Mississippi Corn Promotion Board
2014 Progress Report

Project Title: Corn Response to Zn Fertilization

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Department: Delta Research & Extension Center

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

Zinc correlation calibration work has provided great benefit to Mississippi growers. Currently of the seven harvestable trials placed throughout the delta since 2012. We have observed more responsive than non-responsive locations. That translates in to a yield increase 57% of the time we applied Zn fertilizer. Common to all responsive sites were a soil pH above 6.8 and relatively low soil test zinc, below 3.0 lb/ac. Averaged across responsive sites yield increases of 10% were realized, resulting in approximately 22.5 extra bu/ac to the producer's bottom line. More importantly at two of the responsive sites the untreated check yielded over 200 bu/ac, not showing any visual indication of Zn deficiency, however a yield response was recorded.

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 sites for objective two showed borderline characteristics that would indicate these sites may or may not respond to zinc applications.

Trials evaluating foliar injury were completed in 2014. These trials indicated that differential responses in leaf injury occurred among various foliar zinc products. Tissue testing revealed that foliar Zn products that created the greatest visual injury, put more Zn in the plant than products showing lesser injury. However, application of any product

Project Results/Outcomes (continued)

resulted in sufficient tissue Zn concentrations to produce maximal yield. The take home point from this trial is that visual leaf injury did not influence grain yield. Yield remained unaffected by early season tissue injury and should be considered cosmetic in nature.

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

8 publications, 33 presentations, 3 workshops, 3 field days, and other deliverables.

Graphics

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

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Fig 1. Corn response to Zn rate in Correlation/Calibration trials. Averaged across Zn responsive sites we observe a 10% yield increase or 22.5 bu/ac.

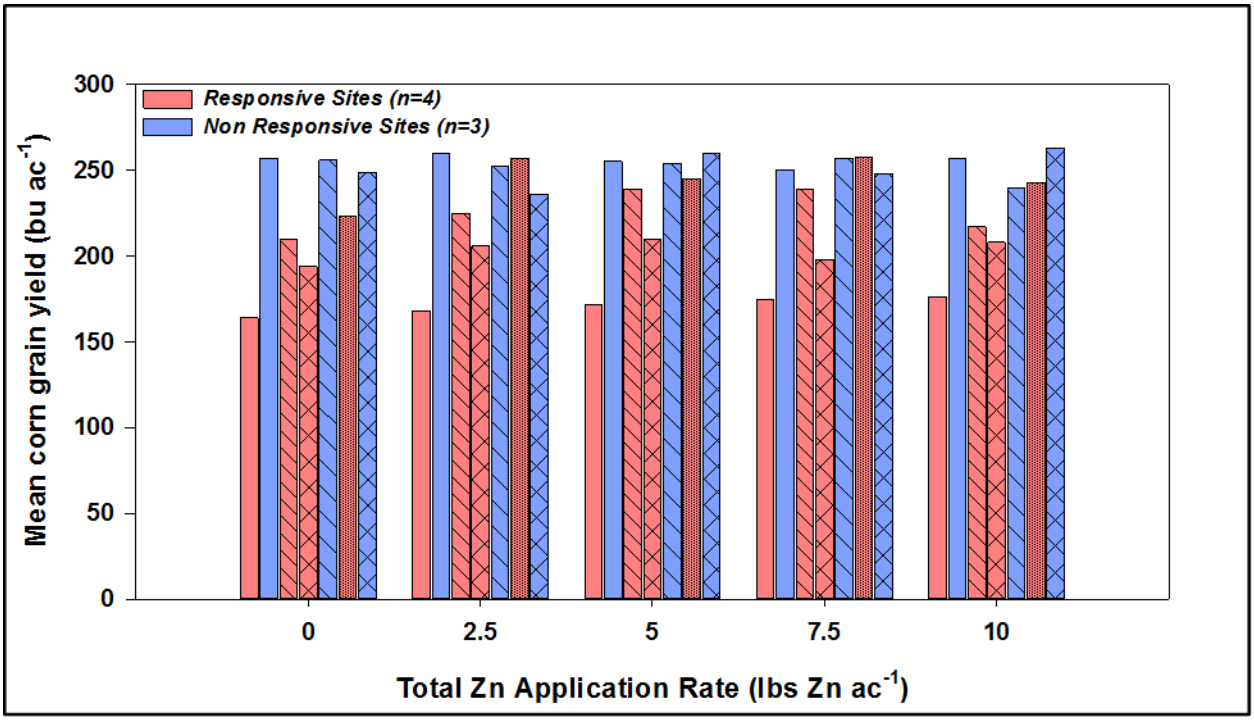

Fig 2. Visual injury estimate from foliar Zn application 9 d after application for research trials managed between 2013-2014.

