

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

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Introduction

- Europe produced 91.1M t of potatoes from 3.5M ha in 2014.
- Potassium (K) nutrition is critical for potato yield, quality and marketability.
- On average 221 kg K₂O 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

NUTRIENT	APPLICATION RATE (kg ha ⁻¹)						
	N	P ₂ O ₅	K ₂ O	MgO	CaO	S	Cl
Control	170	100	0	0	0	0	0
Control + kieserite	170	100	0	80	0	37	0
MOP	170	100	300	0	0	0	200
MOP + POLY4 (75:25)	170	100	300	32	90	101	166
POLY4	170	100	300	128	364	407	64

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

NUTRIENT	APPLICATION RATE (kg ha ⁻¹)						
	N	P ₂ O ₅	K ₂ O	MgO	CaO	S	Cl
Control	160	150	0	0	65	0	0
MOP	160	150	200	0	65	0	160
MOP + kieserite	160	150	200	21	65	7	160
MOP + POLY4 (75:25)	160	150	200	21	126	27	131
POLY4	160	150	200	85	33	109	43

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)

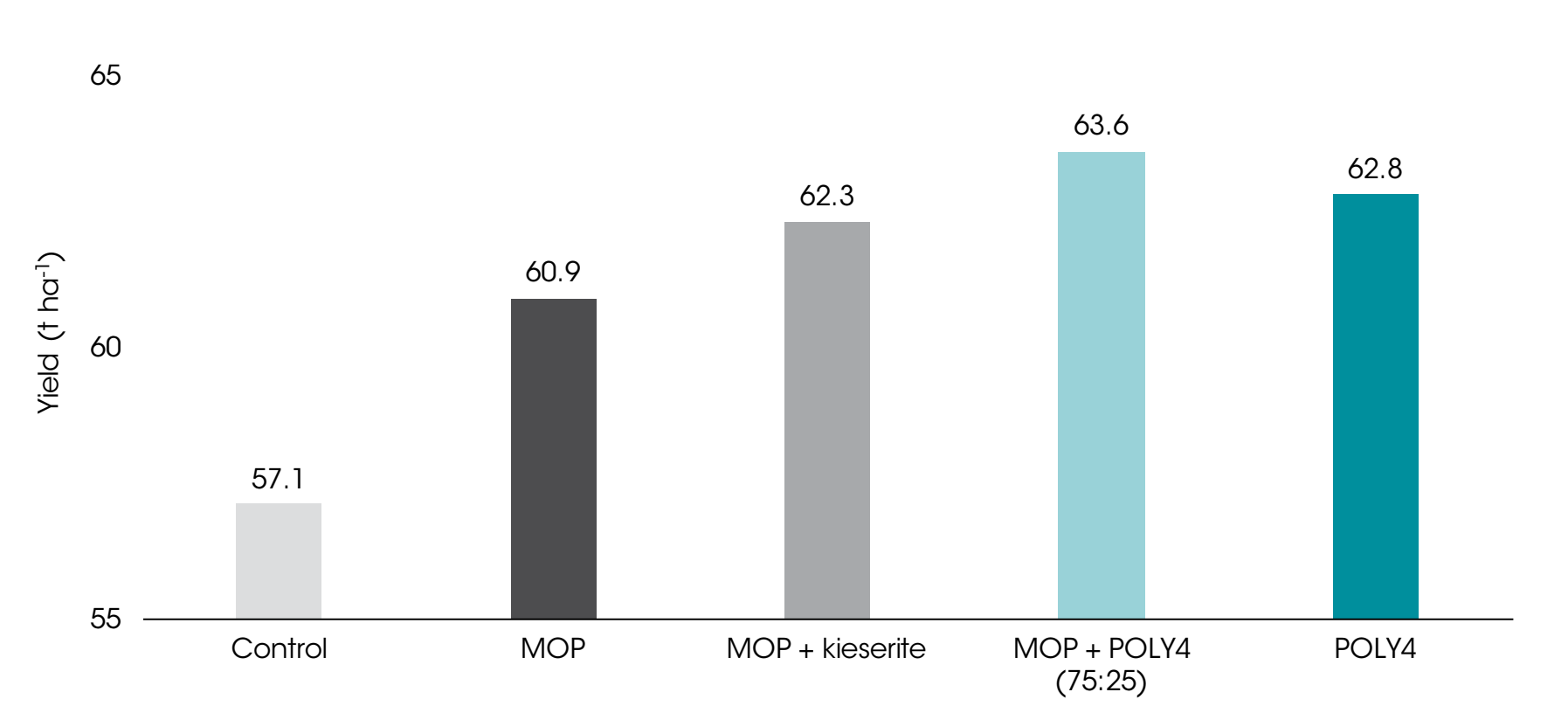
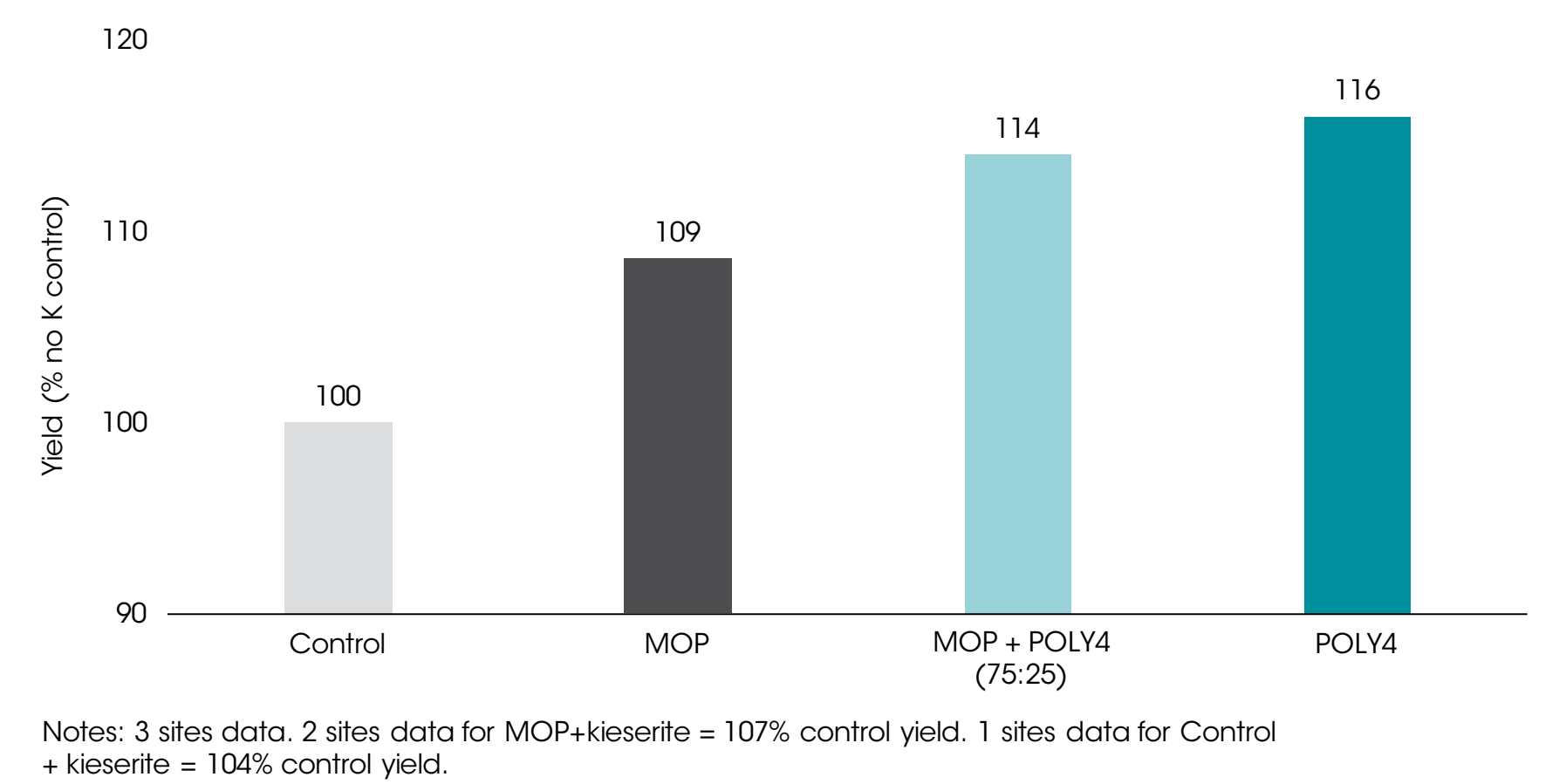


Figure 2: Average normalised yields (% of no K control) for fertilizer treatments

