

ANTHRACNOSE CONTROL ON AN ANNUAL BLUEGRASS PUTTING GREEN WITH VARIOUS FUNGICIDES

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INTRODUCTION

Anthracoze basal rot (caused by the pathogen *Colletotrichum cereale*; ABR) continues to emerge as a chronic disease of annual bluegrass (*Poa annua* ABG) putting greens. While various cultural practices and fertility programs have been developed to reduce ABR symptoms, fungicides are often required to provide an acceptable level of disease suppression. An important factor in determining the efficacy of fungicides used to control ABR is the potential for pathogen resistance. For this reason, it is important to evaluate existing commercially available fungicides as well as new and emerging experimental chemistries to continue to improve our ability to manage the disease. The objective of this research was to evaluate the efficacy of various commercially available and experimental fungicides on ABR suppression.

MATERIALS & METHODS

A one-year field study was initiated at the Valentine Turfgrass Research Center located in University Park, PA. Soil was a sandy loam with a pH of 7.1 and 2.6% organic matter. On 14 Sep 2015 the area was core cultivated and fertilized with 0.5 lb N 1000 ft⁻² and 1.0 lb P 1000 ft⁻² from urea and triple super phosphate, respectively.

Annual bluegrass accounted for approximately 97% of the species within the study site when treatments were initiated on 25 Apr 2016. All fungicide treatments were applied with a CO₂ pressurized (40 psi) sprayer equipped with an air-induction flat fan nozzle (TeeJet AI9508EVS), calibrated to deliver 2.0 gal of water 1000 ft⁻². The area was mowed five days per week to a height of 0.110 in. Preventive applications of Emerald (boscalid) were applied at 0.13 oz 1000 ft⁻² as needed to control dollar spot. Treatments were initiated on 25 Apr 2016 and reapplied according to the application schedule. All treatments are listed in the data tables.



Figure 1. Anthracnose on a research putting green at the Joseph Valentine Turfgrass Research Center, 2016.

Plots measured 3 ft x 6 ft and were arranged as a randomized complete block design with four replications. Percent anthracnose was visually assessed on a 0 to 100% scale where 0 = no disease present and 100 = entire plot area affected by ABR. Turfgrass quality and color were also visually assessed on a 1 to 9 scale where 1 = entire plot brown or dead and 9 = optimum greenness and/or density. All data were subjected to analysis of variance and means were separated at $P \leq 0.05$ according to Fisher's Protected least significant difference test.

RESULTS & DISCUSSION

Disease activity in the area in the form of foliar anthracnose was first observed in late June. Disease progressed rapidly through the study with percent ABR reaching up to 27% within the nontreated control plots on 1 Jul (Table 1.). Disease severity continued to increase through July with ABR reaching 60 to 74% within the nontreated control plots on 28 Jul and peaked in early August.

On 1 Jul, despite disease levels of 17 to 27% ABR in the nontreated control plots, there were no statistical differences when compared to the treated plots (0 to 16% ABR) (Table 1.). On 15 Jul, only plots

treated with Howler + Capsil (21% ABR), Howler (33% ABR) or Companion (31% ABR) failed to reduce disease incidence when compared to the nontreated control plots (60 to 74% ABR). All other treatments suppressed ABR relative to the nontreated plots (0 to 6% ABR).

On 29 Jul, plots treated with Signature Xtra Stressgard (4.0 oz, 14-day) + Mirage (1.0 fl oz, rotated) + Daconil Ultrex (3.2 oz, rotated) or Lexicon (0.34 fl oz, 14-day) + Daconil Action 93,5 fl oz, 14-day) + Signature Xtra (4.0 fl oz, 14-day) + Primo Maxx (0.125 fl oz, 14-day) continued to exhibit no ABR symptoms. Plots treated with Howler + Capsil, Howler, or Companion failed to reduce disease incidence (45 to 54% ABR) when compared to the nontreated plots (60

to 74 % ABR). All other treatments provided a significant and similar reduction in disease (0 to 17% ABR) (Table 1.). On the final rating date (12 Aug), plots treated with Howler + Capsil, Howler, or Companion (4.0 fl oz, 14-day) had similar percent ABR (53 to 59% ABR) to the nontreated plots (68 to 81 % ABR). All other treatments had significant levels of disease control (0 to 23% ABR).

