

The Effects of Various Fungicides on the Control of Overwintering Diseases 2003-04

M.A. Anderson and J.B. Ross
Prairie Turfgrass Research Centre
Tom Altmann and Jason Carleton
Greywolf Golf Resort

Summary

This trial was developed in order to evaluate various fungicides for their control of overwintering diseases. The site at Greywolf Golf Resort was chosen due to consistently high disease on creeping bentgrass fairways. This site is considered a worst case scenario for snow moulds due to the susceptibility of the grasses to snow mould and the long winters with deep snow cover. As a result, plots were not inoculated as significant natural infections typically occur at this site. Plots were laid out and treatments were applied on October 17 and 27, 2003. An evaluation to determine the effectiveness of the various treatments was conducted on April 16, 2003.

The winter of 2003-04 was considered to be one where snow pack was normal to above normal and disease pressure was very high. The snow cover duration was about 158 days. However, a rainfall event that occurred prior to, during and after the first application of the products likely reduced their effectiveness. This may have increased the area covered by disease, as it was 93% on the untreated control plots.

All products were applied on both application dates unless otherwise stated. Rate of application was per 100m². Effective control was obtained with the following treatments.

- Rovral Green GT 250ml and Daconil 50WG 250ml and Terraclor 75W 120g
- Quintozene 7-3-12 1560g (single application on final date only)
- Quintozene 7-3-12 1560g
- Quintozene 7-3-12 1170g
- Quintozene 7-3-12 780g
- Triticonazole SC1.67 32ml and Compass 50WG 15.2g
- Banner 130EC 170ml and Daconil 50WG 250ml
- Rovral Green GT 250ml and Compass 50WG 7.6g

Introduction

Fine turfgrasses, which are not protected by fungicides, are predisposed to damage caused by snow moulds. On golf greens, where creeping bentgrass (*Agrostis palustris*) or annual bluegrass (*Poa annua*) are the predominant species disease damage is a frequent occurrence. Turfgrasses weakened or damaged by snow moulds are extremely slow to recover and are often invaded by opportunistic weedy grass species. As the possibility of chemical resistance to snow moulds increases, new fungicides may be of benefit.

A typical snow mold prevention program consists of three fall applications and a single application in the spring and fungicides with different modes of action are alternated. However, in this trial, the same products were applied on both dates so that the individual fungicides or tank mixes could be evaluated for snow mould control.

Materials and Methods

Plots were located on a fairway at the Greywolf Golf Resort, Panorama, British Columbia, Canada. This site was chosen due to consistently high disease pressure on creeping bentgrass fairways from winters with lasting snow cover. 1 m x 2 m plots were arranged in a randomized complete block design with four replications. A 0.5 meter buffer was maintained around each plot. Treatments were applied with a compressed air sprayer on October 17 and October 27, 2003 which was 16 and 5 days prior to permanent snow cover. The sprayer was equipped with TeeJet 8004 nozzles and was calibrated to apply 10.3 litres/100m². Plots were not inoculated.

Disease ratings were conducted on April 16, 2004 and were based on percent area symptomatic. Pathogen identification was by means of visual and microscopic assessment. Three samples were taken from each of the four untreated control plots and used for an individual disease severity assessment. Sample size was approximately 5 by 5 cm and was removed with a knife. Individual shoots from each sample were visually examined for the presence of sclerotia of *Typhula ishikariensis* (long duration snow cover grey snow mould). In addition, one leaf from each of the individual samples was examined under a microscope for the presence of spores of *Microdochium nivale* (pink snow mould). Percentage of plants and leaves infected was determined in order to assess disease severity for each disease.

All treatments were applied on both application dates unless otherwise indicated. The following treatments are listed as amount of product per 100m².

1. Untreated control
2. Quintozene 7-3-12 1560g single application on final date only
3. Quintozene 7-3-12 1560g
4. Quintozene 7-3-12 1170g
5. Quintozene 7-3-12 780g
6. Triticonazole SC1.67 64ml
7. Triticonazole SC1.67 32ml
8. Triticonazole SC1.67 16ml
9. Compass 50WG 3.8g
10. Compass 50WG 7.6g
11. Compass 50WG 15.2g
12. Rovral Green GT 250ml and Compass 50WG 7.6g
13. Triticonazole SC1.67 32ml and Compass 50WG 7.6g
14. Rovral Green GT 360 ml
15. Banner 130EC 170ml and Daconil 50WG 250ml
16. Triticonazole SC 1.67 32ml and Compass 50WG 15.2g
17. Arrest 75W 275g
18. Triticonazole SC1.67 16ml and Rovral Green GT 250ml
19. Triticonazole SC1.67 32ml and Daconil 50WG 250ml
20. Triticonazole SC1.67 64ml and Rovral Green GT 250ml
21. Rovral Green GT 250ml and Daconil 50WG 250ml and Terraclor 75W 120g
22. Eagle 40 WP 30g and Rovral Green GT 250ml
23. Eagle 40 WP 30g and Insignia 22.5g
24. Eagle 40 WP 30g and Insignia 15g

