Planting Date Effects on Irrigated Soybean

Background

Research has shown that earlier planted soybeans can provide the opportunity for higher yields. Because of this, soybean planting dates have been moving to the last week of April or the first week of May when planting conditions and equipment allow in the Midwest region. This study was developed to determine the effect of planting date on soybean yield and crop canopy. The study was also intended to determine the effect of seeding density on soybean yields. Similar studies have been conducted at Gothenburg Learning Center: 2013 - Effect of Planting Date on Soybean Yield and 2011 - Soybean Planting Date. The 2015 study used an expanded number of planting dates. The study evaluated the timing of canopy closure and soybean yield as planting dates moved from April 1st to June 10th.

Canopies close quicker with earlier planting allowing full interception of the sun’s radiation during pod set and seed fill. More light ‘harvested’ may result in greater yield. Earlier planted soybeans can reach R1 growth stage (early flowering) sooner and can potentially have a longer growing season. While internode elongation is temperature dependent, node accrual is time dependent. After V1 growth stage, soybean plants gain a new node once every 3.7 days; therefore, more nodes may be accrued with early-planted soybeans.\(^1\) New nodes continue to accumulate through the R5 growth stage.

In a 2014 survey of 181 Nebraska farmers, over half of those surveyed responded they were planting soybeans at a rate of 140,000 to 170,000 seeds per acre.\(^2\) Some research has demonstrated seeding rates can be reduced to 120,000 seeds/acre in fields with clay loam/silty clay loam soils.\(^3\) Population decisions should be made carefully with increased costs of production.

Study Guidelines

Two soybean products were planted: 2.4 MG and 3.0 MG at a rate of 160,000 seeds/acre. 2015 planting Dates: April 1, April 24, May 1, May 15, May 26, and June 10. Soybeans were planted into a field that was previously corn and had been strip-tiled April 1, 2015. The study was kept weed-free and a total of 6 inches of irrigation was applied during the growing season to keep plants free of moisture stress. The study was a randomized complete block design with 3 replications in large strips (150 ft by 10 ft) with the center two rows harvested.

Results and Discussion

| Table 1. Results of MG 2.4 Soybean Products for 7 Planting Dates Spanning a 70-Day Planting Season. |
| --- | --- | --- | --- |
| Planting Date | Average Yield (bu/acre) | Gross Revenue (dollars) | Revenue Decrease Compared to Ideal Date (dollars) |
| April 1 | 78 | 624 | -96 |
| April 24 | 88 | 704 | -16 |
| May 1 | 89 | 712 | -8 |
| May 8 | 90 | 720 | 0 |
| May 15 | 87 | 696 | -16 |
| May 26 | 87 | 696 | -24 |
| June 10 | 75 | 600 | -120 |

| Table 2. Results of MG 3.0 Soybean Products for 7 Planting Dates Spanning a 70-Day Planting Season. |
| --- | --- | --- | --- |
| Planting Date | Average Yield (bu/acre) | Gross Revenue (dollars) | Revenue Decrease Compared to Ideal Date (dollars) |
| April 1 | 77 | 616 | -96 |
| April 24 | 89 | 712 | 0 |
| May 1 | 84 | 672 | -40 |
| May 8 | 84 | 672 | -40 |
| May 15 | 81 | 648 | -64 |
| May 26 | 81 | 648 | -64 |
| June 10 | 76 | 608 | -104 |

Yield at the early planting date was likely reduced by frost damage. This, combined with the greater than three-week interval in April with no planting dates, may have caused the yield curve to slope at a higher than expected rate toward the early planting date. Without a frost, there could have been a longer optimal planting window on the early end of the curve.
Planting Date Effects on Irrigated Soybean

Figure 1. Soybean yield based on planting date of two products planted at the Gothenburg Learning Center
* Note this graph is drawn with the date as a scale so that the equation line can be applied to the chart.