ACKNOWLEDGEMENTS

We thank Syngenta, Bayer, AgBiome, the Pennsylvania Turfgrass Council, and the Joseph Valentine Turfgrass Research Center staff for supporting this research.

Table 1. Percent anthracnose basal rot on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| Treatment and rate per 1000 sq ft ^y | Application code ^y | Percent anthracnose ^z | | | | |
|------------------------------------------------|-------------------------------|----------------------------------|--------|--------|--------|--------|
| | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 1 Signature Xtra Stressgard 4.0 oz..... | BDFHJ | 0 a ^x | 0 c | 0 c | 0 c | 2 c |
| Mirage 1.0 fl oz | BF | | | | | |
| Daconil Ultrex 3.2 oz | DHJ | | | | | |
| 2 Tartan 2.0 fl oz | A | 0 a | 0 c | 0 c | 1 c | 2 c |
| Signature Xtra Stressgard 4.0 oz | BFHJL | | | | | |
| Exeris stressgard 4.0 fl oz | BFJ | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Daconil Ultrex 3.2 oz | H | | | | | |
| 26GT 4.0 fl oz | L | | | | | |
| 3 Tartan 2.0 fl oz | A | 0 a | 0 c | 0 c | 16 c | 20 c |
| Signature Xtra Stressgard 2.0 oz | BCDEFGHIJKL | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Exeris Stressgard 4.0 fl oz | FJ | | | | | |
| 26GT 4.0 fl oz | L | | | | | |
| Daconil Ultrex 3.2 oz | BH | | | | | |
| 4 Tartan 2.0 fl oz | A | 0 a | 0 c | <1 c | 17 c | 23 bc |
| Signature Xtra Stressgard 2.0 oz | BCDEFGHIJKL | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Exeris Stressgard 1.5 oz | FGHIJKL | | | | | |
| Daconil Ultrex 3.2 fl oz | B | | | | | |
| 5 Tebuconazole 0.6 fl oz | BDFHJL | 0 a | 1 c | 3 c | 3 c | 2 c |
| 6 Howler 0.5 g/100ml | BCDEFGHIJKL | 0 a | 10 abc | 21 abc | 45 b | 52 ab |
| Capsil 6.0 fl oz/100gal | BCDEFGHIJKL | | | | | |
| 7 Howler 0.75 g/100ml | BDFHJL | 0 a | 14 abc | 33 a | 53 ab | 59 a |
| 8 Companion 4.0 oz | BDFHJL | 0 a | 16 abc | 31 ab | 54 ab | 58 a |
| 9 Howler 0.5 fl oz | BDFHJL | 0 a | 3 bc | 6 bc | 8 c | 9 c |
| Tebuconazole 0.3 fl oz | BDFHJL | | | | | |

Table 1. Percent anthracnose basal rot on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| Treatment and rate per 1000 sq ft ^y | Application code ^y | Percent anthracnose ^z | | | | |
|------------------------------------------------|-------------------------------|----------------------------------|-------|--------|--------|--------|
| | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 10 Daconil Action 3.5 fl oz | BDFHJL | 0 a | 0 c | 1 c | 4 c | 3 c |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 11 Velista 0.3 oz..... | BDFHJL | 0 a | 0 c | <1 c | 2 c | 2 c |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 12 Daconil Action 3.5 fl oz | BDFHJL | 0 a | 0 c | <1 c | 1 c | 1 c |
| Velista 0.5 oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 13 Daconil Action 3.5 fl oz | BDFHJL | 0 a | 0 c | 0 c | 6 c | 7 c |
| Medallion 1.0 oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 14 Daconil Action 1 oz | BDFHJL | 0 a | 0 c | 0 c | 2 c | 3 c |
| Velista 0.3 oz | BDFHJL | | | | | |
| Medallion 1.0 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 15 Daconil Action 3.5 fl oz | BDFHJL | 0 a | 0 c | <1 c | <1 c | 2 c |
| Velista 0.5 oz | BDFHJL | | | | | |
| Heritage Action 0.2 oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 16 Lexicon 0.34 fl oz | BDFHJL | 0 a | 0 c | 0 c | 0 c | 1 c |
| Daconil Action 3.5 fl oz | BDFHJL | | | | | |
| Signature Xtra 4.0 oz | BDFHJL | | | | | |
| Primo Maxx 0.125 fl oz | BDFHJL | | | | | |