Product Active Ingredient Information

Arrest 75W	Contact	Wettable Powder	Thiram/Oxycarboxin/Carbathiin
Compass 50WG	Systemic	Wettable granular	Trifloxystrobin 50%
Daconil 50WG	Contact	Wettable granular	Chlorothalonil 500g/l
Eagle 40WP	Systemic	Wettable Powder	Myclobutanil 40%
Insignia 20WG	Systemic	Wettable granular	Pyraclostrobin 20%
Quintozene 7-3-12	Contact	Granular	Quintozene 15.4%
Rovral Green GT	Contact	Liquid	Iprodione 240g/l
Terraclor 75W	Contact	Wettable Powder	Quintozene 75%
Triticonazole 1.67SC	Systemic	Soluble concentrate	Triticonazole 16.7%

Status of Registration in Canada

Arrest is registered for grey and pink snow mould, as well as LTB. Banner, Daconil, Terraclor, quintozene, and Rovral Green are all registered for use on grey and pink snow mould. Eagle is only registered for grey snow mould. Compass, although registered for turf, is only registered for use on brown patch, leaf spot and grey leaf spot. Both Triticonazole and Insignia are not registered for use in Canada at this time, although both are being considered. At present, the only registered tank mix for grey and pink snow mould is Daconil and Rovral Green. For more information go to the following website. <http://www.hc-sc.gc.ca/pmra-arla/english/main/search-e.html>

Results

Weather Conditions 2003-04

The Greywolf Golf Resort is located in Panorama, British Columbia. It is a golf/ski resort and is located above the town site of Invermere in mountainous terrain. Snow pack was normal to above normal and maximum cover on the test site was approximately 110 cm. Permanent snow cover occurred on November 2, 2003 and had completely melted by April 10, 2004. Snow cover duration of approximately 158 days produced very high disease severity (93% damage on untreated control plots).

Prior to and during the first application of fungicide on October 17, considerable precipitation (15mm) was recorded. Plots had a small amount of standing water prior to the fungicide application and the excess water was removed with roller squeegees. As it was not raining at the time, the decision was made to apply the various treatments. However, during application and immediately following application approximately 5mm of rain was recorded.

Presence of Overwintering Pathogens

Shoot numbers in individual samples ranged from 10 to 21 depending on the size of the sample and the density of the shoots. Of the 155 shoots rated for grey snow mould, 13% were infected, while 100% of the samples were infected with pink snow mould. Individual samples were also removed from an adjoining rough area and another fairway and examined for the presence of disease. The rough area was predominantly Kentucky bluegrass while the fairway was creeping bentgrass. The fairway sample had 90% of the shoots infected with grey snow mould and also showed the presence of pink snow mould. In contrast, the Kentucky bluegrass sample had 70% of the shoots infected with grey snow mould but pink snow mould was not present.

Comparison of Various Treatments

Table 1 - Percent disease for various fungicides (April 16, 2004).

Product and Rate	Percent disease cover
Rovral Green GT 250ml and Daconil 50WG 250ml and Terraclor 75W 120g	9.00 A
Quintozene 7-3-12 780g	17.75 A
Quintozene 7-3-12 1560g (Single application)	18.75 A
Triticonazole SC 1.67 32ml and Compass 50WG 15.2g	20.00 A
Quintozene 7-3-12 1560g (Double application)	20.25 A
Banner 130EC 170 ml and Daconil 50WG 250ml	22.50 A
Quintozene 7-3-12 1170g	24.75 A
Rovral Green GT 250ml and Compass 50WG 7.6g	25.00 A
Compass 50WG 15.2 g	51.25 B
Eagle 40 WP 30g and Rovral Green GT 250ml	57.50 BC
Triticonazole SC 1.67 32ml and Compass 50WG 7.6g	58.75 BCD
Rovral Green GT 360 ml	71.25 BCDE
Eagle 40 WP 30g and Insignia 22.5g	71.25 BCDE
Triticonazole SC 1.67 64ml and Rovral Green GT 250ml	71.25 BCDE
Compass 50WG 3.8g	75.00 CDEF
Triticonazole SC 1.67 16ml and Rovral Green GT 250ml	75.00 CDEF
Triticonazole SC 1.67 32 ml and Daconil 50WG 250 ml	76.25 CDEF
Compass 50WG 7.6 g	78.75 DEFG
Eagle 40 WP 30g and Insignia 15g	81.25 EFG
Triticonazole SC 1.67 64 ml	89.25 EFG
Triticonazole SC 1.67 16ml	92.50 FG
Untreated control	93.25 FG
Arrest 75W 275g	98.50 G
Triticonazole SC 1.67 32ml	99.00 G
LSD value	20.5

