TRIAL RESULTS

POTATOES

MINNESOTA (2015)
TRIAL OBJECTIVE

To evaluate POLY4 (straight and in combination with MOP) at recommend K2O rate against MOP balanced for N, P, K, S, Ca and Mg.

HIGHLIGHTS

YIELD IMPROVEMENTS ACROSS ALL SIZE CATEGORIES

PARTLY K SUBSTITUTION WITH POLY4 INCREASED NUTRIENT UPTAKE BY UP 63% FOR K, Ca, Mg AND S

MAINTAINED POTATO QUALITY

DEMONSTRATED ECONOMIC CASE OF K SUBSTITUTION OF POLY4

TREATMENT TABLE

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>N</th>
<th>P2O5</th>
<th>K2O</th>
<th>MgO</th>
<th>CaO</th>
<th>S</th>
<th>Cl</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>268</td>
<td>152</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>POLY4</td>
<td>268</td>
<td>152</td>
<td>448</td>
<td>192</td>
<td>544</td>
<td>608</td>
<td>96</td>
</tr>
<tr>
<td>MOP balanced4</td>
<td>268</td>
<td>152</td>
<td>448</td>
<td>192</td>
<td>544</td>
<td>153</td>
<td>358</td>
</tr>
<tr>
<td>POLY4 + MOP (50%:50% K2O)4</td>
<td>268</td>
<td>152</td>
<td>448</td>
<td>96</td>
<td>272</td>
<td>304</td>
<td>227</td>
</tr>
<tr>
<td>POLY4 + MOP (75%:25% K2O)4</td>
<td>268</td>
<td>152</td>
<td>448</td>
<td>144</td>
<td>408</td>
<td>456</td>
<td>162</td>
</tr>
</tbody>
</table>

TRIAL DESIGN

PARTNER: UNIVERSITY OF MINNESOTA
LOCATION: US
YEAR: 2015

• Potatoes are the world’s second largest non-grain crop and the fourth largest food crop with 381 Mt produced in 2014 worldwide¹.

• The value of potatoes sold in 2014 was worth US$3.9 billion in the US¹.

• 66% of potatoes sold are for processing into snacks, french fries or other products for foodstuffs.

• Previous potato trials in the US have shown using POLY4 to supply up to 100% of the K2O requirement benefits potato yield and quality.

¹ From the Food and Agriculture Organization of the United Nations (FAO) data.
**MARKETABLE YIELD**

- Analysis of marketable yield by size identifies beneficial effects of POLY4.

- POLY4+MOP (75%:25% K₂O) showed the greatest benefit to all potato sizes compared to balanced MOP as nutrient source greatly effects tuber sizes.

**TUBER MACRO-NUTRIENT UPTAKE**

- Increases in macro-nutrients in the tuber drives yield.

- Compared to all POLY4 treatments, MOP balanced treatments had the lowest nutrient uptakes.

- The differences in nutrient uptake between MOP balanced and POLY4 treatments reflects the crops need to see the right nutrients from the right source at the right time.
POTATO QUALITY

- High specific gravity reflects tuber dry matter indicating superior fry quality.
- The nutrient source has little effect on glucose content of tubers.
- MOP balance was found to have the lowest yield and lowest dry matter content.

<table>
<thead>
<tr>
<th>FERTILIZER PLAN</th>
<th>QUALITY PARAMETER</th>
<th></th>
<th></th>
<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Specific gravity</td>
<td>Tuber dry</td>
<td>Bud end</td>
<td>Stem end</td>
<td>Dry matter</td>
</tr>
<tr>
<td></td>
<td>adjusted (%)</td>
<td>matter (%)</td>
<td>glucose</td>
<td>glucose</td>
<td>yield (t ha⁻¹)</td>
</tr>
<tr>
<td>POLY4</td>
<td>1.07</td>
<td>20.4</td>
<td>0.36</td>
<td>3.22</td>
<td>11.73</td>
</tr>
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<td>MOP balanced²</td>
<td>1.07</td>
<td>18.8</td>
<td>0.37</td>
<td>2.36</td>
<td>9.90</td>
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<tr>
<td>POLY4 + MOP (50%:50% K₂O)³</td>
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<td>20.1</td>
<td>0.27</td>
<td>3.51</td>
<td>11.71</td>
</tr>
<tr>
<td>POLY4 + MOP (75%:25% K₂O)³</td>
<td>1.07</td>
<td>20.4</td>
<td>0.28</td>
<td>3.73</td>
<td>12.73</td>
</tr>
</tbody>
</table>

POTATO ECONOMICS

- Changing the nutrient inputs has financial implications for growers.
- A crop margin assessment indicates the importance of nutrient sources on costs vs returns³.
- Spreader costs are included to account for the different weights of fertilizer applied⁴.
- MOP with gypsum and kieserite showed the worst economic returns due to yield limitations and moderate input costs.
- Use of POLY4 with MOP showed higher economic returns driven by higher yields.

Notes: 1) FAOSTAT (2017); 2) POLY4 and MOP were used in a ratio to meet K₂O requirement; 3) All treatments received 268 N kg ha⁻¹ and 152 kg P₂O₅ ha⁻¹, 2.2 kg Zn ha⁻¹, 0.6 kg B ha⁻¹ from UAN, ESN, MAP, Zinc Chloride and Boric acid; 4) MOP balanced treatment contains lime and kieserite; 5) GENSTAT means; 6) Fertilizer prices based on US Mid-West 2016 annual prices: MOP (US$214/t), POLY4 (US$200/t), Lime (US$25/t), Kieserite (US$250/t); 7) Analysis accounts for yield changes and fertilizer application cost of US$16.16/t; 8) Potato price USDA National 2016 US$197.58/t. Initial soil analysis: Soil organic matter 1.12%, N 4.8%, P 37 mg kg⁻¹, K 83 mg kg⁻¹, Ca 266 mg kg⁻¹, Mg 46 mg kg⁻¹, S 3.5 mg kg⁻¹.

Sources: USDA, University of Minnesota (2015) 14000-UMN-14011-15

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