Cold Front Planting Timing – Corn (Cold Front 1)

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Objective

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

Background

Crop Year: 2022
Location: NW Agricultural Research Station
County/Town: Wood/Custer
Soil Type: Hoytville Clay
Drainage: Tile 40'

Previous Crop: Soybeans
Tillage: No-till
Planting Date: Varies (see Methods)
Seeding Rate: 34,000
Harvest Date: 11/9/2022

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 by the seed which can cause chilling injury. Imbibition is the rapid uptake of water from the soil. This typically occurs within 24 hours after planting. Cal and Obendorf (1972) showed sensitivity to corn when imbibing water at 5° Celsius (41° F) in the first 24 hours, otherwise known as seed chilling injury. If the seed imbibed warm water in the first 24 hours, no injury was seen. Today, the consensus is 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, one day prior, 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. Soil temperature information at the 2 inch depth was collected from the weather stations at each research location. 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	

Key				
	1	3 days prior	4	Day of cold front
	2	2 days prior	5	1st day suitable after
	3	1 day prior	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	5/11/2022
Cold Front 1, 2 days prior	5/12/2022
Cold Front 1, 1 day prior	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

This cold front resulted in statistically significant yield differences; best yield results were achieved with planting after the cold fronts (Table 2).

Table 2. Corn 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	189.1 BC	66
2 days prior to	179.0 C	65.8
1 day prior to	192.9 B	68.8
Day of	198.9 AB	69
First suitable after	206.6 A	59.7
2 weeks after	210.7 A	59.7
	LSD (0.1) 12.35	

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

Cold fronts are difficult to predict. This cold front was predicted for 5/14/2022. For this cold front, 0.51" of rain fell on May 14th, with another 0.71" falling on May 16th. Air and soil temperatures did not decrease until May 16th and 17th – two days after the prediction.

Plants emerged out of the ground six to eight days after planting. The population was consistent across the early planting dates. Plants in each treatment reached the R1 growth stage one day apart, respective to their planting date. The same trend was observed as well when reaching the black layer.

Yield differences were statistically higher for corn planted the day of the projected cold front, the next suitable day, and two weeks after (which both occurred on May 23rd). The day of the cold front yield was statistically the same as the later planting dates and higher than the days leading up to the cold front. The warmer soil temperatures for two days after planting – likely – kept any yield loss from occurring on that planting date. However, planting prior to the cold front showed some yield losses (2 days prior to).

Summary

It does not appear that planting the day of cold front impacted yield (though a definite cold front was not present). Cooler air and soil temperatures are needed to further explore the cold front research question in corn.

The authors have 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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