EVALUATION OF FUNGICIDES FOR CONTROL OF POWDERY MILDEW ON KENTUCKY BLUEGRASS IN CENTRAL OREGON (2020)

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Introduction

Powdery mildew caused by *Blumeria graminis* f. sp. *poae* is a common foliar disease in Kentucky bluegrass (KBG) seed production systems of the Pacific Northwest. In central Oregon, the disease usually appears in early spring, causing white, powdery spots on leaves that eventually turn necrotic (Butler et al., 2002). Powdery mildew is favored by relatively cool and humid conditions, and the disease tends to be more prominent in older leaves and first-year stands. Powdery mildew is primarily controlled with fungicides, of which many are labeled for use in KBG seed production (Pscheidt and Ocamb, 2020). A study was initiated in the spring of 2020 to compare the efficacy of currently labeled fungicides and fungicides that show potential for labeling in grass grown for seed.

Materials and Methods

The trial was established in a first-year commercial KBG seed production field (cv. 'Rhythm') in Madras, OR. The field was planted in August 2019 in 2.5-foot-wide beds (three rows of plants per bed) and was furrow irrigated. Plots were 30 feet x 10 feet with 5-foot buffers. The experimental design was a randomized complete block with four replicates and eight treatments, including a nontreated control.

Fungicides were applied when plants were 2–5 inches in height on April 8 and again at late boot to early heading on May 7. Applications were made using a CO_2-charged spray boom configured with six TP8002VS flat fan nozzles spaced 18 inches apart delivering 20 gal/acre at 28 psi.

Powdery mildew severity was evaluated in five 10-ft^2 subplots located in the center two beds of each plot using a 0–5 ordinal scale, where 0 = no disease present, 1 = 1–10% of subplot exhibiting mildew, 2 = 11–30% of subplot exhibiting mildew, 3 = 31–70% of subplot exhibiting mildew, 4 = 71–90% of subplot exhibiting mildew, and 5 = 91–100% of subplot exhibiting mildew. The sum of the ordinal ratings from the five subplots was used for analyses. Repeated ratings were used to calculate area under disease progress curve (AUDPC) values using the following formula: $\Sigma_i^{n-1}((Y_i + Y_{i+1})/2)(t_{i+1} - t_i)$, where Y_i = cumulative disease severity at the i^{th} observation, t_i = time (days) at the i^{th} observation, and n = number of observations. The center two beds of each plot (30 feet x 5 feet) were swathed on July 10, 2020 and harvested on July 28. The seed was cleaned and conditioned using laboratory-scale seed-cleaning equipment to assess seed yield.

Disease rating and AUDPC data were subjected to analysis of variance using PROC MIXED in SAS 9.4, and treatment means were compared using Tukey's honest significant difference test ($\alpha = 0.05$). Yield data were subjected to the Kruskal-Wallis test using PROC NPAR1WAY in SAS.

Results and Discussion

A significant effect of fungicide treatment was observed at all evaluation dates and for AUDPC values ($P < 0.0001$; Tables 1 and 2). Quilt Xcel SE, Aproach 2.08 SC, Aproach 2.08 SC + PropiMax EC (both rates), and Tilt 3.6E significantly reduced powdery mildew at all evaluation dates compared to the control. All of the fungicide products significantly reduced AUDPC values compared to the nontreated control, with the exception of Headline SC.

Although not statistically significant, fungicide treatments increased numerical yields by 41.3–73.4% compared to the nontreated control (Table 1). Interestingly, Headline SC, which did not significantly reduce AUDPC values compared to the nontreated control, exhibited the second-highest yields overall. Significant ($P < 0.05$) negative correlations were observed between yield and powdery mildew ratings collected on April 23, April 29, May 6, and May 14, as well as between yield and final AUDPC values, indicating reduced yields with increasing powdery mildew severity (Table 2). Plans are in place to repeat this trial at two locations in 2021.

References

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Table 1. Powdery mildew disease severity ratings, area under disease progress curve (AUDPC) values, and seed yields of Kentucky bluegrass following fungicide treatments.[1]

Treatment (rate)[2]	Apr. 18	Apr. 23	Apr. 29	May 6	May 14	AUDPC	Yield[3]
							(lb/a)
Nontreated	8.0 a	8.8 a	11.5 a	11.5 a	15.8 a	183.1 a	1,151.8
Quilt Xcel SE (14 oz/a)	3.0 bc	2.5 bc	1.3 c	0.5 c	0.8 c	31.1 bc	1,997.0
Aproach 2.08 SC (9 oz/a)	2.3 c	3.0 bc	3.8 bc	3.8 b	8.0 b	59.6 bc	1,627.6
Aproach 2.08 SC (9 oz/a) + PropiMax EC (4 oz/a)	2.8 bc	2.0 c	1.5 c	0.3 c	0.0 c	28.5 c	1,810.4
Aproach 2.08 SC (6 oz/a) + PropiMax EC (4 oz/a)	3.0 bc	1.5 c	1.3 c	0.0 c	0.0 c	23.9 c	1,811.6
TebuStar 3.6L (8 oz/a)	5.3 ab	5.5 ab	4.5 bc	3.0 bc	2.3 c	83.1 b	1,805.6
Headline SC (12 oz/a)	5.3 ab	6.8 a	8.5 ab	9.3 a	10.3 b	137.9 a	1,826.7
Tilt 3.6E (4 oz/a)	4.3 bc	2.5 bc	0.5 c	0.0 c	0.0 c	27.6 c	1,747.3
P-value	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	0.0762

[1]Disease rating and AUDPC data were subjected to analysis of variance using PROC MIXED in SAS 9.4 (SAS Institute, Cary, NC), and treatment means were compared using Tukey's honest significant difference test ($\alpha = 0.05$). Column means followed by the same letter are not significantly different at LSD ($P < 0.0001$).
[2]All products were applied with Induce, a nonionic surfactant, at 0.25% v/v.
[3]Yield data were subjected to the Kruskal-Wallis test using PROC NPAR1WAY in SAS. The Kruskal-Wallis chi-square statistic and corresponding *P*-value are presented.

Table 2. Correlations and corresponding *P*-values between yield and in-season powdery mildew ratings and between yield and final area under disease progress curve (AUDPC) values.

	Apr. 18	Apr. 23	Apr. 29	May 6	May 14	AUDPC
Yield	-0.23339 $P = 0.1986$	-0.45054 $P = 0.0097$	-0.50698 $P = 0.0031$	-0.45134 $P = 0.0095$	-0.55664 $P = 0.0009$	-0.49051 $P = 0.0044$