Table 1. Percent anthracnose basal rot on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| Treatment and rate per 1000 sq ft ^y | Application code ^y | Percent anthracnose ^z | | | | |
|------------------------------------------------|-------------------------------|----------------------------------|-------|--------|--------|--------|
| | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 17 A16422 3.5 fl oz | BDFHJL | 0 a | 0 c | 1 c | 2 c | 2 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A7087 0.5 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 18 A16422 2.5 fl oz | BDFHJL | 0 a | 0 c | <1 c | <1 c | 2 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A7087 0.5 fl oz | BDFHJL | | | | | |
| Appear 6 fl oz | BDFHJL | | | | | |
| 19 A16422 1.5 fl oz | BDFHJL | 0 a | 0 c | <1 c | 5 c | 5 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A7087 0.5 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 20 A16422 3.5 fl oz | BDFHJL | 0 a | 0 c | 0 c | <1 c | 2 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A22063 0.5 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 21 A16422 2.5 fl oz | BDFHJL | 0 a | 0 c | 0 c | 2 c | 1 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A22063 0.5 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 22 A16422 1.5 fl oz | BDFHJL | 0 a | 0 c | <1 c | 2 c | 3 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A22063 0.5 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 23 A16422 3.5 fl oz | BDFHJL | 0 a | 0 c | 0 c | 2 c | 3 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A17856 1.0 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |

Table 1. Percent anthracnose basal rot on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| Treatment and rate per 1000 sq ft ^y | Application code ^y | Percent anthracnose ^z | | | | |
|------------------------------------------------|-------------------------------|----------------------------------|--------|--------|--------|--------|
| | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 24 A16422 2.5 fl oz | BDFHJL | 0 a | 0 c | <1 c | 2 c | 1 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A17856 1.0 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 25 A16422 1.5 fl oz | BDFHJL | 0 a | 0 c | 2 c | 2 c | 3 c |
| A20744 0.3 oz | BDFHJL | | | | | |
| A17856 1.0 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 26 Affirm 11.3 WDG 0.88 oz..... | BDFHJL | 0 a | 0 c | 1 c | 1 c | 2 c |
| A16422 3.5 fl oz | BDFHJL | | | | | |
| Appear 6.0 fl oz | BDFHJL | | | | | |
| 27 Nontreated | - | 0 a | 27 a | 43 a | 66 ab | 74 a |
| 28 Nontreated | - | 0 a | 20 ab | 43 a | 74 a | 81 a |
| 29 Nontreated | - | 0 a | 17 abc | 37 a | 60 ab | 68 a |
| 30 Nontreated | - | 0 a | 21 ab | 42 a | 68 ab | 74 a |

^z Percent anthracnose basal rot (ABR) was visually assessed on a 0 to 100% scale where 0 = no disease present and 100 = entire plot area affected by ABR.

^y Treatments were applied on the following dates: A = 25 Apr, B = 26 May, C = 1 Jun, D = 8 Jul, and E = 15 Jun, F= 22 Jun, G= 29 Jun, H= 5 Jul, I= 12 Jul, J= 19 Jul, K= 26 Jul, L= 2 Aug.

^x Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ according to the Fisher's Protected least significant difference test.

