

# Development of Improved Turfgrass with Herbicide Resistance and Enhanced Disease Resistance Through Transformation

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## **Goals:**

- Establish a transformation system for creeping bentgrass.
- Improve the utility of creeping bentgrass by incorporating genes to confer herbicide resistance or enhanced resistance to fungal pathogens.

Through genetic engineering, effective and selective weed control with herbicides and more environmentally sound and cost-effective control of plant diseases with reduced use of fungicides is possible. We have reached several milestones: successful turfgrass transformation, efficient tissue culture and regeneration systems, recovery of several cultivars of creeping bentgrass with resistance to two different herbicides, and field tests of clones of Ignite-resistant creeping bentgrass. Transgenic bentgrass, a product of laboratory experimentation, shows promise as a useful tool for golf course management.

We are making good progress in incorporating single gene traits for herbicide resistance and enhanced disease resistance in turfgrass. We now have embryogenic callus lines and suspension cultures derived from them with high regeneration potential from nine creeping bentgrass cultivars. We have established both particle gun and protoplast transformation systems for creeping bentgrass and have obtained first-generation stable transformants with resistance to the herbicide Ignite (bialaphos).

In tests of more than one thousand regenerants from transformed tissues for herbicide sensitivity in the greenhouse, we have obtained more than one hundred herbicide-resistant transgenic plants of COBRA, EMERALD and SOUTHSORE. This summer, we conducted the first field test of herbicide-resistant creeping bentgrass in the USA, and showed that the transgenic plants were resistant to up to three times (2.25 lb AI/A) the label rate (1.5 to 4 fluid ounces per gallon of water).

To enhance fungal disease resistance in turf-

grass, three chitinase gene constructs were obtained, adapted to our transformation vectors, and introduced into creeping bentgrass through particle gun and protoplast transformation. We have begun greenhouse herbicide tests with putative transgenic plants that carry genes expressing bean chitinase or tobacco chitinase B, and are preparing to test transgenic plants for disease resistance.