Mississippi Corn Promotion Board
2013 Progress Report

Project Title: Corn Response to Zinc Fertilization
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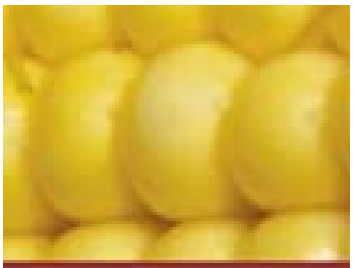


Project Summary (Issue/Response)

Micronutrient fertilization is extremely important for balanced fertility, but is often overlooked when developing fertilization programs. Monocot crops, such as corn, are very sensitive to Zn deficiency. Historically, the bulk of Zn research in the Mid-South, and within Mississippi has investigated the influence of zinc fertilization on soils cropped to rice, or when used as a combined starter fertilizer in corn. Because of the recent acreage shift to corn on soils previously cropped to cotton with little history of zinc fertilization, additional research is warranted. Also, little research has evaluated the sole influence of zinc on corn growth and yield in Mississippi, or attempted to define critical soil test levels to predict yield response. Research was initiated during 2012 to attempt to meet the following objectives: 1) to evaluate the influence of Zn fertilization on tissue Zn concentration and grain yield of corn, and 2) determine the effect of Zn source, application rate and strategy on effectiveness of zinc fertilization. The proposed research would provide updated Lancaster and new Mehlich-3 soil test Zn correlation/calibration data to Mississippi corn producers, and provide insight into which Zn delivery methods are adequate for Mississippi corn production. During the season grower concern over foliar burn from top-dressed applications of zinc led us to establish a new objective. The new objective was to document if foliar injury from zinc sprays influenced corn grain yield.

Project Results/Outcomes

For the first objective, 2 field trials were established and harvested, one at the Delta Research and Extension Center, one on the Douglas farm in Bolivar Co. near Boyle, and two attempted sites that were not harvestable. The trials were placed on soils with characteristics that would suggest a response to zinc. Each site placement had a soil pH > 6.8 and a low Lancaster or Mehlich-3 soil test Zn level (<4 mg/kg). Mean corn grain yields were increased at one of the two research sites, the yield increase was statistically different. For the responsive site at DREC, grain yield was increased by 33 bu/ac when compared to the untreated control (Fig 1). In contrast tissue Zn concentrations were not increased with increasing Zn application rates on the two responsive sites. Soil test correlation steps will be conducted once enough data points are collected, results from year two have added to year one results and provided an excellent start for the correlation process.

Project Results/Outcomes (continued)

For objective two, one trials was established at the Delta Research and Extension Center to determine if Zn application strategy influenced corn grain yield and tissue Zn concentration. In the one harvestable trial, Zn application strategy did not statistically influence corn grain yield. However, Zn added with UAN and placed 10" to the side of the row yielded numerically less than when zinc was applied foliar, in furrow, or as a dry granular product to the soil surface (Fig 2). Tissue Zn concentrations 2wk after application were not statistically different than the untreated control. All zinc tissue concentrations collected were above the critical value of 20 mg/kg. Based on soil analysis, the two established site for objective two showed borderline characteristics that would indicate these sites may or may not respond to zinc applications.

In many cases zinc deficiency is observed in-season, and foliar applications is the only option to meet the plants critical Zn requirement. Many consultants and producers alike experienced issues with zinc products causing foliar injury. Objective three was added during the season to address this concern. In general, the citric acid chelated product caused significant foliar injury, with the severity of injury increasing at total Zn application rate increased(Fig 3). In contrast, the EDTA chelated product caused little to no foliar injury across the range of application rates. The product x Zn rate interaction was not significant for tissue Zn concentration taken 2 wk after application. In general averaged over Zn products tissue concentration increased with increasing application rate. Data from 2012 and 2013 suggest that grain yield is unaffected by foliar injury from application of citric acid chelated products(Fig 4). However, the trials were placed on corn that was seeded to soil that was not prone to zinc deficiency. It is unclear if grain yield would be influenced by the foliar injury if corn plants were Zn deficient.

Project Impacts/Benefits

All corn acres in Mississippi could be impacted by research results if revision of soil test recommendations is warranted. Initially impact will be limited to acres that are currently experiencing zinc fertility issues and acreage that has historically not received zinc fertilization. Potential changes in recommendations with regard to Zn delivery systems could also impact the current acreage that receives Zn fertilization.

