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Chloride fertilizer in winter wheat — effect of Cl and interactions with foliar fungicides under severe leaf rust pressure

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Introduction:

Responses to chloride fertilizers in winter wheat have been widely documented in the Great Plains and the Pacific Northwest. Increased yields have been attributed as a micro nutrient response as well as being attributed to a reduced incidence of fungal disease associated with enhance chloride nutrition. In Texas trials, topdress applications of Cl- have caused significantly reduced leaf rust and septoria ratings at bloom, and significant yield responses. In the trial reported in this paper, Cl- had positive and significant interactions with systemic foliar fungicides which are commonly used in wheat. Use of Cl- resulted in lower leaf rust ratings and significant yield increases when used either in combination with or in sequence with wheat fungicides. Previously reported data does not document such interactions.

Materials and Methods:

A plot site was selected in winter wheat (var. 2163) which was heavily infested with leaf rust in near Hillsboro, Texas. Wheat received initial treatments at Faces stage 6 on March 5 and 6. The soil at this site was a Houston Black Clay with a pH of approximately 8.0. It was a poorly drained site, and the wet winter had caused frequent standing water and conditions which greatly favored the proliferation of wheat leaf rust. Chloride was applied as magnesium chloride at the rate of 40 lbs Cl per acre as a foliar solution. The wheat fungicides, Bayleton and Tilt were applied with a CO2 backpack sprayer at 35 psi in a water volume of 19 gpa. Both fungicides received a non-ionic surfactant at 0.25% v/v. The Cl treatments were applied on March 5. The initial fungicide treatments were applied on March 6. Sequential fungicide applications were made on April 7 at Feeke's growth stage 9, or flag leaf fully

emerged.

Thirteen treatments involving rate, time of application and sequential treatments (Table 1). Bayleton 50% DF was applied at the 2.0 oz/ac rate topdress either alone or in combination with MgCl2. The 2 oz/ac with MgCl2 was also evaluated with a sequential 2 oz/ac application at stage 9. A treatment evaluating a 2 oz/ac topdress application of Bayleton followed by a 4 oz/ac sequential application of Tilt at stage 9 was included. Tilt L was applied at the 2 oz/ac rate either alone or in combination with MgCl2 at topdress. Tilt at the oz/ac rate was also applied as a single treatment either at topdress or at Feeke's 9. MgCl2 was applied at the 40 lb Cl/ac rate at topdress either alone or in sequence with the Bayleton or Tilt 2 or 4 oz/ac rate at Feeke's 9.

Leaf rust ratings were taken visually once per week, beginning about 1 week after initial treatments were made. The first 3 ratings reflect whole plant values, or estimates of the percentage of the entire leaf mass damaged by overwintering leaf rust. After March 29, the uppermost leaf with a significant infection of leaf rust was selected and rated.

Plot size was 15 x 40 feet. Plots were replicated 3 times in a randomized block design. Five foot alleys were cut, with a resulting plot harvest of 35 feet by 4.5 feet. Plots were direct harvested with a research plot combine.

Results and Discussion:

Conclusions from this trial should be tempered with the thought that leaf rust was severe to the extent that more than half of the plant canopy was destroyed prior to initial treatments. Plots treated topdress with Bayleton had significantly lower leaf rust ratings than the untreated check for 6 weeks following treatment, whereas plots treated with the 2 oz rate of Tilt were significantly less injured than the untreated check for only 2 weeks. Neither of these treatments yielded more than the check. Wheat treated with the combination of either Bayleton or Tilt at 2 oz/ac plus Cl- at 40 lbs/acre was significantly less affected by leaf rust than the untreated check for 7 weeks, with the Cl- treatment resulting in 1 and 5 weeks added protection, respectively from leaf rust than the topdress fungicide treatments alone, either at the 2 or 4 oz rate. Both 2 oz topdress treatments with Cl- yielded significantly more than plots treated with fungicide only. The Cl- topdress treatment alone resulted in 5 weeks of leaf rust suppression. While this treatment did not yield significantly lower than the fungicide-Cl treatments, leaf rust suppression was not as persistent.

Sequential treatments with 2 oz/ac of either Bayleton or Tilt in combination with Cl- followed by a second 2 oz rate at flag leaf exertion gave essentially season long protection from damaging levels of leaf rust, with a slight advantage observed in the Tilt-Cl treatments. Topdress Cl- followed by a full 4 oz/ac rate of Bayleton or Tilt also gave good protection season long from rust and yielded comparably with the sequential fungicide+Cl-fungicide treatments. The Cl- topdress treatment followed by 4 oz/ac Bayleton at flag leaf gave the best grain yield and overall leaf rust protection across the season with the exception of the last rating date of May 10, which corresponded with 10 days post bloom.

From this trial, it is obvious that the effect of Cl and foliar fungicides are complementary and additive. Light or full rates of fungicides applied early season (Feeke’s 6) in a heavy leaf rust infestation reduced

damage from the disease temporarily, but were inadequate to relieve pressure from this disease through grain fill. Cl alone reduced crop injury from the disease for about 5 weeks, but was not different from the check at season's end. Cl and fungicides applied as a combination at topdress or sequentially at topdress gave significant relief from crop injury due to leaf rust for most of the growing season, and improved yields over treatments not using both products. Sequential fungicide applications (Bayleton 2oz/ac followed by Tilt 4oz/ac) did not give leaf protection equal to combination or sequential treatments with Cl and fungicide.

Infestations of this magnitude from leaf rust as observed in 1997 are the exception rather than the rule. In the observation of the author, they occur only in a 1 in 4 or 5 year frequency. The topdress Cl- and fungicide strategy which was employed in this study has the potential to allow farmers to scout fields and make applications of Cl fertilizer and/or fungicide as needed to deal with a major disease problem in wheat.