Applying lessons learned from fertigation research to irrigated and dryland crop production

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Nitrogen uptake and dry matter accumulation in cereals

% of final content

Nitrogen

Dry Matter

Planting Tillering Heading Maturity

0% 25% 50% 75% 100%
Background

- Fertigation common on-farm, but research involving replicated fertility treatments applied with irrigation systems are rare
- Special thanks to Ross McKenzie
- Thanks to ACIDF and Agrium for funding the project
Background

• Objective: To determine if there are yield and seed quality benefits or detriments from N fertigation applied to wheat and canola
• Fertigation treatments are in addition to a range of N fertility treatments applied at seeding
• 2013-2016
• Jail Land site only
Wheat and canola response to fertigation

- Base fertilization: 0, 30, 60, 90, 120 kg N/ha mid-row banded at seeding
- ESN mid-row banded at 60 kg N/ha
- 30 kg N/ha fertigation applied with 12 mm water at 1 of 3 times or all 3 times
Fertigation timing

Wheat:
- Tillering
- Flag Leaf
- Anthesis
- All 3 times (90 kg N/ha total fertigation)
- No fertigation

Canola
- 5-6 leaf rosette
- Bolting
- Flowering
- All 3 times (90 kg N/ha total fertigation)
- No fertigation
# 2015 and 2016 Fertigation Layout

<table>
<thead>
<tr>
<th>Year</th>
<th>Crop</th>
<th>Layout</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>Wheat</td>
<td>Diagram 1</td>
</tr>
<tr>
<td>2016</td>
<td>Wheat</td>
<td>Diagram 2</td>
</tr>
</tbody>
</table>

![2015 and 2016 Fertigation Layout](image-url)
2013 Canola yield response to N

![Graph showing canola yield response to nitrogen application at different stages of growth: none, tillering, flag, anthesis, and all stages combined. The graph plots yield (kg/ha) against total nitrogen (kg/ha).]
2014 Canola yield response to N

<table>
<thead>
<tr>
<th>Total N kg/ha</th>
<th>Yield kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>30</td>
<td>150</td>
</tr>
<tr>
<td>60</td>
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<tr>
<td>180</td>
<td>900</td>
</tr>
<tr>
<td>210</td>
<td>1050</td>
</tr>
</tbody>
</table>

Legend:
- none
- 5-6 Leaf
- Bolting
- Early Flower
- all
2015 Canola yield response to N

![Graph showing yield kg/ha versus Total N kg/ha for different stages of growth: none, tillering, flag, anthesis, and all.](image_url)
2016 Canola yield response to N
2013-2016 Canola yield response to N
2013 Wheat yield response to N

Yield kg/ha vs. Total N kg/ha

- none
- tillering
- flag
- anthesis
- all
2014 Wheat yield response to N

Yield kg/ha vs. Total N kg/ha

- none
- tillering
- flag
- anthesis
- all
2015 Wheat yield response to N

Yield kg/ha vs. Total N kg/ha

- none
- tillering
- flag
- anthesis
- all
2016 Wheat yield response to N
2013-2016 Wheat yield response to N
2013-2016 Wheat protein response to N
Conclusions/thoughts/questions

Canola less flexible than wheat to fertigation
  – We did not see an agronomic reason to fertigate rather than apply all N at seeding
  – Treatments applied with 12 mm irrigation

Protein increase is the primary reason to fertigate wheat, but you need protein premiums
Conclusions/thoughts/questions

Do we understand denitrification?
Why didn’t we see evidence of denitrification in 2013 and 2014?
How much room for improvement in NUE is there over existing systems?
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