

# Confirmation of QTL Markers for Dollar Spot Resistance in Creeping Bentgrass

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## Objectives:

1. Genotype backcross and pseudo F<sub>3</sub> generations for the 180 SSR markers identified to date.
2. Evaluate the populations for dollar spot resistance to a different isolate of *Sclerotinia homoeocarpa* than previously evaluated.
3. Confirm QTLs in the backcross and pseudo F<sub>3</sub> generations to provide definitive SSR QTL markers that can be directly utilized for marker-assisted selection in turfgrass breeding programs.

**Start Date:** 2007

**Project Duration:** two years

**Total Funding:** \$50,000

Previous research projects have identified QTL (Quantitative Trait Loci) for important traits in mapping populations of creeping bentgrass. The goal of this project is to confirm putative QTL for dollar spot resistance identified in a previous study by evaluating the QTL markers in three subsequent mapping populations (two backcross populations and a second generation [pseudo F<sub>3</sub>] population) developed from the initial mapping population.

Although 530 individuals exist for the three generations, only 384 individuals (92 from each backcross population and 192 from the pseudo F<sub>3</sub> generations) were chosen for genotyping due to the expense and time associated with analyzing such a large number of samples. DNA was re-isolated from the 384 individuals from the three populations due to DNA degradation in the freezer over time.

Parents of the three generations have been genotyped for all the SSR markers. With every new population, the parents need to be evaluated for polymorphic markers that will be useful for mapping. In all three populations, approximately 70% of the markers are polymorphic and will be useful for the backcross and F<sub>3</sub> generations. Approximately one-third of the total markers have been genotyped in the backcross and F<sub>3</sub> generations.

For the initial mapping study, one isolate identified as 'H2' from the cultivar 'Crenshaw' was used to evaluate disease development in the initial pseudo F<sub>2</sub>, both backcross and the pseudo F<sub>3</sub> generations. Two years of dollar spot disease data has been completed for these populations. All the mapping populations have been evaluated for dollar spot disease using another



Providing definitive SSR QTL markers will provide a means to utilize marker assisted selection in the development of dollar spot resistant creeping bentgrass

isolate identified as 'A1', which was collected on the Plant Biology and Pathology Research and Extension Farm at Adelphia, NJ from a perennial ryegrass host (PRG).

This trial was established in the fall of 2005 and inoculated with the PRG isolate in the spring of 2006. It was evaluated for dollar spot resistance in the summer of 2006 and 2007. Dollar spot severity was similar in both years. Severity was not as severe with the 'PRG' isolate compared to the 'Crenshaw' isolate. Trends in disease resistance were generally similar in both years with a few inconsistencies. No significant mid-parent heterosis was observed in backcross generations (both years) and transgressive segregants were observed.

All QTL confirmation studies involve studying QTL markers in different genetic backgrounds and/or different environments. The backcross and pseudo F<sub>3</sub> populations proposed to be used in this study for QTL confirmation were specifi-

cally constructed to validate the QTL identified in the initial pseudo F<sub>2</sub> population. Disease phenotype data for all three populations to the 'Crenshaw' isolate and PRG isolate has already been completed.

The SSR data from the 200 loci together with the dollar spot disease field data (from 2003 and 2004 and from 2006 and 2007) for the 384 individuals in the pseudo F<sub>3</sub> and backcross mapping populations will be evaluated for QTL markers using interval mapping in MapQTL 5.0. Four putative SSR QTL markers were identified in the initial population for the 'Crenshaw' isolate. One was identified in the susceptible parent and three were identified in the resistant parent. One QTL has been identified in the resistant parent for the PRG isolate.

Once the backcross and F<sub>3</sub> generations are genotyped, interval mapping in MapQTL 5.0 will be used to validate and confirm QTLs identified in the initial population. The QTLs will be confirmed in these populations to identify useful SSR QTL markers that can be directly and easily implemented into turfgrass breeding programs. This confirmation step is critical to identify true QTLs and crucial to the successful implementation of these markers into a marker assisted-selection program.

## Summary Points

- Dollar spot disease developed following inoculation.
- Dollar spot reaction of individuals was tested in a mapping population exposed to the isolate identified as 'PRG'.
- Four putative SSR QTL markers were identified in the initial population for the 'Crenshaw' isolate. One was identified in the susceptible parent and three were identified in the resistant parent. One QTL has been identified in the resistant parent for the PRG isolate.