Incorporating a Rye Cover Crop Into a Wheat- Soybean Rotation

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Advised: Dr. Joel Ransom Extension Small Grains
My Background

• Drake, ND
• Family Farm and Ranch
  – Grow wheat, canola, flax, sunflowers, soybeans, and corn
  – Raise black angus cattle
• Bachelor’s- 2018
  – North Dakota State University
  – Crop and Weed Science
Cover Crop

A Cover Crop is a species, or mix, grown in the “traditional offseason” for the benefit of the soil and following cash crop

- Advantages
  - Soil Erosion Control
  - Water Management
  - Weed Management
  - Nutrient Scavenging
  - Ability to Graze Livestock

- Disadvantages
  - Soil Moisture Competition
  - Light Competition
  - Nutrient Competition
  - Time
  - Competition with Cash Crop

Research Focus
Cover Crop

Northern Climate
• Utilize cover crop between wheat harvest and soybean seeding
  – Gives the longer growing season for cover crop establishment

Greenseeding
• Planting cash crop directly into actively growing cover
• Weather conditions this spring
  – Allow grower to use cover crop to soak up excess moisture
Rye

- Winter Annual- goes through vernalization
- Temperature
  - Starts Growing- 33°F
  - Optimal 55-65°F
  - Frost Tolerant to -30°F
- Seeding Rate- 20 lbs/acre up to 100 lbs/acre
- Marketability
Why Rye?

• Rapidly produces ground cover in fall
• Deep rooting to alleviate compaction, improve drainage
• Positive effect on soil tilth
• Weed Control
  – Root exudes allelopathic compounds inhibit weed seed and growth
  – Low temp growth provides early light competition on weeds
• Considered the best crop where fertility is low and winter temperatures are extreme
Research Question

• What effect will termination timing date of rye have on the soybean crop?
Research Objectives

Evaluate:

• Interaction between rye and soybean
• Ability of rye to control weed population
• Moisture content of soil after cover crop
• Nitrogen scavenging ability of rye
Experiment- Location

Steele County- ND
• Conventional Till
• Previous Crop: HRSW
• Rye: Drilled
  – Planted after wheat harvest
• Soybean- AG05X9
  – Planted May 21, 2019

Red Lake County- MN
• No-till Program
• Previous Crop: HRSW
• Rye: Drilled
  – Planted after wheat harvest
• Soybean: 08
  – Planted: May 20, 2019
Locations

Red Lake County June 19, 2019

Steele County June 17, 2019
Experiment- Setup

Both Experiments treated the same

• RCBD- 5 treatments and 5 replications, border surrounding
• Individual Plot
  – 10 ft wide by 25 ft long
• Termination- Glyphosate
  – 32 fl oz/acre rate
  – AMS/NIS adjuvant 1% v/v
Timing Treatments

- Trt 1 - 2 weeks prior to planting date: May 7, 2019
- Trt 2 - 1 week prior to planting date: May 14, 2019
- Trt 3 - At planting date: May 21, 2019
- Trt 4 - 1 week post planting date: May 28, 2019
- Trt 5 - 2 weeks post planting date: June 4, 2019
Data Collection - Biomass

Biomass - plant material above ground

- Collected on date of termination for each treatment respectively

- Procedure
  - Snip all rye plants above ground for 3 ft
  - Collect plants from both rows of rye
  - Place in drier to remove moisture and weigh
Data Collection- Weed Population

• Date: June 17, 2019- two weeks after last termination date

• Procedure:
  – Place 1 sq ft. area at the front and back of each plot
  – Count individual plants
  – Average counts
Data Collection- Yield

Plot- middle two rows harvested using plot combine

• Red Lake County
  – October 25, 2019

• Steele County
  – October 8, 2019
Results Steele County

Biomass vs. Weed Population

- **Weed Count AVG (#/sqft)**
- **Biomass AVG (g/yr)**

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weed Count AVG</th>
<th>Biomass AVG</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 wks prior</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>1 wk prior</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>planting</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>1 wk post</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>2 wks post</td>
<td></td>
<td>60</td>
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</tbody>
</table>

NDSU
Results Steele County

Stand Count Vs. Yield

- Stand Count (in thousands)
- Yield AVG (Bu/ac)

<table>
<thead>
<tr>
<th>Time</th>
<th>Stand Count</th>
<th>Yield AVG</th>
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</thead>
<tbody>
<tr>
<td>2 wks prior</td>
<td>78.98</td>
<td>55.966</td>
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<tr>
<td>1 wk prior</td>
<td>81.31</td>
<td>54.731</td>
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<tr>
<td>planting</td>
<td>84.79</td>
<td>54.413</td>
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<tr>
<td>1 wk post</td>
<td>76.66</td>
<td>51.915</td>
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<tr>
<td>2 wks post</td>
<td>84.21</td>
<td>48.967</td>
</tr>
</tbody>
</table>
Comments

- As biomass increases, weed population decreases
- Treatment 1 was significantly different than Treatment 5 according to LSD (6.16bu/acre)
- No other treatments differed significantly
- Treatment 5 was a trifoliate behind early in the season
- Higher weed pressure than Red Lake County
Results Red Lake County

Yield and Biomass

LSD- Yield
2.7074

<table>
<thead>
<tr>
<th></th>
<th>Biomass AVG (g/yd)</th>
<th>Yield bu/acre</th>
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</thead>
<tbody>
<tr>
<td>2 wks prior</td>
<td>26.17</td>
<td>27.14</td>
</tr>
<tr>
<td>1 wk prior</td>
<td>38.38</td>
<td>29.68</td>
</tr>
<tr>
<td>planting</td>
<td>44.9</td>
<td>64.88</td>
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<tr>
<td>1 wk post</td>
<td></td>
<td>30.00</td>
</tr>
<tr>
<td>2 wk post</td>
<td></td>
<td>28.79</td>
</tr>
</tbody>
</table>
Comments

- Weed pressure very low at time of count
- Yields were significantly different
- Earliest timing was the lowest
- Yields were lower in general
  - Late Harvest
  - Animal Damage
  - High Moisture
Conclusion

• In a wet year, growers are able to extend the termination date past planting
• In a drier year, may want to terminate earlier to avoid moisture competition
Future

Moving forward for the upcoming year

- Nitrogen Analysis on biomass samples
- Soil analysis - nitrogen and moisture
- Look at extending time between termination dates
- Collect the same data as we had this year
- Hopefully more favorable weather conditions
Thank You