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Evaluation of limpograss (*Hemarthria altissima*) breeding lines under different grazing management systems

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Introduction

Limpograss (*Hemarthria altissima*) is a stoloniferous, warm-season perennial grass from South Africa and is frequently used to extend the grazing season in poorly drained soils of subtropical regions (Quesenberry et al. 2004). The cold tolerance of limpograss allows it to grow at temperatures below which other commonly used warm-season grasses (e.g. bermudagrass) become unproductive. Use of limpograss has helped to reduce forage shortfall during winter, therefore reducing feeding costs. In the past 30 years, the area planted to limpograss in Florida, USA has grown faster than that of any other forage grass species. It is estimated that over 0.2 million ha are planted to limpograss (Quesenberry et al. 2004).

Recent University of Florida research with limpograss has focused on developing new hybrids, which incorporate the persistence of the most widely used cultivar Floralta with the digestibility of cv. Bigalta. Preliminary clipping and grazing trials evaluated 50 breeding lines and identified 5 lines (designated 1, 4F, 10, 32 and 34) with superior performance. Within the overall program goal of identifying the best limpograsses for cultivar release, the specific objective of this experiment was to investigate the forage productivity and sward canopy characteristics of these 5 breeding lines, relative to Floralta, in response to different grazing management strategies.

Materials and Methods

The research was conducted from May to October 2012 at the University of Florida Beef Research Unit, northeast of Gainesville, FL, USA. The soils are classified as sandy Spodosols of the Pomona series (sandy, siliceous, hyperthermic Ultic Alaquods), with pH of 5.3 and P, K and Mg levels of 5.5, 36 and 109 mg/kg, respectively. Limpograss plots were planted in July 2011 and allowed to establish until May 2012, when they were uniformly mowed to 20 cm prior to initiation of rotational stocking treatments. Based on soil test recommendations, pastures were limed (2.2 t/ha) and fertilized with 19 kg P and 75 kg K/ha in April, and N was applied at 135 kg/ha in 3 equal applications of 45 kg/ha in April, June and August.

The study included 24 treatments, arranged as a 6 x 2 x 2 factorial experiment with 2 replications in a randomized complete block design. Experimental units were 8 m x 8 m. Treatments included the 6 limpograss entries (1, 4F, 10, 32, 34 and Floralta), 2 pre-graze light interception levels (LI; 80 and 95%) that determined when the pasture was ready to be grazed, and 2 post-graze stubble heights (SH; 20 and 30 cm). LI was measured with a SunScan Canopy Analysis System model E-312-SS1-COM (Delta-T Devices, Cambridge, UK). Using LI as the grazing trigger generally results in more uniform canopy characteristics across grazing events, compared with calendar-based timing. The 95% LI value had previously been proposed as an 'optimum' threshold for initiation of grazing, because it reflects the inflection point of the growth curve where growth rates are maximum but before herbage accumulation rate starts decreasing (Lemaire and Chapman 1996; da Silva and Nascimento Jr. 2007). The reason for using 80% LI and shorter SH (20 cm) than the recommended (30 cm) for limpograss was to apply significant selection pressure on the entries. Cross-bred Angus yearling heifers (~400 kg) were used to graze the pastures using mob stocking.

Herbage mass was quantified before and after each grazing event from four 0.25 m² quadrats per pasture. Forage was dried to constant weight to determine dry matter (DM). Herbage mass harvested by grazing (HH; kg DM/ha) was calculated as the difference between pre- and

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post-grazing herbage mass of a given grazing cycle, and herbage accumulation (HA; kg DM/ha) was determined as the pre-graze herbage mass minus post-graze mass of the previous grazing cycle. The HA of the first grazing cycle was considered to be pre-graze herbage mass of that cycle. Canopy height was measured at 20 locations per pasture prior to grazing. Leaf and stem mass and leaf:stem ratios were measured for the third grazing event of the season on entries 1, 4F, 10 and cv. Floralta. Two 0.25 m² quadrats were sampled per pasture for this evaluation. Data were analyzed using PROC GLMMIX of SAS.

Results and Discussion

HA and HH for entries 10 and 4F were as great as or greater than those for any other entry, but values were not statistically different from those for Floralta (F) (Table 1). There was no effect of either LI or SH on HA or HH.

Table 1. Total herbage accumulation (HA), total herbage harvested (HH) and number of grazing periods at 2 pre-graze light interception (LI) levels, for 6 limpograss entries.

Entry	Total HA (t/ha)	Total HH (t/ha)	Number of grazing periods	
			LI80	LI95
10	11.6a[1]	9.9a	5a	4a
4F	10.4ab	8.9ab	5a	3b
F	9.5abc	7.9abc	5a	3b
32	8.4bc	7.1bc	4c	3b
1	8.0c	6.4c	4.5b	3b
34	7.8c	6.0c	4c	3b

[1]Means within a column not followed by the same letter are significantly different (P<0.05).

The number of grazing events during the season was greater for LI80 than LI95, regardless of entry (4.6 vs. 3.2, respectively). Entry 10 had more grazing events than any other entry for LI95 and more than all but 4F and Floralta for LI80.

Canopy height across entries was affected by both LI and SH levels. At initiation of grazing, LI95 pastures were taller (73 cm) than LI80 (59 cm). Post-grazing SH also affected canopy height at which target LI was reached. For pastures grazed to 20 cm SH, there was an 11 cm difference between LI80 (59 cm) and LI95 (70 cm), whereas for pastures grazed to 30 cm, the difference was 16 cm (60 vs. 76 cm, respectively). This difference most likely reflects phenotypic plasticity associated with use of a shorter SH, whereby regrowth was denser, allowing target LI to be reached at a shorter canopy height (Lemaire and Chapman 1996). This is supported by data showing that swards grazed to 20 cm SH had greater bulk density than those grazed to 30 cm (69 vs. 62 kg DM/ha/cm; P<0.10). The taller canopy of LI95 treatments imposed constraints on grazing efficiency, because the forage was prone to lodging and trampling. Limpograss grows upright when there is significant light competition; therefore, the LI95 treatment resulted in greater stem accumulation than did LI80 (1,079 vs. 853 kg DM/ha, respectively; P=0.07). These data indicate that use of 95% LI as a trigger for initiating grazing is not as appropriate for limpograss as it is for other species (da Silva and Nascimento Jr. 2007).

Conclusions

Limpograss entries 10 and 4F performed at least as well as cv. Floralta and are good candidates for cultivar release. Unlike the recommendation for several tropical grasses, the use of 95% light interception is unlikely to be a useful threshold to commence grazing of limpograss, because canopies at this level of light interception are very tall, stemmy and susceptible to lodging and trampling.

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