HIGHLIGHTS

POLY4 improved early growth parameters: plant height, crop canopy and leaf greenness.

POLY4 increased total potato yield by 11% and marketable yield by 15% over MOP + S.

POLY4 application reduced the proportion of non-marketable potato tubers by 27% compared to MOP + S.

Financial margins were increased by US$192/ha when POLY4 replaced MOP + S.
TRIAL OBJECTIVE

To assess the response of potato yield and quality to POLY4 fertilizer in India.

Leading states for potato production in India are:

<table>
<thead>
<tr>
<th>Province</th>
<th>Production (Mmt)</th>
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</thead>
<tbody>
<tr>
<td>Uttar Pradesh</td>
<td>13.9</td>
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<tr>
<td>West Bengal</td>
<td>8.4</td>
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<td>Bihar</td>
<td>6.4</td>
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<td>Gujarat</td>
<td>3.6</td>
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<tr>
<td>Madhya Pradesh</td>
<td>3.2</td>
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</tbody>
</table>

OVERVIEW

PARTNER: Sardar Vallabhbhai Patel University of Agriculture and Technology.

LOCATION: Bulandshahar

YEAR: 2018

- 2.2 million hectares of potato were planted in India in 2017–2018 with total annual production of 49 Million metric tonnes (Mmt).¹

- The trial was in Uttar Pradesh which produced more potatoes than any other state in India.¹

- The potato variety used was Kufri Bahar – a variety grown for table potatoes.

- The performance of POLY4 was tested against recommended application rates of K₂O and S by locally-typical MOP and elemental sulphur fertilizer.

- The trial was a randomised block design with three replicates.

- Potato yield data is presented for 100 kg K₂O ha⁻¹.

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<table>
<thead>
<tr>
<th>Treatments</th>
<th>Nutrients applied (kg ha⁻¹)</th>
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<tbody>
<tr>
<td></td>
<td>N</td>
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<tr>
<td>N + P (control)</td>
<td>180</td>
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<tr>
<td>POLY4 50</td>
<td>180</td>
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<tr>
<td>POLY4 100</td>
<td>180</td>
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<td>POLY4 150</td>
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<tr>
<td>MOP50 + S</td>
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<td>MOP100 + S</td>
<td>180</td>
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<tr>
<td>MOP + POLY4 (25:75)</td>
<td>180</td>
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<tr>
<td>MOP + POLY4 (50:50)</td>
<td>180</td>
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<tr>
<td>MOP + POLY4 (75:25)</td>
<td>180</td>
</tr>
</tbody>
</table>

Province Production (Mmt)

- Uttar Pradesh: 13.9
- West Bengal: 8.4
- Bihar: 6.4
- Gujarat: 3.6
- Madhya Pradesh: 3.2
**EARLY CROP GROWTH**

**HEIGHT VERSUS DAYS AFTER PLANTING (DAP)**

- Plant height and leaf area index allow plants to shade-out weeds that otherwise compete for space, nutrients and water.
- POLY4 increased crop growth compared to MOP + S at 60 and 75 DAP.
- POLY4 improved leaf area index (LAI) by 5% compared to MOP + S. Higher LAI means the crop has a denser canopy cover which leads to better weed control and greater light interception for photosynthesis.
- Soil-plant analysis development (SPAD) is a measure of the greenness, which is proportionate to the chlorophyll content of leaves. The POLY4 treatment had a higher SPAD value.

**POTATO YIELD**

- Total yield
  - N + P: 21.4 t ha⁻¹
  - MOP + S: 25.3 t ha⁻¹
  - POLY4: 28.0 t ha⁻¹
  - Increase: 11% compared to N + P

- Marketable yield
  - N + P: 19.9 t ha⁻¹
  - MOP + S: 23.0 t ha⁻¹
  - POLY4: 26.5 t ha⁻¹
  - Increase: 15% compared to N + P
Compared to MOP + S, POLY4 fertilizer increased total and marketable yield.

Yields were also significantly higher in response to increased proportion of POLY4 in the fertilizer blend.

Tubers that weighed less than 25 g were considered as non-marketable.

POLY4 increased the number of marketable tubers compared to MOP + S.

The proportion of potato yield that was non-marketable was reduced by 27%.

POTATO QUALITY: DRY MATTER CONTENT

Higher dry matter content (DM%) is the most important characteristic that helps to attract a price premium from the potato frying industry. For processing, high tuber dry matter content influences the oil absorption rate to achieve a good fry colour.

DM% content was increased with the use of POLY4.
• Farmer margins were increased progressively as a greater proportion of the K fertilizer was applied by POLY4.

• The POLY4 treatment gave the best additional margin by US$192/ha compared to MOP + S.

Notes: 1) Statistics of Horticulture, Ministry of Agriculture & Farmers Welfare, India (2017); 2) Treatment table is based on the recommended K₂O rate of 100 kg K₂O ha⁻¹. MOP + S contains elemental sulphur with bentonite. All treatments received 180 kg N ha⁻¹ and 80 kg P ha⁻¹. MOP + POLY4 was used in a ratio of 66.7:33.3 K₂O; 3) POLY4 = 3 % Cl⁻, and MOP = 48% Cl⁻; Initial soil analysis: pH 7.5; 7 mg P kg⁻¹, 71 mg K kg⁻¹, and 7 mg S kg⁻¹; 4) pH and EC measured in a 1:2.5 soil:water extraction; 5) Results presented are based on data from GENSTAT factorial plus added control and regression analyses with significance tested at 5% level; 6) Measured 60 days after planting; 7) Fertilizer prices based on local prices: MOP (US$194/t), POLY4 (US$181/t), bentonite (US$270/t). Analysis accounts for fertilizer application of spreading cost of US$9.10/t. Potato price was US$75/t. Margin = crop output (US$/ha) minus (cost of fertilizer material plus spreading cost).

*Mean of K fertilizer

Source: Sardar Vallabhbhai Patel University of Agriculture and Technology (2018) 76000-SVPU-76010-17