TRIAL RESULTS

SILAGE CORN

UK (2014)
TRIAL OBJECTIVE

Compare responses of MOP, SOP and POLY4 on silage corn on a $K_2O$ basis.

HIGHLIGHTS

UP TO 39% IMPROVEMENT IN DRY MATTER YIELD.

UP TO 9% CRUDE PROTEIN IMPROVEMENT.

28-52% NUTRIENT UPTAKE IMPROVEMENT FOR ALL SIX MACRO-NUTRIENTS.

LOWER FERTILIZER PLAN COSTS.

TRIAL DESIGN

PARTNER: WARWICK UNIVERSITY
LOCATION: UK
YEAR: 2014

- Corn harvested for silage is an important feed for animals, especially in areas where crop land for grazing is limited.
- Managed well the crop can provide a high yielding, nutrient rich, source of protein crucial for animal diets produced at a lower cost than grass silage.
- Silage corn is proven to be an effective route around the yield ceiling associated with grass silage dairy systems.
- The European Union grows ~5 million hectares silage corn equivalent to a potential 7mtpa POLY4 market.
- Potassium offtake from a corn silage crop is up to 10 times as much as a corn grain crop, the $K_2O$ requirement is potentially 220 kg $K_2O$ ha$^{-1}$.
- Where soil potassium levels are normal, agronomic practice dictates that offtake is replaced by a fertilizer source nutrient.
- High quality mineral supplements can be incorporated into silage corn in order to create the optimal animal feed ration.

TRIAL SUPPLEMENT TABLE

<table>
<thead>
<tr>
<th>TREATMENTS</th>
<th>AVERAGE NUTRIENT APPLIED IN TRIAL (kg ha$^{-1}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>120</td>
</tr>
<tr>
<td>MOP</td>
<td>120</td>
</tr>
<tr>
<td>SOP</td>
<td>120</td>
</tr>
<tr>
<td>POLY4</td>
<td>120</td>
</tr>
</tbody>
</table>
CORN CRUDE PROTEIN CONTENT

- POLY4 improves corn crude protein content which is important for animal nutritional value, POLY4 outperforms MOP by 9% and SOP by 7%.
- Crude protein content in corn silage should be ~8% for beef cattle.
- POLY4 elevates protein content making it a highly desirable fertilizer source for the silage crop.
- Silage grown on POLY4 minimizes the supplementary protein required in the animal diet.

NUTRIENT UPTAKE

- POLY4's sulphate seems to be supportive of nitrogen uptake which appears to be linked to POLY4 nutrient release rates.
- Potassium is the highest demanded nutrient by corn and POLY4 supports 28% greater uptake compared to MOP.
- POLY4 seems to be the preferred source of macro-nutrients for corn, consistently improving nutrient uptake.

DRY MATTER CONTENT

- POLY4 supports maximum tissue dry matter content, maintaining dry matter in a range which is not detrimental to animal digestion.
- A high moisture content is undesirable since it hinders fermentation.
- POLY4 is supportive of quality by reducing the risk of aerobic spoilage.
- In order to achieve a high-quality silage grade dry matter content should be 30+ % regardless of K₂O application rate POLY4 exceeds this benchmark.
CORN DRY MATTER YIELD (US$ t⁻¹)⁵

- The dry matter yield is the most important yield parameter.
- Dry matter yield represents the feed and energy value for the animal.
- POLY4 significantly outperformed MOP by 39% and outperformed SOP by 4%.

![Graph showing corn dry matter yield comparison between MOP, SOP, and POLY4](image)

**FERTILIZER ECONOMICS** ⁵

- POLY4 demonstrates an opportunity to improve farmers’ margins.
- POLY4 is shown to be a high value source of potassium and sulphur providing nutrient requirements at a competitive price point, even at a high input cost of US$250/t.
- In addition, POLY4 supplies beneficial micro-nutrients not supplied by MOP or SOP.
- Sulphur containing potassium sources are the most economical choice for the farmer with POLY4 reducing total fertilizer cost by US$56/ha⁻¹ over the SOP based option.

<table>
<thead>
<tr>
<th></th>
<th>MOP</th>
<th>SOP</th>
<th>POLY4</th>
</tr>
</thead>
<tbody>
<tr>
<td>DM Yield (t ha⁻¹)</td>
<td>17.4</td>
<td>23.2</td>
<td>24.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>K&lt;sub&gt;2&lt;/sub&gt;O</th>
<th>SO₃</th>
<th>Total cost (US$/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional MOP+S fertilizer solution (US$/ha)</td>
<td>104</td>
<td>164</td>
<td>84</td>
<td>US$352</td>
</tr>
<tr>
<td>Premium SOP fertilizer solution (US$/ha)</td>
<td>104</td>
<td>184</td>
<td>76</td>
<td>US$364</td>
</tr>
<tr>
<td>Balanced multi-nutrient POLY4 fertilizer option (US$/ha)</td>
<td>104</td>
<td>136</td>
<td>67</td>
<td>US$308</td>
</tr>
</tbody>
</table>

Notes: 1) FAO 2017; 2) The removal of plant biomass accounts for the additional nutrient offtake; 3) GENSTAT means; 4) GENSTAT exponential regression; 5) Assumed costs per hectare based on retail pricing available January 2015; SOP US$800/t, MOP US$450/t, Urea US$480/t, POLY US$250/t; commercial N/S top dressing (Double Top) US$450/t. Initial soil analysis pH 6.8; P 36 mg kg⁻¹, K 157 mg kg⁻¹, Mg 157 mg kg⁻¹, Ca 1554 mg kg⁻¹, SO₃ 11.9 mg kg⁻¹.

Sources: Warwick University, Sirius Minerals 8000-WCC-8012-14.