Evaluation of Soil Test Potassium and Side Dress Application of Potassium and Biochar on Corn Nutrition and Grain Yield in Eastern SD: Year 2

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Summary

Declines in soil potassium fertility (STK) have been increasing in recent years and corn ear leaf analysis have increasingly shown plant K deficiencies. Further farmers transitioning to no-till have especially noticed greater K deficiencies. Recent results from the NREC funded clay mineralogy project along with results from North Dakota suggest soils high in smectite clay soils require more K fertilizer to optimize yield compared to soils with more kaolinite types of clays. This proposed project is to enhance Robert Miller's corn K project that was funded last year by including further clay mineralogy tests and evaluating the effect of placement for K fertilizer in no-till soils. The research objectives are 1) assess the impact of soil test K and soil K base saturation on ear leaf nutrition, stalk K content and grain yield, 2) evaluate crop leaf nutrition and grain yield response to K fertilizer with and without biochar applied at V3 and V4 corn development stages, and 3) determine the effect of K fertilizer placement (surface broadcast vs. sidebanding) on corn growth and yield. Research will be used to develop a predictive model of corn K deficiency K fertilizer response. Additionally, the effect of K fertilizer placement in no-till soils on crop growth and yield will be determined. The project results will be shared annually with the cooperating producers and agronomists. This study will also be the basis of extension programming (presentations and fact sheets) regarding K recommendations and the effect of soil properties on K recommendations. Results will provide growers and agronomists with updated K management information. The approximate annual budget of this project is $97,442 from SD NREC plus $14,000 per from an industry support partner.

Goals and Objectives

The goal of this project is to gain understanding regarding the soil properties that effect K availability to corn and create new soil specific K fertilizer recommendation guidelines for SD. The specific objectives of this project are: 1) assess the impact of soil test K and soil K base saturation on ear leaf nutrition, stalk K content and grain yield across four eastern SD sites, 2) evaluate the crop leaf nutrition and grain yield response to K fertilizer with and without biochar applied at V3 and V4 development at four sites, and 3) determine the effect of K fertilizer placement (surface broadcast vs. sidebanding) on corn growth and yield.

2023 Results:

- Studies have been established at 6 field sites.
- Soil samples were collected for soil health and soil fertility prior to planting and fertilization.
- Fertilizer treatments of different potassium sources were applied.
- V6 plant samples were taken and are currently being processed in preparation for analyzing for nutrient analysis.

Impacts:
Comparisons regarding the following K fertilizer sources:

- KCl vs.
    - Aspire (KCl with 2 Boron forms)
    - K acetate (no chloride)
- Biochar alone vs.
    - With Aspire
    - Wth K acetate
- Control vs. all

- Increase corn producer awareness of potential soil and plant K deficiencies.
- Provide information on the soil properties associated with K deficiencies.
- Provide corn grain yield response to K fertilization probabilities based on soil test information that will be used by farmers to make decisions regarding K fertilization based on research results.
- Training of a graduate and several undergraduate students in soil fertility.

Budget:
Project Budget (As of June 1, 2023):

Budget Category	Budget	Total Expenses	Available
Salaries	$31,619.00	$6,114.32	$25,504.68
Benefits	$3,145.00	$501.55	$2,643.45
Travel	$4,000.00	$0.00	$4,000.00
Contractual	$47,000.00	$0.00	$47,000.00
Supplies	$4,000.00	$0.00	$4,000.00
Tuition remission	$7,678.00	$0.00	$7,678.00
Capital Equipment	$0.00	$0.00	$0.00
Non-Capital Equipment	$0.00	$0.00	$0.00
F&A (Indirect) Charges	$0.00	$0.00	$0.00
Total	**$97,442.00**	**$6,615.87**	**$90,826.13**