

The response of winter barley to polyhalite fertilizer

Lillywhite RD¹, Chapman S¹, Pavuluri K², Lewis TD² & Meakin R²,

¹Warwick Crop Centre, University of Warwick, Wellesbourne, Warwick, CV35 9EF, UK

²Sirius Minerals PLC, Manor Garth, Scarborough, YO11 3TU, UK

Background

- Polyhalite is a naturally occurring evaporative mineral containing 12% K, 19% S, 12% Ca and 4% Mg.
- The fertilizer value of polyhalite has long been recognized but the discovery of large reserves, circa 220 million tonnes, in the UK has prompted a re-evaluation of its use as a source of plant nutrients.
- The aim of the study was to examine the performance of polyhalite by comparison with other commercial potassium fertilizers; sulphate of potash (SOP) and potassium chloride/muriate of potash (MOP).



Granular polyhalite fertilizer

Field trial

- A replicated field trial was established at Warwick Crop Centre in October 2013 and harvested in July 2014.
- Soil nutrient status at drilling: adequate P (29 mg/l), low K (79 mg/l), adequate Mg (110 mg/l); Ca (1403 mg/l).
- All fertilizer treatments were applied in November 2013.
- All plots received 150 kg N/ha (as ammonium nitrate) split equally in two equal applications (March and April 2014).

Treatments

- **Control.** No K₂O or SO₃
- **Polyhalite (PH)** at 50, 100 & 150 kg/ha K₂O
- **Sulphate of potash (SOP)** at 50, 100 & 150 kg/ha K₂O
- **Potassium chloride (MOP)** at 50, 100 & 150 kg/ha K₂O
- **Potassium chloride at 100 kg/ha K₂O plus gypsum (adds 282 SO₃) (MOP+G)**

