

Determining optimal planting date and soil temperature for enhanced growth and yield of soybean under no-till semi-arid condition

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Planting date plays significant role in field crop production. Early or late planting may decrease grain yield and quality of a crop due to increased biotic (insect, disease, weed, and bird incidence), and/or abiotic stress (frost, drought, and high temperature). Northwestern North Dakota has a cool semi-arid climate with annual precipitation of <13 inches. The long-term weather data shows that, in this region, the last spring freeze may occur in the last week of April and the first fall freeze in October. There is a need of determining an optimal soybean planting dates and soil temperature for Northwestern ND that provide optimal growing period, decrease chances of frost and/or drought damage, and enhance grain yield.

Materials and methods

Soybean was seeded at Williston Research Extension Center, Williston, ND on 3rd, 10th, 16th, and 25th of May, and 3rd, 9th, and 15th of June 2018 using a 7 rows no-till plot planter. Soil moisture and temperature data at 4 inches depth were continuously recorded from April 26, 2018 to October 2018. Canopy temperature and normalized difference vegetation index (NDVI) were measured weekly with a FLIR® E60 Thermal Imaging camera and a modified NDVI Sony camera; respectively.

Results and discussion

The trial received heavy rain, wind and hailstorms that damaged the crop and adversely affected yield (June 23: wind speed=46 mph, precipitation = 1.53"; June 28: wind speed = 61 mph, precipitation = 0.94", hailstorm; July 9: wind speed = 48 mph, precipitation = 1.67"). There was a significant effect of planting date on plant stand and grain yield. Soybean planted on and after July 9 had the highest plant stand of ~93000/a, which was on an average 20 to 40 thousand more plants than earlier planting dates (Fig.1). Soybean planted on May 16 and 25 had a maximum grain yield of ~17 bu/a, which was on an average 3 to 6 bushels more grain than other planting dates (Fig.2).

Figure 1. Effect of planting date on plant stand.

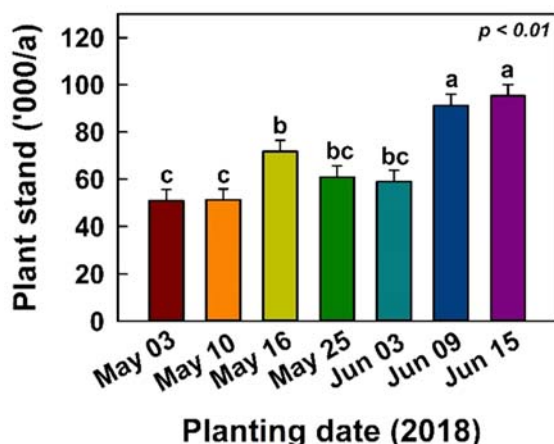


Figure 2. Effect of planting date on grain yield.

