



Agronomy update November 2014

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University of Warwick – Barley field trial



Barley is the fourth largest cereal crop in terms of hectares, amounting globally to 49.8 million hectares harvested in 2013 ¹

European barley is either spring or winter planted with varying fertilizer application timings

Barley is produced for food, malt production and animal feed

Product target was malting barley ² which attracts a premium of around US\$24 ³ per metric tonne over animal feed

The trial design was set up in order to assess the effectiveness of POLY4 as a potassium and sulphur fertilizer



Sources: 1) FAO 2013; 2) Malting barley grain N target is 1.55-1.85, POLY4 grown crop achieved an overage of 1.79 from an autumn application 3) UK Agriculture 2014

POLY4 improves overwinter plant survival

Higher spring shoot numbers maximise crop potential





POLY4 supports strong overwinter survival for barley

Notes: 1) Mean results of shoot count across 50-150kg K₂O/ha; 2) cv Florentine sown 15/10/13, Assessed 17 March 2014; Initial soil analysis: pH 6.7, N 17.97mg/kg, P 30.0mg/kg, K 52.3mg/kg, SO₄ 7mg/kg, Mg 118.0mg/kg Sources: University of Warwick

POLY4 barley nutrient uptake



POLY4's nutrients are readily available for plant uptake

Barley total nutrient uptake¹

(kg/ha)



POLY4 ensures high fertilizer use efficiency of nitrogen

- POLY4 provides an excellent and efficient source of plant available potassium outperforming other potassium based fertilizers
- POLY4 supports a significantly greater sulphur uptake compared to SOP

POLY4 is supportive of macro-nutrient uptake

Notes: 1) GENSTAT results at 100kg K₂O/ha; Initial soil analysis: pH 6.7, N 17.97mg/kg, P 30.0mg/kg, K 52.3mg/kg, SO₄ 7mg/kg, Mg 118.0mg/kg Sources: University of Warwick

POLY4 reduces the chances of "hidden hunger"^{1,2}

Deficiencies in micro-nutrient uptake often contribute to disease vulnerability



POLY4 appears to significantly improve uptake of a range of micro-nutrients

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Crop quality parameter indicated by leaf greenness

Leaf greenness is a determinant of crop health and yield potential



Key findings

- Sulphur supply is important in supporting chloroplast numbers
- The chloroplasts in green leaves function to provide energy for growth and metabolism
- Leaf greenness is indicative of greater photosynthetic capacity which creates more carbohydrate for distribution to the grain, which is supportive for yield growth
- POLY4 NDVI ² value is a significant 23% greater than MOP and outperforms SOP by 3% at the recommended K₂O application rate of 75kg K₂O/ha

POLY4 improves an important indicator of barley quality

Notes: 1) GENSTAT exponential regression; 2) Normalised difference vegetation index (NDVI) index measurement leaf greenness; Initial soil analysis: pH 6.7, N 17.97mg/kg, P 30.0mg/kg, K 52.3mg/kg, SO₄ 7mg/kg, Mg 118.0mg/kg Sources: University of Warwick

POLY4 yield comparison against standard fertilizer sources



POLY4 as a multi-nutrient fertilizer source increases barley yield



Key findings

- MOP replaces potassium offtake but has little direct effect to boost yield without sulphur
- Local recommendations would support the use of additional sulphur ²
- SOP outperforms MOP by 125%
- POLY4 maximises yield by outperforming SOP by a further 10%
- An economic route to overcome the yield limit must be found by the grower

POLY4 outperforms both MOP and SOP on yield

Barley sulphur uptake response curve

POLY4 as an effective sulphur source for barley





POLY4 supplies the crucial yield limiting sulphur

POLY4 provides flexibility of fertilizer application

POLY4 can be applied in spring and autumn with similar results



POLY4 is an excellent source of potassium with flexible application timing

Notes: 1) GENSTAT exponential regression; 2) GENSTAT ANOVA P=0.876; 3) RB209 HMSO 2010; Initial soil analysis: pH 6.7, N 17.97mg/kg, P 30.0mg/kg, K 52.3mg/kg, SO₄ 7mg/kg, Mg 118.0mg/kg Sources: University of Warwick

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Meeting farmer crop nutrient requirements

POLY4 farmer economic value demonstrated supplying essential nutrients



- Traditional fertilizer practice would be MOP with a separate application of double top to satisfy the sulphur requirement
- POLY4 as a sulphur source with additional K₂O reduces the overall cost of meeting the potassium requirement with sulphur and beneficial magnesium and calcium including micro- nutrients
- Even at a high input cost of US\$250 POLY4 provides a US\$12 saving over MOP plus a sulphur source

POLY4 provides an economical solution for farmers while supplying essential macro- and micro-nutrients in comparison to alternatives

Notes: 1) Assumed costs based on retail pricing available October 2014; MOP US\$450/t, Urea US\$480/t, POLY US\$250/t, TSP US\$408/t commercial N/S top dressing US\$450/t; 2) Double top is a trademark name for ammonium nitrate/ ammonium sulphate blend from GrowHow Sources: Sirius Minerals

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POLY4 effects on overall barley crop





POLY4 provides increased crop quality, yield and value for farmers



Thank you