The Effect of Cereal Rye Cover Crop Termination Timing on Irrigated Corn

Trial Objective

- The use of cover crops in agriculture has many agronomic and economic benefits as well as challenges. Cover crops can help reduce wind and water erosion, mitigate soil compaction, and suppress weeds. However, cover crop termination timing with its effects on soil moisture, soil temperature, weed suppression, and other factors, is a challenge to consider when cover crops are incorporated into the rotation.
- The objective of this study was to evaluate how corn is influenced by cover crop termination timing.

Research Site Details

Location	Soil Type	Previous Crop	Tillage Type	Planting Date	Harvest Date	Potential Yield (bu/acre)	Seeding Rate (seeds/acre)
Gothenburg, NE	Hord Silt Loam	Soybean	No-till	5/11/22	11/10/22	250	36,000

- The entire study area was drilled with a rye cover crop at 100 lb/acre on Oct 22, 2021.
- The study design was a split-plot with termination timing as the whole plot treatment and corn product as the subplot treatment with four replications.
- Corn products
  - Two regular tall corn
    - Good vigor (111 RM)
    - Poor vigor (114 RM)
  - One short statured corn (112 RM)*
- Cover crop termination timings
  - 5 weeks before planting (WBP)
  - 3 WBP
  - 1 WBP
- The cover crop was terminated with an application of Roundup PowerMAX® herbicide at 32 fl oz/acre.
- A composite soil sample per cover crop termination treatment was taken on April 27, 2022 (Table 1).
- A starter fertilizer application of 100 lb/acre N, 60 lb/acre P, 25 lb/acre S, 0.25 lb/acre Zn was applied across all treatments at planting. Additional N was sidedressed at the V6 growth stage at 50 lb/acre N using 360 Y-DROP® applicators on June 17, 2022.
- Corn was irrigated with a sub-surface drip system throughout the growing season.
- Normalized Difference Vegetation Index (NDVI) values were collected using a GreenSeeker® handheld crop sensor on June 28, 2022.
- Final stand counts and ear height were taken just prior to harvest.
- Plots were combine-harvested. Grain moisture content, test weight, and total weight were determined. Statistical analysis for Fisher's LSD was performed.

*This product is not currently available for commercial sale or commercial planting. Commercialization is dependent on multiple factors, including successful conclusion of the regulatory process. The information presented herein is provided for educational purposes only, and is not and shall not be construed as an offer to sell.

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Table 1. Soil test information

Termination timing	Soil depth (in)	Soil pH	Organic matter (%)	Nitrate (lb/ acre N)	Phosphorus (ppm)	Potassium (ppm)
5 WBP†	0 - 8	6.3	4.0	17	31	346
	8 - 24	-	-	17	-	-
3 WBP	0 - 8	6.4	4.2	5	28	444
	8 - 24	-	-	2	-	-
1 WBP	0 - 8	6.0	4.5	6	43	395
	8-24	-	-	7	-	-

Test methods: pH, soil:water 1:1; Organic matter, LOI; Nitrate, KCl; Phosphorus, M-3; Potassium, Ammonium acetate. †WBP = Weeks Before Planting

