

Cold Front Planting Timing – Soybeans (Cold Front 2)

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Objective

Determine how planting prior to a cold front impacts soybean yield.

Background

Crop Year: 2022	Previous Crop: Corn
Location: NW Agricultural Research Station	Tillage: Disked 12/7/2021
County/Town: Wood/Custer	Planting Date: Varies (see Methods)
Soil Type: Hoytville Clay	Seeding Rate: 160,000
Drainage: Tile 40'	Harvest Date: 10/11/2022

This project came about to investigate which planting condition changes may impact yield. This would enable farmers to make more informed decisions on when they should stop planting prior to a predicted cold front. The concern is imbibition of cold water which can cause chilling injury. Imbibition is the rapid uptake of water from the soil. This typically occurs within 24 hours after planting. Bramlage, Leopold and Parrish (1978) showed sensitivity to soybean when imbibing water at 12° Celsius (53.6° F) or less for 30 minutes, otherwise known as seed chilling injury. Today, the consensus is that chilling injury is more likely to occur at soil temperatures below 50°F (Lindsey 2022).

Methods

Planting occurred in relation to predicted cold fronts. Cold fronts (a warm air mass replaced by a cooler air mass) with precipitation were our target. Treatments included planting three days prior to a cold front, two days prior to, one day prior to, the day of the cold front, followed by the first suitable day after, and two weeks after. Soils were allowed to warm first in the spring to at least 55 degrees Fahrenheit before initiating planting to ensure the 3, 2 and 1 day prior treatments were planted into soil conditions above where past research has shown injury. Each treatment was replicated four times and laid out in a randomized complete block design. This study included two cold fronts at this location, and the data below represents the second cold front.



Layout

32	33	34	35	36	37	38	39	40	41	42	43	44	45	
B	501	502	503	504	505	506	801	802	803	804	805	806	B	
	3	6	2	1	5	4	3	2	1	6	4	5		
		1	3 days prior to						4	Day of cold front				
		2	2 days prior to						5	1st day suitable after				
		3	1 day prior to						6	2 weeks after				

B	601	602	603	604	605	606	701	702	703	704	705	706	B
	1	4	3	6	5	2	3	4	2	1	5	6	
32	33	34	35	36	37	38	39	40	41	42	43	44	45

Table 1. Treatment List and Planting Dates

Treatment	Planting Date
Cold Front 2, 3 days prior to	5/23/2022
Cold Front 2, 2 days prior to	5/24/2022
Cold Front 2, 1 day prior to	5/25/2022
Cold Front 2, day of cold front	Unplanted due to weather
Cold Front 2, first day fit	5/31/2022
Cold Front 2, 2 weeks after	6/6/2022

Results

Cold fronts are difficult to predict. From May 25th through May 26th, there was 1.57” of rainfall, but soil temperatures warmed as planting proceeded and did not drop below 60°F until June 4th (Table 3).

Stand counts were taken at the V3 growth stage. The closer the planting date was to the cold front, the more the overall population decreased due to some crusting from a heavy rain event. As a result, slower seedling vigor was observed in the early growing season on plots planted one day prior to and the day of the cold front. These planting dates set back plant growth, causing the soybeans to take four days longer to get to the V3 growth stage compared to the plots planted three days and two days prior to the cold front. Later in the season, there was only a two-day difference in the plots when entering the R3 stage.

The planting dates nearest the weather front resulted in higher yields. The 2 weeks after planting date had the lowest yield. Overall, the results of this study suggest that delaying the planting date until early June decreased grain yields. Additionally, better germination and crop stands were achieved when avoiding heavy rainfall events close to planting time.



Treatment	Yield Avg (bushels/acre)	Avg Daily Soil Temp, 2" (deg F)
3 days prior to	74.2 B	59.7
2 days prior to	76.7 A	62.5
1 day prior to	75.7 AB	63.5
Day of	N/A	66.3
First suitable after	72.4 B	73.8
2 weeks after	66.9 C	68.6
	LSD (0.1) 1.85	

Table 2. Avg Daily Soil Temperatures at 2 inch Depths Between Planting Dates

Date	Avg Daily Soil Temp, 2" (deg F)
5/26/2022	66.3
5/27/2022	66.9
5/28/2022	69.0
5/29/2022	70.1
5/30/2022	71.8
6/1/2022	73.7
6/2/2022	70.5
6/3/2022	66.9
6/4/2022	59.9
6/5/2022	70.3

Summary

Yield results were statistically higher two days prior to and one day prior to the weather front. It becomes difficult to conclude the impact a cold front has on planting timing because this cold front resulted in rainfall and no temperature decreases.

Cooler air and soil temperatures are needed to further explore the cold front research question in soybean.

The authors have not written reports for past years at the time of publishing this report but details from all study dates can be found at: <https://go.osu.edu/coldfrontcttc23>.

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For more information, contact:



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