Development of Genetically Engineered Creeping Bentgrass Resistant to Fungal Disease

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Goals:

- Improve disease resistance of creeping bentgrass using a new genetic engineering approach.
- Introduce the bean chitinase gene into creeping bentgrass to develop varieties resistant to fungal diseases.

This project is designed to improve disease resistance of creeping bentgrass using genetic engineering. The objectives are 1) to develop efficient gene transfer systems in creeping bentgrass and 2) to develop genetically engineered creeping bentgrass with high expression of chitinase genes. Chitinase is one of the defense-response proteins induced in plants upon fungal infections. It is a lytic enzyme that catalyzes the hydrolysis of chitin, a cell wall component of many fungal pathogens. It was shown that constitutively high expression of this protein in genetically engineered tobacco resulted in enhanced resistance to fungal diseases.

For the first year of this project we focused our research efforts on developing a reliable genetic transformation system for creeping bentgrass and isolating chitinase genes from Kentucky bluegrass.

To develop gene delivery systems in creeping bentgrass, we have tried two methods: particle bombardment using a gene gun, and direct gene transfer into protoplasts (plants cells without cell walls) by electric discharges. Parameters affecting efficiencies of gene delivery for both methods have been optimized and transformed cells are now being selected. We have also identified strong regulatory sequences required for a high level of foreign gene expression in creeping bentgrass. Based on these results, transformation vectors that are more suitable for creeping bentgrass are being constructed.

A partial fragment of chitinase genes has been isolated from Kentucky bluegrass and we are currently working on isolation of complete chitinase genes.