Evaluation of copper and boron for control of ergot on Kentucky bluegrass in Oregon, 2017

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Introduction

The ergot fungus can only infect the unfertilized ovaries of grasses, so factors that affect pollination efficiency can also affect ergot epidemics. Cultivars with short, uniform flowering periods and cultivars that produce copious amounts of viable pollen are less likely to be impacted by ergot than cultivars with extended flowering periods, low pollen production, and/or poor pollen viability. Deficiencies of two micronutrients in particular, copper and boron, can lead to male sterility in wheat and supplemental applications of these two micronutrients has been shown to decrease ergot and other floral diseases in wheat. The potential for micronutrients to improve pollination and reduce ergot in grass grown for seed needs to be determined. The objective of this research was to evaluate supplemental micronutrient applications during anthesis to reduce ergot.

Materials and Methods

Replicated field plots (70 ft^2) of Kentucky bluegrass (cv. 'Blue Ghost') were established at the Central Oregon Agricultural Research Center in August 2016. Plots were infested with sclerotia in October 2016. Plots were subjected to fertilization, irrigation, and cultural practices that are standard in the area.

Foliar treatments of copper sulfate (0.25 lb./A), TriPlex Boron® (0.5 lb./A), and a combination of copper sulfate (0.25 lb./A) and TriPlex Boron® (0.5 lb./A) were applied on May 19 (early Feekes 10.1) prior to flowering. A treatment consisting of ManKocide® (a premix of copper hydroxide and the fungicide mancozeb) at a rate of 1.7 lb./A was applied on May 23 (late Feekes 10.1). Plant tissue samples were taken prior to treatment application and 72 hours after application. Plant materials were dried at 60C and ground with a Wiley Mill. Ground samples were sent to OSU's Central Analytical Laboratory (Corvallis, OR) and analyzed for boron and copper concentrations using inductively coupled plasma optical emission spectrometry (ICP-OES).

The number of sclerotia were quantified from 50 plants per plot to determine ergot incidence and severity prior to swathing. An ergot disease index (EDI) was calculated by multiplying incidence and severity. Plots were harvested and seed was cleaned at the USDA ARS National Forage Seed Production Research Center prior to recording yields. Data were subjected to analysis of variance and treatment means were compared using Tukey's honest significant difference test.

Results and Discussion

Foliar treatments of copper sulfate, TriPlex Boron®, or copper sulfate + TriPlex Boron® did not significantly reduce ergot incidence ($P = 1.00$), severity ($P = 0.62$), or ergot disease index ($P = 0.80$). ManKocide®, a combination of copper hydroxide (CuOH) and the fungicide mancozeb, also did not significantly reduce ergot compared to the control ($P > 0.05$). Copper and boron

levels were not significantly different among treatments ($P > 0.59$). Significant effects on yield were also not observed ($P = 0.28$). Data is summarized in Table 1.

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Tables

Table 1. Ergot incidence, ergot severity, and ergot disease index (EDI), and seed yield following treatments with the micronutrients boron and/or copper prior to anthesis[1]

Treatment	Micronutrient	Rate (lb./A)	Change boron (ppm)	Change Copper (ppm)	Ergot incidence	Ergot severity	EDI	Yield (lb./A)
Control	**NA**	**NA**	-1.1	-2.7	0.3	28.8	9.0	1,980
TriPlex Boron	**B (16%)**	**0.5**	-1.2	-2.3	0.3	32.3	10.2	1,588
$CuSO_4 \cdot 5H_2O$	**Cu (25%)**	**0.25**	-0.4	-3.1	0.3	39.0	12.6	1,727
TriPlex Boron + $CuSO_4 \cdot 5H_2O$	**See above**	**See above**	-1.2	-4.1	0.3	36.0	12.9	2,000
ManKocide	**Cu (30%)**	**1.7**	-1.3	-2.4	0.3	45.5	15.8	1,800
		***P*-value**	0.59	0.94	1.00	0.62	0.80	0.28

[1] Treatments were not significantly different from each other ($P > 0.05$).