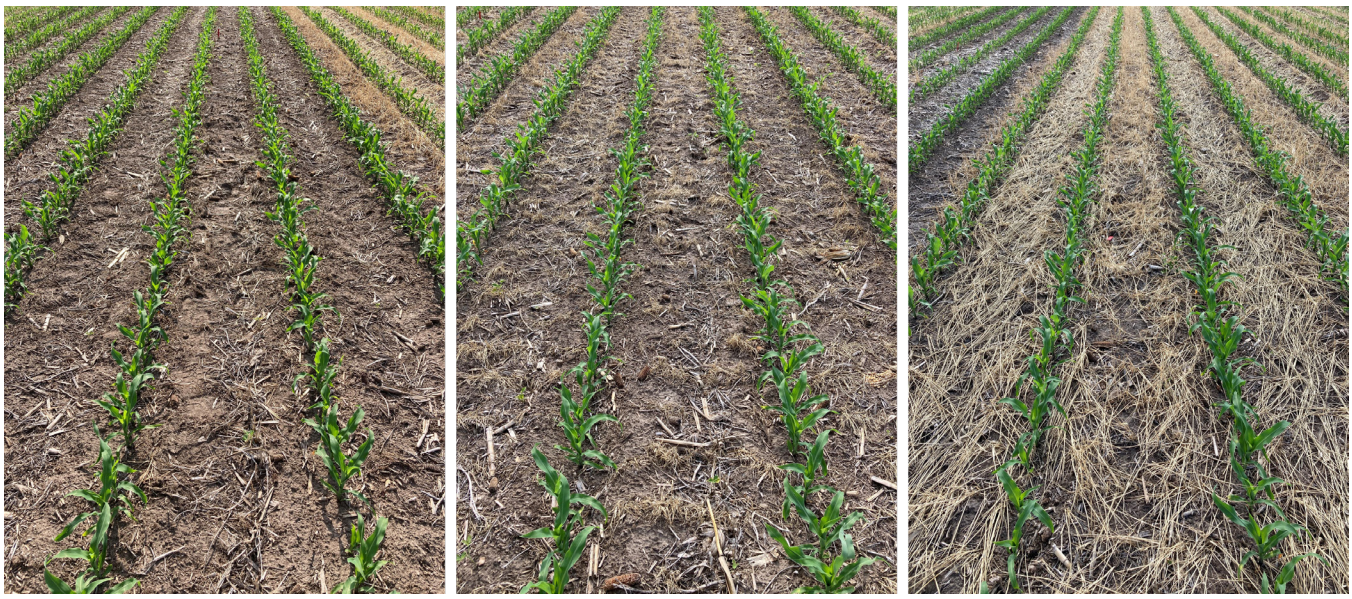

Figure 1. Plot pictures showing the 5 weeks before planting (WBP) (left), 3 WBP (center), and 1 WBP (right) cover crop termination treatments for the 111 RM corn product. Photos taken on June 7, 2022 at Bayer Water Utilization Learning Center, Gothenburg, NE.

Understanding the Results

- There is a significant trend between NDVI values and cover crop termination timing. The earlier the burndown, the higher the NDVI recorded at the V8 growth stage, which indicates a larger quantity of healthy vegetation (Figure 1). The lowest NDVI values were recorded when the burndown treatment was applied 1 WBP (Figure 2), indicating that there was significantly less healthy tissue when the burndown treatment was applied closer to planting.
- Nutrient tie up and soil moisture depletion by cover crops prior to seeding can be challenging. Based on soil test information (Table 1), it is possible that some nitrogen (N) was tied up and not readily available for plots terminated 1 and 3 WBP as indicated by the lower soil nitrate levels for those treatments compared to the levels for the 5 weeks before planting treatment.
- No significant precipitation occurred two weeks after sidedressing (see weather data in research report book introduction), hindering the opportunity for the applied N to be absorbed by the corn plants, thus increasing the difference between treatments.

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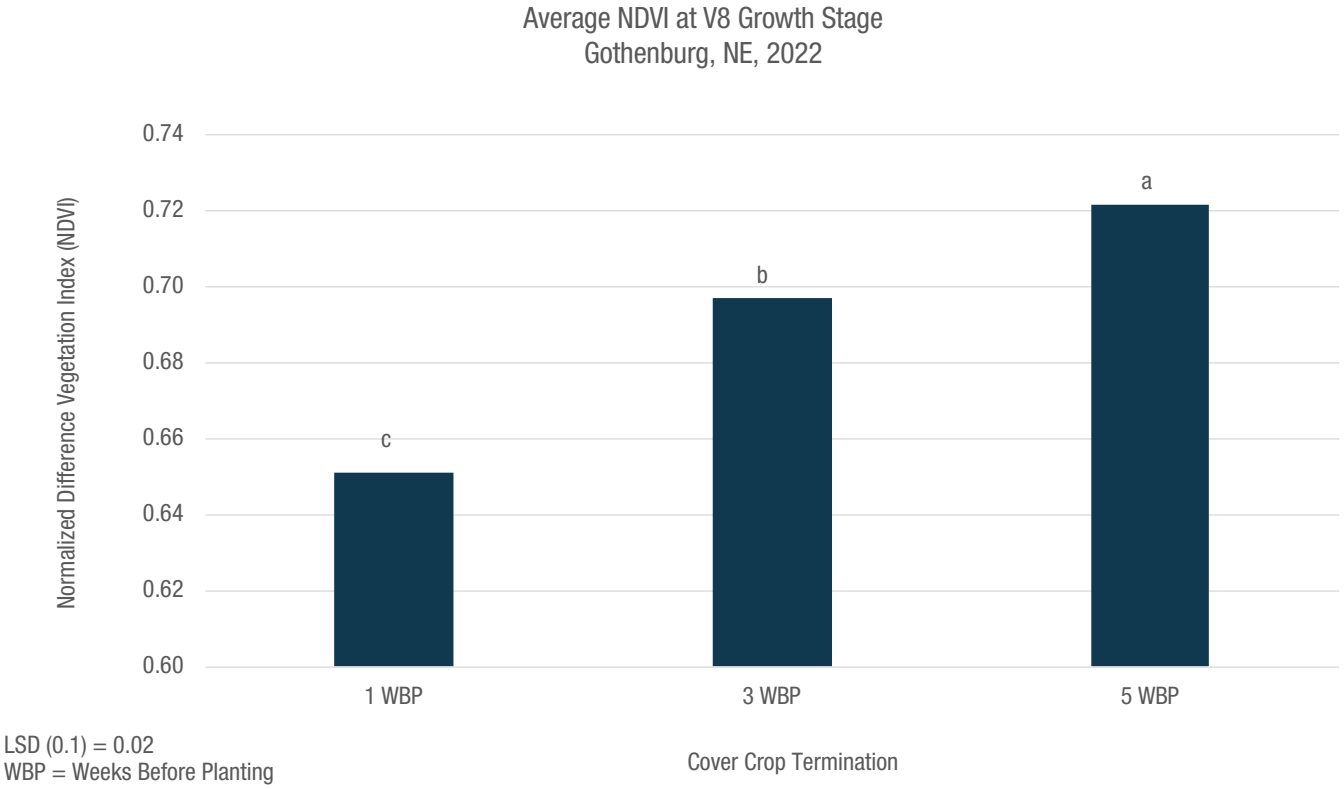

