

The Starting Rotation

2012 evaluation of fungicides and fungicide rotation programs for the control of anthracnose and effects on turf quality on an annual bluegrass putting green.

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.

was installed on top of the sub grade. Annual bluegrass sod (no known resistance issues) from Bos Sod Farms from Canada was placed over the sand.

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

MATERIALS AND METHODS. The trial was initiated on June 14th, 2012. Treatments 1 through 14 were applied six times on a two-week interval with the last treatment date being Aug. 23rd. Treatments 15 and 16 were applied three times on a four-week interval with the last treatment date being Aug. 9th. The trial was conducted on an annual bluegrass putting green located at the OSU Lewis-Brown Horticulture Farm in Corvallis, Ore., which is approximately 60 miles south of Portland. The green was built in April 2009 using the California Method (12 inches of USGA sand placed over a soil sub grade). Flat drainage

Table 1. Plot and Surface Quality without Regard to Color

Trt #	Product (s)	Rates (oz./M)	Plot Qual. 6/27	Surf. Qual. 7/12	Surf. Qual. 7/25	Surf. Qual. 8/09	Surf. Qual. 8/23	Surf. Qual. 9/6	Surf. Qual. Avg.
1	Untreated	na	5.9	7.5	7.0	6.3	5.3	4.8	6.2
2	Briskway alternated w/ Daconil Action	.62/3.5	6.6	7.6	7.9	7.8	7.9	8.0	7.8
3	Briskway alternated w/ Daconil Action	.50/3.5	6.0	7.1	7.6	7.4	7.8	7.5	7.5
4	A8574D	0.22	5.9	7.4	7.6	7.5	7.6	6.8	7.4
5	A8574D	0.42	6.0	7.9	7.8	7.4	7.0	6.5	7.3
6	A18281A	1.0	5.9	7.8	7.5	7.5	7.5	7.4	7.5
7	A19858A	0.6	6.1	7.4	7.3	7.0	7.3	7.1	7.2
8	Briskway + Daconil Action	.62+3.5	6.5	7.6	7.8	7.9	7.9	7.6	7.8
9	Briskway + Daconil Action	.50+3.5	6.3	7.6	7.9	8.0	7.8	8.0	7.9
10	Bayer Rotation 1	See Above	6.8	7.8	7.6	7.9	7.9	8.0	7.8
11	Bayer Rotation 2	See Above	6.9	8.0	7.9	7.8	7.9	8.0	7.9
12	Torque + Spectro alt. with Affirm + Spectro	.60+3.75/.90+3.75	6.0	7.6	7.8	8.0	7.9	7.8	7.8
13	BASF Rotation 1	See Above	5.9	7.5	7.8	7.8	7.8	7.5	7.7
14	Fertilizer Check	.20 lbs. N	7.0	7.9	7.4	7.8	6.5	6.3	7.2
15	BASF - Pillar G (48 oz)	48	6.0	7.4	7.5	7.0	7.0	6.8	7.1
16	BASF - Headway G (64 oz)	64	5.9	7.4	7.0	6.5	7.1	6.8	7.0
		LSD@ .05	0.6	ns	0.5	0.5	0.7	0.9	na



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 Rain Bird 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 was then set to apply 140 percent of ET for approximately two weeks. The cycle of drying followed by over irrigating continued throughout the trial. The plots were fairly lean when the trial started and were not fertilized until Aug. 8th when 0.20lbs 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 Aug. 9th). After the fertilizer application, the turf color improved on most plots noted by the ratings on Aug. 23rd.

The treatments applied are listed below:

Trt #	Treatment	Rate (oz./1,000ft ²)
1	Untreated	na
2	Briskway alternated with Daconil Action	.62/3.5
3	Briskway alternated with Daconil Action	.50/3.5
4	A8574D	0.22
5	A8574D	0.42
6	A18281A	1.0
7	A19858A	0.6
8	Briskway + Daconcil Action	.62+3.5
9	Briskway + Daconcil Action	.50+3.5
10	Bayer Rotation 1	See Below
11	Bayer Rotation 2	See Below
12	Torque + Spectro alternated with Affirm + Spectro	.60+3.75/.90+3.75
13	BASF Rotation 1	See Below
14	Ammonium Sulfate alternated with Calcium Nitrate*	3.2 (of N)
15	Pillar G**	48
16	Headway G**	64

*0.20 lbs. of total nitrogen was applied per application.
** Pillar G and Headway G were applied every 4 weeks.

