DEVELOPMENT OF CONTROL PROGRAM FOR *CLAVICEPS PURPUREA* IN KENTUCKY BLUEGRASS SEED PRODUCTION

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Abstract

Ergot, an important flower-infecting pathogen affecting grass production, is particularly damaging to Kentucky bluegrass. To determine control measures without the use of field burning, three fungicides in combination with, and without, a surfactant were evaluated on two 'Coventry' Kentucky bluegrass fields located at Trail Crossing and Powell Butte. One hundred panicle samples were collected prior to harvest. Ergot infestation was substantially higher at Powell Butte, which had been infested with sclerotia during the winter and spring. All treatments significantly reduced the total number of sclerotia per plot compared to an untreated check. Of the several materials used, Punch provided the greatest control. Double applications of Tilt and Folicur at the high rate provided greater protection than single applications, or double applications at the low rates. This was true whether the second application was a fungicide or the wetting agent, Penaturf. Evaluation of percent panicles with sclerotia and average sclerotia per panicle provided similar results to total sclerotia per plot.

Introduction

Ergot, caused by the fungus, *Claviceps purpurea,* is an important flower-infecting pathogen in grass seed production regions of the Pacific Northwest. The pathogen produces an elongated, black sclerotia that replaces seeds in infected florets and causes a reduction in yield. These sclerotia are the primary means of survival and source of inoculum. In the spring, during flowering, spores from the sclerotia infect the grass flower and produce secondary spores, which causes exudate (honeydew) and makes harvest difficult. These secondary spores can be spread by water, wind and insects prior to sclerotia formation.

As one of the grass species grown for seed in Oregon, Kentucky bluegrass is particularly affected by ergot. Surveys conducted in central Oregon, where Kentucky bluegrass is the dominant variety being grown, indicate strong regional variation of ergot, with high levels in the Culver and Metolius area, contrasting to low incidence on the Agency Plains, north of Madras.

Because there are no fungicides registered for ergot, the only method of controlling the disease has been through open field burning. This practice has partially suppressed the disease in the past, as indicated by research conducted by John Hardison, plant pathologist at

Oregon State University. In spite of burning, ergot remains a major pest. Recently, pressure to decrease burning may leave grass seed producers with no effective tools to control ergot.

Methods and Materials

Research was conducted on two first-year 'Coventry' Kentucky bluegrass fields in central Oregon. One was with a grower cooperator in the Trail Crossing area and the other was at the Central Oregon Agricultural Research Center, Powell Butte site. The Powell Butte location was inoculated with ergot sclerotia during the winter and spring to insure a high inoculum level prior to application. Three fungicides, flusilazole (Punch, Dupont), propiconazole (Tilt, Ciba Geigy), and tebuconazole (Folicur, Mobay), in combination with, and without, Penaturf surfactant were applied to 10 x 20 ft plots replicated four times in a randomized complete block design. Materials were applied with a CO_2 pressurized boom sprayer. Following local standard procedure for fungicide application to grass seed, one pint/ 100 gal of LI 700 penetrant and 1 pint/ac of 17 percent oil were applied in combination with all fungicides, except one of two 7 oz ai/ac Punch treatments. Applications were made at Trail Crossing on June 7 and June 19, and treatments at the Powell Butte site were made on June 10 and June 19. The double surfactant treatment at Trail Crossing consisted of LI 700 at 4 pt/100 gal and 17 percent oil at 1 pt/ac, rather than Penaturf at 87 oz/ac as used at Powell Butte.

One hundred panicle samples were collected from each plot at Trail Crossing on July 6 and at Powell Butte on July 9. Samples were evaluated for percent of panicles with sclerotia, average sclerotia per panicle, and total sclerotia per plot. As of this reporting, evaluation of seed weight per plot, weight per 1,000 seed, and percent germination has not been completed.

Results and Discussion

A summary of the results for the Trail Crossing location is provided in Table 1, and data for the Powell Butte site is shown in Table 2. Disease levels at Powell Butte, where the trial was inoculated with sclerotia, were much more severe than at Trail Crossing. There were statistically significant differences between treatments for all variables evaluated.

All treatments significantly reduced the total number of sclerotia per plot when compared to the untreated check. Punch provided the best ergot control, with exception of the treatment without the LI 700 and 17 percent oil. Double treatments of all three materials at the higher rate out-performed single treatments of the same rate or double application at half the rate. This was true whether the second application was a fungicide or the wetting agent, Penaturf. Effectiveness of the double treatment of Penaturf at Powell Butte, or the LI 700 and 17 percent oil treatment at Trail Crossing, was well below that of the double fungicide treatments at the higher rates. Results for percent panicles with sclerotia and sclerotia per panicle were similar to total sclerotia per plot.

