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GOLD'n GRO® 9-0-1 + 7% Zn Improves Corn Growth in Zn-deficient Soil: A Preliminary Study

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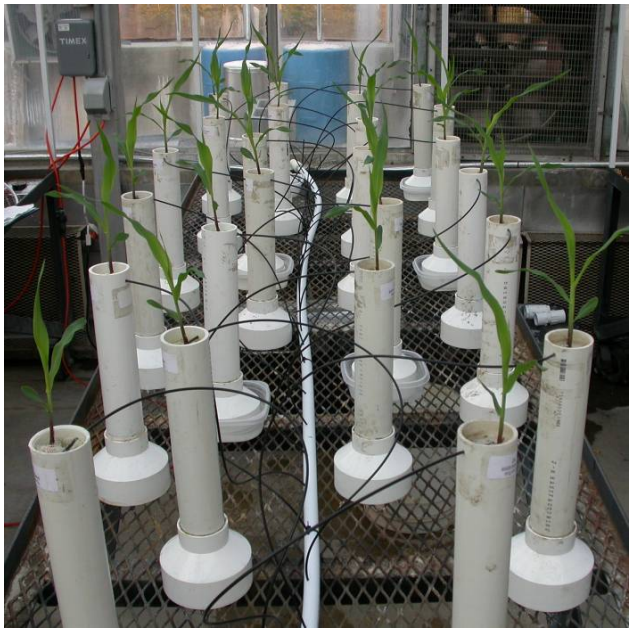
Abstract

Zinc deficiency can limit growth, especially on soils with low organic matter and high pH. Chelated Zn fertilizers maximize Zn bioavailability. We sought to determine the effectiveness of soil-applied *GOLD'n GRO 9-0-1 + 7% Zn*, a chelated Zn source, to reverse or prevent Zn deficiency. *GOLD'n GRO* was applied at 0 to 30 quarts per acre in a high pH soil. Controls included columns treated with ammonium-nitrogen at the same level as the highest *GOLD'n GRO* treatment. Plants treated with *GOLD'n GRO* had twice the dry mass, were greener, and had increased zinc levels in the plant tissue compared to the untreated control plants. A follow-up study will evaluate lower concentrations of *GOLD'n GRO* and will determine the effectiveness of unchelated, inorganic zinc sulfate.

Materials and Methods

Corn plants (cv. 'DK-641') were grown in 2 inch diameter columns in the Utah State University Research Greenhouses. Columns were packed with a 90%/10% (v/v) mixture of sand and a sandy loam soil. Column pH was buffered at ~8 by adding 5 g per column $CaCO_3$. Plants were automatically watered with a zinc-free nutrient solution and harvested 23 days after planting. The photograph below shows plants 12 days after planting. Treatments (*GOLD'n GRO* or ammonium-N) were applied on day 10.

Assuming an effective ground area of 100 cm^2 per plant (4 inches by 4 inches), the application rate was 0, 7.5, 15, or 30 quarts per acre, with 5 replicate columns at each rate. The restricted volume of the columns means that the *GOLD'n GRO* was concentrated in the root zone and our estimated field application rate may thus underestimate the amount necessary to achieve these results. Ammonium nitrogen can alter zinc bioavailability so a separate group of 5 replicate control plants was treated with the same quantity of ammonium as that supplied by the 30 qt/acre *GOLD'n GRO* treatment.



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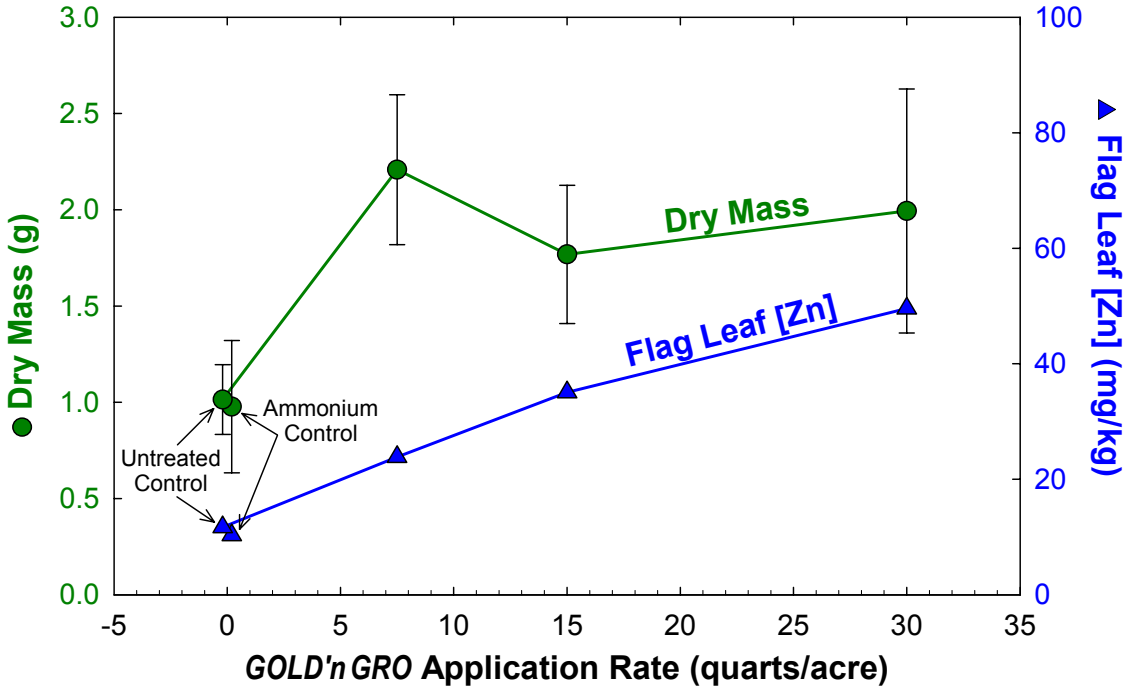
Results

Plants treated with *GOLD'n GRO* had almost twice the dry mass and were visibly greener than the control plants. The foliar Zn concentration steadily increased with increasing *GOLD'n GRO* application rates. Ammonium-treated plants were nearly identical to the untreated control plants in dry mass and Zn concentration. The graph below shows the average and standard deviation of the dry mass and Zn concentration for each treatment. Differences among the 3 levels of *GOLD'n GRO* were not statistically significant. Flag leaves from plants in each treatment were combined and analyzed by ICP-ES for Zn concentration. There were dramatic visual differences between Zn-deficient control (lower left) and *GOLD'n GRO*-treated (lower right) corn plants at only 11 days after the treatments were applied (2 days before harvest). While the control plants appear to show symptoms of phosphorus deficiency, the flag leaf tissue analysis indicated that they were in fact higher in P content (0.49 and 0.56% P) than the *GOLD'n GRO*-treated plants (0.36 to 0.37%). A P level of 0.3% is adequate for optimum growth.



Zn-deficient control plant.

***GOLD'n GRO*-treated plant.**