

Determining suitable planting date and soil temperature for enhanced growth and yield of soybean under no-till semi-arid condition
(Mid-Year Report)

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Objectives

- ✦ To find out the optimal soybean planting date for western ND.
- ✦ To determine an optimal soil temperature (at 4” depth) for planting soybean at western ND.

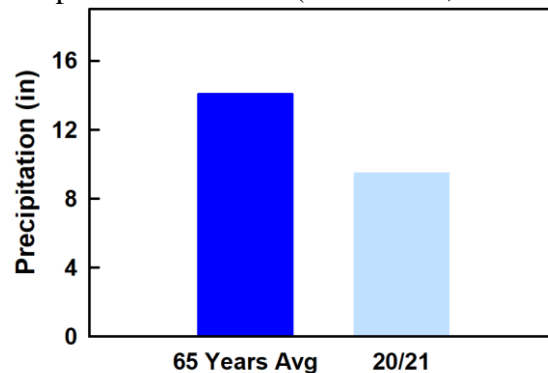
Completed works

Two glyphosate-tolerant soybean varieties (either treated with Obvious @ 4.6 oz / 100 lb seed or not treated) were seeded at Williston Research Extension Center, Williston, ND on 3rd, 10th, 17th, 25th, and 31st of May, and 7th and 14th of June 2021 using a 7-row no-till plot planter. During crop growth, the soil moisture and temperature data at four inches depth were continuously recorded. Drones equipped with multispectral, thermal, or RGB cameras were flown over the experimental field to estimate Canopy Temperature (CT), Normalized Difference Vegetation Index (NDVI), and Normalized Difference Red Edge (NDRE). At maturity, we measured plant height with a meter scale, collected biomass from nine square feet, and harvested crops using a plot combine.

Preliminary results

- ✦ 2021 was an extreme drought year. From 2020/10/01 to 2021/09/30, we received 9.5 inches of annual precipitation, which was 4.5 inches lower than the 65-year average (Fig. 1).

Figure 1. Annual Precipitation at WREC (October 1st, 2020 – September 30th, 2021)



- ✦ There was no effect of seeding date, variety, and seed treatment on soybean plant height. The average plant height of the soybean was 23.8 inches.
- ✦ Averaged across other treatments, soybean planted on June 14th had the highest test weight (Fig. 2A) and grain yield (Fig. 2B), followed by soybean planted on May 17th.
- ✦ Averaged across other treatments, variety ND 17009GT had 1.9 lb/bu higher test weight (Fig. 3A) and 1.8 bu/ac more grain yield than ND 18008GT (Fig. 3B).

Figure 2. Soybean test weight and grain yield under different planting dates.

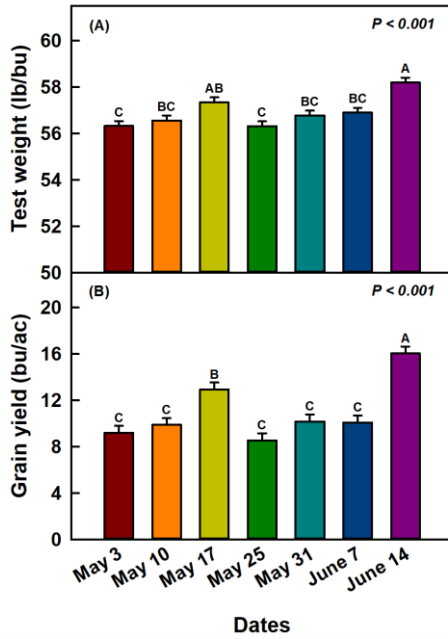
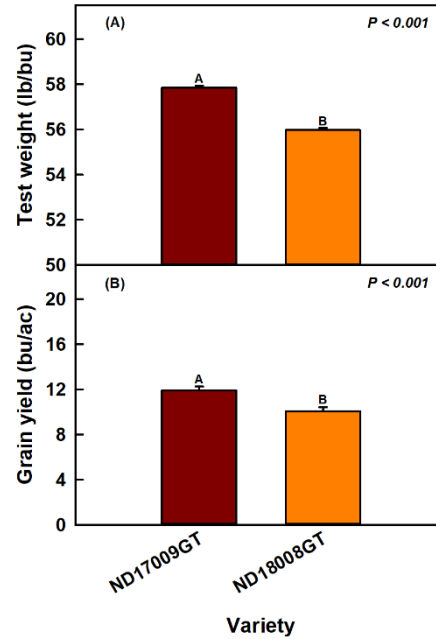


Figure 3. Soybean test weight and grain yield under different varieties.



Works to be completed

We will be processing and analyzing the data on yield components from biomass, the data on growth and physiology from aerial images acquired with UAS, and the data on soil moisture and soil temperature collected with different sensors.

Acknowledgments

We acknowledge the financial support of the North Dakota Soybean Council. Mention of trademark or proprietary product does not constitute a guarantee or warranty of the product by North Dakota State University. It does not imply its approval to the exclusion of other products which may also be suitable.