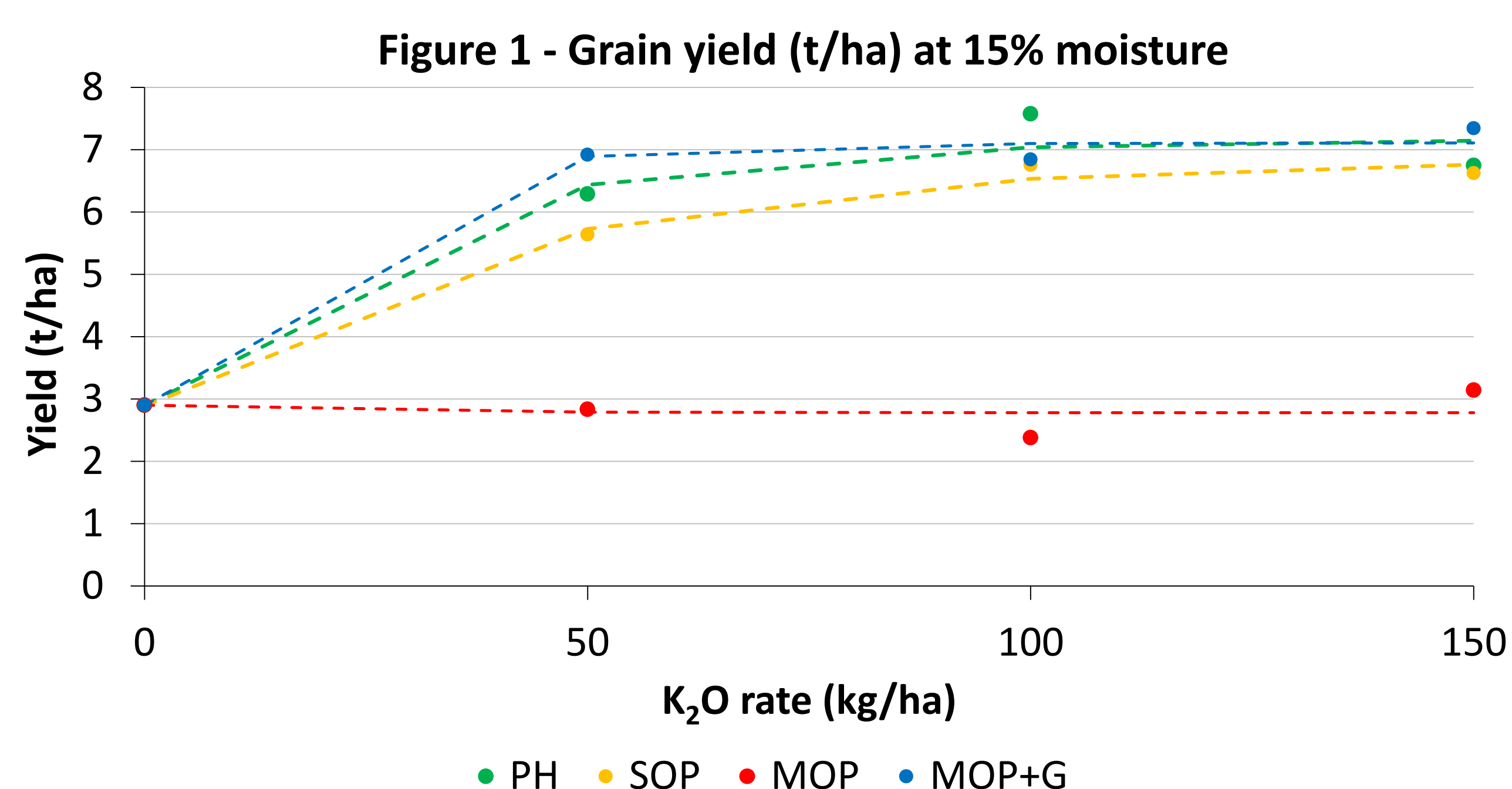


Table 1 – Grain yield (t/ha) and nutrient uptake (kg/ha) with 95% confidence Tukey results as letters

Treatment	Grain FW yield (t/ha)	K uptake (kg/ha)	S uptake (kg/ha)	Ca uptake (kg/ha)	Mg uptake (kg/ha)
At 100 kg/ha K ₂ O					
Control	2.9 ^a	46 ^a	3.4 ^{ab}	9.1 ^a	5.8 ^a
PH	7.6 ^b	85 ^c	11.7 ^c	15.7 ^b	11.1 ^b
SOP	6.8 ^b	75 ^{bc}	7.5 ^{ac}	15.2 ^b	11.3 ^b
MOP	2.4 ^a	55 ^{ab}	3.3 ^a	7.3 ^a	4.5 ^a
MOP+G	6.8 ^b	89 ^c	11.6 ^c	20.0 ^b	10.5 ^b
p value	<0.001	0.013	<0.001	<0.001	<0.001

Results

- All treatments except MOP out yielded the control ($p < 0.001$). MOP performed poorly. This suggests that availability of S might have been a limiting factor in this trial (Figure 1).
- There were small differences in K uptake and Mg uptake between PH, SOP and MOP+G (Table 1). These were not significant ($p = 0.991$ and 0.874 respectively).
- S uptake was highest for PH and MOP+G. Gypsum is an effective form of both SO₃ and Ca.
- In summary, results from PH, SOP and MOP+G were comparable and better than MOP and the control.

Conclusions

- Polyhalite is an effective source of both K and S as measured by crop yield and nutrient uptake.
- Polyhalite is comparable in performance to SOP and MOP+G and better than MOP on its own.
- The combination of K and S in polyhalite is a convenient source of both potash and sulphur.
- The Ca and Mg in polyhalite does not appear to enhance crop uptake under these trial conditions.

This study was funded by Sirius Minerals PLC



Scan here for
Sirius Minerals
Webcast

Warwick Crop Centre
www.warwick.ac.uk/go/wcc

Scan here for more
on Warwick Crop
Centre

