MONITORING ERGOT INFECTION POTENTIAL IN COMMERCIAL CULTIVARS OF KENTUCKY BLUEGRASS, GRANDE RONDE VALLEY OF NORTHEASTERN OREGON

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Introduction

A study was conducted in the Grande Ronde Valley of northeastern Oregon to evaluate ergot infection potential, crop phenology, and seed yield in eight commercial cultivars of Kentucky bluegrass (KBG). Ergot, caused by the fungal pathogen *Claviceps purpurea*, is a floral disease of cool-season grass seed crops in Oregon and Washington. The pathogen infects unfertilized flowers of host grasses and forms sclerotia instead of seed, which results in yield loss and reduced seed quality. Sclerotia overwinter and germinate in the spring to produce fruiting bodies called capitula, which in turn release millions of airborne ascospores.

The release of ascospores typically coincides with grass flowering (anthesis), which is the only period of host susceptibility. The objective of this study was to evaluate the potential of KBG cultivars to escape infection by ergot based on the flowering period of each cultivar in relation to peak ascospore production.

Materials and Methods

The trial (KBG-3) was direct seeded on April 2, 2015 in a commercial field of winter wheat with a 10-foot double disc plot drill with eight openers set on a 15-inch row spacing. The trial site had been treated with glyphosate 30 days before seeding to control the winter wheat crop and stabilize the soil to prevent wind erosion as the new stand of KBG established. The seeding rate for each cultivar was 5 lb/acre. KBG cultivars were selected based on importance to the local seed industry and potential to cover a range of flowering dates. Plots were 10 feet x 32 feet and were arranged in a randomized complete block design with four replications. Soil type at the site was an Imbler fine sandy loam (77% sand, 19.8% silt, 3.2% clay, 2.0% OM, 5.9 pH, and CEC of 11.4 meq/100g).

Crop phenology was assessed weekly from mid-April to late June to determine timing and duration of flowering for each KBG cultivar. The Feekes scale was used to stage crop development. Initial appearance of stigmas and/or anthers is considered to be the beginning of flowering (Feekes 10.51). Flowering was considered to be complete when at least 90% of the plot reached Feekes 11.1 (milk stage). Since phenology observations were made on a weekly basis, estimates were collected at flowering initiation and completion to determine the percentage of panicles at Feekes 10.51 and 11.1 development stages.

A Burkhard 7-day recording volumetric spore trap was used to monitor and quantify ascospore release on a continual basis from April 20 to June 21, 2016. The trap was located in the center of the KBG-3 trial site, with the air intake orifice located approximately 2 feet above the soil surface. Spore trap tapes were collected weekly, and the number of *C. purpurea* ascospores was determined microscopically on an hourly and daily basis. A second monitoring site was also located in a commercial field of 'Baron' Kentucky bluegrass (KBG-4) situated 0.25 mile northeast of Imbler, OR.

Disease incidence was monitored from May 31 to June 24. Final observations were collected on June 24, 2016 to determine disease incidence and severity by collecting 40 panicles randomly from each plot at the KBG-3 site. Incidence was calculated based on the number of panicles containing ergot sclerotia. Severity was calculated based on the number of sclerotia present in each infected panicle. Plots were swathed on June 29, 2016 and combine harvested on July 24, 2016. The KBG-4 site was utilized to monitor ergot ascospore activity and crop phenology only.

Seed yield was determined by processing samples at the OSU-Hermiston Agricultural Research and Extension Center in Hermiston, OR. The 4- to 6-kg seed samples from each harvested plot were weighed to determine total weight of uncleaned seed. Next, 1,000-gram (approximate weight) subsamples were collected for conditioning to determine clean seed yield/acre. Each subsample was debearded for 4½ minutes and then cleaned with a Clipper 3-screen cleaner set up with 7-round top, 7-round middle, and 6 x 34 mesh bottom screens. Clean seed yield/plot was calculated based on cleanout percentage for each subsample and is expressed as a percentage of the industry standard 'Abbey' KBG.

Results and Discussion

Overall, ergot ascospore production was very low at both monitoring sites during the 2016 growing season (Figure 1). Only 36 ascospores were collected during

the entire season at the KBG-3 variety trial site, from May 2 to June 1 (31 days). Even fewer ascospores (12) were collected at the 'Baron' commercial field (KBG-4) monitoring site during a shorter (15-day) period from May 6 to May 20.