Table 2. Quality on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| Treatment and rate per 1000 sq ft ^y | Application code ^y | Quality ^z | | | | |
|------------------------------------------------|-------------------------------|----------------------|---------|---------|---------|---------|
| | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 1 Signature Xtra Stressgard 4.0 oz..... | BDFHJ | 7.3 ab ^x | 7.3 ab | 7.8 ab | 7.3 a | 7.3 a |
| Mirage 1.0 fl oz | BF | | | | | |
| Daconil Ultrex 3.2 oz | DHJ | | | | | |
| 2 Tartan 2.0 fl oz..... | A | 6.8 ab | 6.8 abc | 7.8 ab | 6.5 abc | 6.5 a |
| Signature Xtra Stressgard 4.0 oz | BFHJL | | | | | |
| Exteris stressgard 4.0 fl oz | BFJ | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Daconil Ultrex 3.2 oz | H | | | | | |
| 26GT 4.0 fl oz | L | | | | | |
| 3 Tartan 2.0 fl oz..... | A | 7.0 ab | 7.0 abc | 7.8 ab | 7.0 ab | 7.0 a |
| Signature Xtra Stressgard 2.0 oz | BCDEFGHIJKL | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Exteris Stressgard 4.0 fl oz | FJ | | | | | |
| 26GT 4.0 fl oz | L | | | | | |
| Daconil Ultrex 3.2 oz | BH | | | | | |
| 4 Tartan 2.0 fl oz..... | A | 7.0 ab | 6.5 abc | 7.0 a-e | 6.8 ab | 7.0 a |
| Signature Xtra Stressgard 2.0 oz | BCDEFGHIJKL | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Exteris Stressgard 1.5 oz | FGHIJKL | | | | | |
| Daconil Ultrex 3.2 fl oz | B | | | | | |
| 5 Tebuconazole 0.6 fl oz..... | BDFHJL | 6.5 ab | 6.5 abc | 6.0 c-f | 5.5 ae | 5.5 abc |
| 6 Howler 0.5 g/100ml..... | BCDEFGHIJKL | 6.3 b | 5.8 c | 5.5 ef | 5.3 bf | 4.8 bcd |
| Capsil 6.0 fl oz/100gal | BCDEFGHIJKL | | | | | |
| 7 Howler 0.75 g/100ml..... | BDFHJL | 6.0 b | 5.8 c | 5.5 ef | 4.5 def | 4.5 bcd |
| 8 Companion 4.0 oz..... | BDFHJL | 6.5 ab | 6.3 bc | 5.5 ef | 3.8 f | 3.8 d |
| 9 Howler 0.5 fl oz..... | BDFHJL | 6.5 ab | 6.8 abc | 6.5 af | 5.8 ad | 5.8 ab |
| Tebuconazole 0.3 fl oz | BDFHJL | | | | | |

Table 2. Quality on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| | Treatment and rate per 1000 sq ft ^y | Application code ^y | Quality ^z | | | | |
|----|------------------------------------------------|-------------------------------|----------------------|---------|---------|---------|--------|
| | | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 10 | Daconil Action 3.5 fl oz | BDFHJL | 6.5 ab | 7.0 abc | 6.3 b-f | 6.3 abc | 6.3 a |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 11 | Velista 0.3 oz..... | BDFHJL | 6.8 a | 6.8 abc | 6.5 a-f | 6.8 ab | 6.8 a |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 12 | Daconil Action 3.5 fl oz | BDFHJL | 6.3 b | 6.0 bc | 6.3 b-f | 6.5 abc | 6.8 a |
| | Velista 0.5 oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 13 | Daconil Action 3.5 fl oz | BDFHJL | 6.8 ab | 6.8 abc | 6.8 a-f | 6.3 abc | 6.5 a |
| | Medallion 1.0 oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 14 | Daconil Action 1 oz | BDFHJL | 6.8 ab | 6.8 abc | 6.3 b-f | 6.5 abc | 6.5 a |
| | Velista 0.3 oz | BDFHJL | | | | | |
| | Medallion 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 15 | Daconil Action 3.5 fl oz | BDFHJL | 6.5 ab | 6.5 abc | 6.8 a-f | 6.3 abc | 6.5 a |
| | Velista 0.5 oz | BDFHJL | | | | | |
| | Heritage Action 0.2 oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 16 | Lexicon 0.34 fl oz | BDFHJL | 8.0 a | 7.8 a | 8.0 a | 7.0 ab | 7.3 a |
| | Daconil Action 3.5 fl oz | BDFHJL | | | | | |
| | Signature Xtra 4.0 oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |

Table 2. Quality on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| | Treatment and rate per 1000 sq ft ^y | Application code ^y | Quality ^z | | | | |
|----|------------------------------------------------|-------------------------------|----------------------|---------|---------|---------|--------|
| | | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 17 | A16422 3.5 fl oz | BDFHJL | 6.5 ab | 6.5 abc | 6.5 a-f | 6.5 abc | 6.5 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A7087 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 18 | A16422 2.5 fl oz | BDFHJL | 7.3 ab | 7.3 ab | 7.5 abc | 6.8 ab | 6.8 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A7087 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6 fl oz | BDFHJL | | | | | |
| 19 | A16422 1.5 fl oz | BDFHJL | 6.8 ab | 7.0 abc | 7.3 a-d | 7.0 ab | 7.0 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A7087 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 20 | A16422 3.5 fl oz | BDFHJL | 7.0 ab | 7.3 ab | 7.5 abc | 7.3 a | 7.3 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A22063 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 21 | A16422 2.5 fl oz | BDFHJL | 7.0 ab | 7.0 abc | 7.0 a-e | 6.8 ab | 7.0 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A22063 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 22 | A16422 1.5 fl oz | BDFHJL | 6.5 ab | 6.8 abc | 6.8 a-f | 7.0 ab | 7.0 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A22063 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 23 | A16422 3.5 fl oz | BDFHJL | 6.3 b | 6.5 abc | 6.8 a-f | 6.5 abc | 6.5 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A17856 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |

Table 2. Quality on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| | Treatment and rate per 1000 sq ft ^y | Application code ^y | Quality ^z | | | | |
|----|------------------------------------------------|-------------------------------|----------------------|---------|---------|---------|---------|
| | | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 24 | A16422 2.5 fl oz | BDFHJL | 6.8 ab | 6.8 abc | 7.3 a-d | 7.0 ab | 7.0 a |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A17856 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 25 | A16422 1.5 fl oz | BDFHJL | 6.3 b | 6.3 bc | 6.5 a-f | 6.0 ad | 6.0 ab |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A17856 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 26 | Affirm 11.3 WDG 0.88 oz..... | BDFHJL | 6.8 ab | 6.5 abc | 7.3 a-d | 6.8 ab | 7.0 a |
| | A16422 3.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 27 | Nontreated | - | 5.8 b | 5.8 c | 5.8 def | 3.8 f | 3.8 d |
| 28 | Nontreated | - | 6.3 b | 6.3 bc | 5.3 f | 4.0 ef | 4.0 cd |
| 29 | Nontreated | - | 6.3 b | 6.0 bc | 5.5 ef | 4.5 def | 4.0 cd |
| 30 | Nontreated | - | 6.3 b | 6.0 bc | 5.5 ef | 4.8 cf | 4.5 bcd |

^z Quality was visually assessed on a 1 to 9 scale where 1 = entire plot brown and 9 = optimum uniformity and density.

^y Treatments were applied on the following dates: A = 25 Apr, B = 26 May, C = 1 Jun, D = 8 Jul, and E = 15 Jun, F = 22 Jun, G = 29 Jun, H = 5 Jul, I = 12 Jul, J = 19 Jul, K = 26 Jul, L = 2 Aug.

^x Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ according to the Fisher's Protected least significant difference test.

