

# 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 K<sub>2</sub>O ha<sup>-1</sup> is applied to maincrop potatoes in the UK.
- MOP (muriate of potash) is the most common K fertilizer. MOP contains Cl<sup>-</sup> 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<sup>-</sup>.
- 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 <sup>-1</sup> )						
	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> 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 <sup>-1</sup> )						
	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> 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<sup>-1</sup>, K 106 mg kg<sup>-1</sup>, Mg 46 mg kg<sup>-1</sup>

Site 2 - pH 5.9, P 8 mg kg<sup>-1</sup>, K 99 mg kg<sup>-1</sup>, Mg 86 mg kg<sup>-1</sup>

Site 3 - pH 5.8, P 4.7 mg kg<sup>-1</sup>, K 90 mg kg<sup>-1</sup>, Mg 86 mg kg<sup>-1</sup>, S 17 mg kg<sup>-1</sup>



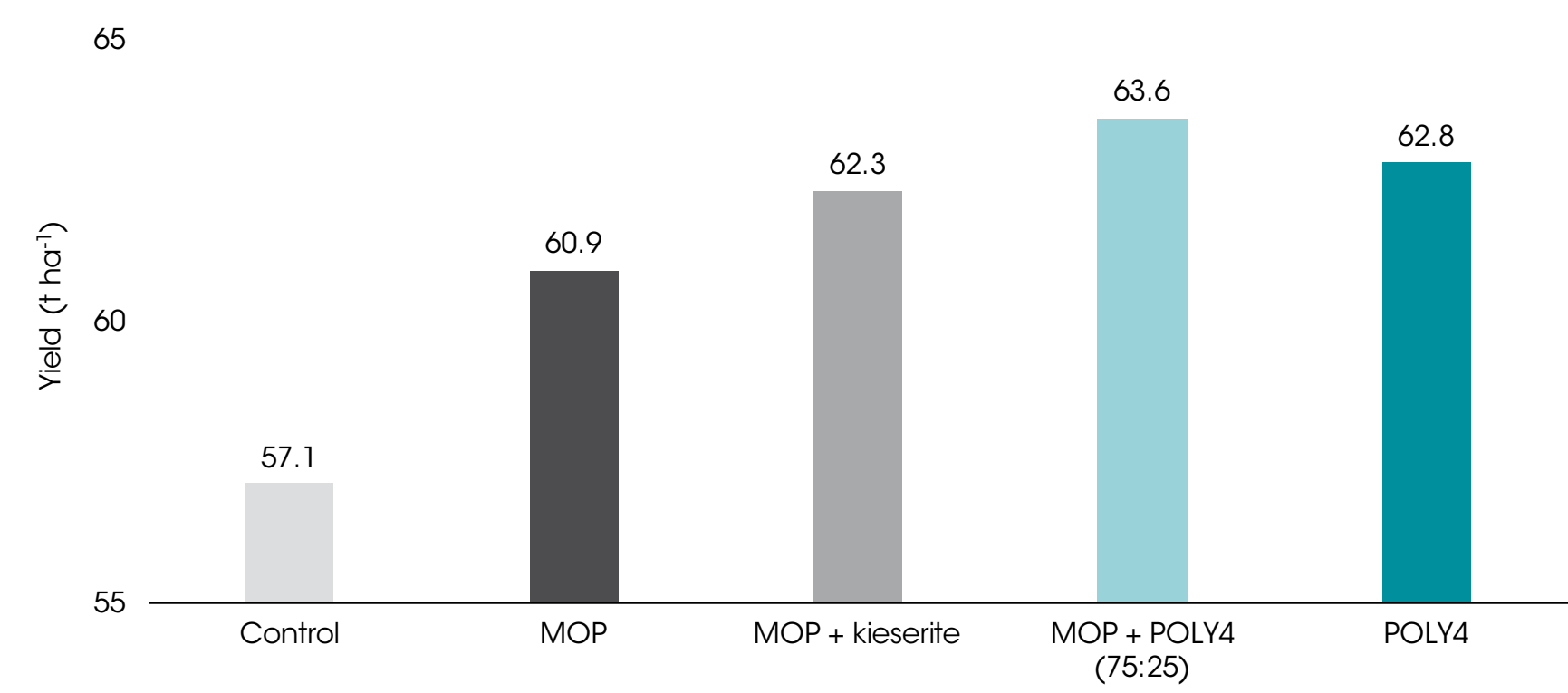
## Statistical analysis

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.

