



Bacterial Etiolation—More Positive Results

The USGA and concerned golf courses supported university studies of an unusual problem on bentgrass greens. Symptoms often coincided with changing weather conditions and were more prevalent with frequent rainfall. Called etiolation, grass blades and stems turned yellow and began to elongate during high temperature and humidity. In rare cases, the symptoms were severe resulting in loss of turfgrass stands. The results provide clues that bacteria may be responsible for damaging bentgrass greens. Yet, the over-use of some plant growth regulators may increase the occurrence of this problem.

Since 2010, scientists at North Carolina State University isolated 228 bacteria from 64 locations. Several bacteria included species from *Acidovorax*, *Bacillus*, *Enterobacter*, *Microbacterium*, *Pantoea*, *Pseudomonas*, *Stenotrophomonas* and *Xanthomonas*. Known plant pathogens *Acidovorax avenae* and *Xanthomonas campestris* were present in less than 30% of the samples. Some isolates of *Pantoea* sp. caused chlorosis and dieback. *Pantoea* bacteria did not cause leaf and stem elongation when compared



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to *A. avenae* inoculations. Continued research will explore the diversity of bacteria living within turfgrasses.

Field observations of bacterial etiolation suggested biostimulant and plant growth regulator applications encouraged symptoms. The research showed biostimulants to have little effect. But, frequent applications of trinexapac-ethyl (PrimoMaxx at 0.125 fl oz. 1000 ft² every 7 days) increased etiolation caused by *A. avenae*.

In 2013, an additional field study was initiated to evaluate the impact of plant growth regulators PrimoMaxx SC (trinexapac-ethyl), Trimmit SC (paclobutrazol), and Cutless 50W (flurprimidol) on bacterial etiolation caused by *A. avenae*. Results from the 2-year trial were similar to previous trials in that PrimoMaxx increased symptoms compared to the non-treated control; however, multiple rates of Trimmit and Cutless decreased etiolation symptoms compared to PrimoMaxx applied every 7 days (Figure 1). PrimoMaxx applications still resulted in the highest turf quality, as turf was not damaged as a result of *A. avenae* inoculations. High rates of Trimmit and Cutless did cause phytotoxicity during periods of low nighttime temperatures, but turf eventually recovered.

Based on this research, reducing the frequency of PrimoMaxx applications or altering plant growth regulator programs with Trimmit or Cutless can maintain quality playing conditions while limiting etiolation.

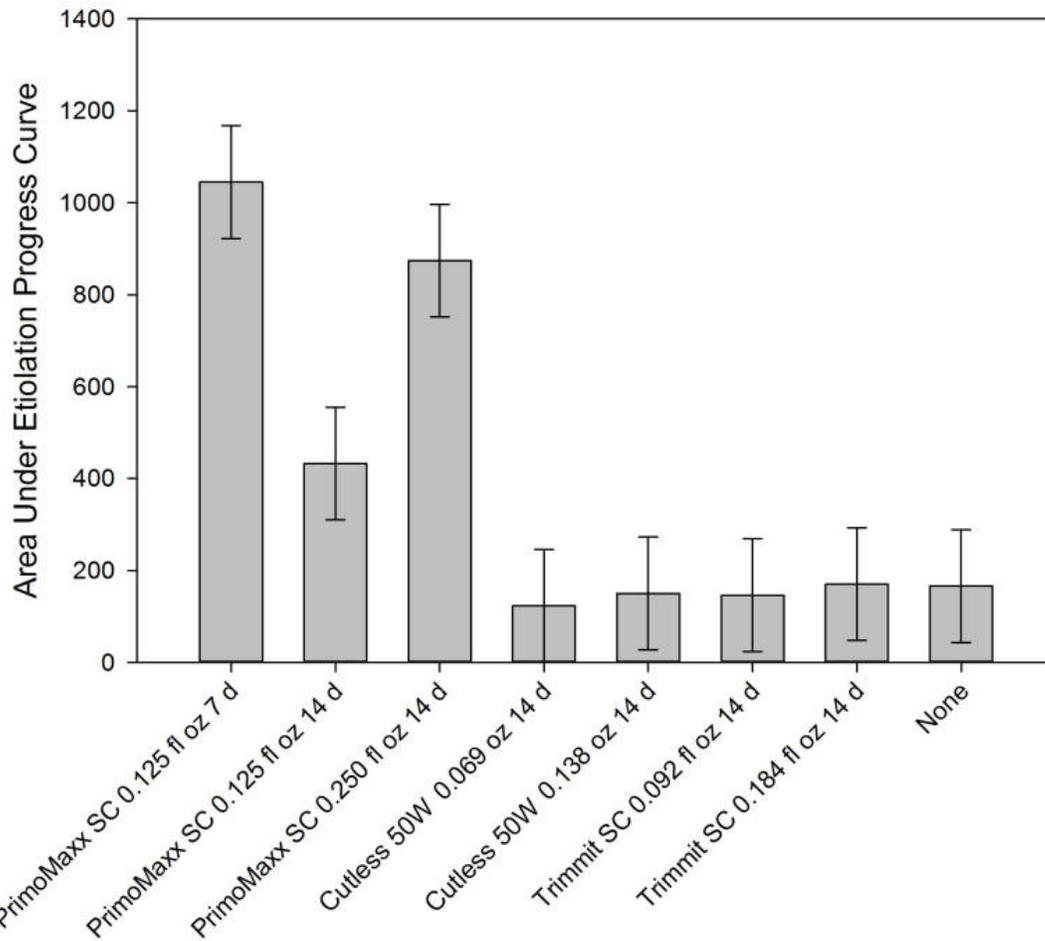
Source: [Joseph A. Roberts](#)

Additional Information:

[Investigations into the Cause and Management of Etiolation on Creeping Bentgrass Putting Greens](#)

[Management of Bacterial Wilt of Creeping Bentgrass Caused by *Acidovorax avenae* on Golf Courses in the Eastern United States](#)

[Occurrence and Identification of an Emerging Bacterial Pathogen of Creeping Bentgrass](#)



*The graph summarizes the impact of plant growth regulators on bacterial etiolation caused by *Acidovorax avenae* in 2013. Etiolation is presented as area under etiolation progress curve values. This represents a season-long measure of etiolation for each treatment. Even though etiolation was present in PriomMaxx treatments, there was no significant damage to bentgrass turf. Error bars represent Tukey's Honest Significant Difference at the 0.05 probability level.*