ESTIMATION OF PLOIDY LEVELS AND GENETIC PARAMETERS FOR A BERMUDAGRASS COLLECTION

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Introduction

- Bermudagrass is the most important warm season forage grass in the South Eastern United States
- Few new cultivars are being released to the market, usually with high GxE
- New biotic (Stem Maggot) and abiotic (drought) stresses can be addressed by breeding
- The goal is to generate tools to do breeding more efficiently in bermudagrass

Objectives

1. Determine the Ploidy level of 287 bermudagrass entries from the GRIN and Tifton core collections.
2. Study the association of ploidy with all traits measured
3. Use linear mixed models to estimate genetic parameters of the entire collection

Materials and Methods

- Field experiment in three locations (two states) with 287 accessions in a row-column designs with two replications with augmented representation of controls: Coastal, Tifton 85 and Jiggs.
- Material from two collections: Tifton Core collection and USDA-GRIN collection.
- Fresh leaf samples were taken, chopped and nuclei extracted. Ploidy level was estimated on Accuri C6 Flow Cytometer, with barley used as the standard. The effect of ploidy was study in every trait.
- Traits measured: yield (5-6 times), flower coverage percentage, Bermudagrass Stem Maggot (BSM) damage, plot coverage percentage, plant height, stolon length, leaf width, frost damage, and percent nitrogen in leaf tissue.
- Genetic parameters were estimated using linear mixed models in ASReml.

