

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

Dr. Gary Harmon

Cornell University

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:

Eric B. Nelson

Kristen L. Ondik

This research has been designed primarily to focus on the impacts of fungicide applications on levels of biological control in native and microbial-augmented USGA and soil-based putting greens.

This is the second year of funded research. Trials were established on native (standard peat-sand) and microbially-augmented (constructed with the inclusion of composted brewery waste and with Bio-Trek 22G [containing *Trichoderma harzianum*] included). The following fungicides were applied at the maximum label concentration and minimum labeled time interval: chlorothalonil (Daconil Ultrex), iprodione (Chipco 26019 Flo), mefenoxam (Subdue Maxx), propiconazole (Banner Maxx), triadimefon (Bayleton), benzamida (Prostar 50WP), and cyproconazole (Sentinel). Plots were in a randomized pattern with 5 replications. At various time intervals over the summer, cores (1 X 5 cm) were taken from each plot and microbial populations were assessed by dilution plating.

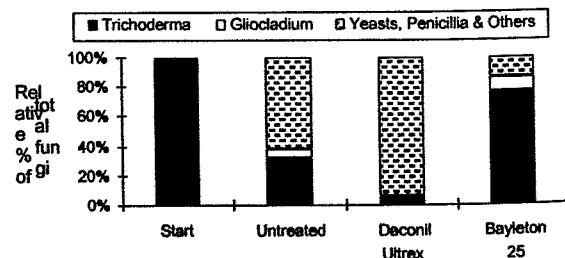


Figure 22. Relative percentages of fungi on foliage after treatment with two fungicides.

The results from the 1996 field season can be summarized as follows:

- Almost no detectable differences were obtained in total or specific fungal or bacterial numbers. Similarly, assays of BIOLOG plates to determine physiological groupings of microbial populations demonstrated no detectable effect of fungicide applications.
- The only major effect of fungicide applications noted was in microbial respiration. Application of fungicides increased microbial activity.

Thus we saw few substantial effects in the 1996 trials. Therefore, we hypothesized that there were few effects on the root/soil microbes because of fungicide degradation or dilution. However, there should be effects on foliar microbes. Therefore, in 1997, we conducted similar trials on the augmented plots only, but cut each soil core into root and leaf portions by slicing the thatch layer near its upper surface with a razor blade. All of the data was compiled in the final report, but results can be summarized as follows:

- There was little long-term effect reduction of total fungi or bacteria on leaves or roots. The accompanying Figure 22 demonstrates representative results. However, application of some fungicides, especially Daconil Ultrex, may enhance development of some fungi such as yeasts on leaves and components of the fungi on leaves appear to vary as a percentage of the total.
- Two related fungi, *Trichoderma harzianum* and *Trichoderma (Gliocladium) virens*, are the principal components of the endophytic fungi on

leaves, and made up nearly all fungi tested at the start of the season. At the end of the trial, these two fungi comprised about 40% of the total fungi seen, but after treatment with some fungicides, especially Daconil, their numbers dropped to only about 6% of the total. On the other hand, the percentages of these two fungi increased to nearly 90% after treatment with Bayleton.

These results suggest that effects of fungicides on resident leaf fungi are not as dramatic as we expected. The apparent differences between percentages and total populations of fungi on the two graphs is a consequence of the difference between arithmetic and log plots. The main results of the chemical applications were to alter the fungal compositions but not their total numbers. Apparently, fungal populations only are slightly or transiently affected by chemical applications. However, the shifts in populations seen in this study could substantially affect disease incidence in the absence of actual toxicity of the chemical in question to the pathogen being controlled.

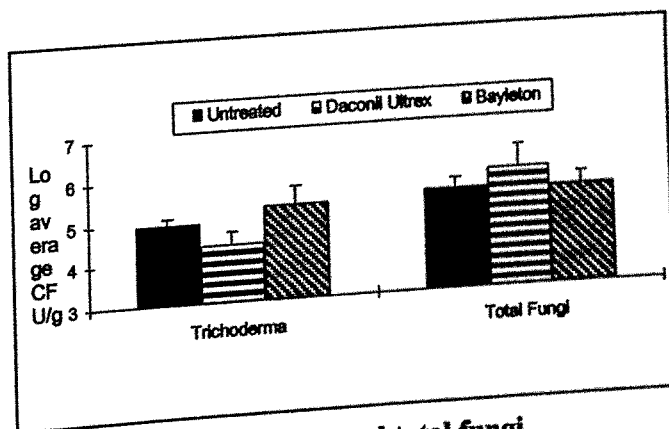


Figure 23. *Trichoderma* and total fungi populations after fungicide treatments.