These same treatments were evaluated during 1992 at the Trail Crossing location. There were

low levels of ergot throughout the area, and no statistical difference was discernable between treatments. However, the trend was for double fungicide treatments at the high rates to provide the greatest crop protection. It also appears from the 1992 data that Penaturf may have reduced seed weight, while the single Punch application without the surfactant Silwet-77 produced the highest weight. Germination tests from the 1992 study indicate that double applications of Folicur significantly reduced seed germination, while there were no significant differences between the untreated plots and those treated with Tilt, Punch and Penaturf. If seed weight or germination is adversely influenced in 1993, this may place limitations on the use of certain products or application methodologies.

Table 1. Evaluation of fungicide treatments for ergot control on 'Coventry' Kentucky bluegrass in the Trail Crossing area of central Oregon, 1993.

Fungicide Treatments	Rate of application June 7	June 19	Panicles sclerotia	Sclerotia per panicle	Sclerotia per plot
	----oz		percent		100 panicles
Punch 25EC	71		1.8 ab[2]	0.8 a	3.3 ab
Punch 25EC	14		0.3 a	0.3 a	0.3 a
Punch 25EC	7		0.5 ab	0.5 a	1.0 a
Punch 25EC, Punch 25EC	7	7	0 a	0 a	0 a
Punch 25EC, Penaturf	7	78	0 a	0 a	0 a
Folicur 3.6F -	3.6		1.0 ab	0.6 a	1.3 a
Folicur 3.6F, Folicur 3.6F	1.8	1.8	2.5 ab	2.2 a	8.8 b
Folicur 3.6F, Folicur 3.6F	3.6	3.6	1.3 ab	0.6 a	1.5 a
Folicur 3.6F, Penaturf	3.6	87	0.5 ab	0.5 a	0.5 a
Tilt 3.6E	3.3		2.5 ab	1.2 a	4.0 ab
Tilt 3.6E, Tilt 3.6E	1.7	1.7	1.3 ab	1.8 a	3.5 ab
Tilt 3.6E, Tilt 3.6E	3.3	3.3	0.5 ab	0.5 a	0.5 a
Tilt 3.6E, Penaturf	3.3	87	0.5 ab	1.3 a	1.3 a
Penaturf, Penaturf	87	87	2.5 ab	1.3 a	4.3 ab
Untreated			3.5 b	5.3 b	16.5 c

Fungicide treatment without LI 700 penetrant and 17 percent oil.

[2] Means in column followed by the same letter are not statistically different by Duncan's Multiple Range test at P 0.05.

Table 2. Evaluation of fungicide treatments for ergot control on 'Coventry' Kentucky bluegrass at the COARC Powell Butte location in central Oregon, 1993.

Fungicide Treatments	Rate of application June 10	June 19	Panicles with sclerotia	Sclerotia per panicle	Sclerotia per plot
	----oz ai/A----		percent		100 panicles
Punch 25EC	71		41 def[1]	2.1 abc	121 abcde
Punch 25EC	14		8 a	1.2 a	12 a
Punch 25EC	7		22 ab	1.7 ab	51 ab
Punch 25EC, Punch 25EC	7	7	17 ab	1.7 ab	31 a
Punch 25EC, Penaturf	7	78	15 ab	1.3 a	24 a
Folicur 3.6F	3.6		45 def	2.9 bcd	184 bcde
Folicur 3.6F, Folicur 3.6F	1.8	1.8	57 fg	3.2 cd	224 de
Folicur 3.6F, Folicur 3.6F	3.6	3.6	30 bcd	2.2 abc	78 abcd
Folicur 3.6F, Penaturf	3.6	87	24 abc	1.8 abc	52 ab
Tilt 3.6E	3.3		45 def	3.2 cd	212 cde
Tilt 3.6E, Tilt 3.6E	1.7	1.7	50 of	3.1 bcd	191 bcde
Tilt 3.6E, Tilt 3.6E	3.3	3.3	31 bcde	2.4 abc	97 abcde
Tilt 3.6E, Penaturf	3.3	87	32 bcde	1.9 abc	73 abc
Penaturf, Penaturf	87	87	56 fg	3.9 d	244 e
Untreated			70 g	4.0 d	466 f

[1] Fungicide treatment without LI 700 penetrant and 17 percent oil.

[2] Means in column followed by the same letter are not statistically different by Duncan's Multiple Range test at P 0.05.