

## The Ecological Impact of Introducing a Foreign Organism into the Turfgrass Ecosystem

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- Objective** The objective of this study was to determine the ecological effect of introducing a high concentration of a biological control organism into the turfgrass environment.
- Rationale** The use of biological control organisms to augment chemical pesticide applications is gaining popularity amongst the environmentally conscious. While a moderate amount of information is known about the effect of pesticides on the indigenous ecology of a given environment, relatively little data exists describing the effect of introducing living organisms to a native community, especially a turfgrass system. Pesticides, organic matter, and nutrients are all cycled by the activity of microorganisms in the natural environment. In order to assess the potential risks to these processes one must understand the effects of inputs such as the application of living organisms on native members of the turfgrass community.
- How it was done** Approximately  $10^6$  cfu ml<sup>-1</sup> of *P. aureofaciens* was applied nightly to an established creeping bentgrass through the existing irrigation system. The bacteria were applied in 0.1 inch of water. To determine the effect of repeated, high concentration *P. aureofaciens* applications on the indigenous turfgrass environment bacteria, samplings of the leaves, thatch, and soil (~1 inch depth) were made periodically. DNA was extracted from each matrix and subsequently PCR amplified using primers specific for bacterial 16SrDNA sequences. Samples were electrophoresed across a denaturing gradient to separate bands of differing sequence and to produce a molecular “fingerprint” of the bacterial population. Banding patterns of leaf thatch and soil samples with and without *P. aureofaciens* treatments were compared. Bands that either appeared or regressed (representing effected bacteria) according to the *P. aureofaciens* applications were excised from the gel, cloned into *E. coli*, and sequenced to determine bacterial identity.
- Results to date** The effect of *P. aureofaciens* applications on the indigenous bacterial community was most pronounced in the turfgrass canopy (Fig. 1). Although only one bacterial member of the population was impacted following the *P. aureofaciens* treatments (as detected by one regressing band), this bacteria was effected greatly as indicated by the diminishing intensity of its band.
- Little detectable variation exists between control and treated samples with regard to the thatch layer (Fig. 1), and no detectable changes in population structure were evident in the soil (data not shown).
- Excision and sequencing of the regressing band followed by alignment within existing databases suggests that the effected member of the community is from the family *Cytophagaceae*. Selected *Cytophaga* spp. have been reported to be active in producing cellulase (cellulose degradation), amylase (starch degradation), and chitinase (chitin

degradation). Thus, the effected bacteria may have specific qualities that are desirable in the turfgrass environment for organic matter breakdown and fungal inhibition.

Regardless of the resulting physiological or biochemical effects imparted on the turfgrass system by introductions of foreign organisms, further research must assess the true impact of the selective pressure against members of the bacterial community.

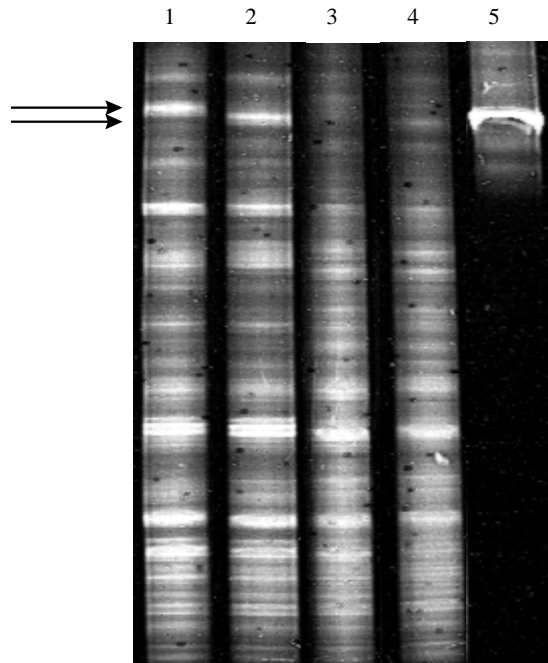


Figure 1. DGGE of bacterial DNA/PCR samples from (1.) leaf canopy *without P. aureofaciens* (PA) application, (2.) leaf canopy with PA application, (3.) thatch layer with out PA application, (4.) thatch layer with PA application, and (5.) pure PA PCR product. The arrows denote changes in the leaf surface bacterial populations. Top arrow: *Cytophagaceae* DNA which disappears following *P. aureofaciens* application. Bottom arrow: *P. aureofaciens* which is present only after application to the turfgrass system (lane 2, faint)