Figure 2: Percent canopy closure for four planting dates of a 2.4 MG product at selected measurement dates.
Planting Date Effects on Irrigated Soybean

Takeaways

In this study, yield was closely tied to the planting date of the soybean product with the highest yield when averaged across products coming at the April 24th planting date. Due to this high yield, the treatment also provided the most gross revenue per acre. There were fairly stable yields across the planting dates that were between the end of April and the end of May. The suggested planting date for this region of Nebraska is during the last week of April and the first week of May and our results closely matched this for the 2015 growing season. With the early planting date we were able to show a negative response to both planting too early and planting too late because yield at both the April 1st and June 10th planting dates were significantly lower than all of the other dates.

The reason for low yields at the April 1st planting date was likely due to frost after soybean emergence which reduced plant stands. Temperatures reached slightly less than 30°F on May 12th which resulted in some stand loss due to soybeans freezing off. The lack of canopy closure for the April 1st planting date is likely due to this stand loss, but stand reduction was not measured in this study. Throughout the season it was apparent that the percentage of canopy closure on a given date was closely related to the planting date of the plot except for the April 1st planting date which suffered stand loss resulting in slower canopy closure. Early canopy closure may aid yield potential in several ways including an increase in leaf area to gather photosynthates and reducing the ability of weeds to compete with the soybean plants.

Sources

Websites verified 1/8/16
Planting Date Effects on Irrigated Soybean

Figure 4. Soybeans in the April 1st planting date pictured on May 1st. At this point there was a great stand in this planting date which was later reduced by frost.

Figure 5. Soybeans in the April 1st planting date showing various levels of frost damage from a freeze on May 12th. (Note the healthy plants, plants regrowing below the main growing point, and dead plants. The damage was most severe where corn residue had blown back into the strip tilled seed bed.)

Figure 6. Group 2.4 soybean planted April 1st planting date showing the canopy on June 19th with an estimated 8% canopy cover.

Figure 7. Group 2.4 soybean planted April 24th with an estimated 16% canopy cover on June 19th.
Planting Date Effects on Irrigated Soybean

Figure 8. Group 2.4 soybean planted May 15th with an estimated 4% canopy cover on June 19th.

Figure 9. Group 2.4 soybean planted June 10th just emerging on June 19th.

Figure 10. Group 2.4 soybean planted April 1st with an estimated 37% canopy cover on July 10th.

Figure 11. Group 2.4 soybean planted April 24th with an estimated 54% canopy cover on July 10th.

Figure 12. Group 2.4 soybean planted May 15th with an estimated 47% canopy cover on July 10th.

Figure 13. Group 2.4 soybean planted June 10th with an estimated 29% canopy cover on July 10th.
Planting Date Effects on Irrigated Soybean

Figure 14. Group 2.4 soybean planted April 1st with an estimated 83% canopy cover on July 27th.

Figure 15. Soybean planted April 24th with an estimated 80% canopy cover on July 27th.

Figure 16. Soybean planted May 15th with an estimated 75% canopy cover on July 27th.

Figure 17. Soybean planted June 10th with an estimated 82% canopy cover on July 27th.

Figure 18. Group 2.4 soybean planted April 1st with an estimated 82% canopy cover on August 7th.

Figure 19. Group 2.4 soybean planted April 24th with an estimated 98% canopy cover on August 7th.
Planting Date Effects on Irrigated Soybean

Figure 20. Group 2.4 soybean planted May 15th with an estimated 95% canopy cover on August 7th.

Figure 21. Group 2.4 soybean planted June 10th with an estimated 93% canopy cover on August 7th.

Figure 22. Group 2.4 soybean planted April 1st starting to senesce on September 9th.

Figure 23. Group 2.4 soybean planted April 24th showing increased senescence compared to the April 1st planting date on September 9th.

Figure 24. Group 2.4 soybean planted June 10th showing no signs of senescence on September 9th.

Legals
The information discussed in this report is from a multiple site, single year, non-replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

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