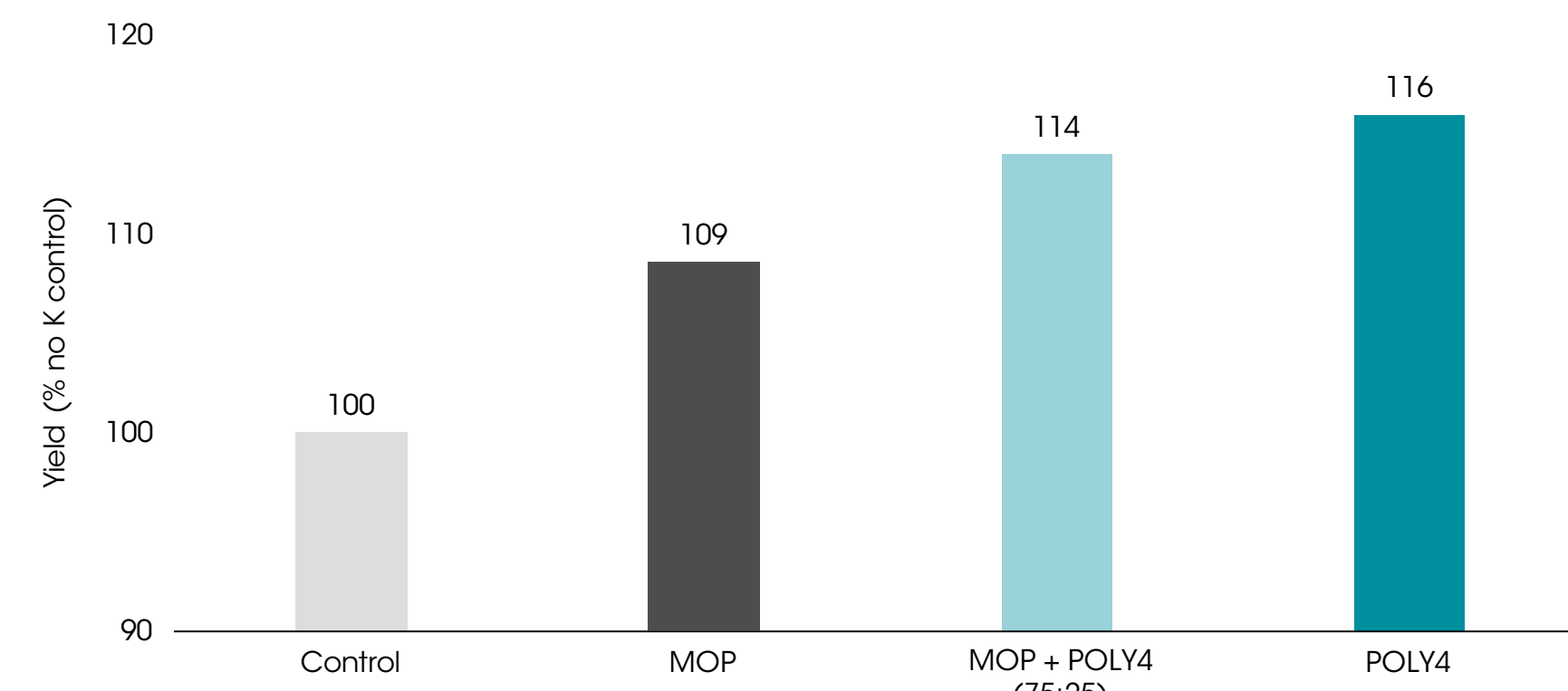
## Yield results

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**



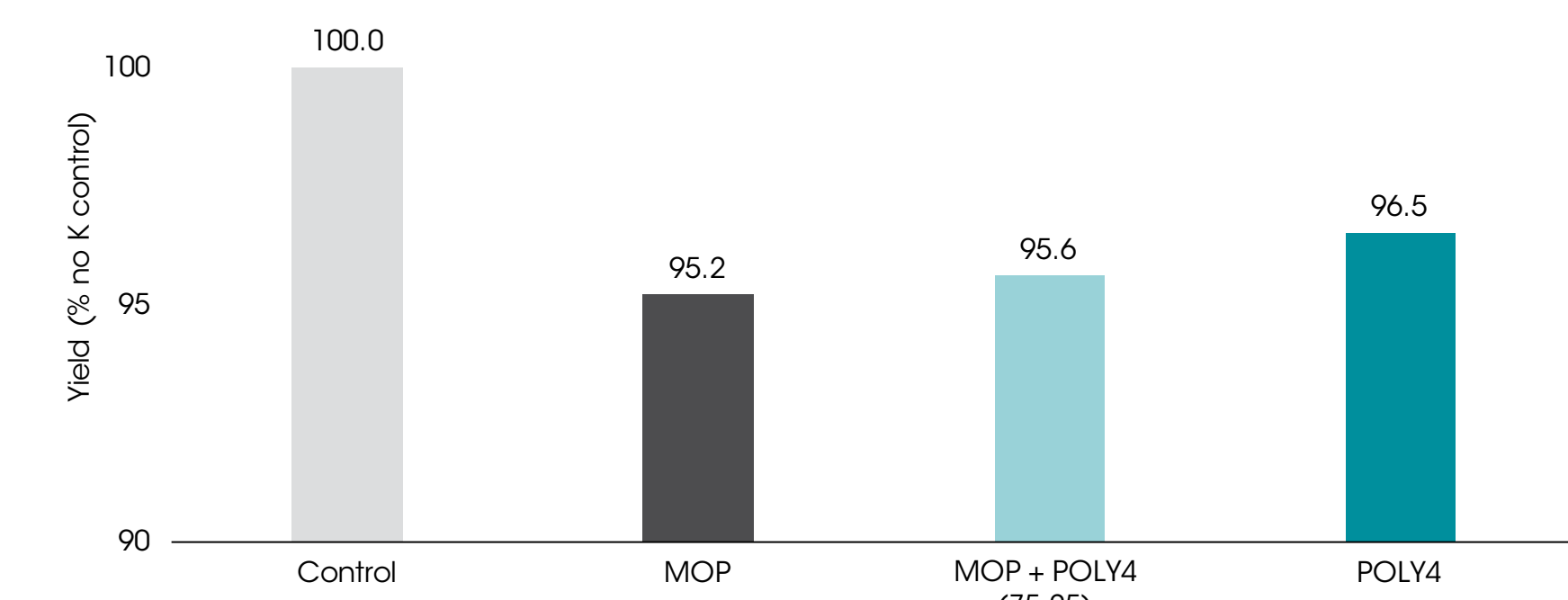
Notes: 3 sites data. 2 sites data for MOP+kieserite = 107% control yield. 1 sites data for Control + kieserite = 104% control yield.

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<sup>-</sup> 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%**



Notes: three sites data; two sites data for MOP+kieserite = 94.1% control DM%; one sites data for control + kieserite = 99.2% control 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.