Napiergrass (*Pennisetum purpureum* Schum.) Triploid Hybrids for Biofuel Feedstock in the Caribbean Basin

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Abstract

Napiergrass (*Pennisetum purpureum* Schum.) is considered the best perennial adapted feedstock for biofuel production in the southern US. In the Caribbean and elsewhere, it has potential for invasiveness. Because its propagation is mainly asexual, flowering is not necessary and its suppression may limit its invasiveness. The objective of this study was to evaluate 150 (entries) sterile, triploid, interspecific hybrids between napiergrass (tetraploid) and pearl millet (diploid) developed by the University of Florida breeding program for morphological characteristics and biomass. The study was conducted at the Isabela substation of the Agricultural Experiment Station, University of Puerto on an Oxisol (Cotito series, pH 5.5). Phytomers (15-cm) were planted in plots (2.5 x 1-m) on well prepared soils in November 2009. The design was a randomized complete block with three replicates. Emergence and date of flowering was monitored weekly and total tiller emergence determined at 60-d post planting. At 150-d after planting, stem diameter (randomly selected plants within plots), leaf width (mm) and biomass (Mg ha^{-1}) was determined by harvesting the whole plot and clipping tillers at 15-cm height. Data was analyzed using analysis of variance (SAS, 1999). Because napiergrass is photosensitive in the tropics, inflorescence was observed as soon as tillers emerge and no difference was detected among triploid hybrids. Flowering continued throughout the establishment phase (5-mo). There were differences (P<0.05) in tiller development among triploids (10 tillers plant for entry 4). Entries also differed in stem diameter (P<0.05; 13mm for entry 30), but not on leaf width (5-6 mm). Maximum biomass production was observed on entries 132, 145, and 34 with biomass yield of 14.8, 14.6 and 14 Mg ha^{-1}, respectively. Yields were not as high as expected particularly in the aftermath. In summary, triploids are highly photosensitive and although it flowers profusely no viable seeds were observed. Biomass will continuously be monitored during the summer months of 2010 to assess persistence and yield at 90-d harvest.

Introduction

- Napiergrass (*Pennisetum purpureum* Schum.) is considered the best perennial adapted feedstock for biofuel production in the southern US.
- In the Caribbean and elsewhere, it has potential for invasiveness.
- Because its propagation is mainly asexual, flowering is not necessary and its suppression may limit its invasiveness.
- In the tropics, Napiergrass grows year-round and responds to N fertilization.
- Information on interspecific hybrids on biomass potential, characteristics for improved persistence are needed.

Objectives

- Assess 150 (entries) sterile, triploid, interspecific hybrids between napiergrass (tetraploid) and pearl millet (diploid) for morphological characteristics and biomass potential.

Results

Table 1. Mean biomass (kg/plot) and leaf width of 20 pennisetum hybrids on April 2010.

Entries	Kg/hat	Leaf width (mm)
132	14.75	6.6
145	14.63	6.0
34	14.00	5.6
141	13.37	5.6
15	12.50	5.5
121	11.35	5.3
86	10.85	5.3
43	9.90	5.3
56	9.37	5.3
139	8.67	5.3
118	8.40	5.0
30	8.30	5.0
106	8.20	5.0
111	8.20	5.0
51	7.60	5.0
54	7.56	5.0
71	7.53	5.0
151	7.38	5.0
138	6.80	5.0
77	6.75	5.0
LSD	1.25	NS

Materials & Methods

- The experiment was conducted at the Isabela substation of the Agricultural Experiment Station, University of Puerto on an Oxisol (Cotito series; pH 5.5).
- Phytomers (15-cm) were planted in plots (2.5 x 1-m) on well prepared seed beds in November 2009.
- The design was a randomized complete block with three replicates.

Results

Table 2. Mean plant height (cm) and tillers (no.) of 20 pennisetum hybrids n June 2010

Entries	cm	No. tillers
87	200	14.6
12	186	14.3
36	185.3	14.3
77	181	13.0
53	176.7	12.7
56	174.6	12.5
82	174.3	12.0
47	173.7	12.0
128	173	12.0
115	173	11.7
93	172.7	11.7
72	172	11.5
146	171.7	11
123	171	11
134	170	11
133	168.3	11
109	168	11
95	167.7	11
118	167.3	11
40	157.3	11
LSD	35	NS

Materials & Methods

- Emergence and date of flowering was monitored weekly and total tiller emergence determined at 60-d post planting.
- At 150-d after planting, stem diameter (randomly selected plants within plots), leaf width (mm) and biomass (Mg ha^{-1}) was determined by harvesting the whole plot and clipping tillers at 15-cm height.
- Data was analyzed using analysis of variance (SAS, 1999).

Discussion

- Because Napiergrass is photosensitive in the tropics, inflorescence was observed as soon as tillers emerge and no difference was detected among triploid hybrids.
- Flowering continued throughout the establishment phase (5-mo).
- There were differences (P<0.05) in tiller development among triploids (15/plant for entry 87), Table 2.
- Entries also differed in stem diameter (P<0.05; 10 mm for entry 30), but not on leaf width (5-mm), Table 1.
- Maximum biomass production was observed on entries 132, 145, and 34 with biomass yield of 35, 19.3 and 14.3 Mg ha^{-1}, respectively. (Table 1).
- Yields were not as high as expected particularly in the aftermath as establishment growth was mainly during the short days.
- Biomass are expected to differ during the summer harvest period

Conclusion

- In summary, triploids are highly photosensitive and although it flowers profusely no viable seeds were observed.
- Biomass will continuously be monitored during the summer months of 2010 to assess persistence and yield at 90-d harvest.

References

SAS Inst., 1999. SAS/STAT® User's Guide (Release 6.12). SAS inst. Inc. Cary, N.C.

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