HIGHLIGHTS

POLY4 increased tomato yield by up to 54% compared to MOP.

The POLY4 option generated up to US$16,822 greater financial margin compared to the industry standard blend.

The POLY4 blends showed the lowest CO$_2$e emissions supporting economic and environmental sustainability.
TRIAL OBJECTIVE

To investigate the response of fresh market tomatoes to POLY4 and MOP in two NPK blends (6:3:12 and 11:4:17).

Tomato is the most consumed vegetable worldwide. FAOSTAT reported that 177 Million metric tonnes (Mmt) of tomatoes were grown globally in 2016, with approximately five million hectares of crop planted. The largest producers were China, the United States and India. The European Union produced around 18 Mmt of tomatoes in the 2016 – 2017 season, 40% of which were sold on the fresh market.

OVERVIEW

PARTNER: VIRGINIA TECH
LOCATION: VIRGINIA, US
YEAR: 2016

• The United States is one of the world’s leading producers of tomatoes, second only to China. Fresh and processed tomatoes sales in the United States account for more than US$2 billion.¹

• Virginia is the third largest tomato-producing state after California and Florida. Tomatoes are produced on coastal plain soils with high K and S deficiencies.

• Virginia tomato growers typically use NPK blends containing MOP which miss S, Mg and Ca.

• The trial was conducted as a follow up to a similar trial in 2015. It was a randomised complete block design with four replications.

• An additional treatment augmented MOP with Ca and S to balance these inputs with the POLY4 fertilizer.

• The trial included a K response experiment with an N + P control. This data is not reported.

TREATMENT TABLE²³⁴

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Nutrients applied (kg ha⁻¹)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>K₂O</td>
</tr>
<tr>
<td>Control</td>
<td>0</td>
</tr>
<tr>
<td>MOP (6:3:12 &amp; 11:4:17) blends</td>
<td>160</td>
</tr>
<tr>
<td>MOP + (N, P, K, Ca, S) blends</td>
<td>160</td>
</tr>
<tr>
<td>POLY4 (6:3:12 &amp; 11:4:17) blends</td>
<td>160</td>
</tr>
</tbody>
</table>

³ Connecticut Agricultural Experiment Station. 2018. Tomato nutrition. URL: https://extension.cornell.edu/plants/tomato/nutrition
⁴ University of California. 2019. Tomato nutrition. URL: https://www.ipm.ucdavis.edu/Entomology/diseases/pests/pp211.html
POLY4 fertilizer programme delivered greater yield with up to 54% increase compared to MOP blends whilst also supplying S, Mg and Ca.

- When growing tomatoes, sulphur encourages green leaves and imparts flavour to tomatoes; magnesium is particularly important at flowering and throughout fruiting; calcium is needed to ensure strong leaf and root development and foliage growth.
• Blends containing S and CaO delivered higher yields and higher net margins.

• The POLY4 option generated US$735 greater financial margin compared to the nutrient-balanced MOP blends (MOP + Ca + S).

CO₂ e emission per tonne of fertilizer were calculated for each blend.

• The POLY4 blends showed the lowest CO₂ e emissions. The lowest CO₂ e emission-tomato yield ratio meant POLY4 was the most CO₂ e efficient and environmentally-friendly fertilizer solution for growing tomatoes.

![Graph showing the comparison of CO₂ e emissions and margin between different fertilizer options.]

Note: 1) USDA (2016); 2) Blends and fertigation delivered 224 kg N ha⁻¹ to all plots; 3) P₂O₅ was applied in blends for good agricultural practice; 4) Initial soil analysis: pH 6.4; 24 mg P kg⁻¹, 61 mg K kg⁻¹, 294 mg Ca kg⁻¹, 47 mg Mg kg⁻¹; 5) Nutrient content: urea: 46:0:0; DAP: 18:46:0; MOP: 0:0:60 + 48 Cl⁻; ammonium sulphate: 21:0:0 + 24 S; gypsum: 0:0:0 + 22 S + 33 CaO; POLY4: 0:0:14 + 19 S + 6 MgO + 17 CaO + 3 Cl⁻; 6) Yield results presented are based on a K₂O rate of 160 kg ha⁻¹; 7) MOP blends were made with urea, DAP and MOP; 8) MOP+ blends were made with AS, urea, DAP, MOP and gypsum; 9) POLY4 blends were made with urea, DAP, MOP and POLY4; 10) Fertilizer prices were obtained from CRU, based on US Mid-West 2016 (end of 2016) annual prices: urea (US$243/t), AS (US$248/t), DAP (US$346/t), MOP (US$239/t), POLY4 (US$200/t), gypsum (US$25/t); 10) Net return = Crop output minus (cost of fertilizer material + cost of fertilizer application). The price of tomato: US$904/t; 11) CO₂ e (CO₂ equivalent) emission per tonne of fertilizer associated with fertilizer materials were obtained from Ricardo-AEA: 51 kg POLY4CO₂e, 1800 kg urea CO₂e, 350 kg MOP CO₂e, 840 kg ammonium sulphate CO₂e, 125 kg gypsum CO₂e.

Source: Virginia Tech 23000-VIR-23015-16

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