

2012 Evaluation of Syngenta Fungicides and Fungicide Rotation Programs for the Control of Anthracnose and Effects on Turf Quality on an Annual Bluegrass Putting Green

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INTRODUCTION

The purpose of this trial was to evaluate the effectiveness of various fungicides and fungicide rotations in controlling anthracnose (*Colletotrichum cereale*) and maintaining plot quality on an annual bluegrass (*Poa annua*) putting green.

MATERIALS AND METHODS

The trial was initiated on June 13th, 2012. All treatments were applied six times on a two week interval with the last treatment date being August 21st. The trial was conducted on an annual bluegrass putting green located at the OSU Lewis-Brown Horticulture Farm in Corvallis, Oregon which is approximately 60 miles south of Portland. The green was built in April of 2009 using the California Method (12" of USGA sand placed over a soil sub grade). Flat drainage was installed on top of the sub grade. Annual bluegrass aerification cores from Emerald Valley Golf Course in Cresswell, Oregon were placed on top of the sand, and then rolled, topdressed, irrigated and mowed until smooth. Disease samples from Emerald Valley's *Poa annua* putting greens were tested by the U.C. Riverside Disease Laboratory (Dr. Frank Wong) and were confirmed to have Qol and T-methyl resistance.

The trial area was not inoculated with the anthracnose fungal pathogen before the trial, and therefore, the general goal of turf cultural practices was to encourage the natural onset of the disease by stressing the turf with low mowing heights, limited nitrogen, and either too little or too much water. However, stressing the plots too much can cause all the plots to deteriorate, thus losing any ability to distinguish plot quality differences resulting from the fungicide treatments. Therefore, the stress had to be balanced with a minimum acceptable level of plot quality.

With this goal in mind, the plots were mowed Monday through Friday using a Toro Flex walking greens mower set to a bench height of .105 inches. The plots were double mowed beginning the third week of July until the end of August. Irrigation was applied using a RainBird irrigation system with Hunter I-20 heads. At the onset of the trial, the irrigation system was set to apply 60 percent of ET (calculated from an on-site weather station). Irrigation was subsequently reduced until drought symptoms began appearing in the afternoon at which time the dry spots were hand watered. Following the drying out



period, the irrigation system was then set to apply 140 percent of ET for approximately 2 weeks. The cycle of drying followed by over irrigating continued throughout the trial. The green was cored aerified on April 9th with a John Deere Aercore 800 set to produce holes with a 2 by 2 inch spacing using 5/8" tines (½ inch hole). Before the trial started, the plots had received 2.3 lbs. of nitrogen (per 1,000 sq. ft.) in 2012 with the last application being 0.2 lbs. of nitrogen (per 1,000 sq. ft.) from calcium nitrate applied on June 12th. At the start of the trial, the green was characterized as "fairly lean". After the trial started, the plots were not fertilized until August 8th when 0.20 lbs per 1,000 sq. ft. of soluble nitrogen from UMAXX (urea) along with 6 ounces of Foltec foliar fertilizer (The Andersons) was applied.

As a result of the stress applied, the leaves began turning brown and the plot color approached the minimum acceptable level in the first week of August (see color ratings on August 8th). Because of the brown leaves present on August 8th, the disease ratings may overstate disease severity on that date as it is nearly impossible to distinguish brown leaves from diseased leaves. After the fertilizer application, the turf color improved on most plots noted by the ratings on August 23rd.

The treatments applied are listed below:

Trt #	Treatment	Rate (oz./1,000 ft ²)
1	Untreated	na
2	Ammonium Sulfate alt. with Calcium Nitrate	0.20 lbs N/app
3	Secure 4.17 SC	0.5
4	Concert II + Secure	4.0 + 0.5
5	Secure 4.17 SC + A14658D	0.5 + 6.0
6	Daconil Action 6.11 SC	3.5
7	Heritage TL 0.8 ME	1.0
8	Secure alternated with Daconil Action	0.5/3.5
9	Secure + Appear Alt w/ Dac Action + Appear	0.5+6.0/3.5+6.0
10	A16841A + Daconil Action	0.5 + 3.5
11	Secure + Appear	0.5 + 6.0
12	3 Way Rotation Program	
	1. Briskway	0.62
	2. Daconil Action + Appear	3.5 + 6.0
	3. Secure + Appear	0.5 + 6.0

Daily high temperatures and relative humidity at the time of high temperature for the dates of applications are listed in the table below:

Date	High Temp	RH at time of High Temp
6/13	67	52%
6/26	64	69%
7/10	82	46%
7/24	80	51%
8/08	75	49%
8/21	79	50%

The individual plots measured 25 square feet (5 ft X 5 ft). The products were applied with a CO₂-powered sprayer using TeeJet 80015 nozzles at 30 psi producing a total spray volume of two gallons per 1,000 sq. ft. The speed was calibrated with an electronic metronome.

