TRIAL RESULTS

POTATO

MINNESOTA, US (2016)

HIGHLIGHTS

IMPROVED TUBER SIZE
IMPROVED YIELD AND QUALITY
REDUCED FERTILIZER SPREADING COST
GREATER FINANCIAL MARGIN

poly4.com
TRIAL OBJECTIVE

To determine the effectiveness of POLY4 as a fertilizer for potato production.

TREATMENT TABLE

<table>
<thead>
<tr>
<th>TREATMENTS</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>152</td>
<td>269</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>MOP+GYPSUM</td>
<td>152</td>
<td>269</td>
<td>448</td>
<td>534</td>
<td>0</td>
<td>305</td>
<td>359</td>
</tr>
<tr>
<td>MOP+Ca+Mg+s</td>
<td>152</td>
<td>269</td>
<td>448</td>
<td>534</td>
<td>192</td>
<td>460</td>
<td>359</td>
</tr>
<tr>
<td>MOP+POLY4 (50:50)</td>
<td>152</td>
<td>269</td>
<td>448</td>
<td>267</td>
<td>97</td>
<td>305</td>
<td>227</td>
</tr>
<tr>
<td>POLY4</td>
<td>152</td>
<td>269</td>
<td>448</td>
<td>534</td>
<td>192</td>
<td>609</td>
<td>96</td>
</tr>
</tbody>
</table>

OVERVIEW

PARTNER: UNIVERSITY OF MINNESOTA
LOCATION: MINNESOTA, US
YEAR: 2016

- The United States is the fifth largest potato producer in the world.¹
- In 2014 the US produced approximately 20 million tonnes of potato.¹
- Minnesota ranked eighth in the United States in potato production in 2016².
- POLY4 can be an important fertilizer for potato since it is chloride sensitive and requires large quantities of K and Ca.
- The trial was a randomised complete black design with four replications.
- Fertilizers were applied in a split application of 224 kg K₂O ha⁻¹ pre-planting and 224 kg K₂O ha⁻¹ at emergence.

¹ Source: United States Department of Agriculture
² Source: Minnesota Department of Agriculture
The proportion of marketable tuber size (>85 g) was highest under POLY4, compared to the alternative commercial fertilizer programmes, which resulted in improved economic return.

**Specific Gravity and Dry Matter**

- Specific gravity and dry matter are quality indicators in potato production.
- POLY4 produced potato tubers with the highest dry matter content and improved fryability.
- POLY4 maintains potatoes’ important quality parameters.

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>SPECIFIC GRAVITY</th>
<th>DRY MATTER (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOP+GYPSUM</td>
<td>1.07</td>
<td>18</td>
</tr>
<tr>
<td>MOP+Ca+Mg+S</td>
<td>1.07</td>
<td>19</td>
</tr>
<tr>
<td>MOP+POLY4 (50:50)</td>
<td>1.07</td>
<td>19</td>
</tr>
<tr>
<td>POLY4</td>
<td>1.07</td>
<td>20</td>
</tr>
</tbody>
</table>

** Marketable Yield**

- With POLY4, potato yield increased by up to 15% compared MOP+gypsum option and 4% above the MOP+Ca+Mg+S option.
- The increase in yield reflects the potential of POLY4 to offer potato farmers more economic benefit than MOP-based fertilizer plans.
NET RETURN

- POLY4+MOP blend achieved a greater yield with a lower nutrient input. This indicated greater fertilizer use efficiency.

- POLY4 increased margin by between US$1,095 and US$264 compared to MOP+gypsum and MOP+Ca+Mg+S options respectively.

- The POLY4 + MOP blend increased the financial margin by US$160 compared to using MOP+Ca+Mg. The improvement in net return under MOP+POLY4 (50:50) was partly due to reduction in spreading cost.

TRANSFORMING POTATO FERTILIZER PLANS

- Increased application flexibility for fertilizer programmes with POLY4
- POLY4 provides sustained nutrient delivery
- POLY4 reduces chloride application
- POLY4 decreases fertilizer spreading passes and cost

TREATMENTS

<table>
<thead>
<tr>
<th>Product by kg ha⁻¹</th>
<th>Application Cl⁻ content kg ha⁻¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOP+Ca+Mg+S</td>
<td>6035</td>
</tr>
<tr>
<td>POLY4</td>
<td>3970</td>
</tr>
<tr>
<td>DIFFERENCE</td>
<td>-2065</td>
</tr>
</tbody>
</table>

Note: 1) Food and Agricultural Organisation Statistics, FAOSTAT (2017); 2) USDA (United States Department of Agriculture, 2017); 3) Initial soil analysis: pH 6.1, K 58 mg kg⁻¹, Ca 550 mg kg⁻¹, Mg 123 mg kg⁻¹, S 2.0 mg kg⁻¹; 4) Results presented are from GENSTAT analysis based on ANOVA means; 5) Fertilizer prices were obtained from CRU and are based on US Mid-West 2016 annual prices: MAP (US$346 t⁻¹), MOP (US$239 t⁻¹), POLY4 (US$200 t⁻¹), gypsum (US$25 t⁻¹), limestone (US$25 t⁻¹). The environmentally safe nitrogen (ESN) (Agrium Inc.) (US$232 t⁻¹) is an implied price based on urea price. The epsom price is implied price based on kieserite price (US$250 t⁻¹). The UAN price is based on Europe price converted to US$ (US$161 t⁻¹). Fertilizer spreading cost: US$16.16. The price of potato obtained from FAOSTAT: US$193 t⁻¹; 6) net return = crop output – (cost of fertilizer material + cost of fertilizer application).

Sources: University of Minnesota (2016) 14000-UMN-14014-16.