Flowering period initiation and completion dates were determined for each cultivar (Table 1). 'Wildhorse', 'Endurance', 'ThermalBlue', 'Jumpstart', and 'Prosperity' began flowering between May 10 and May 17. 'Baron' and 'Abbey' began flowering between May 17 and May 24. 'Midnight II' began flowering May 17.

Peak ascospore activity at the KBG-3 site occurred between May 5 and May 8 (Figure 1), which was approximately 7–10 days before the early-flowering cultivars 'ThermalBlue', 'Jumpstart', and 'Wildhorse' began flowering (Table 1). After May 8, ascospore activity diminished and was intermittent until June 1, when ascospore activity ended.

The low ascospore density still presented a low risk for ergot infection in mid- to late May, since all cultivars were in various stages of flowering at that time. The risk of infection for 'ThermalBlue' and 'Jumpstart' cultivars was very low, as both had finished flowering by June 7; the end of their flowering period preceded that of all other cultivars by 7 days or more. 'Wildhorse' was at higher infection risk because its flowering stage lasted from mid-May to mid-June.

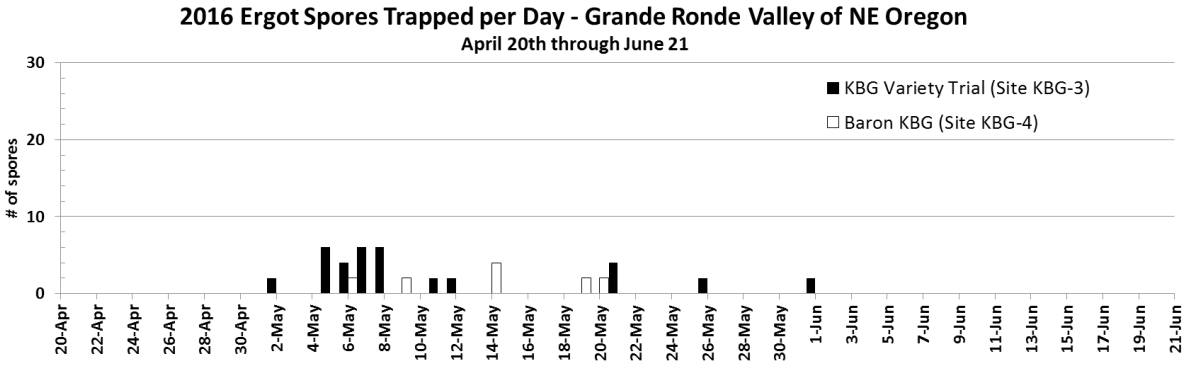

Figure 1. Results from two ergot monitoring sites in the Grande Ronde Valley of northeastern Oregon, 2016.

Table 1. Flowering period, ergot incidence, and seed yield for eight Kentucky bluegrass cultivars, Grande Ronde Valley of northeastern Oregon, 2016.

	---- Flowering period and % of panicles ----			Ergot incidence	---------- Seed yield[1] ----------	
Cultivar	Initiation[2,3]	End[4]	Period			
			(days)		(lb/a)	% Abbey
Baron	May 24 (80)	June 14 (75)	21	0	1,408 a	109 a
Wildhorse	May 17 (60)	June 14 (70)	28	0	1,406 a	109 a
Abbey	May 24 (65)	June 14 (95)	21	0	1,407 a	100 ab
Endurance	May 17 (30)	June 14 (92)	28	0	1,286 a	99 ab
ThermalBlue	May 17 (90)	June 7 (96)	21	0	1,107 ab	93 ab
Jumpstart	May 17 (65)	June 7 (100)	21	0	1,139 ab	88 ab
Prosperity	May 17 (25)	June 14 (50)	28	0	1,123 ab	87 ab
Midnight II	May 17 (1)	June 14 (75)	28	0	871 b	73 b
LSD ($P = 0.05$)					391	28.6

[1]Preliminary yield results
[2]Initiation of flowering period = Feekes 10.51 (flowering)
[3]No flowering was observed in any cultivars on May 10, 2016.
[4]End of flowering period = Feekes 11.1+ (milk stage)

Symptoms of ergot infection (honeydew) were not observed at any time prior to harvest at either the KBG-3 or KBG-4 site. Preharvest evaluations to determine disease incidence levels did not detect any honeydew or sclerotia in KBG panicles collected at the KBG-3 site.

First-year seed yields (Table 1) variedly considerably from 903 to 1,747 lb/acre across all cultivars and replications. 'Baron' and 'Wildhorse' yielded 9% more clean seed than the industry standard 'Abbey', but their yields were not statistically different from those of any other cultivar except for 'Midnight II', which yielded 23% less.

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