

Potato

Trial results in Minnesota, US (2016)

- Improved tuber size
- Improved yield and quality
- Reduced fertilizer spreading cost
- Greater financial margin



Trial objective

to determine the effectiveness of POLY4 as a fertilizer for potato production.

Treatment table³

| TREATMENTS | AMOUNT OF NUTRIENT APPLIED (kg ha ⁻¹) ³ | | | | | | | |
|----------------------|--|-------------------------------|------------------|-----|-----|-----|-----|--|
| | N | P ₂ O ₅ | K ₂ O | MgO | CaO | S | CI | |
| CONTROL | 152 | 269 | 0 | 0 | 0 | 0 | 0 | |
| MOP+GYPSUM | 152 | 269 | 448 | 534 | 0 | 305 | 359 | |
| MOP+Ca+Mg+s | 152 | 269 | 448 | 534 | 192 | 460 | 359 | |
| MOP+POLY4 (50:50) | 152 | 269 | 448 | 267 | 97 | 305 | 227 | |
| POLY4 | 152 | 269 | 448 | 534 | 192 | 609 | 96 | |

overview

| PARTNER: | UNIVERSITY OF MINNESOTA |
|-----------|-------------------------|
| LOCATION: | MINNESOTA, US |
| YEAR: | 2016 |

- The United States is the fifth largest potato producer in the world.¹
- In 2014 the US produced approximately 20 million tonnes of potato.¹
- Minnesota ranked eighth in the United States in potato production in 2016².
- POLY4 can be an important fertilizer for potato since it is chloride sensitive and requires large quantities of K and Ca.
- The trial was a randomised complete black design with four replications.
- Fertilizers were applied in a split application of 224 kg $\rm K_2O$ ha^-1 pre-planting and 224 kg $\rm K_2O$ ha^-1 at emergence.



Yield based on tuber size

• The proportion of marketable tuber size (>85 g) was highest under POLY4, compared to the alternative commercial fertilizer programmes, which resulted in improved economic return.



Specific gravity and dry matter

- Specific gravity and dry matter are quality indicators in potato production.
- POLY4 produced potato tubers with the highest dry matter content and improved fryability.
- POLY4 maintains potatoes' important quality parameters.

| TREATMENTS | SPECIFIC GRAVITY | DRY MATTER (%) |
|-------------------|------------------|----------------|
| MOP+GYPSUM | 1.07 | 18 |
| MOP+Ca+Mg+S | 1.07 | 19 |
| MOP+POLY4 (50:50) | 1.07 | 19 |
| POLY4 | 1.07 | 20 |

Marketable yield⁴

- With POLY4, potato yield increased by up to 15% compared MOP+gypsum option and 4% above the MOP+Ca+Mg+S option.
- The increase in yield reflects the potential of POLY4 to offer potato farmers more economic benefit than MOP-based fertilizer plans.



Net return^{4,5,6}

- POLY4+MOP blend achieved a greater yield with a lower nutrient input. This indicated greater fertilizer use efficiency.
- POLY4 increased margin by between US\$1,095 and US\$264 compared to MOP+gypsum and MOP+Ca+Mg+S options respectively.
- The POLY4 + MOP blend increased the financial margin by US\$160 compared to using MOP+Ca+Mg. The improvement in net return under MOP+POLY4 (50:50) was partly due to reduction in spreading cost.



Transforming potato fertilizer plans

- Increased application flexibility for fertilizer programmes with POLY4
- POLY4 provides sustained nutrient delivery
- POLY4 reduces chloride application
- POLY4 decreases fertilizer spreading passes and cost

| Treatments | # Product by kg ha⁻¹ | # Application | Cl⁻ content kg ha⁻¹ |
|-------------|-------------------------|------------------|------------------------|
| MOP+Ca+Mg+S | 6035 | 7 | 359 |
| POLY4 | 3970 | 5 | 96 |
| Difference | -2065 | -2 | -263 |
| | | | |



Note: 1) Food and Agricultural Organisation Statistics, FAOSTAT (2017); 2) USDA (United States Department of Agriculture, 2017); 3) Initial soil analysis: pH 6.1, K 58 mg kg⁻¹, Ca 550 mg kg⁻¹, Mg 123 mg kg⁻¹, S 2.0 mg kg⁻¹; 4) Results presented are from GENSTAT analysis based on ANOVA means; 5) Fertilizer prices were obtained from CRU and are based on US Mid-West 2016 annual prices: MAP (US\$346 t⁻¹), MOP (US\$239 t⁻¹), POLY4 (US\$200 t⁻¹), gypsum (US\$25 t⁻¹), limestone (US\$25 t⁻¹). The environmentally safe nitrogen (ESN) (Agrium Inc.) (US\$232 t⁻¹) is an implied price based on urea price. The epsom price is implied price based on kieserite price (US\$250 t⁻¹). The UAN price is based on Europe price converted to US\$ (US\$161 t⁻¹). Fertilizer spreading cost: US\$16.16. The price of potato obtained from FAOSTAT: US\$193 t⁻¹; 6) net return = crop output – (cost of fertilizer material + cost of fertilizer application).

Sources: University of Minnesota (2016) 14000-UMN-14014-16.

