

## Cold Front Planting Timing – Soybeans (Cold Front 1)

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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).

Hypothesis: Planting the day of the cold front will reduce yields due to seed chilling injury.

### 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 first cold front.



## Layout

46	47	48	49	50	51	52	53	54	55	56	57	58	59
B	101	102	103	104	105	106	401	402	403	404	405	406	B
	6	2	1	3	4	5	1	2	3	5	4	6	
		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	201	202	203	204	205	206	301	302	303	304	305	305	B
	5	6	3	4	1	2	4	3	2	5	1	6	
46	47	48	49	50	51	52	53	54	55	56	57	58	59

Table 1. Treatment List and Planting Dates

Treatment	Planting Date
Cold Front 1, 3 days prior to	5/11/2022
Cold Front 1, 2 days prior to	5/12/2022
Cold Front 1, 1 day prior to	5/13/2022
Cold Front 1, day of cold front	5/14/2022
Cold Front 1, first day fit	5/23/2022
Cold Front 1, 2 weeks after	5/23/2022

## Results

Cold fronts are difficult to predict. For this cold front, 0.51" of rain fell on May 14<sup>th</sup>, with another 0.71" falling on May 16<sup>th</sup>. Air and soil temperatures did not drop until May 16<sup>th</sup> and 17<sup>th</sup> – two days after the prediction. This study resulted in statistically significant yield differences with the 2 days prior to the cold front planting date yielding statistically higher than both planting dates after the cold front (Table 2).

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 that were planted one day prior to and the day of the cold front. These planting dates set back plant growth. The soybeans took four days longer to enter 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.



Table 2. Soybean Yield Response to Planting Dates prior to Cold Front

Treatment	Yield Avg (bushels/acre)	Avg Daily Soil Temp, 2" (deg F)
3 days prior to	76.8 AB	66
2 days prior to	79.3 A	65.8
1 day prior to	75.3 B	68.8
Day of	77.9 AB	69
First suitable after	74.3 B	59.7
2 weeks after	72.8 B	59.7
	LSD (0.1) 2.75	

Table 3. Avg Daily Soil Temperatures at 2 inch Depths Between Planting Dates

Date	Avg Daily Soil Temp, 2" (deg F)
5/15/2022	69.4
5/16/2022	65.7
5/17/2022	63.8
5/18/2022	60.4
5/19/2022	65.3
5/20/2022	68.0
5/21/2022	69.8
5/22/2022	65.2

### Summary

Yield differences were statistically higher at the two days prior to the cold front planting compared with the two planting dates after. Since the one day prior to planting yielded lower than the day of the cold front, and was statistically the same as the two later planting dates, it is difficult to conclude the impact of cold fronts on soybean yields.

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

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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### References

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