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Effect of Preceding Crop and Residue Management on Corn Establishment in Manitoba

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Introduction

- *Cool spring conditions combined with a relatively short growing season can create challenges for corn production in Manitoba.*
- *While early seeding is critical to optimize yield and reduce the risk of crop failure, this practice may expose corn seed to cold soil conditions that are not optimal for germination and emergence.*
- *This ongoing multi-year study will assess the effects of preceding crop and residue management on corn.*
- *Preliminary observations on the effects of cool spring temperatures in Manitoba in 2025 on corn establishment in this study are reported.*

Materials and Methods

In 2023, a multi-year field study was initiated on a Newdale clay loam soil north of Brandon, MB to assess the effect of preceding crop and residue management practices on a subsequent corn crop.

Recommended cultivars of Liberty-tolerant canola (C), glyphosate-tolerant soybean (S), and CWRS wheat (W) were grown in the year prior to corn, and residue management treatments applied after harvest (Table 1; Fig. 1). A recommended corn cultivar was seeded into these treatments the following spring.

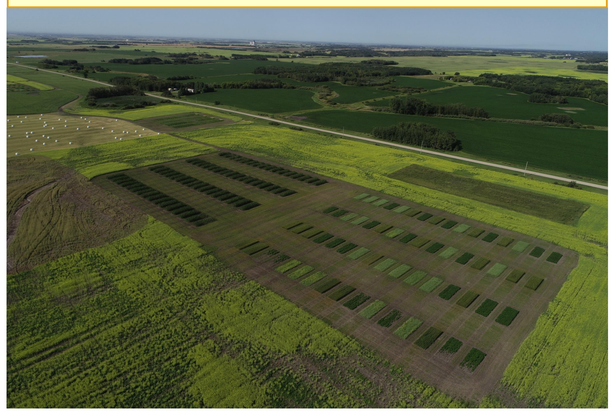
Table 1: Management treatments

Preceding crop	canola	C
	soybean	S
	wheat	W
Residue management	conventional till	CT
	no till with straw removed	NT-
	no till with straw retained	NT+
	strip till	ST

*In NT treatments, standing stubble was retained and straw was either chopped through the combine and returned to the plot area (NT+) or straw was removed from the plot area (NT-). CT and ST was implemented in fall.

Fig. 1. Residue management treatments in fall 2024

Fig. 2. Corn phase (left) and preceding crop phase (right) of field study north of Brandon, MB at AAFC's Phillips Farm in 2024.

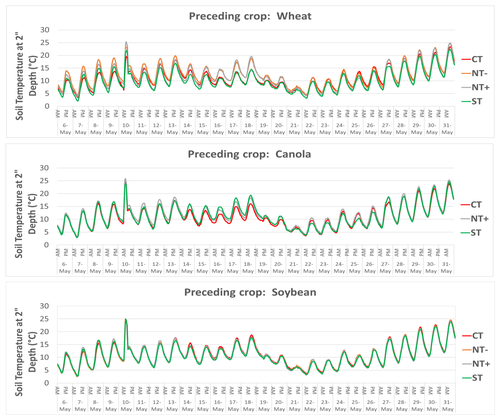


Treatments were arranged in a Randomized Complete Block Design (RCBD) with four replicates (Fig. 2). Preceding crops were direct-seeded into stubble using a ConservaPak seeder (9" rows), and corn planted using a Haldrup planter (30" rows). Generally-accepted management practices were employed.

Preliminary Findings

- Cool conditions in spring 2025 provided a unique opportunity to assess effects on corn establishment.
- Mean soil temperature at planting on May 5 was 15°C, with ≥10°C measured in all plots, followed by a cooler period during the 3rd week of May (Fig. 3).
- Soil temperature appeared to vary more so among residue management treatments where wheat rather than soybean was the preceding crop (Fig. 3).