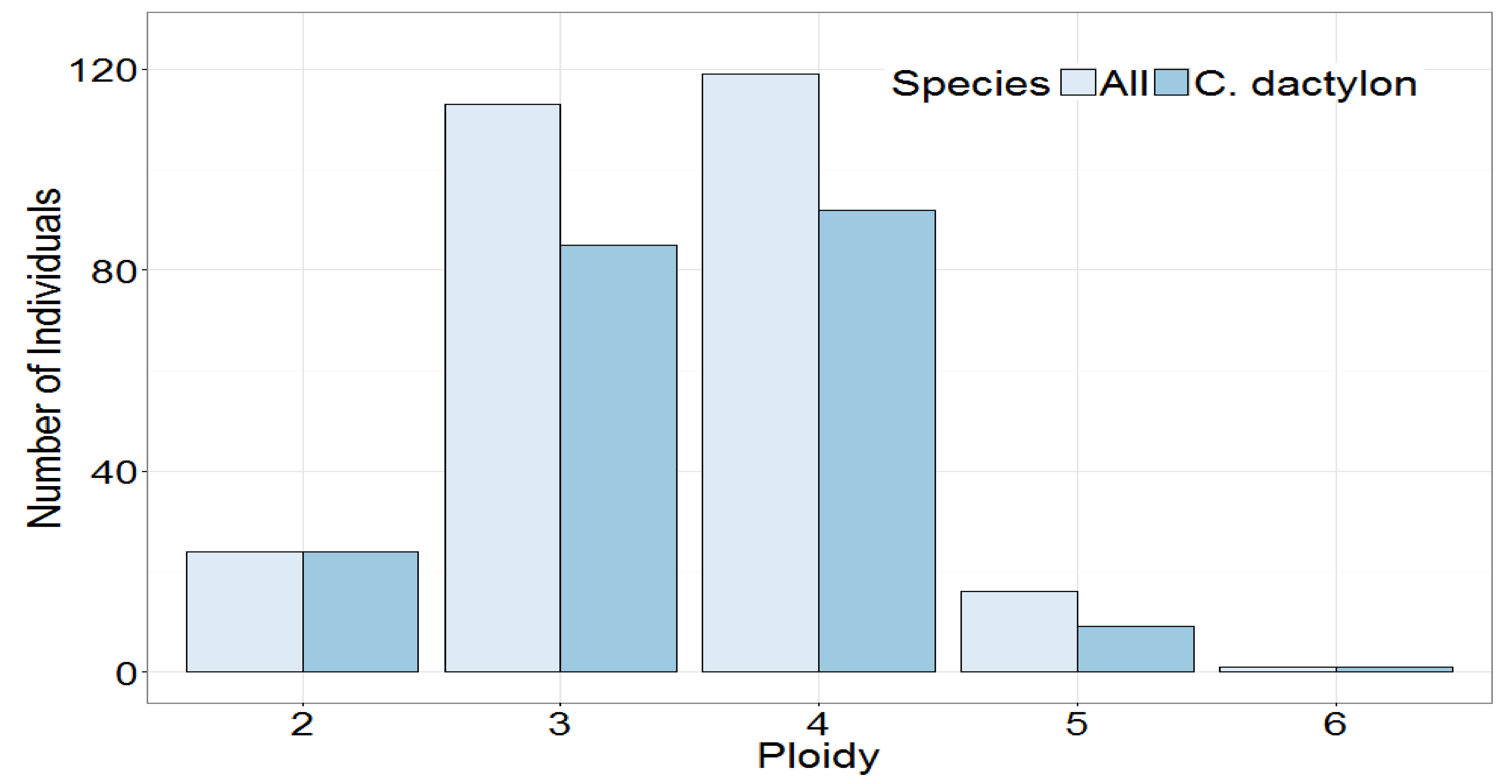
Table 1. Genetic Correlations

Trait	L. width	% N	Cover %	F. Cover %	L. Height	Frost D.	BSM	Stolon L.	Yield
Leaf Width		0.10	0.09	0.06	0.04	0.09	0.08	0.07	0.06
% Nitrogen	0.08		0.10	0.10	0.09	0.08	0.10	0.11	0.09
Cover %	0.20	0.17		0.09	0.07	0.09	0.07	0.08	0.06
Flower Cover %	**0.61**	0.11	0.06		0.07	0.09	0.08	0.09	0.08
Leaf Height	**0.74**	-0.21	0.44	0.34		0.08	0.08	0.06	0.04
Frost Damage	-0.18	0.63	0.28	-0.14	-0.37		0.08	0.10	0.06
BSM	0.02	-0.03	**0.44**	-0.16	**0.24**	-0.16		0.09	0.08
Stolon Length	**0.65**	0.03	**0.59**	0.31	0.74	-0.15	0.31		0.06
Yield	**0.57**	**-0.40**	**0.56**	0.19	0.76	**-0.67**	0.26	**0.69**	

Genetic correlations- lower diagonal
Standard errors- upper diagonal.

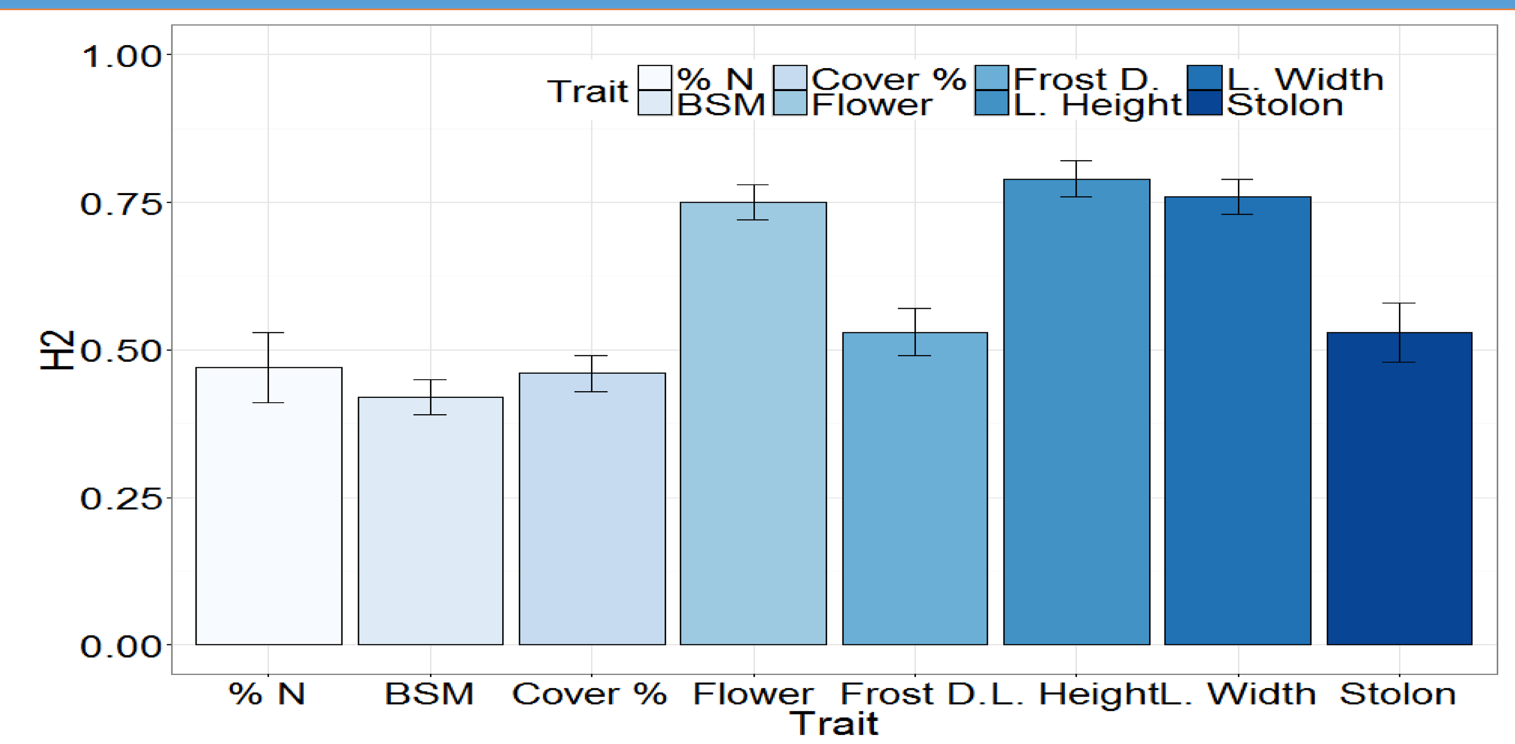
The strongest genetic correlations were found between the morphological traits, as well as yield and morphological traits.