LSD (0.1) = 0.02
WBP = Weeks Before Planting

Figure 2. Average NDVI at the V8 growth stage as impacted by cover crop termination timing at the Bayer Water Utilization Learning Center, Gothenburg, NE (2022).

- Across all corn products, the highest numerical yields were obtained when terminating cover crop 3 or 5 WBP (Figure 3). However, the yield difference was not statistically significant. As NDVI data suggests (Figure 2), N tie up and soil moisture depletion at the beginning of the growing season might explain this yield trend.
- No significant difference was observed in yield when comparing different corn products (Figure 4) and their interactions with cover crop termination timing. Also, harvest stand count did not differ significantly between treatments (data not shown).

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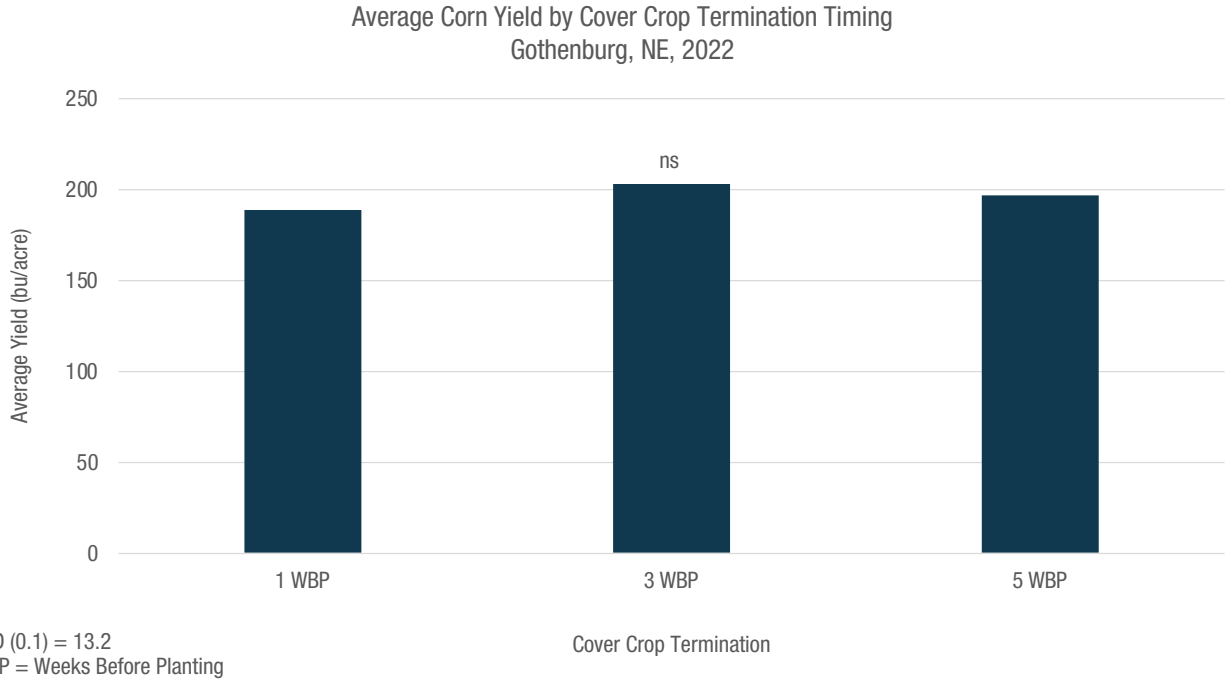

