Development of Improved Turfgrass with Herbicide Resistance and 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.*

Cooperators:

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This project seeks to improve creeping bentgrass through transformation to provide golf course managers with more effective and selective weed control with herbicides and more environmentally sound and cost-effective control of plant diseases with reduced use of fungicides. During the past year we have accomplished several major goals.

As the first step in cultivar development of herbicide-resistant creeping bentgrass, bialaphos-resistant progeny from crosses of original transformants and non-transformed plants have been planted in the field. These plants will be maintained as mowed spaced plants. Next spring and summer, the Rutgers bentgrass breeder, Dr. William Meyer, can select those individuals with good overall turf qualities for incorporation into his breeding program. Progeny from crosses using new sources of non-transgenic plants are currently being screened for herbicide resistance and resistant plants will be placed in the field next spring.

We have made improvements in the efficiency of transformation by particle gun bombardment and have obtained plants transformed with the bacterio-opsin gene. In other species, this gene has conferred good broad-spectrum disease resistance. Next spring these plants will be field tested to evaluate the effect of the transgene. We have experiments in progress on other disease resistance and abiotic stress tolerance genes.

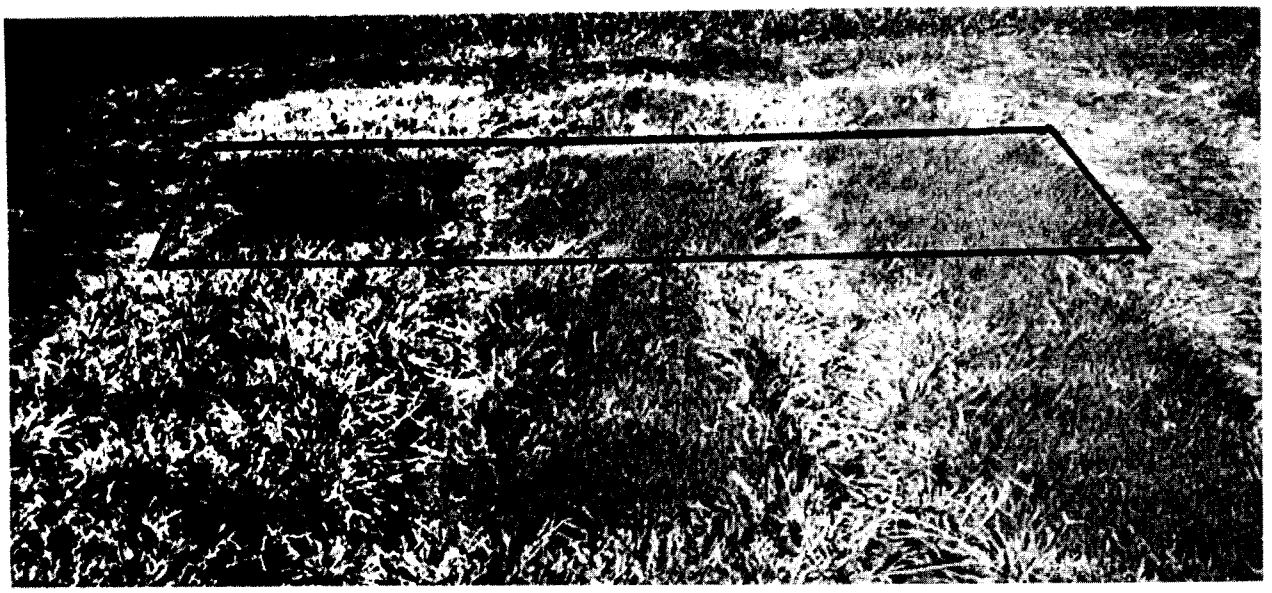

Figure 8. Bialaphos resistant bentgrass: Disease field study taken in September 1996. The treatments included bialaphos applied at label rate once in late May, bialaphos applied in late May, July and August at label rate, an untreated hand weeded check, and an untreated and non-weeded check.

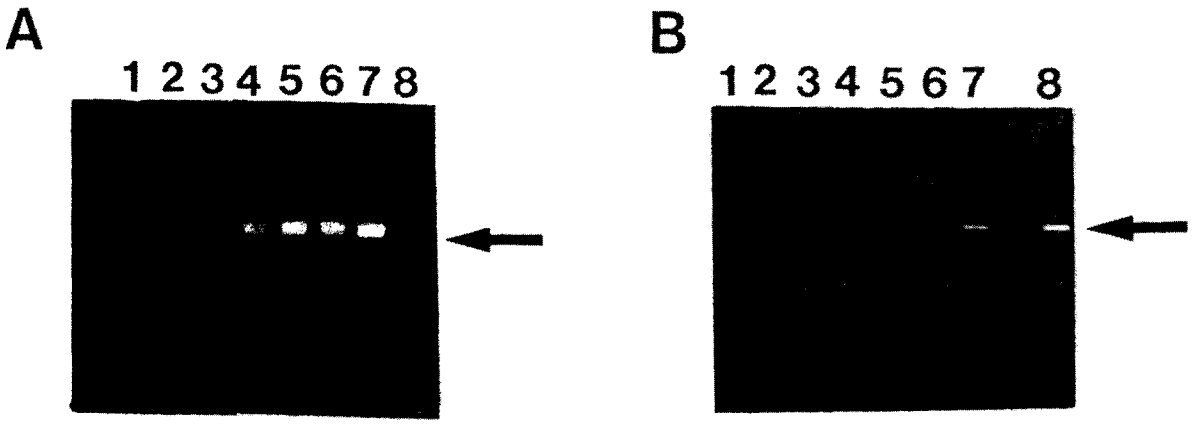

Figure 9. Polymerase chain reaction (PCR) confirmation of bentgrass transformation with the bacterio-opsin gene. DNA from non-transformed plants and four transformed individuals was used in PCR reactions with primers to either the *bar* (A) or to bacterio-opsin (B). The positions of the expected bands are indicated by arrows. Lane 1, no DNA control; lanes 2 and 3, DNA from non-transformed plants; lanes 4 through 7, DNA from transformed plants; and lane 8, plasmid control.