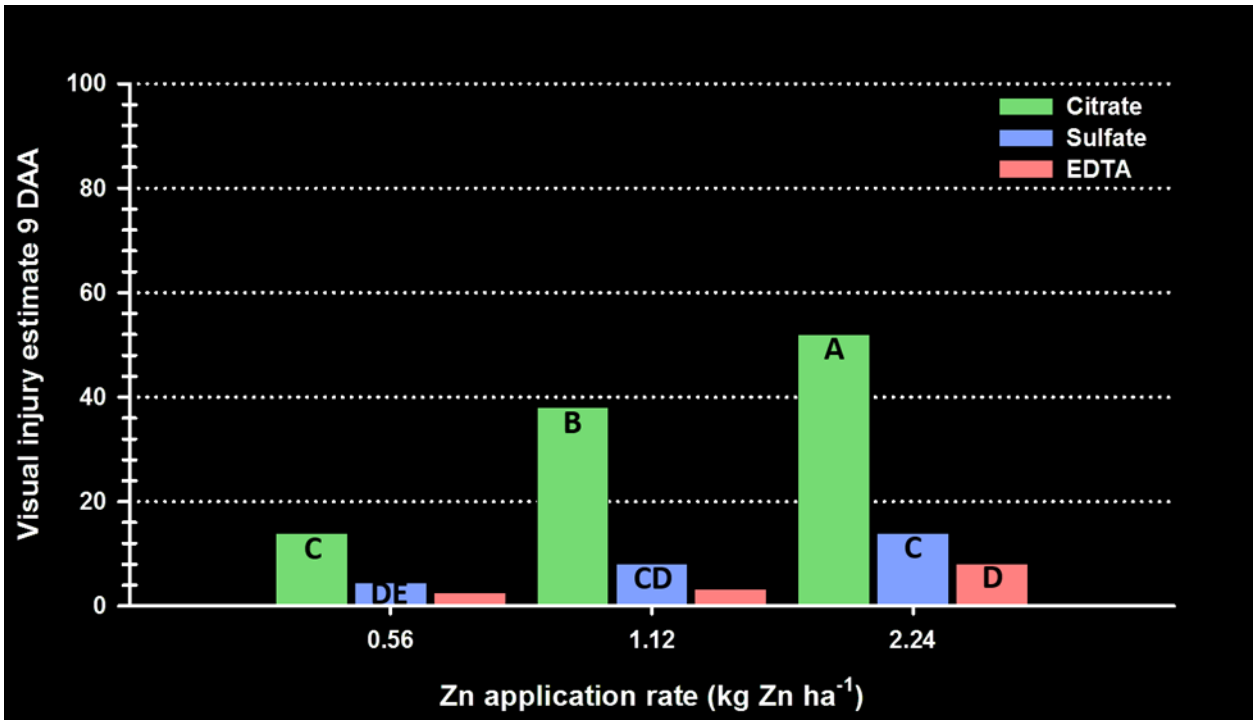

Fig 3. Whole plant tissue Zn concentration as influenced by foliar Zn application for research trials managed between 2013-2014.

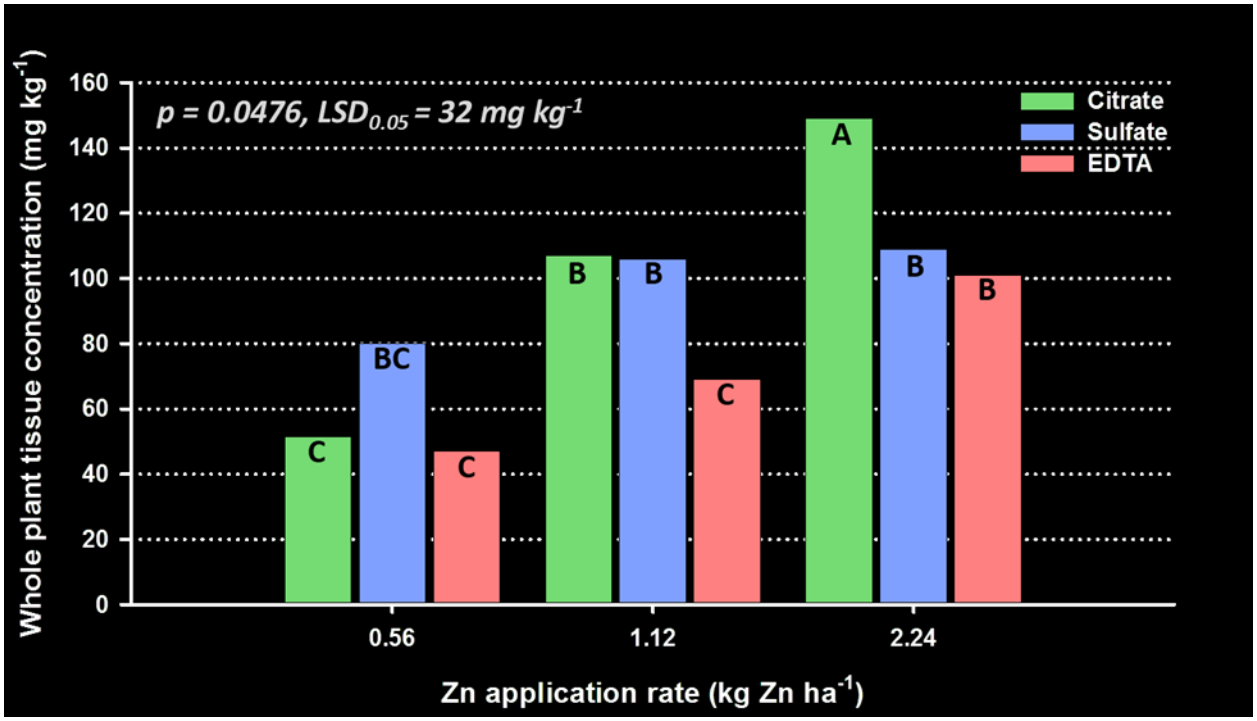

Fig 4. Mean corn grain yield as influenced by foliar Zn application for research trials managed between 2013-2014.