Spray Programs:

Bayer Rotation 1-Trt 10	Rate (oz./1,000ft ²)	Date of Application
Reserve	3.6	June 14 th
Signature + Daconil Ultrex	4.0+3.2	June 27 th
Insignia + Daconil Ultrex	0.90+3.2	July 12 th
Reserve	3.6	July 25 th
Signature + Daconil Ultrex	4.0+3.2	August 9 th
Reserve	3.6	August 23 rd

Bayer Rotation 1-Trt 11	Rate (oz./1,000ft ²)	Date of Application
Reserve	3.6	June 14 th
Signature + Daconil Ultrex	4.0+3.2	June 27 th
Reserve	3.6	July 12 th
Signature + Daconil Ultrex	4.0+3.2	July 25 th
Reserve	3.6	August 9 th
Reserve	3.6	August 23 rd

Bayer Rotation 1-Trt 13	Rate (oz./1,000ft ²)	Date of Application
Trinity	1.0	June 14 th
Insignia SC + Trinity	0.54+1.0	June 27 th
Honor	1.1	July 12 th
Trinity	1.0	July 25 th
Insignia SC + Trinity	0.54+1.0	August 9 th
Honor	1.1	August 23 rd

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
6/14	70	49%
6/27	77	36%
7/12	78	52%
7/25	84	49%
8/09	82	46%
8/23	73	43%

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 27th – 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 four 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.

RESULTS. Overall, the disease pressure was moderate to low with untreated check plots receiving average disease cover ratings of 8.0 percent on Sept. 6th – 14 days after the final treatment. Additionally, the fertilizer check treatment (Trt 14) had disease cover ratings averaging 4.8 percent on Sept. 6th. This treatment had a total of 0.20 lbs. of total nitrogen per 1,000 sq. ft. applied per application.

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 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. Additionally, sometimes the fungicides themselves either improve turf quality or have a negative effect (e.g. DMI's tend to cause leaf texture to widen) which can impact surface quality.

There were no statistical differences between plots treated with fungicides for percent disease cover. Additionally, all fungicide treatments were statistically better than both the untreated control



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(Trt 1) and the untreated fertilizer control (Trt 14). Nine of the fourteen fungicide treatments had average disease cover ratings of 0.2 percent or less on Sept. 6th. Three more fungicide treatments had average disease cover ratings of 0.5 percent or less on Sept. 6th. Only two fungicide treatments had average disease cover ratings over 1 percent on Sept. 6th: A8574D (Trt 5) with 1.4 percent disease cover, and Pillar G (Trt 15) with 1.6 percent disease cover.

Because of the low fertility level, the color of the plots was generally lower than what one would normally see on a high-end golf course. However, the color was surprisingly good on many

