

**Investigating Impact of starter fertilizer placement on plant development, grain yield, and nutrient uptake – Year 3
Progress Report June 2023**

PI: Dr. Péter Kovács, SDSU Department of Agronomy, Horticulture & Plant Science

Email: peter.kovacs@sdstate.edu; Phone: (218) 280-2870

Co-PI: Dr. Jason Clark, Department of Agronomy, Horticulture & Plant Science

Email: Jason.D.Clark@sdstate.edu

Graduate student: Larousse Dorissant

Summary

Starter fertilizer is often associated to promote early plant development and plant-to-plant uniformity especially for early planted crop or in no-till growing conditions. However, the yield impact and benefit of starter fertilizer is inconsistent. Approximately 60% of the producers are applying starter fertilizer in South Dakota according to a recent producer survey. The goal of the project is to compare the effect of starter fertilizer placement and plant development and yield effect. Specific objectives are 1) to determine if use of starter fertilizer increases grain yield throughout in SD (from north to south), 2) to determine if planting date influence the crop response to starter fertilizer 3) to determine the starter fertilizer impact on plant development and nutrient uptake. We will compare an early planting date with a normal/late planting date response with different starter fertilizer placement and product combination. Starter fertilizer will be placed in the following ways: in-furrow lower and higher rate, 2 x 2, and a combination of in-furrow lower rate and 2 x 2 compared to no starter fertilizer treatments. Early season plant development, nutrient uptake and grain yield will be determined.

Goal and objectives

The goal of the project is to compare the effect of starter fertilizer placement and plant development and yield effect. Specific objectives are 1) to determine if use of starter fertilizer increases grain yield throughout in SD (from north to south), 2) to determine if planting date influence the crop response to starter fertilizer 3) to determine the starter fertilizer impact on plant development and nutrient uptake.

Progress update:

We have established this research at three locations using (P9211Q, P9624Q, and P0404AM at South Shore, Brookings, and Beresford, respectively). The first planting date treatments were planted on May 1st near Beresford, on May 5th near Aurora, and on May 9th near South Shore, while the second planting date treatments were planted on May 22th, May 26th, and on May 30th in Beresford, near Aurora and South Shore respectively.

Two starter fertilizers were used (10-34-0 and 8-21-5) with and without additional Zn fertilizer and they were placed in the following ways:

- in-furrow lower rate,
- in-furrow higher rate,
- 2 x 2, and a
- combination of in-furrow lower rate and 2 x 2 placements.

These fertilizer placements will be compared to an untreated control plot. In-furrow low-rate treatment provided approximately 9 lbs. P₂O₅/ac (same amount for the two fertilizer types), the in-furrow high-rate placement treatment provided approximately 14 lbs. P₂O₅/ac, while the 2 x 2 starter placement provided 23 lbs. P₂O₅/ac.

We have already completed the V6 plant biomass sampling from both planting dates. We are processing the biomass samples and preparing them for laboratory analysis.

We captured individual plant information on growth stage of the plant and plant height at V3-V4 (3 or 4 fully developed leaf) growth stages, and we are currently measuring the corn at V8-V9 growth stages to determine if there are early season plant growth development differences due to treatments.

Remainder of tasks to complete:

We continue to monitor crop development differences among treatments and complete the end of season crop measurements and sampling later this year.

We will monitor and document:

- Collect plant samples for biomass and nutrient uptake determination after physiological maturity.
- Grain yield and grain moisture at harvest will be determined through machine harvest.
- 1000 seed weight will be measured from grain samples collected during harvest.

Results will be communicated to stakeholders at upcoming field days, during extension and scientific meetings, and through development of peer reviewed scientific and extension publications. In addition, this project will train and mentor a graduate student, and undergraduate students who will assist during the project.