

South Dakota Nutrient Research and Education Council, Report

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Mid-season research report, Evaluation of Zinc and Boron Micro-nutrients on Corn Nutrition and Grain Yield in Eastern South Dakota

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Synopsis. The research objective, evaluate applications of Zn and B fertilizers and application rates on corn leaf tissue nutrients, grain yield and 1000 kernal weight on four eastern South Dakota grower field sites beginning in 2022, to be continued two additional years. Research deliverables: results presented at South Dakota Agronomy Conference and North Central Fertility Workshop; collaborate with SDSU agronomy staff in development of micro nutrient recommendation guide; Youtube presentation; and publish in ASA Agricultural & Environmental Letters. Research results will provide corn growers and agronomists with present-day micro nutrient management based on research documented results.

Status report: Four research sites installed in grower corn fields Roberts, McCook, Minnehaha and Lincoln counties South Dakota May 26-29, 2023, on soils ranging in texture from loam to clay loam (see Table 1 and Figure 1). All four sites are dryland, no-till cropping systems, previous crop soybeans. Corn GS ranged from emergence to V2.2 at time of plot layout. Sites planted May 5th – 18th, populations 26,000-32,000 per acre, no grower Zn or B was applied to research sites. Soil sampled 0-6" all replications and soil stratified samples 2" depth increments to 8". Soil analysis pH, EC, Buf pH, NO₃-N, wet extractable K (ISU), Mehlich 3 nutrients (P, K, Ca, Mg, S, Zn, B), DTPA-Zn, Hot-Water B, SOM, CEC, and texture. Laboratory soil analysis pending, submitted to Trace Genomics, Ames, IA, June 8, 2022. Brandt Inc. to provided \$12,000 sponsorship and Zn products toward the 2023 research project.

Treatments. Zn and B treatments applied response study, four sites, RCB experimental design plot design six replications (see Appendix A). Treated plot size six-30" row width x 40 feet in length with six fertilizer treatments of:

- (1) Untreated control;
- (2) Soil applied Zn chelate (Sequestar) in 2 x 2 band 2.0 Zn lbs/ac;
- (3) foliar Zn application 0.5 lbs/ac as Zn chelate (Smart Trio) GS V4-V5;
- (4) foliar B application of 0.5 lbs/ac as Solubor GS V4-V5;
- (5) foliar Zn + B application (Smart Trio) + Solubor foliar at GS V4-V5 (rates as above);
- (6) foliar Zn application (Ultra-Che), 0.5 lbs/ac GS V5 (listed as Opt);

Soil treatment applied side dress (3x2) across four locations June 14-16, 2023, Zn chelate source Brandt Sequestar with 25-30 gallons/ac of water. Foliar treatments of Brandt Smart Trio, Solubor and Winfield Zinc Che were applied June 18-20 at corn GS 4.5-5.5 with 25-30 gal/ac water (see Figure 2). Whole plant tissue samples collected GS V4-V5 from UTC plots, submitted to Sure-Tech Laboratories, Indianapolis, IN for N, P, K, S, Mg, Ca, Zn, Mn, Fe, Cu, B. Corn ear leaves at GS R1 to be sampled late July/early August dependent of site corn maturity. Corn stalks to be sampled at harvest from UTC plots

Two grower field observations sites were installed in McCook county. Each site consists of four replications (plot size six 30" rows x 30 feet). Soil samples were collected in May/June; ear leaf tissue samples collected at GS R1; and grain yield data and moisture collected at harvest.

Comments and challenges. We noted uneven emergence at the Roberts site due to planter issues. The McCook county site had very little rainfall as of June 21st and observed significant leaf rolling. Minnehaha and Lincoln county sites were top dressed with urea fertilizer June 16 and 19th, rate TBA by grower. Drone foliar applications were dropped due to wind conditions and cost. Plots were hand sprayed.

Table 1. SD-NREC Zinc-Boron corn research sites South Dakota 2023.

Site Name	Lat	Long	County	Soil Series
Arn-Zn-23	45.42703	-96.81087	Roberts	Esmond-Heimdal-Sisseton complex, 2-6% slopes
Bar-Zn-23	43.48481	-96.66660	Lincoln	Wentworth-Chancellor silty clay loams, 0-2 % slopes
Tie-Zn-23	43.54489	-97.17680	McCook	Clarno-Bonilla loams, 0-2 % slopes
Ren-Zn-23	43.71972	-96.59193	Minnehaha	Moody-Nora complex, 2-6% slopes

Figure 1. Bar-Zn-23 site, Lincoln county, corn GS V2.7, May 25, 2023.



Figure 2. Arn-Zn-23 site, Robert county, Plot 201, corn GS V5.2, June 20, 2023.



Appendix A. SD-NREC Zn-B study plot layout design 2023, all sites.

Zn - B Sites 2023										
Back	6 rows		6 rows		6 rows		6 rows		6 rows	
4	B Foliar V5 104	Zn + B Foliar V5 Rep 2	Zn Soil Side Dress 304	Opt 404	Zn Foliar V5 Rep 4	0 604	Zn + B Foliar V5 704	B Foliar V5 Rep 6	Opt 904	40 ft
3	Zn Foliar V5	Opt	0	Zn Soil Side Dress	B Foliar V5	Zn + B Foliar V5	Zn Foliar V5	Zn Soil Side Dress	0	40 ft
2	Zn Soil Side Dress	B Foliar V5 Rep 1	Zn Foliar V5	Zn + B Foliar V5	0	Opt	B Foliar V5	Opt	Zn Foliar V5	40 ft
1	0 101	Zn + B Foliar V5	Opt 301	B Foliar V5 401	Zn Foliar V5 Rep 3	Zn Soil Side Dress 601	Zn + B Foliar V5 701	0 801	Zn Soil Side Dress 901	40 ft
Block	100	200	300	400	500	600	700	800	900	