Development of Improved Bentgrass Cultivars with Herbicide Resistance, Enhanced Disease Resistance and Abiotic Stress Tolerance Through Biotechnology

Faith C. Belanger
Rutgers University

Objectives:

1. To produce creeping bentgrass cultivars through a combination of genetic engineering and breeding.
2. Provide golf course managers with more effective and selective weed control by developing herbicide-resistant cultivars.
3. To produce creeping bentgrass cultivars with improved disease resistance and abiotic stress tolerance that can be maintained in a more environmentally sound and cost-effective manner.

Start Date: 1998
Project Duration: 5 years
Total Funding: $250,000

Novel genes improving disease resistance in other crops have been inserted into bentgrass genotypes. Resistance to some common turfgrass diseases has been observed.

Dollar spot susceptibility is currently one of the major management problems of creeping bentgrass. We have been pursuing new approaches to improving dollar spot resistance in creeping bentgrass. During the past year we have field tested transgenic plants expressing two potential disease resistant genes, a mutant form of a ribosome-inactivating protein, PAP-Y, and a fungal chitinase. With both genes there was no improvement in resistance compared to the nontransgenic controls.

In another approach to improving dollar spot resistance, we are pursuing interspecific hybridization between creeping bentgrass and colonial bentgrass. Interspecific hybridization between crop species and related species followed by backcrossing is commonly used to introgress desirable genes into a crop. This method has been used in breeding improved cultivars of numerous species, but has not been used in creeping bentgrass breeding and may offer new opportunities for cultivar improvement.

Colonial bentgrass is quite resistant to dollar spot and we may be able to introgress that trait into creeping bentgrass. We have found that interspecific hybridization between colonial bentgrass and creeping bentgrass can occur at low frequencies and the hybrids can be fertile. Some of our interspecific hybrids showed essentially complete dollar spot resistance in the 2001 and 2002 field tests.

Backcrosses to creeping bentgrass were carried out in the summer of 2002 and progeny will be field tested in 2003. Development of a new cultivar using interspecific hybridization will be a long-term project requiring several cycles of crossing and field-testing.

Dollar spot susceptibility is currently one of the major management problems of creeping bentgrass.

Summary Points

- Some colonial bentgrass x creeping bentgrass interspecific hybrids had excellent dollar spot resistance in both the 2001 and 2002 field tests.
- The hybrids were backcrossed to creeping bentgrass and progeny will be field tested in 2003.