Figure 3. Average corn yield as impacted by cover crop termination timing at the Bayer Water Utilization Learning Center, Gothenburg, NE (2022), ns: not statistically significant.

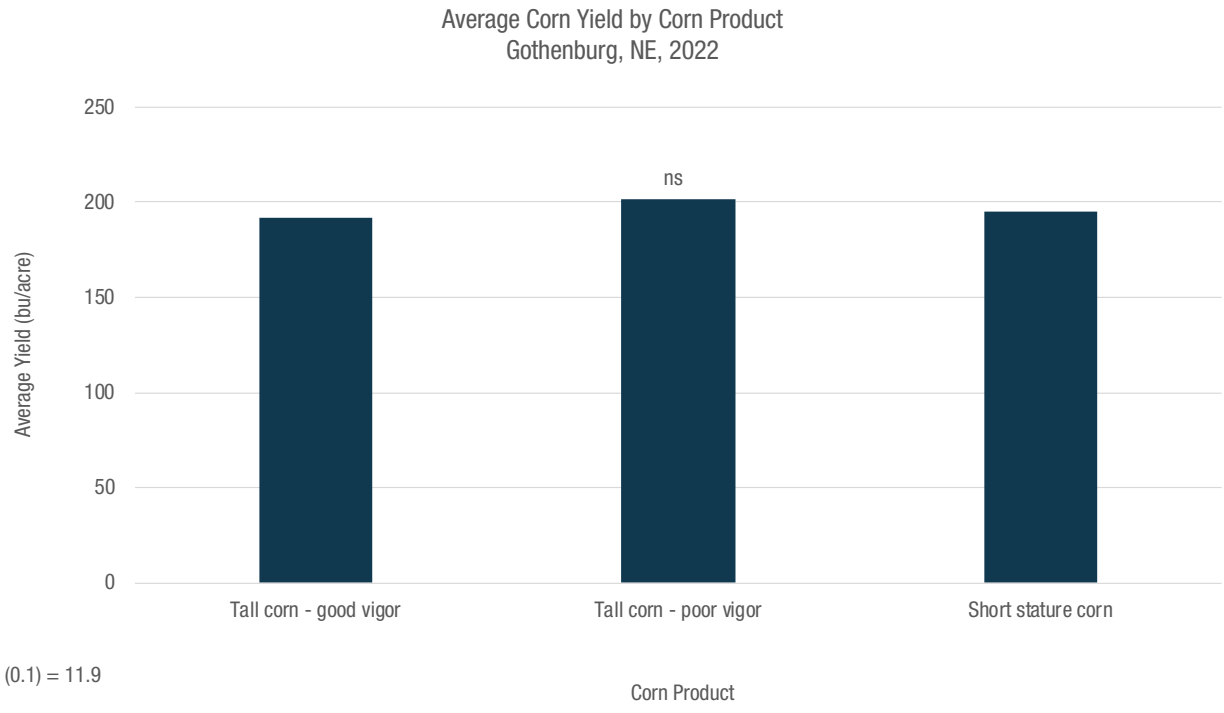

Figure 4. Average corn yield as impacted by corn product at the Bayer Water Utilization Learning Center, Gothenburg, NE (2022), ns: not statistically significant.

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Key Learnings

- Although there was a yield trend favoring earlier cover crop termination timings, the difference was not statistically significant in this study.
- There was no significant effect of corn product on differences in average yield response across termination treatments in this study.
- NDVI readings at the V8 growth stage suggest less nitrogen availability (N tied up) at early vegetative stages when cover crops were terminated close to planting.
- Farmers should work with their local sales team member to help identify the best management practice for their production systems.

Legal Statements