Project Deliverables

Publications:

B.R. Golden, Soil Fertility update. MAIC Conference July 24, 2013, Orange Beach,AL

Buckner, J. N. Kinsey, B.R. Golden, J. Gruver. 2013. Hidden Hunger : Test for micronutrients to ensure crops fire on all cylinders. Progressive Farmer. September issue

Golden, B.R. 2013. DREC tests corn response to Zn fertilization. p. 16-17. In Mississippi State University Delta Research and Extension Center Annual Research Report.

Golden, B.R. 2013. Current soil test correlation and calibration research in Mississippi. Southeast Regional Information Exchange Group-6. Baton Rouge, LA June 16-18, 2013.

Golden, B.R., G. B. Montgomery, and E.J. Larson. 2013. Foliar Injury and Corn Grain Yield Response to Zinc Application. In Annual meetings abstracts [CD-ROM]. ASA, CSSA, and SSSA, Madison, WI. Tampa, FL. Nov 3-6, 2013.

Golden, B.R. 2013. Field Day Presentation: DREC– Soybean maturity group evaluation and corn zinc fertility; Stoneville, MS (July 18, 2013)

Golden, B.R. 2013. Grower Meeting: Itawamba county mid-season crop update – 2013 soil fertility update on correlation calibration; Baldwyn, MS (July 16, 2013)

Golden, B.R. 2013. Grower Meeting: Agronomic crops extension retreat – 2013 soil fertility update on current corn and soybean issues; Hamilton, MS (June 6, 2013)

Golden, B.R. 2013. Grower Meeting: High yield corn production information exchange – micronutrient fertility; Belzoni, MS (Feb 22, 2013)

Project Deliverables (continued)

Golden, B.R. 2013. Grower Meeting: Delta Ag Expo Corn Roundtable – Zinc and nitrogen fertility management for corn; Cleveland, MS (Jan 16-17, 2013)

Golden, B.R. 2013. Technical Meetings/Training Sessions: MS American Society of Agronomy Meeting; Soil fertility considerations for corn and soybean; Grenada, MS (November 13, 2013)

Golden, B.R. 2013. Technical Meetings/Training Sessions: Jimmy Sanders/Pinnacle Ag Inc., Certified Crop Advisor Training – Current issues in row crop fertility; Monroe, LA (Aug 7, 2013)

Golden, B.R. 2013. Technical Meetings/Training Sessions: Jimmy Sanders/Pinnacle Ag Inc., Certified Crop Advisor Training – Current issues in row crop fertility; Birmingham, AL (Aug 1, 2013)

Golden, B.R. 2013. Technical Meetings/Training Sessions: Jimmy Sanders/Pinnacle Ag Inc., Certified Crop Advisor Training – Current issues in row crop fertility; Stoneville, MS (July 31, 2013)

Golden, B.R. 2013. Technical Meetings/Training Sessions: Mississippi Agricultural Consultants Association – Soil test correlation and calibration for soybean and corn; Starkville, MS (Feb 5-6, 2013)

Golden, B.R. 2013. Technical Meetings/Training Sessions: Arkansas Crop Management Conference –Influence of starter fertilizer and foliar micronutrients on corn grain yield; Little Rock, AR (Jan 22-24, 2014)

Graphics

Photo 1. Zinc Deficiency symptomology on corn plant in Holmes County during 2013 growing season.

Graphics (continued)

Fig 1. Corn grain yield response to Zinc application rate during 2013.

