TRIAL RESULTS

POTATOES

BRAZIL (2014)
TRIAL OBJECTIVE

Compare the efficiency of 4-14-08 blend made with MOP to a POLY4 option as source of K on potato yield and quality.

HIGHLIGHTS

YIELD RESPONSE TO MAGNESIUM DEMONSTRATED

6% IMPROVEMENT IN AVERAGE MARKETABLE YIELD

IMPROVEMENTS IN TUBER DRY MATTER

LOWER INPUT COSTS AND LESS INPUTS NEEDED

TRIAL DESIGN

PARTNER: UNIVERSITY OF SÃO PAULO
LOCATION: BRAZIL
YEAR: 2014

• In 2013, produced over 3.5 Mt of potatoes accounting for 23% of global production.¹

• South American potato market is worth US$6 billion of which Brazil accounts for 22%.¹

• Approximately 70% of potatoes are for fresh market, 20% for processing and 10% for seed.²

• Soils are highly weathered and have naturally low fertility requiring high application of fertilizer.

• Official recommendation provides 40–80 kg N ha⁻¹, 100–300 kg P₂O₅ ha⁻¹, and 100 to 250 kg K₂O ha⁻¹, at planting followed by 40–80 N ha⁻¹ at hilling.³

• Brazil potato growers will often use 4-14-8 blends applied prior to planting.

• This rate response study evaluated a balanced MOP 4-14-8 blend against a POLY4 equivalent.⁴,⁵

TREATMENT TABLE

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>AVERAGE NUTRIENT APPLIED (kg ha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>MOP</td>
<td>177</td>
</tr>
<tr>
<td>POLY4</td>
<td>174</td>
</tr>
</tbody>
</table>
MARKETABLE YIELD

POLY4 blend achieves peak yield from 125 kg K₂O ha⁻¹ compared to the standard 400 kg K₂O required from the current commercial blend.

Using POLY4 blends product application rate can be 68% less whilst maintaining yield.

These yield improvements demonstrate practical considerations of POLY4 blends to growers without compromising yields.

MARKETABLE YIELD BY SIZE

The POLY4 (4:14:8) blend outperformed its commercial equivalent by 6%.

POLY4 blend improved the yield of small potatoes by 9% compared to MOP blend.

For the desirable potatoes of larger than 6cm, POLY4 blend improved yields by 4%.

The additional nutrients from POLY4, particularly magnesium, in this blend supported larger yields.

POLY4 successfully substitutes calcium and sulphur from TSP and expensive SSP.

TUBER QUALITY

Tuber dry matter is an indicator of total energy and nutrient content in the edible crop.

POLY4 improved tuber dry matter by 2% over the MOP blend.

Being essentially chloride free, POLY4 removes the problem of chloride management, commonly associated with MOP use.

Chlorides can be responsible for up to 2% reduction in tuber dry matter content.
• Inclusion of POLY4 improves the total nutrient content of the blend and could reduce input costs.\textsuperscript{11}

• The POLY4 option simplifies the blend feedstock reducing inputs.

• Supplementation of the commercial blend with magnesium would add an extra ~US$30/t cost.

• POLY4 option provides beneficial micro-nutrients not supplied by the traditional 4:14:8 NPK blend.

• Trial results indicate that POLY4 blend fed potatoes require less product.

**BRAZIL POLY4 NPK OPTION**

<table>
<thead>
<tr>
<th>Traditional 4:14:8 nutrient composition</th>
<th>POLY4 bonus nutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>P\textsubscript{2}O\textsubscript{5}</td>
</tr>
<tr>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fertilizer input</th>
<th>Urea</th>
<th>TSP</th>
<th>POLY4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Filler</td>
<td>MOP</td>
<td>SSP</td>
<td>TSP</td>
</tr>
<tr>
<td>17%</td>
<td>13%</td>
<td>50%</td>
<td>10%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application rate (kg K\textsubscript{2}O ha\textsuperscript{-1})</th>
<th>POLY4 total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fertilizer input</th>
<th>Commercial total</th>
<th>POLY4 4:14:8</th>
</tr>
</thead>
<tbody>
<tr>
<td>US$261 t\textsuperscript{-1}</td>
<td>US$257 t\textsuperscript{-1}</td>
<td></td>
</tr>
</tbody>
</table>

Sources: Sirius Minerals, University of São Paulo (2014) 4000-USP-4012-14

FAOSTAT 2017; 2) US Potato Board 2014; 3) IAC, 2014; 4) Made with MOP, Urea, TSP and SSP for 4:14:8; 5) Made with POLY4, Urea and MAP for 4:14:8; 6) GENSTAT regression analysis; 7) GENSTAT mean results; 8) Small = <6 cm length; Medium = 6–9 cm length; Large = >9cm length; 9) The Potash Development Association, 2008; 10) University of Nebraska, 2014; 11) Input prices based on CFR Brazil estimates on; Urea Granular US$350/t; TSP US$385/t; MOP US$400/t; SSP US$300/t; POLY4 US$200/t; Kieserite US$250/t. Initial soil analyses pH 4.8; P 108 mg kg\textsuperscript{-1}, K 128 mg kg\textsuperscript{-1}, S 12 mg kg\textsuperscript{-1}, Mg 72 mg kg\textsuperscript{-1}, Ca 640 mg kg\textsuperscript{-1}.