Figure 1. Ploidy Distribution



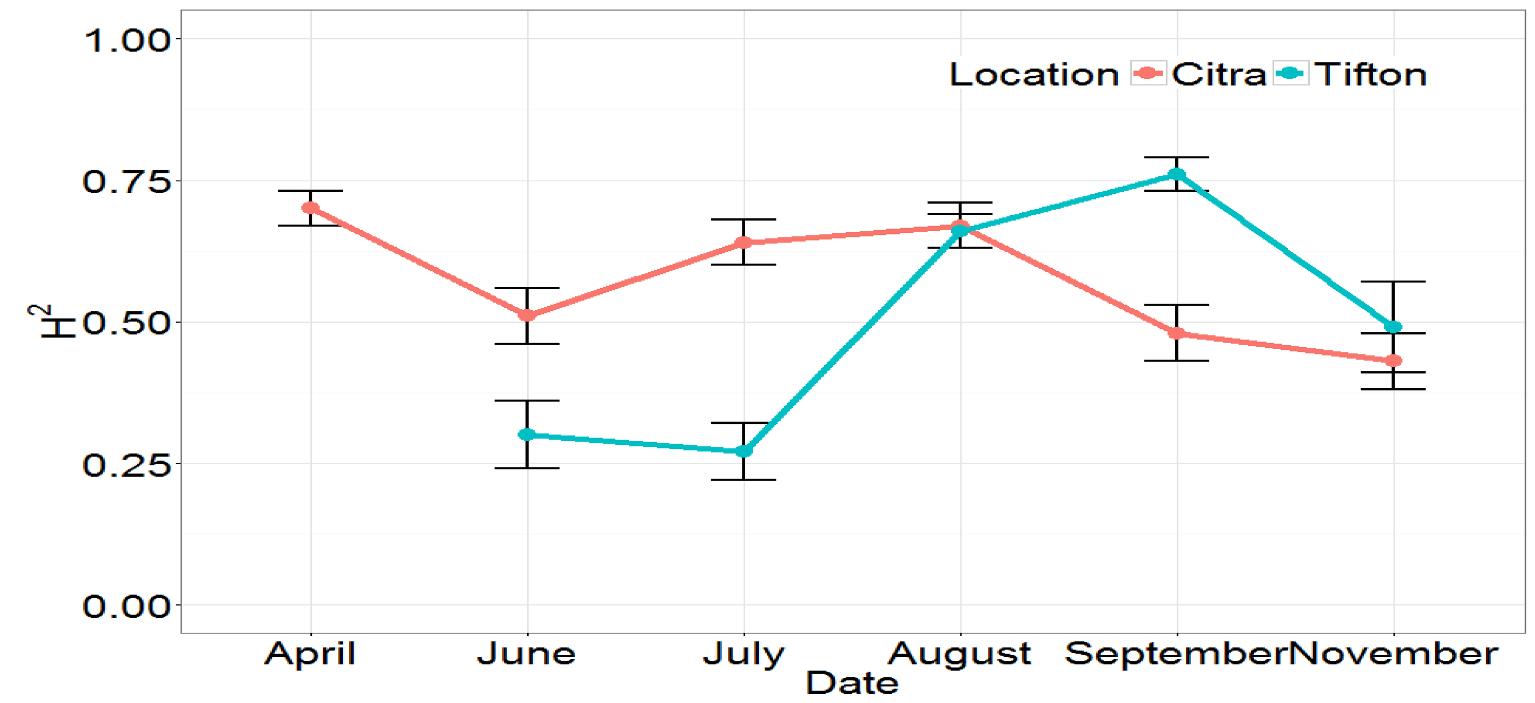
Ploidy distribution for the entire collection (all species) and for bermudagrass (C. *dactylon*). Significant effect of ploidy on some traits was found.

Figure 2. Broad-Sense Heritability



Broad-sense heritability for measured traits ranged from 0.42 (BSM damage) to 0.79 (Leaf Height). Moderate to high heritabilities were found

Figure 3. Heritability Across Sites



Broad-sense heritability for yield by harvest measurement in two location of the southern USA (Citra, FL and Tifton, GA) in 2015

Conclusions

- Ploidy level had a significant effect on frost damage, BSM damage, plot coverage %, flower coverage %, and leaf width.
- Broad-sense heritability varied significantly from trait to trait (Fig. 2)
- Genetic correlations showed some promising relationships between traits (Table 1)
- Evidence of high environmental effects on yield were found when comparing Citra, FL and Tifton, GA (Fig. 3) parameters and rankings.

Implications

- Genetic information will aid in breeding future cultivars, since this germplasm is publicly available
- Morphological traits are expected to have rapid genetic improvement, so fewer resources need to be allocated to them (Fig. 2).
- Indirect selection would be possible.
- Yield was found to be unstable, which would require multiple years and locations to improve (Fig. 3)

Acknowledgments

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