Visual disease severity, color, and surface quality (without regard to color – i.e. uniformity, texture, and density) ratings were taken every two weeks. Additionally, plot quality ratings were taken on June 26th – two weeks after the first application. Ratings were taken the day of, or the day preceding, the fungicide application. Data from each rating date were subjected to analysis of variance using a randomized complete block design with 4 replications. Differences between means were determined by Fisher's LSD at the 5% level. The data and LSD values are displayed in Tables 1 through 3 at the end of this document.

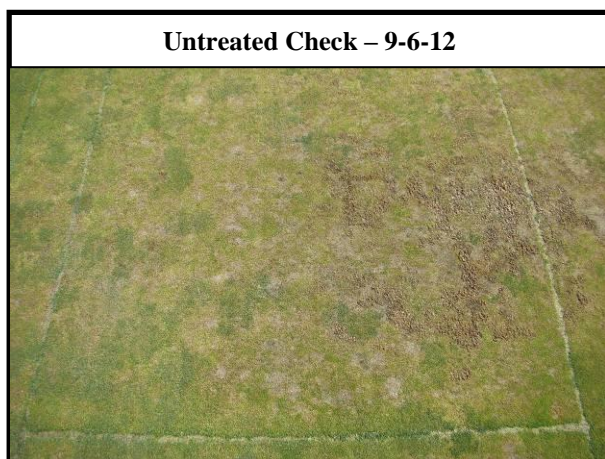
RESULTS

Overall, the disease pressure was moderate with untreated check plots developing average disease cover ratings of 15.5 percent on September 6th – fourteen days after the final treatment. Additionally, the fertilizer check treatment (Trt 2) had disease cover ratings averaging 2.5 percent on September 6th. This treatment had a total of 0.20 lbs. of total nitrogen per 1,000 sq. ft. applied per application.

Treatment 9 (Secure + Appear alternated with Daconil Action + Appear) and treatment 10, a 3-way rotation of Briskway, Daconil Action + Appear, and Secure + Appear performed the best in this trial. Both treatments had excellent disease control and remarkably good turf quality given the extreme conditions the plots were subjected to.

The mix of Secure plus Appear (Trts 11 & 5) also performed well with disease cover ratings below one percent on September 6th, but overall, the color was not quite as good as treatments 9 and 12.

Treatment 4 (Concert II + Secure) performed well but had slightly more disease with a 1.3 percent disease cover rating on September 6th.



Secure applied alone at 0.5 oz. per 1,000 sq. ft. did not do quite as well from a disease control or plot color perspective resulting in 3.5 percent disease cover rating on September 6th and an average color rating of 5.4 (Treatments 9, 12, and 4 average color rated above 7). However, the disease cover rating was not statistically worse than the best treatments.



Heritage TL applied at 1.0 oz. per 1,000 sq. ft. did surprisingly well given the results from prior trials at Oregon State University on this QoI resistant site.

Additional Comments:

The plots were rated for both color and surface quality (without regard for color) separately. The reason for the two ratings is that stressing the turf for anthracnose trials often results in poor color but not necessarily poor surface quality (without regard to color) if the fungicides applied are effective. This method of rating allows us to distinguish those plots that have otherwise good turf quality (with maybe not so good color) from those plots where both the turf color and the surface quality are poor. Using this method, surface quality will track pretty closely with the inverse of percent disease cover because the turf density gets negatively impacted by disease.

The color ratings were generally lower than the surface quality ratings because the low nitrogen levels impact the color much more quickly than the surface quality. Obviously, over time, low nitrogen levels would eventually negatively affect surface quality.

Table 1: Percent Disease Cover

Trt #	Product (s)	Rates (oz./M)	Dis. Cover	Dis. Cover	Dis. Cover	Dis. Cover	Dis. Cover	Dis. Cover
			7/11	7/24	8/8	8/22	9/6	Avg.
1	Untreated	na	0.0	2.0	10.0	11.8	15.5	9.8
2	Amm. Sulfate alt. with Calcium Nitrate	0.20 lbs N/app	0.0	0.4	2.4	2.0	2.5	1.8
3	Secure 4.17 SC	0.5	0.0	0.5	3.3	2.4	3.5	2.4
4	Concert II + Secure	4.0 + 0.5	0.0	0.0	1.5	1.4	1.3	1.0
5	Secure 4.17 SC + A14658D	0.5 + 6.0	0.0	0.2	1.6	0.5	0.9	0.8
6	Daconil Action 6.11 SC	3.5	0.0	0.2	3.9	1.7	1.4	1.8
7	Heritage TL 0.8 ME	1.0	0.0	1.0	3.8	3.5	2.6	2.7
8	Secure alternated with Daconil Action	0.5/3.5	0.0	0.2	0.8	0.4	0.6	0.5
9	Secure + Appear Alt w/ Dac. Action + Appear	0.5+6.0/3.5+6.0	0.0	0.1	0.1	0.1	0.0	0.1
10	A16841A + Daconil Action	0.5 + 3.5	0.0	0.2	0.6	0.2	0.1	0.2
11	Secure + Appear	0.5 + 6.0	0.0	0.0	1.4	1.1	0.9	0.8
12	3 Way Rotation Program 1. Briskway 2. Daconil Action + Appear 3. Secure + Appear	0.62 3.5 + 6.0 0.5 + 6.0	0.0	0.0	0.8	0.2	0.1	0.3
		LSD @ .05	ns	0.9	5.3	4.3	4.7	na

