Evaluation of Cereal Cover Crops Prior to Corn

**Trial Objective**

- Cereal rye is a cool-season winter annual that is a good cover crop that is easy to establish, but seed costs and seed availability can be limiting and allelopathic effects may be a concern.
- Wheat seed may be more readily available than cereal rye.
- The effects of cereal rye and wheat as cover crops prior to corn has not been fully explored in Michigan (MI).
- While cover crops, such as cereal rye and wheat, can reduce erosion, utilize excess soil nutrients, and increase soil organic matter, they must be terminated in a timely manner in the spring to avoid negatively impacting the following cash crop.
- In this trial, different termination timings with a burndown herbicide application and tillage options were assessed to determine the impacts of a cover crop and tillage on final stand and yield potential of the following corn crop.

**Research Site Details**

<table>
<thead>
<tr>
<th>Location</th>
<th>Soil Type</th>
<th>Previous Crop</th>
<th>Tillage Type</th>
<th>Planting Date</th>
<th>Harvest Date</th>
<th>Potential Yield (bu/acre)</th>
<th>Seeding Rate (seeds/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mason, MI</td>
<td>Loam</td>
<td>Soybean and cover crop</td>
<td>No-till and conventional</td>
<td>05/09/2017</td>
<td>11/09/2017</td>
<td>200</td>
<td>35K</td>
</tr>
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<td>05/18/2018</td>
<td>10/22/2018</td>
<td>200</td>
<td>35K</td>
</tr>
</tbody>
</table>

- Cereal rye and wheat cover crops were planted in November 2016 and November 2017 after harvest.
- Cereal rye and wheat cover crops were terminated using Roundup PowerMAX® herbicide at two timings:
  - Two weeks prior to planting corn (Pre-plant)
  - The day of planting (At-plant)
- A 103-day relative maturity corn product was planted at 35,000 seeds/acre.
- Prior to planting, 5 gallons of 10-34-0 were applied in-furrow and followed with 60 gallons of 28% UAN at the V5 growth stage.
- All treatments were planted on the same day.
  - May 9, 2017
  - May 18, 2018
- Four cover crop and tillage treatments were compared:
  - Cereal rye cover crop, no tillage
  - White wheat cover crop, no tillage
  - No cover crop, no tillage
  - No cover crop, conventional tillage
- The trial was a split plot design with cover crop removal timing as the whole plot and cover crop as the sub-plot. A confidence interval of 95% was used to compare treatment means.
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Figure 1. Corn planting into cover crop treatments.

Understanding the Results

Table 1. Effects of cover crop and tillage on final corn stand counts.

<table>
<thead>
<tr>
<th>Year</th>
<th>Treatment</th>
<th>Final Stand Count (plants/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>Cereal Rye – Pre-plant Termination</td>
<td>30,225</td>
</tr>
<tr>
<td>2017</td>
<td>Cereal Rye – At-Plant Termination</td>
<td>27,750</td>
</tr>
<tr>
<td>2017</td>
<td>Wheat – Pre-plant Termination</td>
<td>32,500</td>
</tr>
<tr>
<td>2017</td>
<td>Wheat – At-Plant Termination</td>
<td>31,000</td>
</tr>
<tr>
<td>2017</td>
<td>No Cover Crop – No-Till</td>
<td>31,300</td>
</tr>
<tr>
<td>2017</td>
<td>No Cover Crop – Conventional Till</td>
<td>32,750</td>
</tr>
<tr>
<td>2018</td>
<td>Cereal Rye – Pre-plant Termination</td>
<td>32,700</td>
</tr>
<tr>
<td>2018</td>
<td>Cereal Rye – At-Plant Termination</td>
<td>31,300</td>
</tr>
<tr>
<td>2018</td>
<td>Wheat – Pre-plant Termination</td>
<td>31,700</td>
</tr>
<tr>
<td>2018</td>
<td>Wheat – At-Plant Termination</td>
<td>30,700</td>
</tr>
<tr>
<td>2018</td>
<td>No Cover Crop – No-Till</td>
<td>31,600</td>
</tr>
<tr>
<td>2018</td>
<td>No Cover Crop – Conventional Till</td>
<td>32,500</td>
</tr>
</tbody>
</table>
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Figure 2. Average 2017 corn yield by cover crop, termination timing, and tillage. Treatments with the same letter are not significantly different (alpha level = 0.05).

Figure 3. Average 2018 corn yield by cover crop, termination timing, and tillage. Differences in yield were not significant.
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Figure 4. Average 2017 and 2018 corn yield by cover crop, termination timing, and tillage. Differences in yield were not significant.

- The termination timing of the wheat cover crop had little effect on subsequent corn stands and yield in both 2017 and 2018.
- When averaged over both years, termination of cereal rye two weeks prior to planting had a beneficial impact (though not significant) on corn stand counts and yield (Table 1 and Figure 4).
- Termination of the cereal rye cover crop at the same time as planting may negatively impact yield due to: competition with emerging corn plants for light, delayed availability of nitrogen, and allelopathic compounds suppressing the growth of corn seedlings.

What Does This Mean for Your Farm?

- Modifications of farm operations to include cover crops is a valuable sustainability effort for growers to pursue.
- Waiting too long to terminate a cereal rye cover crop may reduce yield potential.
- Wheat may be a viable cover crop alternative to cereal rye with less concern of allelopathy.
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