# EVALUATION OF FUNGICIDES FOR CONTROL OF POWDERY MILDEW IN KENTUCKY BLUEGRASS IN CENTRAL OREGON, 2000

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Fungicides were evaluated for control of powdery mildew in Kentucky bluegrass during 1998 and 1999. The new fungicides Quadris, Folicur and Rally (Laredo) were compared to industry standards and other registered fungicides. During 2000 the first objective was to evaluate the fungicides applied at the first sign of disease infection, some of which were applied in combination with sulfur (Microthiol). The second objective was to evaluate fungicides applied after moderate levels of powdery mildew had developed as in previous years. In addition to being able to evaluate each set of plots separately, the performance of fungicides could be evaluated for differences in application timing.

Fungicides were evaluated for control of powdery mildew in commercial fields of Kentucky bluegrass ('Merit' and 'Geronimo') grown for seed near Madras, Oregon. The fungicides Rally (Laredo), Tilt, Stratego, Folicur, Bayleton, and Quadris plus Microthiol were applied to 10 x 25 foot plots replicated four times in a randomized complete block design.

The first set of plots had treatments applied at the first sign of disease on April 8, and re-applied on May 19 when the disease began to rebuild. Treatments for the first and second applications were the same except for treatments 3 and 4, which were initially treated with Tilt but were followed by Quadris at 6 oz/a plus Microthiol and Quadris at 9 oz/a plus Microthiol, respectively. The second set of plots (adjacent to the first plots in the same two fields) were treated April 26 once powdery mildew was established. All fungicide treatments were applied with TeeJet 8002 nozzles on a 9-ft, $CO_2$ pressurized, hand-held boom sprayer at 40 psi and 20 gal of water/a. Crop oil concentrate at 1% v/v was applied with fungicides to the first set of plots, while Sylgard 309 was applied at 0.25% v/v with fungicides to the second set of plots.

Plots were evaluated using a rating scale from 0 to 5, with 0 being no mildew present and 5 indicating total coverage. Since the first set of plots were treated at the first sign of disease, no pre-treatments evaluations were made. These plots were evaluated April 17, April 24, May 2, May 10, May 18, May 26 and June 2. The second set of plots were evaluated before treatment April 25 and following treatment on May 3, May 10, May 17, May 24 and May 30.

In the early set of plots (Tables 1 and 2) all fungicides significantly reduced disease compared to untreated plots. All fungicides provided similar protection. On some evaluation dates there were significant differences between fungicides, with Quadris plus Microthiol providing less control and Tilt alone or in combination with Microthiol and Rally (Laredo) applications providing better control than other fungicide treatments. Fungicides remained effective 32 days after treatment, but performance was eroding by 40 days after treatment so follow-up treatments were applied. There was some evidence that Tilt applied in combination with Microthiol performed slightly (non-significantly) better than Tilt alone. No change in disease control was observed when Tilt was followed by Quadris plus Microthiol rather than a second Tilt application. However, there could be resistance management reasons for using products with varying modes of action.

Fungicides applied after disease establishment (Tables 3 and 4) all significantly reduced disease compared to the untreated plots and all provided similar protection. Fungicides in these plots where application was delayed until powdery mildew had developed to moderate levels had begun losing effectiveness by 34 days after treatment.

Table 1. Powdery mildew ratings on Kentucky bluegrass ('Merit') near Madras, Oregon following fungicide application on April 8 and reapplication May 19, 2000.

