TRIAL RESULTS

SUGARCANE

UNIVERSITY OF SÃO PAULO, BRAZIL (2014)
TRIAL OBJECTIVE

To evaluate fertilizer practices by comparing the use of gypsum against POLY4 in conjunction with a liquid feed.

HIGHLIGHTS

9% INCREASE IN YIELD THROUGH BALANCED FERTILIZATION

INCREASE IN ECONOMIC RETURNS FOR THE FARMER

MAINTAINED QUALITY PARAMETERS

IMPROVEMENTS IN SOIL NUTRIENT RETENTION AT DEPTH

INCREASE IN NUTRIENT DELIVERY AT LOWER APPLICATION RATES

TRIAL DESIGN

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

• Sugarcane is an important crop for Brazil, with over 10 million hectares cultivated in 2014¹.

• Renewable energy from sugarcane production accounts for 16% of Brazil’s electricity need through biomass burning².

• Sugarcane is a perennial crop that produces economic yields for up to seven years.

• Field site trials were established on a low nutrient status soil.

• At the mounting stage (approximately 90 days after planting) gypsum was applied at 1000 kg ha⁻¹ and POLY4 at 750 kg ha⁻¹.

• All plots received a liquid NPK 6:15:15 as per standard practice for growing sugarcane.

TREATMENT TABLE

<table>
<thead>
<tr>
<th>FERTILIZER PLAN</th>
<th>N</th>
<th>P₂O₅</th>
<th>K₂O</th>
<th>CaO</th>
<th>MgO</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid starter</td>
<td>60</td>
<td>150</td>
<td>150</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Liquid starter +gypsum</td>
<td>60</td>
<td>150</td>
<td>150</td>
<td>280</td>
<td>0</td>
<td>240</td>
</tr>
<tr>
<td>Liquid starter +POLY4</td>
<td>60</td>
<td>150</td>
<td>255</td>
<td>127</td>
<td>45</td>
<td>143</td>
</tr>
</tbody>
</table>
• Sugarcane yield, sugar content and quality are essential to determining crop value.

• Gypsum application is commonly used in Brazil to improve soil conditions and supply plant nutrients.

• Like gypsum, POLY4 contains calcium and sulphur but also supplies potassium and magnesium in support of crop production.

• POLY4’s multi-nutrient supply delivered a 9% yield increase over gypsum, even at lower sulphur and calcium rates.

**POST-HARVEST NUTRIENT LEGACY** (mg kg⁻¹)

• The POLY4 plan resulted in an average of 23% more calcium and 24% more sulphur than the gypsum plan in the 0–40 cm soil profile, post cropping.

• Applying beneficial calcium ions removes detrimental aluminium and hydrogen ions. Mean post trial levels of aluminium and hydrogen ions were 19 mmol dm⁻³ with gypsum compared to 18.2 mmol dm⁻³ with POLY4.

• The benefits of replacing gypsum as the calcium source with POLY4 is also additional potassium and magnesium supply.

• In this trial, the additional potassium and magnesium from POLY4 made a contribution to all of the soil horizons.

• The POLY4 plan resulted in an average of 37% more potassium and significantly, 54% more magnesium than the gypsum plan in the 0–40 cm soil profile, post cropping.

**CAKE TOTAL NUTRIENT CONCENTRATION** (g kg⁻¹)

• Calcium and sulphur uptake were 3% and 29% higher with POLY4 respectively compared to gypsum.

• Calcium is important for cell division and stabilising and strengthening cell walls.

• Sulphur plays a vital role in plant metabolism and is required for photosynthesis.

• POLY4 also delivers additional micro-nutrients that are beneficial to sugarcane growth.
QUALITY SUMMARY

- Application of fertilizer showed no adverse effects on quality when compared to the control.
- Switching to POLY4 showed improvements over gypsum due to balanced fertilization.

ECONOMIC SUMMARY (US$ ha⁻¹)

- Local standard practice is to apply 1 t ha⁻¹ of gypsum after the liquid starter, generating an additional 10% revenue over the starter alone.
- The POLY4 option utilises 750 kg of product, generating a 20% increase in revenue over the liquid starter.
- The addition of magnesium and potassium from POLY4 differentiates it from the gypsum option.
- The POLY4 option generates an additional US$340 per hectare by applying a more appropriate balance of nutrients compared to the gypsum option.
- Further benefits of the POLY4 option include less material to store on-farm, guarantee sugar content plus variable soil amendments.

### QUALITY SUMMARY

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>Control</th>
<th>Liquid Starter + Gypsum (1000 kg ha⁻¹)</th>
<th>Liquid Starter + POLY4 (750 kg ha⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brix (%)</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Sugar recovery (kg t⁻¹ of cane)</td>
<td>127</td>
<td>128</td>
<td>130</td>
</tr>
<tr>
<td>Purity (%)</td>
<td>85</td>
<td>85</td>
<td>86</td>
</tr>
</tbody>
</table>

### ECONOMIC SUMMARY

![Economic Summary Graph]

**Notes:** 1) FAO 2017; 2) Nunes et al (2016); 3) GENSTAT means; 4) Liquid NPK 6:15:15 was applied to all treatments with fertilizer added during mounting except control; 5) Gypsum plots received 60 kg N ha⁻¹, 150 kg P₂O₅ ha⁻¹, 150 kg K₂O ha⁻¹, 280 kg CaO ha⁻¹, 240 kg S ha⁻¹; 6) POLY4 plots received 60 kg N ha⁻¹, 150 kg P₂O₅ ha⁻¹, 255 kg K₂O ha⁻¹, 127 kg CaO ha⁻¹, 45 kg MgO ha⁻¹, 143 kg S ha⁻¹; 7) Price of sugar is US$194.19/t. Initial soil analysis (0-10 cm): pH 4.3; P 4 mg kg⁻¹; K 59 mg kg⁻¹; Ca 140 mg kg⁻¹; Mg 60 mg kg⁻¹; CEC 38 meq 100g⁻¹.

**Sources:** University of São Paulo (2014), USDA Foreign Agricultural Service. 4000-USP-4013-14