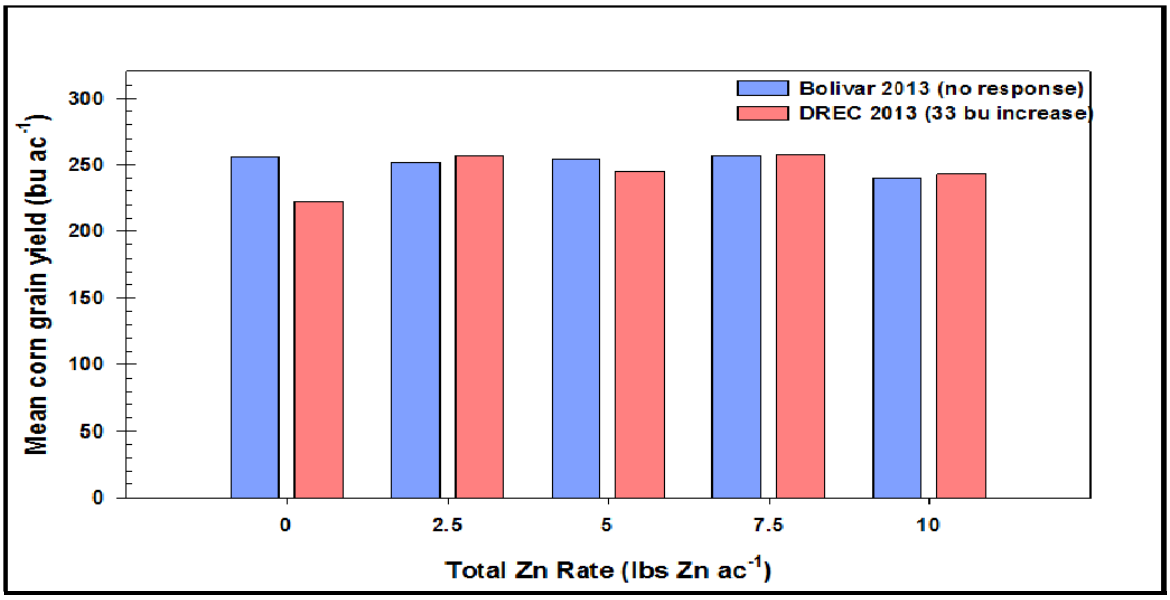
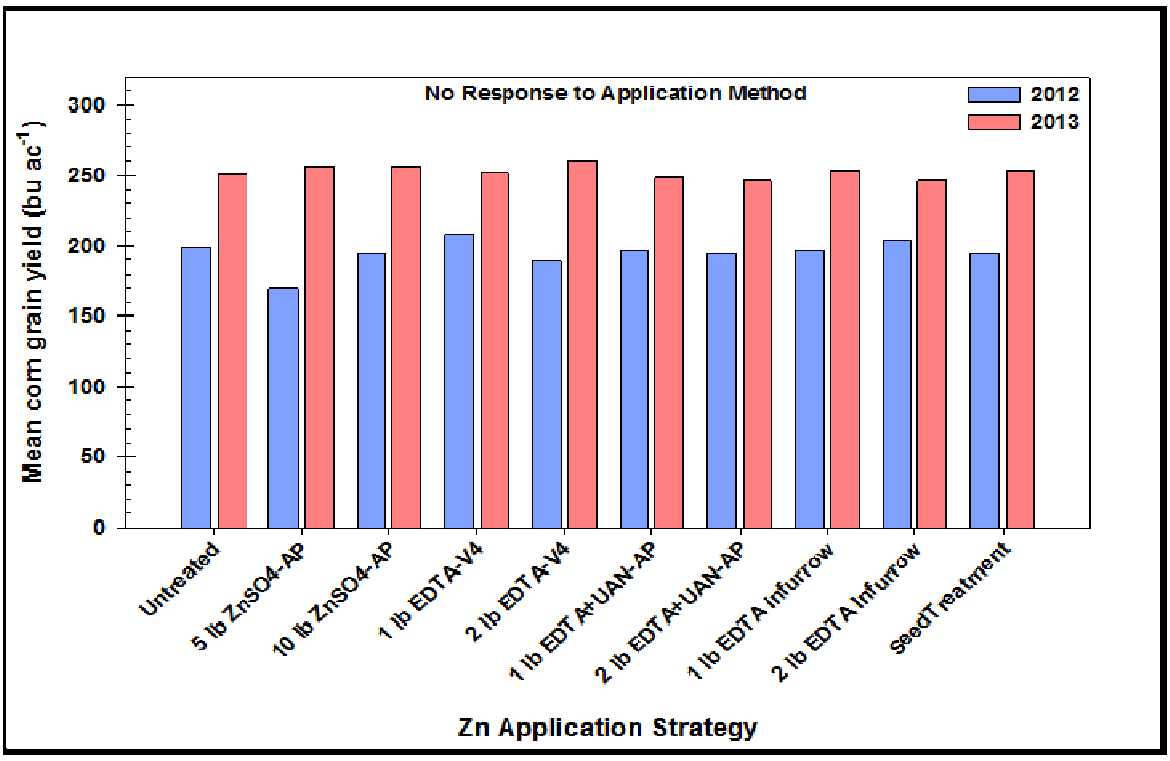


Fig 2. Corn yield response to Zinc application method for research trials conducted during 2012 and 2013.



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