| Treatment | Rate | Evaluation dates | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | April 17 | April 24 | May 2 | May 10 | May 18 | May 26 | June 2 |
| | (product/a) | | | | | | | |
| Quadris + Microthiol | 6 oz + 5 lb/a | 0.48 b | 0.31 b | 0.15 b | 0.33 b | 0.48 b | 0.52 b | 0.75 b |
| Quadris + Microthiol | 9 oz + 5 lb/a | 0.39 b | 0.33 b | 0.21 b | 0.21 b | 0.44 b | 0.27 b | 0.54 b |
| Tilt | 6 fl oz/a | 0.44 b | 0 c | 0 b | 0.02 b | 0.42 b | 0.25 b | 0.36 b |
| Quadris + Microthiol | 6 oz + 5 lb/a | | | | | | | |
| Tilt | 6 fl oz/a | 0.46 b | 0.04 c | 0 b | 0.11 b | 0.40 b | 0.21 b | 0.27 b |
| Quadris + Microthiol | 9 oz + 5 lb/a | | | | | | | |
| Tilt | 6 fl oz/a | 0.40 b | 0.09 c | 0 b | 0.06 b | 0.19 b | 0.11 b | 0.13 b |
| Tilt + Microthiol | 6 fl oz + 5 lb/a | 0.24 b | 0.05 c | 0 b | 0 b | 0.17 b | 0.10 b | 0.06 b |
| Stratego | 10 fl oz/a | 0.23 b | 0.08 c | 0 b | 0.08 b | 0.54 b | 0.25 b | 0.19 b |
| Rally | 10 oz/a | 0.45 b | 0.05 c | 0 b | 0 b | 0.17 b | 0.15 b | 0.04 b |
| Untreated | ---- | 1.05 a | 1.11 a | 1.17 a | 2.13 a | 2.38 a | 2.46 a | 3.25 a |

[1]Rating scale was 0-5, with 0 = no mildew and 5 = the leaves completely covered.
[2]All treatments applied with Sylgard 309 at 1 qt/100 gal
[3]Mean separation with Student-Newman-Kuels Test at $P \leq 0.05$

Table 2. Powdery mildew ratings on Kentucky bluegrass ('Geronimo') near Madras, Oregon following fungicide application on April 8 and reapplication May 19, 2000.

| Treatment | Rate | Evaluation dates | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | April 17 | April 24 | May 2 | May 10 | May 18 | May 26 | June 2 |
| | (product/a) | | | | | | | |
| Quadris + Microthiol | 6 oz + 5 lb/a | 0.59 | 0.80 ab | 0.56 b | 0.46 b | 0.98 b | 0.88 b | 0.88 b |
| Quadris + Microthiol | 9 oz + 5 lb/a | 0.56 | 0.29 b | 0.29 b | 0.36 b | 0.48 b | 0.65 b | 0.85 b |
| Tilt | 6 fl oz/a | 0.45 | 0.25 b | 0.02 b | 0.02 b | 0.44 b | 0.65 b | 0.44 bc |
| Quadris + Microthiol | 6 oz + 5 lb/a | | | | | | | |
| Tilt | 6 fl oz/a | 0.21 | 0.04 b | 0 b | 0.04 b | 0.29 b | 0.22 b | 0.28 bc |
| Quadris + Microthiol | 9 oz + 5 lb/a | | | | | | | |
| Tilt | 6 fl oz/a | 0.54 | 0.16 b | 0 b | 0.04 b | 0.33 b | 0.36 b | 0.21 c |
| Tilt + Microthiol | 6 fl oz + 5 lb/a | 0.44 | 0.19 b | 0 b | 0 b | 0.23 b | 0.13 b | 0.15 c |
| Stratego | 10 fl oz/a | 0.53 | 0.31 b | 0.10 b | 0.09 b | 0.37 b | 0.48 b | 0.33 bc |
| Rally | 10 oz/a | 0.38 | 0.08 b | 0 b | 0.02 b | 0.38 b | 0.40 b | 0.15 c |
| Untreated | ---- | 0.99 | 1.29 a | 1.44 a | 1.65 a | 2.15 a | 2.65 a | 2.67 a |
| | | ns | | | | | | |

[1]Rating scale was 0-5, with 0 = no mildew and 5 = the leaves completely covered.
[2]All treatments applied with Sylgard 309 at 1 qt/100 gal
[3]Mean separation with Student-Newman-Kuels Test at $P \leq 0.05$