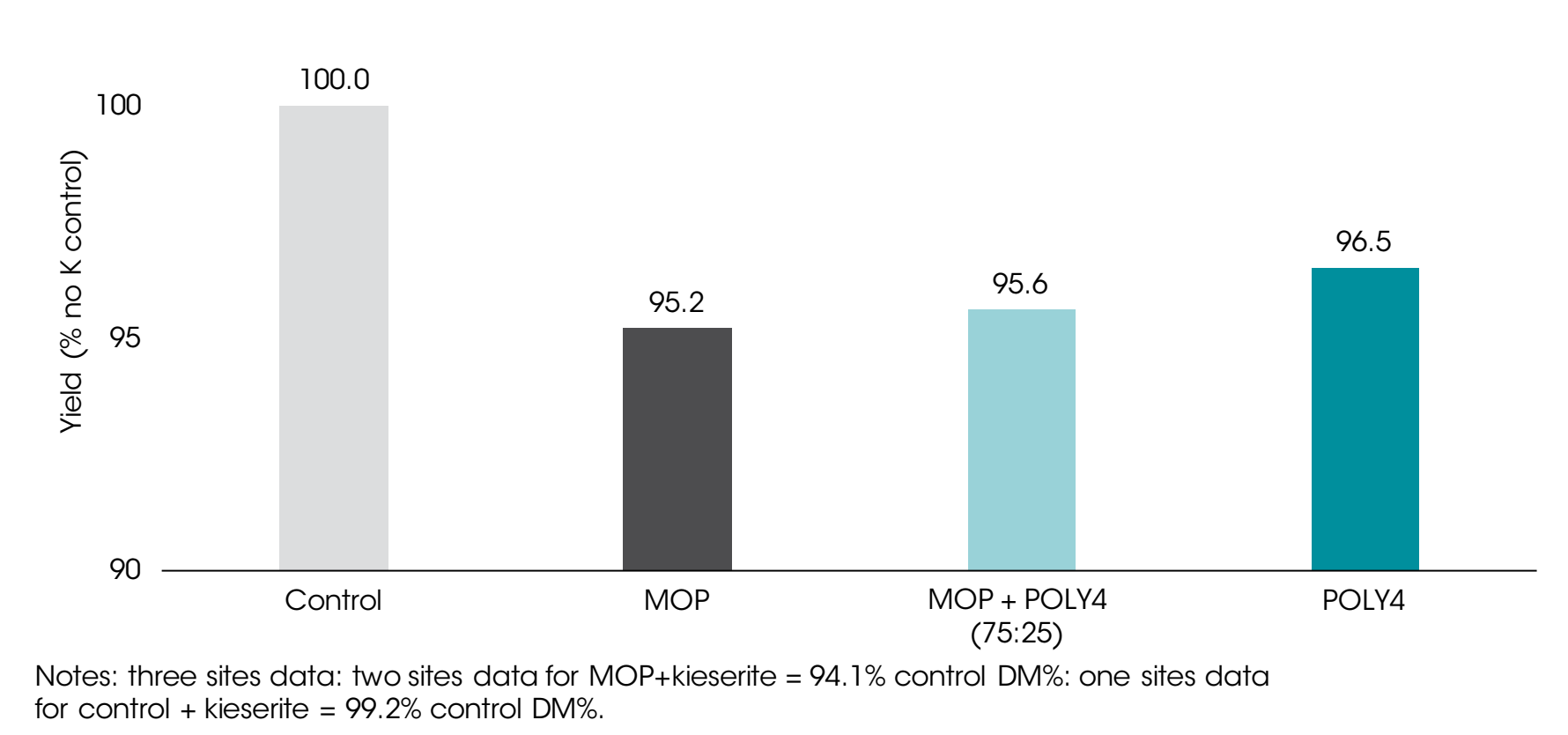


Fertilizer treatments including POLY4 had five of the six greatest treatment crop yields. The MOP + kieserite was also broadly competitive with the POLY4 treatments (only one site). These multi-nutrient fertilizer treatments out-yielded the straight MOP treatment (+1 to +18% of control yield compared to MOP treatment). This indicates a benefit of the S applied in fertilizer treatments and a potential boost from the combined nutrients in POLY4. The MOP + kieserite had a similar yield to the POLY4 treatments indicating that, to maximise potato yield, fertilizers that provide K, Mg and S were required.

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.