



Validation of Quantitative Trait Loci Associated with Freeze Tolerance in St. Augustinegrass

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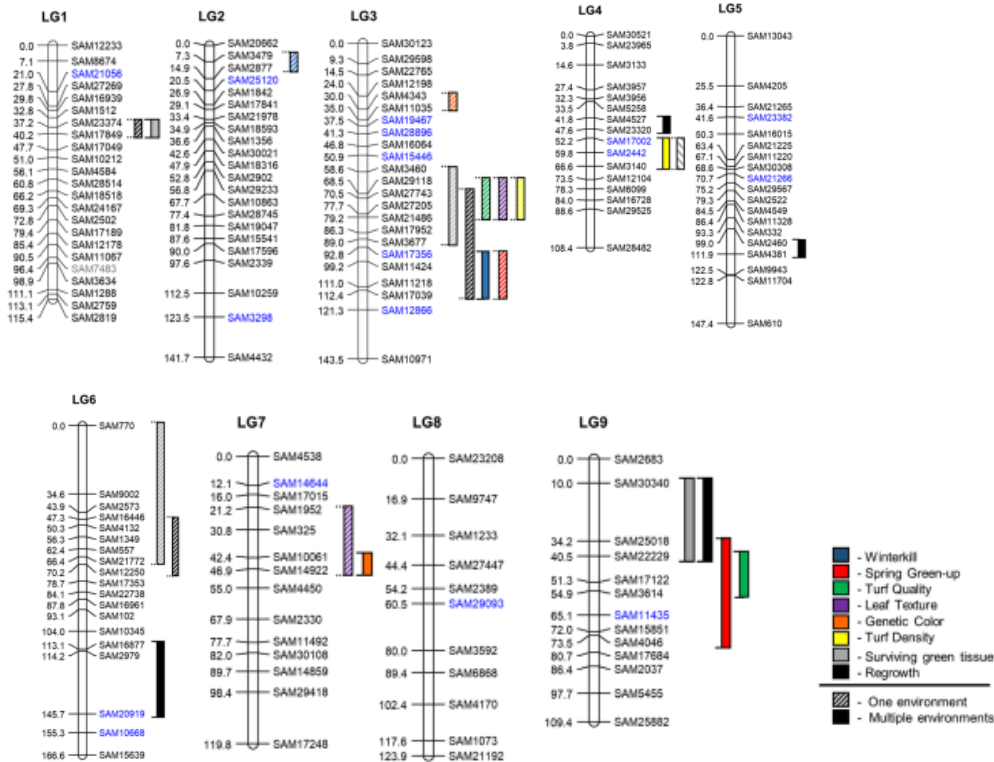
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Background



- St. Augustinegrass is a warm-season turfgrass
- Used for lawns and landscapes
- Shade, pH, weed resistant
- Significant genomic progress in last decade
- 160 SSR markers, cold and turf QTL
- 2871 SNP map developed by Yu et al. 2018

Objectives

1. Use the high density SNP map to identify finer QTL associated with freeze tolerance in 'Raleigh' x 'Seville'
2. Develop a linkage map and identify freeze tolerance QTL for 'Raleigh' x 'Raleigh'
3. Compare QTL to validate candidate regions for marker assisted selection

Materials and Methods

- 2 Populations: 'Raleigh' x 'Seville' & 'Raleigh' x 'Raleigh'
 - Raleigh: Industry standard cold hardy cultivar
 - Seville: generally cold susceptible, acclimates well
- Field evaluations at Lake Wheeler 2013-2015 (Raleigh, NC)
 - SGU and WK were scored on a 1-9 scale
- Lab based freeze tests
 - Two temperatures (-3°C, -4°C) & two treatments (NCA, CA)
 - SGT and RG at weeks 3 and 6 post freezing
- MVQTLCIM used for linkage analysis

Results

Significant QTL identified in 'RxR' population							
Trait	LG	Peak Position (cM)	Position Interval (cM)	LOD	LOD Threshold	Nearest Marker	Environment
SGT	3	52.341	52.341	17.661	17.633	*SSR3677	CA4
RG	9	108.76676	108.767-108.877	30.555	23.047	SSR17841	NCA3
RG	5	4.01	4.01	23.087	23.047	SSR1952	NCA3
RG	1	145.498	145.498	24.631	23.047	SSR15639	NCA3

Most significant QTL by LG identified in 'RxS' population							
WK	1	48.306	40.529-52.366	7.755	3.830	SNP30999	Across
RG	2	82.673	77.135-87.919	9.426	3.530	SNP12185	Across
SGT	3	102.613	97.928-107.176	5.964	3.715	SNP9396	Across
WK	4	80.838	79.344-80.838	8.535	3.830	SNP18259	Across
WK	5	70.846	70.846-71.084	8.600	3.879	SNP54683	Across
WK	6	53.792	53.401-58.619	7.403	3.830	SNP8446	Across
WK	7	88.24	87.541-88.24	4.838	3.879	SNP7974	Across
RG	8	70.514	68.9-75.22	4.683	3.494	SNP18492	Across
SGU	8	0.01	0.01	4.253	3.762	SNP37566	Across
WK	8	0.01	0.01	4.112	3.879	SNP37566	Across
WK	9	39.975	39.975-40.63	6.100	3.879	SNP55431	Across
SGU	9	40.63	39.975-40.63	4.733	3.762	SNP55431	Across

Discussion & Ongoing Work

- QTL analysis of independent environments for 'RxS'
- Identify QTL confounded across environments
- Many small effect QTL for freeze related traits
- Different phenotype evaluations identified different QTL
- Ongoing work:
 - Reference genome for 'Raleigh'
 - Transcriptomic analysis with RNA-Seq