*Numbers followed by the same letter are not significantly different at p=0.05

Very effective control was obtained with the following treatments (Table 1):

- Rovral Green GT 250ml and Daconil 50WG 250ml and Terraclor 75W 120g
- Quintozene 7-3-12 1560g single application only
- Quintozene 7-3-12 1560g
- Quintozene 7-3-12 1170g
- Quintozene 7-3-12 780g
- Triticonazole SC1.67 32ml and Compass 50WG 15.2g
- Banner 130EC 170ml and Daconil 50WG 250ml
- Rovral Green GT 250ml and Compass 50WG 7.6g

Discussion

The effectiveness of the first application of fungicide was no doubt reduced due to the rainfall that occurred prior to, during and after application of the products. Typically 1-4 hours is required for plants to uptake the products through the leaves. It is believed that sufficient rainfall occurred during this period to wash off much of the product and render it ineffective. Therefore, all information in this report regarding products that were ineffective should be taken with the understanding that there really was only one application of product.

Once again this year disease severity was considered to be very high. In fact, in the five years of snow mould trials at Greywolf, there has only been one year where percent disease was less than 80% and that was attributed to reduced snow depth and short duration of snow cover. The rating scale for disease severity is based on area covered with the disease and is classed as very low (0-19%), low (20-39%), moderate (40%-59%), high (60%-79%) and very high (>80%).

For the first time an attempt was made to quantify disease through the observation of individual shoots and leaves. Previously, we had attempted to determine the disease percentage by examining the actual turfgrass stand symptoms of the disease. However, this method was very inaccurate due to the fact that the diseases coalesced which made it difficult to distinguish between them. Furthermore, this method did not take into account that an individual plant could be infected by more than one disease at the same time.

From the revised method it was possible to determine that the disease severity of pink snow mould was very high (>80%) as 100% of the leaves were infected. However, the method for determining the disease severity of grey snow mould produced results that were more variable. Only 13% of the plants had sclerotia of grey snow mould growing on the shoots, which would indicate that disease severity was very low. However, the absence of sclerotia does not necessarily mean that grey snow mould is not present. As it appeared that many of the sclerotia were just emerging through the shoots, a later field sampling may have produced a higher percentage of shoots with sclerotia. In future, refrigeration of the samples may help to produce higher percentages.

When rating the 12 individual samples there was great variability in the number of shoots that had sclerotia. One sample did not have any sclerotia on any of the 21 shoots, while another had sclerotia on 5 of 10 shoots. Rating the individual samples from the control

plots showed that the disease severity of the grey snow mould was very low (0%) to moderate (50%). On the other sampled fairway, grey snow mould was present on 90% of the shoots and on 70% of the Kentucky bluegrass in the rough area. The fairway that had 90% of the shoots infected was higher in elevation and retained snow cover for a few days longer than the test area. This may have been all that was required to produce greater severity.

As far as individual products were concerned the quintozone was very effective in controlling the diseases this year. In fact, the single application at the high rate was just as effective as the products that were applied twice. This might indicate that when pink snow mould severity is high a single application at this high rate may be all that is necessary. Previously, control of snow moulds had been very inconsistent with quintozone which may have been as a result of higher disease severity from grey snow mould. Further study where severity from both diseases is effectively rated will provide more reliable recommendations.

The tank mix of Terraclor 75W (quintozone), Daconil 2787 and Rovral Green GT, which has been effective in trials in the northern United States, was also very effective at Greywolf. Multiple years of evaluation will provide more information on its long term effectiveness.

Rovral Green GT and Compass appears to have potential as a good tank mixture for the control of grey and pink snow mould. Compass, a strobilurin fungicide, at the high rate by itself was somewhat effective. Banner and Daconil was a very effective tank mixture.

Eagle and Rovral Green, which has been the top performer at Greywolf over the years, was only somewhat effective this year. Its effectiveness was likely reduced by the rainfall.

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