Stop 8. Creeping Bentgrass Etiolation and Decline – A Field Study

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A new bacterial disease caused by *Acidovorax avenae* subsp. *avenae* (*Aaa*) is plaguing creeping bentgrass putting greens on golf courses around the country. The pathogen was isolated by the MSU turfgrass diagnostic lab in 2009, and has been found in numerous other golf course samples since. This destructive disease problem is not solved by conventional fungicide usage, and is a recurring problem on many golf courses. Superintendents in Michigan are converting their putting greens to creeping bentgrass due to ice damage plaguing *Poa annua* greens each spring; this poses an imminent risk associated with an incurable infection of *Aaa* on Michigan golf courses.

A field study was undertaken to investigate potential control options for bacterial etiolation caused by *Aaa*. Previous research has found *Aaa* to be most damaging to creeping bentgrass at temperatures above 80^{o} C. Recent research in our lab has shown that etiolation can be induced in creeping bentgrass through root inoculations with *Aaa.* Additionally, many confirmed cases of bacterial etiolation have been from stressed areas on putting greens that were recently plugged or sodded on putting greens and their surround. Using this information, we developed a plan for an effective field study to encourage disease under less than optimal conditions in East Lansing, MI.

The area was sodded with creeping bentgrass (cv. '*Independence*') sod on May 7th, 2013 so that a pure stand was established and the likelihood of infection was increased. From May to June, the study was fertilized with 0.5 lbs of N/1000 sq. ft. and topdressed weekly while mowing height was taken down to 0.15 inches. Inoculations began on June 6th by applying 8 L of *Acidovorax avenae* subsp. *avenae* broth culture grown in TSB media at an average concentration of 10^{9} CFU/ml with a NO_2 powered backpack sprayer. Cultural practices such as rolling, topdressing, and mowing were carried out to best encourage infection.

Treatments (listed below) began on June 19th and were applied using a CO_2 powered backpack sprayer. Etiolation was first observed on June 24th as sporadic yellowing and overgrowth on plots. Individual plants were moved from plots.

Treatment	Product	Rate		Timing	GPA
1	Check	n/a	n/a	n/a	n/a
2	Signature	8.0	oz/1000ft2	14 days	96 GPA
3	Junction	2.0	oz/1000ft2	14 days	96 GPA
4	SP#	2.0	fl oz/1000ft2	14 days	96 GPA
5	Junction	2.0	oz/1000ft2	14 days	96 GPA
	Cutless	0.29	fl oz/1000ft2	14 days	96 GPA
6	Junction	2.0	oz/1000ft2	14 days	96 GPA
	Musketeer	0.28	fl oz/1000ft2	14 days	96 GPA
7	Cutless	0.29	fl oz/1000ft2	14 days	96 GPA

8	Primo	0.75	fl oz/1000ft2	14 days	96 GPA
11	Mycoshield	3.0	lb/A (600 ppm)	14 days	96 GPA
12	Primo	0.5	fl oz/1000ft2	14 days	96 GPA
13	Ammonium sulfate	0.125	lb N/1000ft2	14 days	96 GPA
14	Primo	0.5	fl oz/1000ft2	14 days	96 GPA
	Ammonium sulfate	0.125	lb N/1000ft2	14 days	96 GPA
15	Ammonium sulfate	0.25	lb N/1000ft2	14 days	96 GPA
16	Urea	0.25	lb N/1000ft2	14 days	96 GPA
17	Daconil Action	3.6	fl oz/1000ft2	14 days	96 GPA

When symptoms were present, etiolation was relatively uniform across all plots in the study. No treatments were completely effective at eliminating the spindly growth and yellowing of irregular areas among plots. However, the growth regulator trinexapac-ethyl (Primo) clearly increased symptoms with more severe etiolation taking place in these plots than others (data not shown).

Etiolation symptoms have subsided as temperatures have cooled down this summer; however, this study is significant due to the successful initiation of etiolation symptoms with *Acidovorax avenae* subsp. *avenae*. Prior to this, only laboratory and controlled environment studies have been able to replicate natural symptoms caused by this enigmatic disease. Our current working knowledge of effective inoculation techniques and strategies that encourage disease incidence will allow for more research to take place in the future on this new disease.

Stop 9. Effect of Creeping Bentgrass Seeding Rate and Traffic on Establishment for Putting Greens

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Due to the rapidly increasing breeding efforts in the turfgrass industry, there will be many new and exciting species and varieties available to golf courses over the next years to help save financial and environmental resources. Conversion to these grasses will require complete renovation. This research project is one in a series to begin to investigate the issues surrounding conversion to ensure a seamless transition with minimal disruption and downtime. One of the first priorities is to identify the ideal seeding rate of creeping bentgrass as well as the effect of the seeding rate on traffic tolerance. This is a careful balance in that seed, while relatively inexpensive today, could become a precious commodity due to demand. Also, the relationship between seeding rates and turf density in the first year could play a role in the overall health of the grass.

Foot traffic simulation and seeding rate trial was initiated August 8, 2012 on an experimental putting green at Hancock Turfgrass Research Center, Michigan State University in East Lansing,