Liquid Sili-Max® Improves Wheat Yield at Much Higher Efficiency Than Conventional Dry Silicon Fertilizers

Research Report

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Objective

The objective of this study was to compare, for use in Louisiana wheat production, the efficacy of a liquid silicon (Si) fertilizer (Huma Gro® Sili-Max®) with a commonly used dry Si source (steel slag) and another Si source (wollastonite) often used in research as a suspension. Silica deposition is an important barrier for foliar fungal diseases.

Materials and Methods

The wheat field study was conducted at Louisiana Ag-Center Research Stations. Silicon (Si) treatments presented in Table 1 were replicated four times and arranged in a randomized block design. There were 2 Huma Gro® Sili-Max® (10% Si) treatments (as a foliar band, and as foliar broadcast sprayed evenly over the entire plot). Each treatment was applied twice within 2 weeks at the onset of internode elongation (Feekes growth stage 5). The dry silicon sources (wollastonite [23% Si] and steel slag [11% Si]) were applied and incorporated into the soil prior to planting. Wheat leaf samples were collected one week after the application of silicon solution sources and evaluated for silica bodies (phytolith) deposition and percentage using scanning electron microscopy and energy dispersive x-ray analysis.

The measured parameters were subjected to analysis of variance (ANOVA) using PROC MIXED in SAS; mean separation procedure using pdiff option was conducted for parameters that were affected by the treatment at 95% confidence level ($P \leq 0.05$).

Table 1. Details of the Si Treatments Used

Treatment	No. of Applications	Si Rate, lb/acre	Total Si Applied, lb/ac
Control	—	—	—
Lime	—	—	—
Wollastonite	1	250	250
Steel Slag	1	250	250
Sili-Max® Foliar Band	2	0.032 (4 oz/ac of Sili-Max®)	0.064
Sili-Max® Foliar Broadcast	2	0.064 (8 oz/ac of Sili-Max®)	0.128

Results

Sili-Max® foliar band and Sili-Max® foliar broadcast increased grain yield by 10 and 7 bu/ac, respectively, in reference to the control plot (Fig. 1). It is important to note that the total silicon applied using Sili-Max® solution was substantially lower (0.064 to 0.128 lb Si/ac) than the dry wollastonite and steel slag silicon sources (250 lb Si/ac). The state average wheat yield was low that year due to a mild winter that affected the wheat vernalization. Sili-Max® foliar band had the numerically highest straw yield at 7,941 lb/ac (Fig. 2).

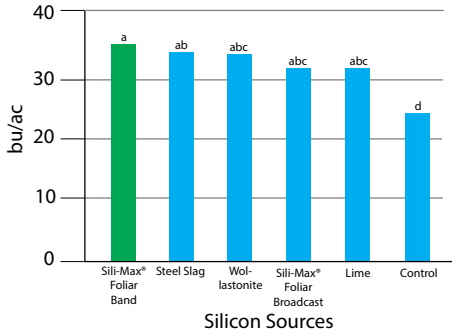

Figure 1. Silicon Source Effect on Grain Yield

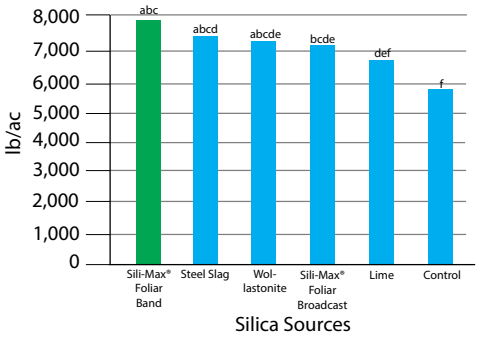

Figure 2. Silicon Source Effect on Straw Yield

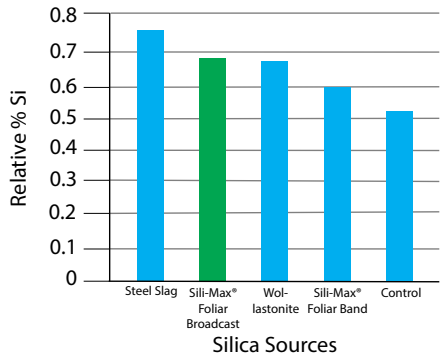

Figure 3. Relative percentage silicon content based on energy dispersive x-ray analysis on leaf samples (silica bodies per 1 mm^2).

The accumulated silica bodies (phytolith) were 0.69% and 0.60% with Sili-Max® foliar broadcast and Sili-Max® foliar band treatments, respectively while the control had 0.53% (Fig.3).

Conclusions

Huma Gro® ***Sili-Max® applied as foliar band at a rate 3,900 times less than the dry silicon sources contributed to higher grain yield*** and straw yield, while the application of Sili-Max® as a foliar broadcast at a rate 1,900 times less than the dry silicon sources led to high Si deposition in wheat leaves.

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