Table 2. Percent Disease Cover

Trt #	Product (s)	Rates	7/12	7/25	8/09	8/23	9/6	Avg.
1	Untreated	na	0	0.8	2.8	6.9	8.0	3.7
2	Briskway alternated w/ Daconil Action	.62/3.5	0	0.0	0.1	0.0	0.1	0.0
3	Briskway alternated w/ Daconil Action	.50/3.5	0	0.1	0.1	0.1	0.1	0.1
4	A8574D	0.22	0	0.1	0.1	0.6	0.5	0.3
5	A8574D	0.42	0	0.0	0.1	1.4	1.4	0.6
6	A18281A	1.0	0	0.0	0.0	0.1	0.3	0.1
7	A19858A	0.6	0	0.0	0.0	0.1	0.1	0.1
8	Briskway + Daconil Action	.62+3.5	0	0.0	0.0	0.0	0.2	0.0
9	Briskway + Daconil Action	.50+3.5	0	0.0	0.0	0.1	0.2	0.1
10	Bayer Rotation 1	See Above	0	0.0	0.0	0.1	0.0	0.0
11	Bayer Rotation 2	See Above	0	0.0	0.0	0.0	0.0	0.0
12	Torque + Spectro alt. with Affirm + Spectro	.60+3.75/.90+3.75	0	0.0	0.0	0.1	0.1	0.0
13	BASF Rotation 1	See Above	0	0.0	0.1	0.1	0.0	0.0
14	Fertilizer Check	.20 lbs. N	0	0.5	2.1	3.1	4.8	2.1
15	BASF - Pillar G (48 oz)	48	0	0.1	0.1	1.4	1.6	0.7
16	BASF - Headway G (64 oz)	64	0	0.2	0.3	0.4	0.4	0.3
		LSD@ .05	ns	0.2	1.0	1.8	1.8	na

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treatments. Treatments that included pigments (Trts. 10 & 11) scored the highest in the color ratings on average, although the color dropped slightly after a DMI fungicide was

applied. Also, color ratings were negatively impacted by disease. Six fungicide treatments had an average color rating of 6.7 or higher throughout the trial. These included the two

Bayer rotations, Torque mixed with Spectro 90 alternated with Affirm mixed with Spectro 90, Briskway (.62 oz.) alternated with Daconil Action, and the two treatments of Briskway mixed with Daconil Action. The fertilizer check had an average color rating of 6.8.

The color ratings were generally lower than the surface quality ratings because the stresses imposed on the plots had a larger impact on color than surface quality.

The surface quality of most of the plots treated with fungicides was excellent. On Sept. 6th, 10 of the 14 fungicide treatments had a surface quality rating averaging 7.1 or higher. Of those, five had a surface quality rating or 7.8 or higher, which included the two Bayer rotations, Torque mixed with Spectro 90 alternated with Affirm mixed with Spectro 90, Briskway(0.50 oz.) mixed with Daconil Action, and Briskway (0.62 oz.) alternated with Daconil Action. **GCI**

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Table 3. Color 1 – 9; 9 = dark green

Trt #	Product (s)	Rates	7/12	7/25	8/09	8/23	9/6	Avg.
1	Untreated	na	6.4	5.4	5.0	5.1	4.5	5.3
2	Briskway alternated w/ Daconil Action	.62/3.5	7.1	6.9	6.1	6.9	6.8	6.8
3	Briskway alternated w/ Daconil Action	.50/3.5	6.5	6.3	5.8	6.8	6.5	6.4
4	A8574D	0.22	6.3	5.8	5.0	6.0	5.5	5.7
5	A8574D	0.42	6.4	5.6	5.0	6.5	6.1	5.9
6	A18281A	1.0	5.9	5.6	4.6	6.3	6.3	5.7
7	A19858A	0.6	6.4	6.0	4.6	6.8	7.0	6.2
8	Briskway + Daconil Action	.62+3.5	6.9	6.6	6.0	6.8	7.0	6.7
9	Briskway + Daconil Action	.50+3.5	6.9	6.9	6.0	7.3	6.9	6.8
10	Bayer Rotation 1	See Above	7.3	6.4	6.1	7.4	7.6	7.0
11	Bayer Rotation 2	See Above	7.5	7.0	7.3	7.6	7.4	7.4
12	Torque + Spectro alt. with Affirm + Spectro	.60+3.75/.90+3.75	7.0	6.8	6.6	7.4	7.1	7.0
13	BASF Rotation 1	See Above	6.0	6.6	5.8	6.6	7.4	6.5
14	Fertilizer Check	.20 lbs. N	7.4	7.0	7.0	6.8	5.8	6.8
15	BASF - Pillar G (48 oz)	48	6.5	5.9	5.0	6.3	6.1	6.0
16	BASF - Headway G (64 oz)	64	6.3	5.5	5.6	7.0	6.6	6.2
		LSD@ .05	0.6	0.7	0.8	0.9	1.1	na

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