BRACKLING OF A BARLEY CROP FERTILIZED WITH POLY4 AND OTHER K FERTILIZERS
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POLY4
GLOBAL AGRONOMY
OVERVIEW
SIRIUS MINERALS R&D PROGRAMME

Trials
339

Crops
36

Countries
25

Collaborators
119

Notes: Trials as of September 2018
INTRODUCING POLY4

A single source of bulk nutrients as foundation for effective, efficient, flexible and sustainable fertilization.

Characteristics

• Improves yield and quality
• Straight or as part of a fertilizer blend
• Efficient nutrient release profile
• pH neutral

Notes: 1) Based on 90% polyhalite grade. Macro nutrients based on w/w % and micro nutrients based on mg kg⁻¹; micro nutrients’ content: B 1.69, Zn 1.9, Mn 3.1, Mo 0.3, Se>0.5, Fe>0.5, Cu 1.1, Sr 1414; 2) POLY4 is the trademark name for polyhalite products from the Sirius Minerals polyhalite project in North Yorkshire. *48% SO₃, B – boron, Cu – copper, Se – selenium, Zn – zinc, Fe – iron, Sr – strontium, Mo – molybdenum, Mn – manganese.
BRACKLING OF A BARLEY CROP
• Irish farmers typically apply K and are beginning to use S for their barley crops. Local recommendations for both sites were 133 kg K$_2$O ha$^{-1}$ and 20 kg S ha$^{-1}$.

• K inputs were supplied by muriate of potash (MOP), sulphate of potash (SOP) and POLY4. Each K fertilizer added 48, 96 or 144 kg K$_2$O ha$^{-1}$. MOP and SOP were also applied at greater rates.

• The trial was repeated on two sites with four replicates in randomised blocks. Only one site brackled. Data from this site only is presented.

### INTRODUCTION AND TRIAL DESCRIPTION: 2017

<table>
<thead>
<tr>
<th>Treatment$^1$</th>
<th>N (kg ha$^{-1}$)</th>
<th>P$_2$O$_5$ (kg ha$^{-1}$)</th>
<th>K$_2$O (kg ha$^{-1}$)</th>
<th>CaO (kg ha$^{-1}$)</th>
<th>MgO (kg ha$^{-1}$)</th>
<th>S (kg ha$^{-1}$)</th>
<th>Cl (kg ha$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N + P + Ca (control)</td>
<td>150</td>
<td>121</td>
<td>0</td>
<td>144</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MOP</td>
<td>150</td>
<td>121</td>
<td>48 – 241</td>
<td>144</td>
<td>0</td>
<td>0</td>
<td>38 – 115</td>
</tr>
<tr>
<td>SOP</td>
<td>150</td>
<td>121</td>
<td>48 – 241</td>
<td>144</td>
<td>0</td>
<td>17 – 52</td>
<td>3 – 9</td>
</tr>
</tbody>
</table>

**Notes:** 1) All plots received 150 kg N ha$^{-1}$, 122 kg P$_2$O$_5$, ha$^{-1}$ and 144 kg CaO ha$^{-1}$ from CAN and TSP. Fertilizer analysis: MOP = 60% K$_2$O, 48% Cl; SOP = 50% K$_2$O, 18% S, 3% Cl; POLY4 = 14% K$_2$O, 17% CaO, 6% MgO, 19% S, 3% Cl. 2) Recommendations based on soil analysis from: Major and Micro Nutrient Advice for Productive Agricultural Crops (4th Edition, 2016); 3) Initial soil analysis for ex-grass site: pH 6.3, 2 mg P kg$^{-1}$, 17 mg K kg$^{-1}$; 4) Initial soil analysis for ex-con site: pH 6.6, 4 mg P kg$^{-1}$, 56 mg K kg$^{-1}$.

**Source:** Teagasc (2017) 65000-TEAG-65011-17.
YIELD RESPONSE

- Yield responsive to K fertilizer
- Advantage of applying K and S
- Small yield advantage for POLY4

Notes: 1. All plots received 150 kg N ha\(^{-1}\), 122 kg P\(_2\)O\(_5\) ha\(^{-1}\) and 144 kg CaO ha\(^{-1}\) from CAN and TSP. Fertilizer analysis: MOP = 60% K\(_2\)O, 48% Cl; SOP = 50% K\(_2\)O, 18% S, 3% Cl; POLY4 = 14% K\(_2\)O, 17% CaO, 6% MgO, 19% S, 3% Cl.
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BARLEY YIELD AND BRACKLING

