Identification of Parasitic Bacteria as Biological Control Agents Against Summer Patch Disease

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Goals:

- Isolate and identify bacteria which can colonize and parasitize the "mycelia" of *Magnaporthe poae*, the causal agent of summer patch disease.

- Screen isolated bacteria for disease control potential using controlled growth chamber and field studies.

Summer patch, caused by the ectotrophic, root-infecting fungus, *Magnaporthe poae*, is a devastating disease of cool season turfgrasses. Current control methods for summer patch, as well as other patch diseases caused by root-infecting fungi, rely heavily on the use of fungicides. In efforts to reduce the amount of fungicides used to control turfgrass diseases such as summer patch, we are investigating the potential use of beneficial bacteria as biological control agents for the disease.

In previous studies, we isolated several bacteria by a fungal trapping method and by enrichment procedures that were capable of suppressing summer patch symptom development at significant levels under controlled environmental conditions. Characterization of these bacteria indicated that several isolates shared common features, including the expression of extracellular enzymes such as chitinases, glucanases, lipases or proteases.

In addition, all bacteria identified as good suppressors were capable of colonizing the turfgrass rhizosphere at high concentrations. A few isolates were observed to produce antibiotic-like activity against *M. poae* in *in vitro* assays. Two bacteria, *Xanthomonas maltophilia* and *Serratia marcescens*, were further characterized for their suppressive abilities. These bacteria were found to consistently suppress summer patch symptoms at greater than 50 percent compared to untreated control plants over a three week period.

Further characterization of these bacteria indicate that application timing is important relative to the level of disease suppression that is achieved. In general, when bacteria were applied prior to fungal colonization of plant roots, less disease suppression was achieved.

Dose level of bacteria also affected the level of disease suppression. A slight but significant difference was observed for the lowest and highest doses of *X. maltophilia*, ranging from 10^8 to 10^{10} cells/ml, in which disease suppression was greatest for plants treated with the highest dose. However, plants treated with similar doses of *S. marcescens* responded in drastically different fashion. Optimal suppression was observed with 10^9 cell/ml. The level of disease suppression decreased with either increasing or decreasing doses from this cell concentration.

This data, correlated with root and soil populations of both bacteria, suggest that bacteria had a direct effect on the fungal pathogen inoculum density in the soil.