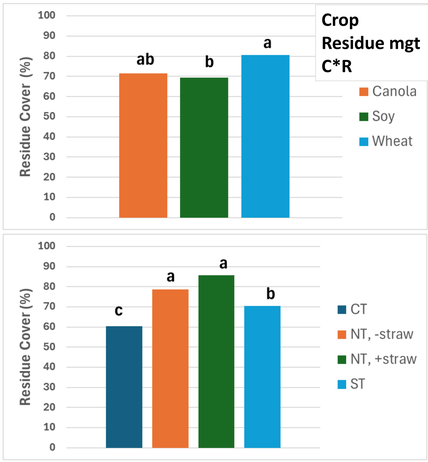
Fig. 3. Soil temperatures post-planting in May 2025.



Percent residue cover

- Both preceding crop and residue management practices influenced the % residue cover on the soil surface in the spring prior to corn planting (Fig 4).
- On average, % residue cover was higher after wheat than soybean, with canola being intermediate.
- Regardless of preceding crop, % residue cover was higher for NT than CT, with ST being intermediate. Percent residue cover averaged 86, 78, 70 and 60 percent for NT+, NT-, ST and CT, respectively.

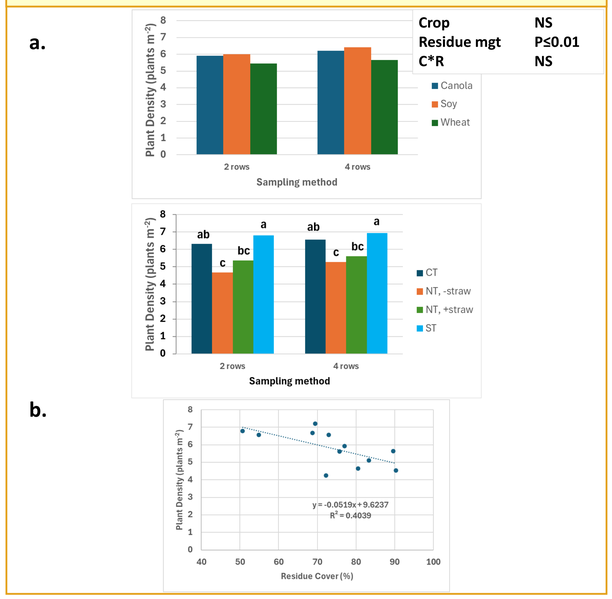
Fig 4. Percent residue cover in spring 2025 prior to corn planting as determined by the line-transect method.



Plant Density

- Cold temperature damage was evident in corn in spring 2025, with uneven stands, ungerminated seed, and emerged leaves belowground observed.
- To determine effects on plant density, all plants in each row of each plot were counted on June 19 once all viable plants had emerged. Density was calculated based on the inner 2 or all 4 rows in each plot to account for possible edge effects (Fig. 5a).
- Trends were the same for both 2 and 4 row counts:
  - *Preceding crop had no effect on plant density.*
  - *ST resulted in a higher plant stand than NT, while CT was intermediate between ST and NT+. NT with or without straw produced similar plant densities.*
  - *Effects of residue management were similar regardless of preceding crop, as indicated by the lack of an interaction between these factors.*
- While there appeared to be a general trend toward lower plant density with higher % residue cover in 2025, residue cover accounted for only ~40% of the observed variability in plant density (Fig 5b).

Fig. 5. Effect of preceding crop and residue management on plant density of corn (a) and relationship between % residue cover and plant density (b) in spring 2025.



Summary

- Cool spring conditions contributed to slow and uneven emergence in corn in 2025.
- By the third week of June once all viable plants had established, plant stands were found to be higher for ST and CT than NT with straw removed. NT with or without straw resulted in similar plant stands.
- While lower plant stands appeared to be associated with higher % residue cover, this factor accounted for only ~40% of the variability in plant stand.
- Preliminary analysis did not reveal a clear and consistent relationship between plant stand and soil temperature in 2025. Further analysis is underway, with 2025 yield data being compiled currently.
- Additional site-years of data will be collected as part of this ongoing study to better understand the effect of a range of early-season conditions on corn.

Acknowledgements

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