Table 3. Color on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| Treatment and rate per 1000 sq ft ^y | Application code ^y | Color ^z | | | | |
|------------------------------------------------|-------------------------------|--------------------|---------|---------|---------|---------|
| | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 1 Signature Xtra Stressgard 4.0 oz..... | BDFHJ | 7.5 abcx | 7.8 a | 7.8 a | 7.8 a | 7.5 ab |
| Mirage 1.0 fl oz | BF | | | | | |
| Daconil Ultrex 3.2 oz | DHJ | | | | | |
| 2 Tartan 2.0 fl oz..... | A | 7.5 abc | 7.8 a | 7.8 a | 7.8 a | 7.3 abc |
| Signature Xtra Stressgard 4.0 oz | BFHJL | | | | | |
| Exteris stressgard 4.0 fl oz | BFJ | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Daconil Ultrex 3.2 oz | H | | | | | |
| 26GT 4.0 fl oz | L | | | | | |
| 3 Tartan 2.0 fl oz..... | A | 7.8 ab | 8.0 a | 7.8 a | 7.3 abc | 7.0 ad |
| Signature Xtra Stressgard 2.0 oz | BCDEFGHIJKL | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Exteris Stressgard 4.0 fl oz | FJ | | | | | |
| 26GT 4.0 fl oz | L | | | | | |
| Daconil Ultrex 3.2 oz | BH | | | | | |
| 4 Tartan 2.0 fl oz..... | A | 7.8 ab | 7.8 a | 7.8 a | 7.8 a | 7.3 abc |
| Signature Xtra Stressgard 2.0 oz | BCDEFGHIJKL | | | | | |
| Interface 4.0 fl oz | D | | | | | |
| Exteris Stressgard 1.5 oz | FGHIJKL | | | | | |
| Daconil Ultrex 3.2 fl oz | B | | | | | |
| 5 Tebuconazole 0.6 fl oz..... | BDFHJL | 6.5 bcd | 5.8 cd | 5.8 bcd | 5.5 cf | 5.5 cg |
| 6 Howler 0.5 g/100ml | BCDEFGHIJKL | 6.3 cd | 5.8 cd | 5.3 cd | 5.3 def | 5.3 dh |
| Capsil 6.0 fl oz/100gal | BCDEFGHIJKL | | | | | |
| 7 Howler 0.75 g/100ml..... | BDFHJL | 6.5 bcd | 5.8 cd | 5 d | 4.8 ef | 4.8 eh |
| 8 Companion 4.0 oz..... | BDFHJL | 6.5 bcd | 5.5 d | 4.5 d | 4.0 f | 3.8 h |
| 9 Howler 0.5 fl oz..... | BDFHJL | 6.3 cd | 6.0 bcd | 5.8 bcd | 5.8 be | 5.8 bf |
| Tebuconazole 0.3 fl oz | BDFHJL | | | | | |

Table 3. Color on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| | Treatment and rate per 1000 sq ft ^y | Application code ^y | Color ^z | | | | |
|----|------------------------------------------------|-------------------------------|--------------------|---------|---------|---------|---------|
| | | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 10 | Daconil Action 3.5 fl oz | BDFHJL | 7.5 abc | 6.8 a-d | 6.5 abc | 6.5 ad | 6.3 ae |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 11 | Velista 0.3 oz..... | BDFHJL | 7.0 bcd | 7.0 a-d | 7.0 ab | 7.0 abc | 6.8 a-d |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 12 | Daconil Action 3.5 fl oz | BDFHJL | 6.8 bcd | 7.0 a-d | 7.0 ab | 6.8 a-d | 6.8 a-d |
| | Velista 0.5 oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 13 | Daconil Action 3.5 fl oz | BDFHJL | 7.3 a-d | 7.0 a-d | 7.0 ab | 6.8 a-d | 6.8 a-d |
| | Medallion 1.0 oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 14 | Daconil Action 1 oz | BDFHJL | 7.3 a-d | 7.0 a-d | 6.8 ab | 6.8 a-d | 6.5 a-d |
| | Velista 0.3 oz | BDFHJL | | | | | |
| | Medallion 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 15 | Daconil Action 3.5 fl oz | BDFHJL | 7.0 bcd | 6.8 a-d | 6.8 ab | 6.5 a-d | 6.5 a-d |
| | Velista 0.5 oz | BDFHJL | | | | | |
| | Heritage Action 0.2 oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |
| 16 | Lexicon 0.34 fl oz | BDFHJL | 8.5 a | 8.0 a | 8.0 a | 8.0 a | 7.8 a |
| | Daconil Action 3.5 fl oz | BDFHJL | | | | | |
| | Signature Xtra 4.0 oz | BDFHJL | | | | | |
| | Primo Maxx 0.125 fl oz | BDFHJL | | | | | |

