EVALUATION OF FUNGICIDES FOR ERGOT CONTROL IN KENTUCKY BLUEGRASS SEED PRODUCTION

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Introduction

The fungal pathogen *Claviceps purpurea* causes ergot in Kentucky bluegrass seed crops in the Pacific Northwest (Alderman et al., 1998). Ergot is also a major disease problem in perennial ryegrass seed produced in irrigated production regions of Oregon and Washington. Ergot negatively affects the grass seed industry at all stages of production; the disease reduces yield, makes harvest difficult, hinders seed cleaning and certification efforts, and can prevent the sale of seed and seed by-products such as screenings and pellets. The fungus infects the unfertilized flowers of grasses and grains and transforms seed into dormant resting structures called sclerotia that overwinter and produce primary inoculum (ascospores) the next season.

Chemical management of ergot relies on fungicide applications during flowering to protect ovaries from airborne ascospores during pollination. Grass seed growers often make multiple fungicide applications during the flowering period in an effort to prevent and control the disease (Walenta et al., 2016). Fungicides (azoxystrobin and propiconazole) are applied either separately or as one of two commercial products that combine both active ingredients in varying amounts (with or without a third fungicide, benzovindiflupyr). These same active ingredients may also be used for rust and/or powdery mildew control in grass seed crops.

Taking into account the potential for repeated applications of similar fungicides for ergot, powdery mildew, and rust control in grass seed crops, the potential exists for resistance development in these fungal pathogens. A need exists to incorporate new active ingredients into the production system due to the limited fungicide options that are currently available for ergot management. Moreover, the rotation of fungicide chemistries or use of fungicides with multiple modes of action could delay the development of fungicide resistance in pathogens affecting grass seed. The objective of this research is to evaluate the efficacy of novel fungicides and fungicide combinations to control ergot in grass grown for seed.

Materials and Methods

Two fungicide trials were established at the Oregon State University Central Oregon Agricultural Research and Extension Center, in Madras, OR. Separate plots of Kentucky bluegrass cultivars 'Blue Ghost' and 'Shamrock' (26 feet long x 5 feet wide with 3-foot buffers) were seeded (5 lb seed/acre) on August 12, 2016. Plots were artificially infested with *C. purpurea* sclerotia on October 20, 2016. Plots exhibited ergot symptoms and produced sclerotia during the summer of 2017 prior to the establishment of the trial in April 2018. The experimental design was a randomized complete block with four and five replicates for 'Blue Ghost' and 'Shamrock', respectively.

Five fungicide treatments and a nontreated control were compared in both trials, with Quilt Xcel SE used as an industry standard. Fungicides were applied to 'Blue Ghost' and 'Shamrock' plots at the beginning of anthesis (Feekes 10.51) on May 21, 2018 and May 18, 2018, respectively. Applications were made using a CO_2-charged spray boom configured with three TP8002VS flat fan nozzles spaced 18 inches apart and delivering 20 gal/acre at 28 psi.

Samples consisting of 100 seed heads were randomly collected from each plot on July 3, 2018. Ergot incidence and severity were measured based on the proportion of panicles containing sclerotia and the number of sclerotia present in each panicle, respectively. Data were subjected to analysis of variance (ANOVA), and treatment means were compared using Tukey's honest significant difference test ($P < 0.05$).

Results and Discussion

A significant effect of fungicide treatment was observed for ergot incidence and severity in 'Blue Ghost' ($P = 0.0002$) and 'Shamrock' ($P < 0.0001$) (Table 1). Trivapro SE, Quilt Xcel SE, Aproach 2.08 SC, and A19649B significantly reduced ergot incidence and severity in 'Blue Ghost' compared to the control. None of the fungicides was significantly different from the industry standard, Quilt Xcel SE. All of the fungicides significantly reduced ergot incidence and severity in 'Shamrock' compared to the nontreated control. Overall, fungicide treatments reduced ergot incidence up to 28% and ergot severity up to 84% depending on the cultivar. These data can be used to obtain new and/or expanded fungicide labels for disease management in grass seed crops.

References

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Table. 1. Ergot incidence and severity in two Kentucky bluegrass cultivars following treatments with fungicides during anthesis.[1]

	FRAC group	-------- 'Blue Ghost' --------		-------- 'Shamrock' --------	
Treatment and rate[2]		Incidence[3]	Severity[4]	Incidence[3]	Severity[4]
(oz/a)					
Control	—	0.39 a	148.3 a	0.25 a	56.0 a
Priaxor SC, 6.0	7 + 11	0.28 ab	81.8 ab	0.10 b	16.2 b
A19649B, 3.8	7	0.21 bc	50.5 b	0.09 b	13.8 b
Aproach 2.08 SC, 12.0	11	0.21 bc	51.0 b	0.12 b	17.6 b
Trivapro SE, 27.4	3 + 7 + 11	0.11 c	24.3 b	0.06 b	12.4 b
Quilt Xcel SE, 14.0	3 + 11	0.17 bc	46.0 b	0.10 b	19.6 b
P-value		0.0002	0.0002	< 0.0001	< 0.0001

[1]Column means followed by the same letter are not significantly different at $P < 0.05$ as determined by Tukey's honest significant difference test.

[2]All products were applied with Induce, a nonionic surfactant, at 0.25% v/v.

[3]Ergot incidence = proportion of panicles containing sclerotia, out of 100 panicles sampled per plot

[4]Ergot severity = number of sclerotia present in each panicle, out of 100 panicles sampled per plot