <sup>b</sup>
Big bluestem	46.3 <sup>a</sup>	21.0 <sup>a</sup>	9.00 <sup>c</sup>
Indiangrass	99.7 <sup>b</sup>	22.7 <sup>a</sup>	9.00 <sup>c</sup>
Switchgrass	222.0 <sup>c</sup>	21.0 <sup>a</sup>	9.00 <sup>c</sup>
Argentine	16.5 <sup>a</sup>	80.2 <sup>b</sup>	9.00 <sup>c</sup>
Pensacola	21.9 <sup>a</sup>	81.3 <sup>b</sup>	8.54 <sup>b</sup>
Tifton 9	17.4 <sup>a</sup>	88.7 <sup>c</sup>	6.71 <sup>a</sup>

<sup>a</sup>Averaged across harvest dates.

<sup>b</sup>At day 28 post-freeze.



**Figure 1** Changes in crude protein content of C<sub>4</sub> grasses following a freeze (-3 °C)