Early Planting of Soybean is a Must for High Soybean Yields

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Early Planting of Soybean is a Must for High Soybean Yields.

Palle Pedersen, Assistant Professor, Agronomy, Iowa State University

Soybean varieties have a genetic yield potential greater than 100 bu per acre. However this yield potential is never reached under field conditions. Environmental conditions are usually never adequate to fully "unlock" the full genetic potential of a variety. The interaction between genetics and environment and how that translates into yield is largely unknown. Yet there are fundamental management decisions that give the best opportunity to maintain high yield. Understanding how a soybean plant develops through the season will provide insight into selection of management decisions that should lead to maintaining the yield potential. After variety selection, planting date is the most important management decision a grower has to make every year.

**Introduction**

Many believe that planting date for soybean is not as important as it is for corn. That is not the case. There is a yield benefit for planting that early, despite cold soil temperatures that slow plant growth during the seedling phase (Elmore, 1990; Lueschen et al., 1992; Oplinger and Philbrook, 1992). Studies involving various planting dates in combination with agronomic practices such as row widths, plant population, and varieties have clearly shown that planting date was the variable having the greatest impact on yield. Yield increases range from 7% (Pedersen and Lauer, 2004a) to 30% (Beuerlein, 1988). The yield response is a result of increased seasonal canopy photosynthesis (Christy and Porter, 1982), greater number of nodes (Wilcox and Frankenberger, 1987; Pedersen and Lauer, 2004), more rapid crop growth rate during seed filling (Pedersen and Lauer, 2004), increased length of the reproductive period (Wilcox and Frankenberger, 1987; Raymer and Bernard, 1988) and greater seed filling rate (Anderson and Vasilas, 1985). Oplinger and Philbrook (1992) reported that early planting dates increased yield even though the number of emerged and harvested plants decreased. Pedersen and Lauer (2004) reported that seed number, pod number, and harvest index increased at early planting dates and that the duration of seed dry matter accumulation was longer for early planting dates.

The optimum time to plant soybean varies from year to year and from region to region. Numerous factors influence the decision on when to start planting soybean. Little research has been conducted in Iowa on soybean planting date. Our objective is therefore to determine the optimum time to plant soybean in Iowa. This presentation will summarize several different studies conducted over the last 3 years in Iowa.

**Materials and Methods**

Three experiments were established in 2003 and one experiment was established in 2004 to evaluate soybean planting date across numerous locations and management practices in Iowa. Most of these studies were initiated to evaluate current soybean seeding rate recommendations. The experimental design in all cases was a randomized complete block design in a split plot arrangement with four replications. Main plot was four planting dates and sub-plot was four
seeding rates. The seeding rate data will not be presented in this presentation.

**Experiment 1.**
The experiment was conducted during 2004 and 2005 at three locations across Iowa (Whiting, Nevada, and DeWitt; Table 1). The soybean variety AG2801 was planted in 15 inch row spacing. Four planting dates were separated by approximately ten days, beginning the last week of April.

**Experiment 2**
The experiment was conducted during 2003 and 2004 at the ISU Northeast Research Farm near Nashua (Table 2). The soybean variety NK-S24-K4 was planted in 30 inch row spacing. Four planting dates were separated by approximately two weeks, beginning May 1.

**Experiments 3 and 4.**
Two experiments (no-tillage vs. conventional tillage) were conducted during 2003 and 2004 at the ISU Southeast Research Farm near Crawfordsville (Table 2). The soybean variety DKB-36-51RR was planted in 30 inch row spacing. The four planting dates were separated by approximately two weeks, beginning May 1. Conventional tillage was chisel plowed in the fall and field cultivated twice in the spring.

Table 1. Soybean yield response to four planting dates at Whiting, Nevada, and DeWitt in 2004 and 2005. Planting dates were separated by ten days.

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Whiting</td>
<td>Nevada</td>
</tr>
<tr>
<td>Late April</td>
<td>82.5</td>
<td>58.4</td>
</tr>
<tr>
<td>Early May</td>
<td>70.9</td>
<td>45.4</td>
</tr>
<tr>
<td>Late May</td>
<td>68.7</td>
<td>-†</td>
</tr>
<tr>
<td>Early June</td>
<td>57.7</td>
<td>45.7</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>3.9</td>
<td>7.9</td>
</tr>
</tbody>
</table>
†Third planting date lost at Nevada in 2004 due to flooding.
‡NS = no significant differences at P ≤ 0.05.

Table 2. Soybean yield response to four planting dates at Nashua and Crawfordsville from 2003-2004. Planting dates were separated by two weeks.

<table>
<thead>
<tr>
<th></th>
<th>Nashua</th>
<th>Crawfordsville</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No-tillage</td>
<td>Tillage</td>
</tr>
<tr>
<td>Early May</td>
<td>49.1</td>
<td>53.3</td>
</tr>
<tr>
<td>Mid May</td>
<td>46.6</td>
<td>49.8</td>
</tr>
<tr>
<td>Early June</td>
<td>43.2</td>
<td>41.5</td>
</tr>
<tr>
<td>Mid June</td>
<td>40.8</td>
<td>29.5</td>
</tr>
<tr>
<td>LSD (0.05)</td>
<td>1.6</td>
<td>4.1</td>
</tr>
</tbody>
</table>
Results and Discussion
Planting date affected soybean yield in all experiments. The response to planting date varied according to location and environmental conditions. Overall, the highest soybean yield was found for the earliest planting date for all experiments.

Significant yield differences were observed at the three locations in central Iowa (Table 1). Highest yields were for both years found at Whiting. At this location, the yield loss from delayed planting was greatest indicating that the penalty for delaying planting is greatest in high yielding environments. In Nevada in 2004, the third planting date was lost to flooding, which also affected the first and second planting date (late April and early May). In 2005, heavy rainfall in Nevada resulted in soil crusting in mid May and all plots were therefore rotary hoed resulting in stand and yield loss for the first and second planting date (late April and early May). The highest yielding plots in Nevada in 2005 were therefore the third planting date (late May). In DeWitt, a strong correlation between planting dates and yield was observed in 2004, but not in 2005. It is speculated that the drought in eastern Iowa was the reason to the small response to planting date there in 2005.

At the northern location, Nashua, the smallest correlation was observed between planting date and yield for the different experiments (Table 2). On average, yield only declined by 0.18 bu per acre per day. Nashua is also the location with the overall lowest yield indicating that planting date may not be as important here compared to other yield limiting factors.

At the southern location, Crawfordsville, the yield response was much larger (Table 2). Soybean yields were similar for the two tillage practice. No planting date by tillage interaction occurred. On average, yield dropped by 0.53 and 0.36 bu per acre per day for the no-tillage and conventional tillage systems, respectively.

Conclusion
If soil conditions are suitable, soybean should be planted during the last week of April and the first week of May in Iowa. It is not recommended to plant earlier than this since there is a risk associated with early planting. A late spring killing frost can cause crop replanting to be necessary. A farmer in northern Iowa should therefore wait until May 1 to minimize the risk of early planting. In addition, planting soybean early “just to plant early” is not advisable unless you have good seedbed conditions. “Mudding-in” soybean and causing soil compaction outweighs any benefit of early planting. The research will continue in 2006.

Acknowledgement
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References