Table 2: Color 1 – 9; 9 = dark green

Trt #	Product (s)	Rates (oz./M)	Color	Color	Color	Color	Color	Color
			7/11	7/24	8/8	8/22	9/6	Avg.
1	Untreated	na	5.8	5.3	4.9	4.5	3.0	4.7
2	Amm. Sulfate alt. with Calcium Nitrate	0.20 lbs N/app	7.4	7.8	6.9	7.5	6.1	7.1
3	Secure 4.17 SC	0.5	5.6	5.8	5.3	5.8	4.8	5.4
4	Concert II + Secure	4.0 + 0.5	7.5	7.1	6.6	7.4	6.6	7.1
5	Secure 4.17 SC + A14658D	0.5 + 6.0	7.5	7.3	6.1	6.8	6.4	6.8
6	Daconil Action 6.11 SC	3.5	5.9	5.9	5.8	6.5	5.4	5.9
7	Heritage TL 0.8 ME	1.0	6.0	5.6	5.4	6.3	5.6	5.8
8	Secure alternated with Daconil Action	0.5/3.5	6.5	6.4	6.0	6.6	6.1	6.3
9	Secure + Appear Alt w/ Dac. Action + Appear	0.5+6.0/3.5+6.0	7.6	7.4	7.0	7.1	7.0	7.2
10	A16841A + Daconil Action	0.5 + 3.5	7.1	6.3	6.1	7.0	6.9	6.7
11	Secure + Appear	0.5 + 6.0	7.6	6.9	6.3	6.4	5.6	6.6
12	3 Way Rotation Program 1. Briskway 2. Daconil Action + Appear 3. Secure + Appear	0.62 3.5 + 6.0 0.5 + 6.0	7.6	7.3	6.3	7.0	7.3	7.1
		LSD @ .05	0.8	1.0	1.2	1.1	1.3	na

Table 3: Overall Plot Quality and Surface Quality without Regard to Color

Trt #	Product (s)	Rates (oz./M)	Plot Qual.	Surf. Qual.	Surf. Qual.	Surf. Qual.	Surf. Qual.	Surf. Qual.	Surf. Qual.
			6/26	7/11	7/24	8/8	8/22	9/6	Avg.
1	Untreated	na	5.6	7.0	6.1	5.5	4.3	3.8	5.4
2	Amm. Sulfate alt. with Calcium Nitrate	0.20 lbs N/app	7.0	7.3	7.6	6.6	6.5	6.0	6.8
3	Secure 4.17 SC	0.5	5.1	7.4	7.5	6.1	6.5	5.5	6.4
4	Concert II + Secure	4.0 + 0.5	6.3	7.8	7.8	7.0	7.4	7.5	7.3
5	Secure 4.17 SC + A14658D	0.5 + 6.0	6.5	7.8	7.8	7.4	7.5	7.3	7.4
6	Daconil Action 6.11 SC	3.5	6.0	7.0	7.5	6.5	6.9	7.0	6.8
7	Heritage TL 0.8 ME	1.0	5.5	7.3	7.3	6.0	6.0	6.4	6.4
8	Secure alternated with Daconil Action	0.5/3.5	5.5	7.8	7.6	7.3	7.8	7.5	7.2
9	Secure + Appear Alt w/ Dac. Action + Appear	0.5+6.0/3.5+6.0	7.0	8.1	8.1	7.9	8.1	8.0	7.9
10	A16841A + Daconil Action	0.5 + 3.5	6.3	7.8	7.5	7.5	8.0	7.8	7.5
11	Secure + Appear	0.5 + 6.0	6.8	8.1	8.0	7.3	7.1	6.8	7.3
12	3 Way Rotation Program 1. Briskway 2. Daconil Action + Appear 3. Secure + Appear	0.62 3.5 + 6.0 0.5 + 6.0	6.0	8.0	8.4	7.6	7.9	8.0	7.6
		LSD @ .05	0.6	0.7	0.7	1.1	1.3	1.1	na