• More K → more yield
• More K → less brackling

Notes: 1) All plots received 150 kg N ha⁻¹, 122 kg P₂O₅ ha⁻¹ and 144 kg CaO ha⁻¹ from CAN and TSP. Fertilizer analysis: MOP = 60% K₂O, 48% Cl; SOP = 50% K₂O, 18% S, 3% Cl; POLY4 = 14% K₂O, 17% CaO, 6% MgO19% S, Cl 3%; 2) Recommendations based on soil analysis from: Major and Micro Nutrient Advice for Productive Agricultural Crops (4th Edition, 2016); 3) Initial soil analysis for ex-grass site: pH 6.3, 2 mg P kg⁻¹, 17 mg K kg⁻¹; 4) Initial soil analysis for ex-corn site: pH 6.6, 4 mg P kg⁻¹, 56 mg K kg⁻¹.

AGRONOMY: BRACKLING

- Brackling is when the stem buckles, but not at the base or top
- Brackling can: decrease yield, cause deterioration of grain quality, and increase cost and difficulty of harvest
- Potassium increases straw strength so contributes to better resistance to brackling
- All K fertilizers significantly reduced brackling
- POLY4-fertilized barley had 55-61% less brackling than other potassium fertilizers

**KEY TAKEAWAY:**

POLY4-FERTILIZED BARLEY HAD LESS BRACKLING.

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BRACKLING

- Less brackling when more K fertilizer was applied.
- Little difference in brackling when MOP or SOP are the K fertilizer.
- At the same K rate there was less brackling when POLY4 was applied.

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2) Recommendations based on soil analysis from: Major and Micro Nutrient Advice for Productive Agricultural Crops (4th Edition, 2016); 3) Initial soil analysis for ex-grass site: pH 6.3, 2 mg P kg⁻¹, 17 mg K kg⁻¹; 4) Initial soil analysis for ex-corn site: pH 6.4, 4 mg P kg⁻¹, 56 mg K kg⁻¹.

BRACKLING

- Same data – log scale

Notes: 1) All plots received 150 kg N ha<sup>-1</sup>, 122 kg P<sub>2</sub>O<sub>5</sub> ha<sup>-1</sup> and 144 kg CaO ha<sup>-1</sup> from CAN and TSP. Fertilizer analysis: MOP = 60% K<sub>2</sub>O, 48% Cl; SOP = 50% K<sub>2</sub>O, 18% S, 3% Cl; POLY4 = 14% K<sub>2</sub>O, 17% CaO, 19% S, Cl 3%;
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BRACKLING

- Do other cations contribute to less brackling?
- NB: Ca added to all treatments with N fertilizer
- POLY4 added extra cations (Mg and more Ca) and there was less brackling
- K was more effective

Notes: 1) All plots received 150 kg N ha⁻¹, 122 kg P₂O₅ ha⁻¹ and 144 kg CaO ha⁻¹ from CAN and TSP. Fertilizer analysis: MOP = 60% K₂O, 48% Cl; SOP = 50% K₂O, 18% S, 3% Cl; POLY4 = 14% K₂O, 17% CaO, 6% MgO19% S, Cl 3%; 2) Recommendations based on soil analysis from: Major and Micro Nutrient Advice for Productive Agricultural Crops (4th Edition, 2016); 3) Initial soil analysis for ex-grass site: pH 6.3, 2 mg P kg⁻¹, 17 mg K kg⁻¹; 4) Initial soil analysis for ex-corn site: pH 6.6, 4 mg P kg⁻¹, 56 mg K kg⁻¹.

CONCLUSIONS

• POLY4 added extra nutrients and had greater yields

• POLY4 added extra cations and had less brackling

• K was the most effective cation at reducing brackling

Notes: 1) All plots received 150 kg N ha⁻¹, 122 kg P₂O₅ ha⁻¹ and 144 kg CaO ha⁻¹ from CAN and TSP. Fertilizer analysis: MOP = 60% K₂O, 48% Cl; SOP = 50% K₂O, 18% S, 3% Cl; POLY4 = 14% K₂O, 17% CaO, 6% MgO 19% S, Cl 3%; 2) Recommendations based on soil analysis from: Major and Micro Nutrient Advice for Productive Agricultural Crops (4th Edition, 2016); 3) Initial soil analysis for ex-grass site: pH 6.3, 2 mg P kg⁻¹, 17 mg K kg⁻¹; 4) Initial soil analysis for ex-corn site: pH 6.4, 4 mg P kg⁻¹, 56 mg K kg⁻¹. Source: Teagasc (2017) 65000-TEAG-65011-17.
THANK YOU

Any questions please contact:
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