POTATO YIELD AND DRY MATTER RESPONSE TO DIFFERENT SOURCES OF POTASSIUM FERTILIZER IN THE UK

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Introduction

- Europe produced 91.1Mt of potatoes from 3.5M ha in 2014.
- Potassium (K) nutrition is critical for potato yield, quality and marketability.
- On average 221 kg K ha\(^{-1}\) is applied to maincrop potatoes in the UK.
- MOP (muriate of potash) is the most common K fertilizer. MOP contains Cl\(^{-}\) which can affect quality of potato crops.
- POLY4 is a naturally occurring multi-nutrient containing four of the six crop macro nutrients (K, Ca, S and Mg), but with a very low concentration of Cl.
- The trials determined the K response of potatoes and the relative effectiveness of POLY4 against other fertilizers.

Treatments

- All sites:
  - K application presented where crop demand was met;
  - N and P supplied by ammonium nitrate and triple super phosphate (according to fertilizer recommendations);
  - All treatments were replicated four times in a randomised block design;
  - Each plot was 10m long, contained two beds with four rows of potatoes;
- Site 1: variety Pentland Dell;
- Sites 2 and 3: variety Casablanca at site 2 and Estima at site 3.

Table 1: Treatments applied for different fertilizer sources in Staffordshire in 2015

<table>
<thead>
<tr>
<th>NUTRIENT</th>
<th>APPLICATION RATE (kg ha(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Control</td>
<td>170</td>
</tr>
<tr>
<td>Control + kieserite</td>
<td>170</td>
</tr>
<tr>
<td>MOP</td>
<td>170</td>
</tr>
<tr>
<td>MOP + POLY4 (75:25)</td>
<td>170</td>
</tr>
<tr>
<td>POLY4</td>
<td>170</td>
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</tbody>
</table>

Table 2: Nutrients applied for all treatments at site 2 and 3

<table>
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<tr>
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<tr>
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<td>160</td>
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</tbody>
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Soil analysis

Site 1 - P 28 mg kg\(^{-1}\), K 106 mg kg\(^{-1}\), Mg 46 mg kg\(^{-1}\)
Site 2 - pH 5.9, P 8 mg kg\(^{-1}\), K 99 mg kg\(^{-1}\), Mg 86 mg kg\(^{-1}\)
Site 3 - pH 5.8, P 4.7 mg kg\(^{-1}\), K 90 mg kg\(^{-1}\), Mg 86 mg kg\(^{-1}\), S 17 mg kg\(^{-1}\)

Statistical analysis

Statistical analysis was carried out using GenStat software version 17 (VSN International, 2011) using ANOVA and regression analysis. Treatments were compared by using single degree of freedom contrasts.

Yield results

Two of the three sites provided significant yield response to fertilizers (Figure 1). The fertilizer treatments demonstrated a similar trend across all three sites. The data is presented in Figure 2.

Figure 1: Yield response to fertilizer treatments (UK, 2015 and 2016)

Figure 2: Average normalised yields (% of no K control) for fertilizer treatments

Dry matter quality

- Supply of K, Mg and Cl can influence tuber dry matter content.
- Pentland Dell is a processing variety that requires high tuber dry matter content.
- Fertilizer treatments did not significantly affect DM% in two of the three trials.
- Some trends can be identified.
- On average, the MOP had the least DM% (figure 3).
- The effect of fertilizer treatments on DM% though were modest and inconsistent (94.1-96.5% of no K control for all K fertilizer treatments).
- Potato size grades were not significantly affected by fertilizer treatments (data not shown).

Figure 3: Effect of fertilizer treatments on potato DM%

Conclusions

- POLY4 and its blends were effective at increasing potato yields. POLY4 tends to out-yield MOP treatments, including those looking to balance inputs of Mg and S. Further work is required to conclude the benefits.
- There was a trend towards higher dry matter content with increasing POLY4 in the fertilizer programmes.

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