Nontarget Effects of Turfgrass Fungicides on Microbial Communities in USGA Putting Green Profiles

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Goals:

- *Establish and microbially characterize standard and biological-augmented root zones on USGA and soil-based putting greens.*
- *Determine comparative responses of native and constructed microbial communities to fungicide applications on USGA and soil-based putting greens.*
- *Assess sensitivities of important groups of turf-associated microbes to common turfgrass fungicides.*
- *Evaluate impacts of fungicide applications on levels of biological control in native and microbially-augmented USGA and soil-based putting greens.*

Cooperators:

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This research is examining the non-target effects of fungicides commonly used for disease control on golf course putting greens. Our goal is to understand the scope and magnitude of microbial responses to fungicide applications so that potentially detrimental side effects may be avoided.

We established plots on sand/peat-based bentgrass greens constructed using USGA specifications, and similar greens to which brewery compost was added during construction and to which the biocontrol fungus *Trichoderma harzianum* was added at the beginning of the experiment. These green structures were used because they were expected to contain different microbial populations. It was expected that fungicides would have dissimilar non-target effects on these different microbial communities.

The fungicides chosen for these experiments were Daconil Ultrex (chlorothalonil), Chipco 26019 Flo (iprodione), Subdue Maxx (mefenoxam), Banner Maxx (propiconazole), Bayleton 25W (triadimefon), Prostar 50WP (benzamide), and Sentinel (cyproconazole).

Surprisingly, the first preliminary data suggests that the various fungicides, even when multiple applications were made at their maximum legal rates, had little effect upon microbial communities. Numbers of organisms known to be highly sensitive to the fungicides being applied were little affected by the treatments used in this experiment. These data suggest that these fungicides are not present at the fungitoxic concentrations below about 1 inch in the soil surface. Several reasons for this lack of

efficacy may be possible, including adsorbing to soil particles and rapid microbial degradation.

This lack of efficacy suggests that the fungicides tested may be less disruptive to normal soil microflora than originally expected. Second, the data suggest that the fungicides should largely be effective only on leaf diseases and have little effect upon subterranean fungal populations and root health.

Augmentation of plots with the compost + *T. harzianum* addition had two noticeable effects. First, levels of *T. harzianum* increased about 1,000 fold with the addition of this biocontrol product and remained at a consistent level over the sampling times. Second, levels of *Actinomycetes* were lower in augmented plots than in non-augmented plots at the second sampling time.

These results are preliminary and will be followed by additional tests on other microflora with measures of both soil microfloral activity and further measures of microbial diversity.

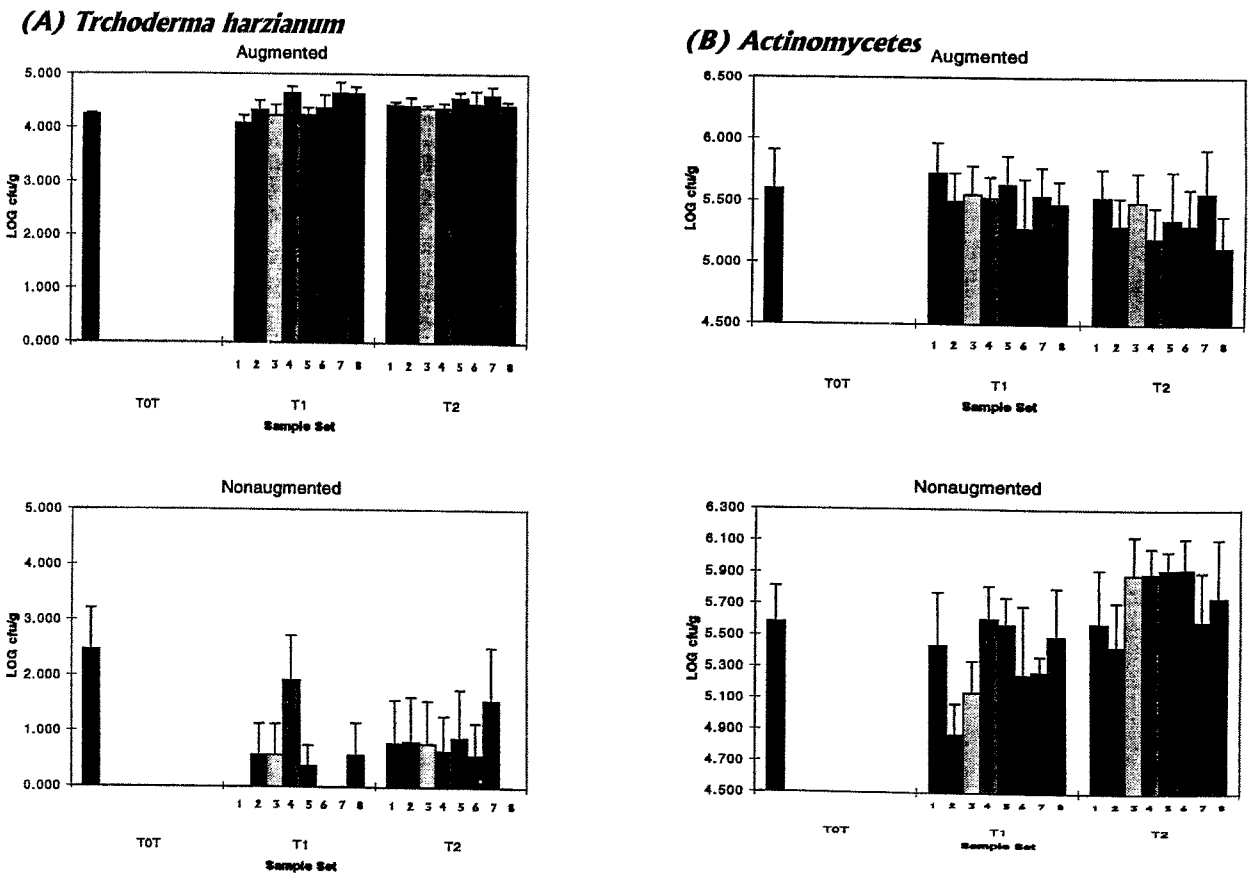

Figure 22. Fungicide effects on (A) *Trichoderma harzianum* and (B) *Actinomycetes* in a sand/peat putting green root zone augmented with brewery-waste compost and *T. harzianum* compared to non-augmented sand/peat root zones. Key: 1) control, 2) chlorothalonil, 3) iprodione, 4) mefenoxam, 5) propiconazole, 6) triadimefon, 7) benzamide, and 8) cyproconazole. The sampling times included: T_{0T} = May 22, T_1 = June 25 and T_2 = July 31, 1996.