Protein and nitrogen yield response of feed barley to post-emergence N application in Alberta

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Feed Barley in Alberta

- Feed barley agronomic management ≠ malt barley
- High protein content increases feed barley quality
- Grain N yield is a product of grain yield x % N content
- Grain N yield may be improved through post-emergence N application just before BBCH 30 – its effect on protein is also of interest

The Study

- 3 year study with 5 sites
  - 10 site-years of data presented (2014-2015)
- Strip plot design
  - Horizontal strip = post-emergence N at BBCH 30
  - Vertical strip = seeding rate x PGR x fungicide combos (16)
- Analysis using PROC MIXED in SAS
  - Site-year considered random effect
  - Linear and quadratic contrasts
  - Absence of interactions allowed horizontal strip results to be averaged over the vertical strip

Standard management for all treatments

- Direct seeded into canola stubble (0.20 to 0.25m row spacing)
- Fertilizer (N, P, K, S) applied at seeding according to soil tests to achieve land cooperator’s 10 year average feed barley yield
- Herbicide weed control and + pre-harvest glyphosate application

Treatment Structure

<table>
<thead>
<tr>
<th>Input</th>
<th>Levels</th>
<th>Timing</th>
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<tbody>
<tr>
<td>Post-emergence N as UAN (28-0-0)</td>
<td>0 kg N/ha</td>
<td>Just prior to BBCH 30 (prior to stem elongation).</td>
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<tr>
<td></td>
<td>34 kg N/ha</td>
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<tr>
<td></td>
<td>68 kg N/ha</td>
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<tr>
<td>Plant growth regulator</td>
<td>Control</td>
<td>BBCH 30-31</td>
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<tr>
<td></td>
<td>Chlormequat chloride</td>
<td></td>
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<tr>
<td>Foliage Fungicide</td>
<td>Control</td>
<td>Tetracne, Prosaro, Dual</td>
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<tr>
<td></td>
<td>Tetracne BBCH 28 (flag leaf fully unrolled)</td>
<td></td>
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<tr>
<td></td>
<td>Prosaro: 2 weeks later</td>
<td></td>
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<tr>
<td></td>
<td>Dual: Both timings</td>
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<tr>
<td>Seeding Rate</td>
<td>233 plant m$^{-2}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>295 plant m$^{-2}$</td>
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BBCH 30: Maximum crop uptake

- BBCH 30 is prior to stem elongation
- Internodes and inflorescence are clustered at the stem base
- Targeting application just prior to max crop uptake
Site-year Information
• April and May seeding dates
• August and September harvest dates

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<tbody>
<tr>
<td>Lethbridge Irrigated</td>
<td>Avg. Protein %</td>
<td>11.5</td>
<td>11.0</td>
<td>9.8</td>
<td>10.4</td>
<td>11.5</td>
<td>12.3</td>
<td>11.9</td>
<td>14.9</td>
<td>12.9</td>
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<tr>
<td>Lethbridge Rainfed</td>
<td>Avg. N at seeding kg ha⁻¹</td>
<td>157</td>
<td>172</td>
<td>98</td>
<td>97</td>
<td>157</td>
<td>107</td>
<td>156</td>
<td>60</td>
<td>112</td>
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<tr>
<td>Bon Accord</td>
<td>Soil NO₃ + N at seeding kg ha⁻¹</td>
<td>165</td>
<td>127</td>
<td>90</td>
<td>100</td>
<td>146</td>
<td>142</td>
<td>173</td>
<td>209</td>
<td>153</td>
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<tr>
<td>Killam</td>
<td>Precipitation (mm)</td>
<td>426</td>
<td>252</td>
<td>325</td>
<td>116</td>
<td>181</td>
<td>121</td>
<td>253</td>
<td>252</td>
<td>101</td>
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<tr>
<td>Falher</td>
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* Soil nitrate in top 0-30cm

Grain N-yield increased with post-emergence N application

- Grain N-yield increased an average of 4.7% and 7.4% with increasing post-emergence N rate
- Environment did not influence the response

Grain protein content increased with post-emergence N application

- Grain protein content increased an average of 2.8% and 4.1% with increasing post-emergence N rates
- Environment x post-emergence N interaction (p=0.023) suggests environment influences protein response

Grain Protein Results

Grain Nitrogen Yield Results

Explaining the grain protein environment x post-emergence N interaction

- Post-emergence N did not increase protein at 3 site-years (individual analysis)
- This occurred where PPT was high and soil N + applied N was low
- With 426mm precipitation, there was a trend of linear protein decrease with increasing post-emergence N rate (p=0.0032)
Conclusions

- Linear responses indicate that protein and N-yield were not maximized between the 0 and 68 kg N ha⁻¹ rates
- Feed barley quality (protein) can be increased by applying N just prior to BBCH 30
- However, when precipitation is high and [soil nitrate + seeding N] levels are low, protein remains unchanged or trends downward

Thank You for Your Time.
Questions?

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