Table 3. Powdery mildew ratings on Kentucky bluegrass ('Merit') near Madras, Oregon following fungicide application on April 26, 2000.

| Treatment | Rate | Evaluation dates | | | | | |
|---|---|---|---|---|---|---|---|
| | | April 25 | May 3 | May 10 | May 17 | May 24 | May 30 |
| | (product/a) | (pre-trtmt) | | | | | |
| Rally | 8 oz/a | 1.20 | 0.53 b | 0.17 b | 0.02 b | 0 b | 0.19 bc |
| Rally | 10 oz/a | 1.29 | 0.75 ab | 0.17 b | 0.02 b | 0 b | 0.06 c |
| Tilt | 4 fl oz/a | 1.11 | 0.61 ab | 0.17 b | 0 b | 0.08 b | 0.38 bc |
| Tilt | 6 fl oz/a | 1.20 | 0.74 ab | 0.19 b | 0.02 b | 0 b | 0.19 bc |
| Stratego | 8 fl oz/a | 1.06 | 0.40 b | 0.13 b | 0.06 b | 0.11 b | 0.19 bc |
| Stratego | 10 fl oz/a | 1.11 | 0.51 b | 0.11 b | 0.02 b | 0.04 b | 0.52 bc |
| Folicur | 6 fl oz/a | 1.30 | 0.80 ab | 0.29 b | 0.04 b | 0.19 b | 0.84 b |
| Bayleton | 4 oz/a | 1.20 | 0.81 ab | 0.13 b | 0.06 b | 0.02 b | 0.32 bc |
| Untreated | ---- | 1.30 | 1.06 a | 1.67 a | 2.15 a | 2.81 a | 2.73 a |
| | | ns | | | | | |

[1]Rating scale was 0-5, with 0 = no mildew and 5 = the leaves completely covered.
[2]All treatments applied with Sylgard 309 at 1 qt/100 gal
[3]Mean separation with Student-Newman-Kuels Test at $P \leq 0.05$

Table 4. Powdery mildew rating on Kentucky bluegrass ('Geronimo') near Madras, Oregon following fungicide application on April 26, 2000.

| Treatment | Rate | Evaluation dates | | | | | |
|---|---|---|---|---|---|---|---|
| | | April 25 | May 3 | May 10 | May 17 | May 24 | May 30 |
| | (product/a) | (pre-trtmt) | | | | | |
| Rally | 8 oz/a | 1.2 | 0.99 | 0.90 | 0.29 b | 0.13 b | 0.46 b |
| Rally | 10 oz/a | 0.95 | 0.86 | 0.33 | 0.23 b | 0 b | 0.17 b |
| Tilt | 4 fl oz/a | 1.31 | 1.15 | 0.83 | 0.42 b | 0.25 b | 0.47 b |
| Tilt | 6 fl oz/a | 1.34 | 1.19 | 0.98 | 0.71 b | 0.33 b | 0.38 b |
| Stratego | 8 fl oz/a | 1.30 | 0.95 | 0.50 | 0.34 b | 0.10 b | 0.50 b |
| Stratego | 10 fl oz/a | 1.39 | 0.90 | 0.46 | 0.23 b | 0.08 b | 0.34 b |
| Folicur | 6 fl oz/a | 1.18 | 1.03 | 0.65 | 0.23 b | 0.15 b | 0.33 b |
| Bayleton | 4 oz/a | 1.41 | 1.20 | 0.85 | 0.56 b | 0.27 b | 0.31 b |
| Untreated | ---- | 1.06 | 1.06 | 1.19 | 1.21 a | 1.52 a | 1.96 a |
| | | ns | ns | ns | | | |

[1]Rating scale was 0-5, with 0 = no mildew and 5 = the leaves completely covered.
[2]All treatments applied with Sylgard 309 at 1 qt/100 gal
[3]Mean separation with Student-Newman-Kuels Test at $P \leq 0.05$