Table 3. Color on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| | Treatment and rate per 1000 sq ft ^y | Application code ^y | Color ^z | | | | |
|----|------------------------------------------------|-------------------------------|--------------------|---------|--------|---------|---------|
| | | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 17 | A16422 3.5 fl oz | BDFHJL | 7.0 bcd | 7.0 a-d | 7.0 ab | 6.8 a-d | 6.5 a-d |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A7087 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 18 | A16422 2.5 fl oz | BDFHJL | 7.3 a-d | 7.5 ab | 7.5 ab | 7.5 ab | 7.0 a-d |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A7087 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6 fl oz | BDFHJL | | | | | |
| 19 | A16422 1.5 fl oz | BDFHJL | 7.0 bcd | 7.3 abc | 7.3 ab | 7.3 abc | 7.3 abc |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A7087 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 20 | A16422 3.5 fl oz | BDFHJL | 7.3 a-d | 7.5 ab | 7.5 ab | 7.3 abc | 7.3 abc |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A22063 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 21 | A16422 2.5 fl oz | BDFHJL | 7.3 a-d | 7.5 ab | 7.5 ab | 7.3 abc | 7.3 abc |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A22063 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 22 | A16422 1.5 fl oz | BDFHJL | 6.8 bcd | 7.3 abc | 7.3 ab | 7.3 abc | 7.3 abc |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A22063 0.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 23 | A16422 3.5 fl oz | BDFHJL | 7.0 bcd | 7.3 abc | 7.3 ab | 7.3 abc | 6.8 a-d |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A17856 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |

Table 3. Color on an annual bluegrass putting green following the application of various commercially available and experimental fungicides, 2016.

| | Treatment and rate per 1000 sq ft ^y | Application code ^y | Color ^z | | | | |
|----|------------------------------------------------|-------------------------------|--------------------|---------|--------|---------|---------|
| | | | 17 Jun | 1 Jul | 15 Jul | 29 Jul | 12 Aug |
| 24 | A16422 2.5 fl oz | BDFHJL | 7.0 bcd | 7.3 abc | 7.3 ab | 7.3 abc | 7.3 abc |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A17856 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 25 | A16422 1.5 fl oz | BDFHJL | 6.5 bcd | 6.8 ad | 6.8 ab | 6.8 a-d | 6.3 a-e |
| | A20744 0.3 oz | BDFHJL | | | | | |
| | A17856 1.0 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 26 | Affirm 11.3 WDG 0.88 oz..... | BDFHJL | 6.8 bcd | 7.3 abc | 7.3 ab | 7.0 abc | 7.0 a-d |
| | A16422 3.5 fl oz | BDFHJL | | | | | |
| | Appear 6.0 fl oz | BDFHJL | | | | | |
| 27 | Nontreated | - | 6.3 cd | 5.5 d | 4.3 d | 4.0 f | 3.8 h |
| 28 | Nontreated | - | 6.5 bcd | 5.5 d | 4.3 d | 4.3 ef | 4.0 gh |
| 29 | Nontreated | - | 6.3 cd | 5.5 d | 4.8 d | 4.5 ef | 4.5 fgh |
| 30 | Nontreated | - | 6.0 d | 5.5 d | 5.0 d | 4.8 ef | 4.8 e-h |

^z Color was visually assessed on a 1 to 9 scale where 1 = entire plot brown and 9 = optimum greenness.

^y Treatments were applied on the following dates: A = 25 Apr, B = 26 May, C = 1 Jun, D = 8 Jul, and E = 15 Jun, F= 22 Jun, G= 29 Jun, H= 5 Jul, I= 12 Jul, J= 19 Jul, K= 26 Jul, L= 2 Aug.

^x Means in a column followed by the same letter are not significantly different at $P \leq 0.05$ according to the Fisher's Protected least significant difference test.