Opportunities for cover crops in North Dakota

- Diverse climate, soil, and cropping systems of North Dakota provide a range of cover crop uses and management requirements.
- Farmers are driving current interest in using cover crops within North Dakota.
- Researchers in North Dakota are beginning to address the range of needs and uses for cover crops.

Rye Varietal Differences when Terminating with the Roller-crimper

Materials and Methods

This study was conducted in central North Dakota at the Carrington Research Extension Center on loam soils in 2008 and 2009. The study was designed as an RCBD with four replications. Rye cover crops were terminated during anthesis using a roller-crimper on June 19 and 23 in 2008 and 2009. The 2009 trial was subject to seven days of early spring flooding and rye plants displayed signs of nitrogen deficiency.

Preliminary Results

- Relative differences in termination effectiveness occurred between rye varieties in both years (Table 1).
- Heading and anthesis date differences were observed between varieties. The range in heading dates was greater in 2009 than in 2008 (Table 1).
- Spring aboveground dry matter differed between varieties in 2009 only. Dry matter production was greater for all varieties in 2008 than in 2009 (Table 1). In 2008, rye termination using the roller-crimper was more effective for varieties with higher spring dry matter production (Figure 1).

Materials and Methods:

This study was initiated at the Carrington Research Extension Center on loam soils in 2008. After field pea grain was harvested in 2008, volunteers were fostered using tillage from seed spread in the field with a combine (harvest lost). This study was established at three locations in the Red River Valley of North Dakota and Minnesota on loam and silt loam soils that varied from highly to moderately susceptible to wind erosion. The study was established at three locations in the Red River Valley of North Dakota.

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Research Question:

Which rye varieties are the first to reach heading and anthesis?

Does increased rye biomass production improve the effectiveness of the roller-crimper?

Cover Crop Research at North Dakota State University

Yvonne Lawley, Laura Overstreet, Steve Zwinger, and Blaine Schatz
North Dakota State University

Cover Crop Use and Management Influenced by the Range of Environmental Conditions in North Dakota.

North Dakota Annual 1971-2000 Normal Precipitation (inch)

Fusarium-free Rye Cover crop with Roller-crimper at 28 Degrees F

Windows for cover crops in North Dakota

- Following early harvested small grains and pulse crops
- Protecting sugarbeet plantings from spring wind damage
- Inter-seeded with corn or soybean row crops
- Following or inter-seeded with forage and silage crops
- Replace fallow when conditions prevent cash crop planting

Cover Crops in Sugarbeet Production Systems

Research Questions:

- Can cover crops be integrated into sugar beet rotations to reduce wind erosion?
- Will cover crops or strip tillage protect sugar beets from wind damage?

Field Pea Relay Cover Crops

Research Question:

Can fall flushes of volunteer field peas be used as cover crops after grain harvest?

Will fall tillage foster more field pea volunteers?

How much harvest loss is acceptable to achieve a good seeding rate for field pea relay cover crops?

Materials and Methods:

This study was initiated at the Carrington Research Extension Center on loam soils in 2008. After field pea grain was harvested in 2008, volunteers were fostered using tillage from seed spread in the field with a combine (harvest lost). This treatment was compared to a control plot where no management was used to foster pea volunteers. The seeding rate of 6 seeds/ft² (standard harvest lost) was compared to a double rate of 12 seeds/ft². The study was designed as an RCBD with four replications. Field pea biomass was measured in late October prior to a killing frost. Spring wheat was planted as a test crop in 2009. A GreenSeeker® was used to evaluate wheat canopy color.

Preliminary Results:

- Fostering volunteer re-growth and increasing field pea seeding rate significantly increased cover crop biomass, nitrogen accumulation, and wheat test crop canopy cover (higher NDVI = darker green color).
- Enhanced cover crop production increased wheat test crop yield when seeding at 12 seeds/ft² but had no effect on wheat protein levels.

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Reasons farmers give for using cover crops:

- Keeping the soil covered and live roots growing
- Increase soil organic matter
- Fixing nitrogen or scavenging leftover nutrients
- Providing food and habitat for soil microorganisms
- Residue management
- Late-season grazing for cattle

Table 1: Evaluating rye variety susceptibility to termination using the roller-crimper in central North Dakota.

<table>
<thead>
<tr>
<th>Rye Variety</th>
<th>Heading (Day of Year)</th>
<th>Anthesis (Day of Year)</th>
<th>Height (inch)</th>
<th>Dry Matter (lb/ac)</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>DR0207</td>
<td>156</td>
<td>53.0</td>
<td>7190</td>
<td>1.5</td>
<td></td>
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<tr>
<td>Rymin</td>
<td>154</td>
<td>53.2</td>
<td>6805</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td>Remington</td>
<td>155</td>
<td>53.2</td>
<td>5888</td>
<td>6.8</td>
<td></td>
</tr>
<tr>
<td>Hancock</td>
<td>153</td>
<td>53.1</td>
<td>6888</td>
<td>4.4</td>
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<tr>
<td>Wheeler</td>
<td>164.5</td>
<td>46.3</td>
<td>2750.9</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>Rymin</td>
<td>164.8</td>
<td>46.5</td>
<td>2528.8</td>
<td>4.3</td>
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<tr>
<td>Hancock</td>
<td>165.3</td>
<td>47.9</td>
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<tr>
<td>Dacold</td>
<td>171.8</td>
<td>39.8</td>
<td>2083.4</td>
<td>9.3</td>
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</tr>
</tbody>
</table>

LSD (P<0.05) 1 - NS NS 3.4

Means followed by the same letter are not significantly different (P<0.05).

Table 2: Influence of cover crops and strip tillage on sugarbeet yield and quality compared to conventional usual grow tillage at Casselton, ND in 2009.

<table>
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<tr>
<th>Treatment</th>
<th>Root Yield</th>
<th>Sugar</th>
<th>SLM</th>
<th>Net Sugar</th>
<th>RSA</th>
<th>RST</th>
<th>Sugarbeet Stand</th>
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<td></td>
<td>(ton/ha)</td>
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<td>(beets/100 ft)</td>
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LSD (P<0.05) 2.09 0.363 0.1093 0.445 647 8.896 12

LSD values indicate the least significant difference between treatments.

SLM = sugar loss to molasses; RSA = recoverable sugar per acre; RST = recoverable sugar per ton.

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