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Chloride Fertilization on Yield and Development Rate of Several Wheat Varieties in Montana

Personnel

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Location

Montana State University - Post farm, near Bozeman

Objectives

1. To determine if MgCl2 foliar applications made during vegetative growth will suppress physiologic leaf spot in winter wheat

2. To determine the effect of MgCl2 foliar applications on yield, kernel weight, and test weight in cultivars of winter wheat susceptible to physiologic leaf spot.

Specific results and conclusions for each objective

Objective 1 & 2

Field trials were established at the Post Farm on an Amsterdam silt loam. Background soil Cl levels at this site were approximately 8 lbs/a (0-24"). Two studies were conducted at this site

$MgCl_2$ timing study

A magnesium chloride foliar application-timing study was conducted with CDC Kestrel. This cultivar is particularly susceptible to physiologic leaf spot. The treatments included a control (no Cl), and three $MgCl_2$ time of applications. The application timing and rates were at 20 lbs Cl/a at tillering-joint (Feekes growth stage 6-7), 10 lbs Cl/a at flag leaf emergence (Feekes growth stage 8), and 10 lbs Cl/a at boot (Feekes growth stage 10).

Foliar applications of $MgCl_2$ were effective in suppressing physiologic leaf spot in the flag and flag-1 leaves of CDC Kestrel (Table 1). Inspection of individual leaf blades showed that once a lesion(s) appeared application of Cl would not rehabilitate the affected tissue. Foliar Cl applications did prevent the appearance of new chlorotic areas on the leaf blade surface. Therefore, foliar Cl applications made early during vegetative growth were the most effective. Yield and mature kernel weight were not improved by foliar Cl applications even though leaf spot severity was reduced. Foliar Cl application results in some tissue burning. This may have

negated the positive effects on physiologic leaf spot.

Table 1. CDC Kestrel winter wheat yield, kernel weight, test weight, leaf spot severity, and plant Cl as affected by foliar $MgCl_2$ applications.

Treatment	Yield	Kernel wt	Test wt	Leaf spot severity†		Plant Cl	
				Flag	Flag-1	Whole	Flag leaf
	bu/a	g/100	lbs/bu	------- % -------		---------- g/kg ----------	
Control	53.7	24.3	58.3	8.1	19.4	0.72	6.18
Tiller	54.1	24.5	58.5	0.2	0.4	2.73	1.99
Flag leaf	56.5	24.5	58.7	1.9	3.7	1.60	0.88
Boot	55.8	24.7	58.8	1.3	12.6	1.73	2.88
LSD (.05)	NS	NS	NS	1.0	4.1	0.33	0.21

† Leaf spot severity = portion of leaf affected by chlorotic + necrotic lesions.
‡ Plant Cl levels at early heading emergence.

$MgCl_2$ vs. KCl comparison on winter wheat cultivars

The efficacy of foliar $MgCl_2$ (applied at late-tillering) was contrasted with soil applied KCl in controlling physiologic leaf spot and improving yield. Unfortunately physiologic leaf spot did not develop at this site in the two cultivars, Redwin and Promontory, which are susceptible to this phenomena. The plant Cl levels at this site this were approximately 800-900 ppm. This is just below the 1000 ppm threshold level for producing physiologic leaf spot. Dry weather conditions during late-vegetative growth and grain-fill periods likely contributed to the absence physiologic leaf spot symptoms in these cultivars. Winter wheat yields were not affected by Cl for any of the cultivars tested. Kernel weight size was improved by Cl in two of the cultivars. Both Cl fertilizer sources were equally effective.

Table 2. Promontory winter wheat yield, kernel weight, test weight, and plant Cl as affected by chloride.

Treatment	Yield	Kernel weight	Test weight	Whole plant Cl †
	bu/a	g/1000	lbs/bu	g/kg
K_2SO_4	78.5	29.8	62.2	0.85
KCl	79.5	29.7	62.3	4.11
$MgCl_2$	78.6	30.1	62.5	2.92
LSD (.05)	NS	NS	NS	1.44

† Plant Cl levels at early heading emergence.

Table 3. Redwin winter wheat yield, kernel weight, test weight, and plant Cl as affected by chloride.

Treatment	Yield	Kernel weight	Test weight	Whole plant Cl †
K_2SO_4	61.4	30.9	62.8	0.87
KCl	62.4	32.1	63.2	2.94
$MgCl_2$	63.1	32.1	62.5	2.82
LSD (.05)	NS	0.7	0.6	0.87

† Plant Cl levels at early heading emergence.

Table 4. Tiber winter wheat yield, kernel weight, test weight, and plant Cl as affected by chloride.

Treatment	Yield	Kernel weight	Test weight	Whole plant Cl †
K_2SO_4	59.2	29.9	64.6	0.67
KCl	60.1	30.0	62.7	3.47
$MgCl_2$	58.8	30.7	63.2	2.50
LSD (.05)	NS	0.6	NS	0.73

† Plant Cl levels at early heading emergence.

Give a brief economic analysis of any observed responses.

Yield responses to Cl were not observed at this site, so there was no economic response.

Can PPI/FAR cite data ?

Yes

Planned changes for next year.

Foliar applications will be tested again next year with CDC Kestrel. Comparison with other cultivars will be dropped