Cold Front Planting Timing – Corn (Cold Front 2)

Amanda Douridas, Ohio State University Extension Educator, Madison County
Nick Eckel, Ohio State University Extension Educator, Wood County
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Objective

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

Background

Crop Year: 2022	Previous Crop: Soybeans
Location: NW Agricultural Research Station	Tillage: No-till
County/Town: Wood/Custer	Planting Date: Varies (see Methods)
Soil Type: Hoytville Clay	Seeding Rate: 34,000
Drainage: Tile 40’	Harvest Date: 11/9/2022

This project came about to investigate which planting condition changes may affect 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 (41º 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 to, one day prior to, 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. Treatments were replicated four times, but due to a harvest error, only three treatments were included in the results. Treatments were laid out in a randomized complete block design. The ‘day of’ planting was planned but got rained out and therefore did not occur. 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 second cold front.

Layout

33	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
501	502	503	504	505	506	801	802	803	804	805	806	B
3	6	2	1	5	4	3	1	2	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

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	
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

The study showed minimum but statistically significant yield differences related to planting dates (Table 2), the last planting date (2 weeks after cold front) was the only treatment that resulted in a lower yield.

Table 2. Corn Yield Response to Planting Dates prior to of Cold Fronts

Treatment	Yield Avg (bushels/acre)	Avg Daily Soil Temp, 2" (deg F)
3 days prior to	205.4 A	59.7
2 days prior to	201.5 A	62.5
1 day prior to	201.3 A	63.5
Day of	N/A	66.3
First suitable after	207.9 A	73.8
2 weeks after	188.2 B	68.6
	LSD (0.1) 9.03	

Table 2. Soil Temperatures at 2 inch depths between Planting Dates

Date	Avg 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

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.

Stand counts were better in the treatments two and three days prior to the projected cold front. In the treatments planted one day prior to the cold front, the stand population was reduced by 25% (likely affected by the rainfall event on May 25-26 of 1.57 inches). However, this did not result in a significant yield difference compared to the other high yielding dates. Each treatment reached the R1 growth stage one day apart, respective to their planting date. The same trend was observed when corn was reaching the black layer.

Yield results were statistically the same for three, two, and one day(s) prior to the cold front, along with the first suitable day after.

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.

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

Summary

Since the yield was lower when planted 2 weeks after the cold front, we may infer planting prior to the cold front was worth the risk at these later planting dates.

The authors have not written up 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:
Amanda Douridas
OSU Extension –Madison County
217 Elm St.
London, Ohio 43140
Douridas.9@osu.edu

References:

Cal, J.P. and Obendorf, R.L. (1972), Imbibitional Chilling Injury in *Zea mays* L. Altered by Initial Kernel Moisture and Maternal Parent1. Crop Science, 12: 369-373 cropsci1972.0011183X001200030034x. https://doi.org/10.2135/cropsci1972.0011183X001200030034x

Lindsey, A., Lindsey, L., Ortez, O. (2022) *Imbibitional Chilling – Is it a concern?* C.O.R.N. Newsletter 2022-11. https://agcrops.osu.edu/newsletter/corn-newsletter/2022-11/imbibitional-chilling-%E2%80%93-it-concern