



POLY4
A SIRIUS MINERALS PRODUCT

TRIAL RESULTS

POTATOES

MINNESOTA (2015)



poly4.com

TRIAL OBJECTIVE

To evaluate POLY4 (straight and in combination with MOP) at recommend K_2O rate against MOP balanced for N, P, K, S, Ca and Mg.

HIGHLIGHTS

YIELD IMPROVEMENTS ACROSS ALL SIZE CATEGORIES

PARTLY K SUBSTITUTION WITH POLY4 INCREASED NUTRIENT UPTAKE BY UP 63% FOR K, Ca, Mg AND S

MAINTAINED POTATO QUALITY

DEMONSTRATED ECONOMIC CASE OF K SUBSTITUTION OF POLY4

TRIAL DESIGN

PARTNER: UNIVERSITY OF MINNESOTA
LOCATION: US
YEAR: 2015

- Potatoes are the world's second largest non-grain crop and the fourth largest food crop with 381 Mt produced in 2014 worldwide¹.
- The value of potatoes sold in 2014 was worth US\$3.9 billion in the US¹.
- 66% of potatoes sold are for processing into snacks, french fries or other products for foodstuffs.
- Previous potato trials in the US have shown using POLY4 to supply up to 100% of the K_2O requirement benefits potato yield and quality.



TREATMENT TABLE

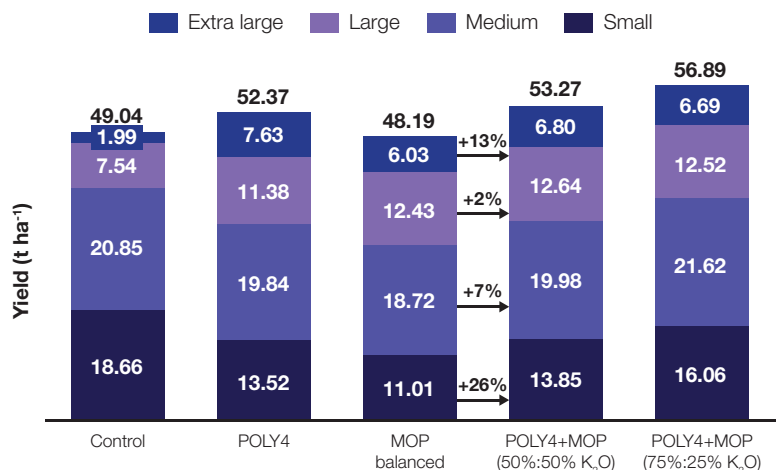
	NUTRIENT	NUTRIENT APPLIED IN TRIAL (kg ha ⁻¹)						
		N	P ₂ O ₅	K ₂ O	MgO	CaO	S	Cl
	Control	268	152	0	0	0	0	0
	POLY4	268	152	448	192	544	608	96
	MOP balanced ³	268	152	448	192	544	153	358
	POLY4 + MOP (50%:50% K ₂ O) ⁴	268	152	448	96	272	304	227
	POLY4 + MOP (75%:25% K ₂ O) ⁴	268	152	448	144	408	456	162



MARKETABLE YIELD

- Analysis of marketable yield by size identifies beneficial effects of POLY4.
- POLY4+MOP (75%:25% K_2O) showed the greatest benefit to all potato sizes compared to balanced MOP as nutrient source greatly effects tuber sizes.

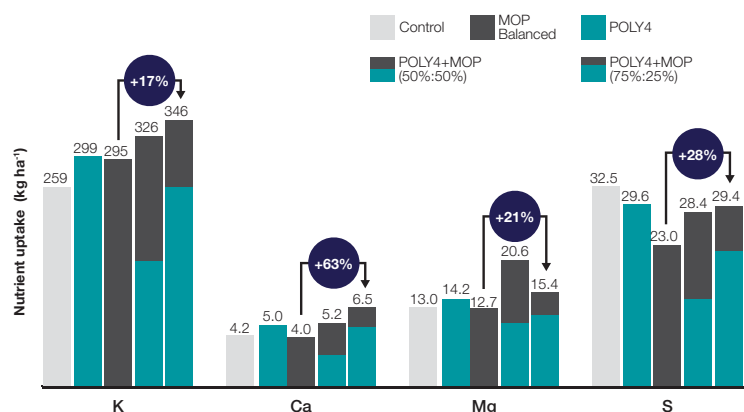
Potato size breakdown of marketable yield¹⁻⁵



TUBER MACRO-NUTRIENT UPTAKE

- Increases in macro-nutrients in the tuber drives yield.
- Compared to all POLY4 treatments, MOP balanced treatments had the lowest nutrient uptakes.
- The differences in nutrient uptake between MOP balanced and POLY4 treatments reflects the crops need to see the right nutrients from the right source at the right time.

Tuber macro-nutrient uptake¹⁻⁴



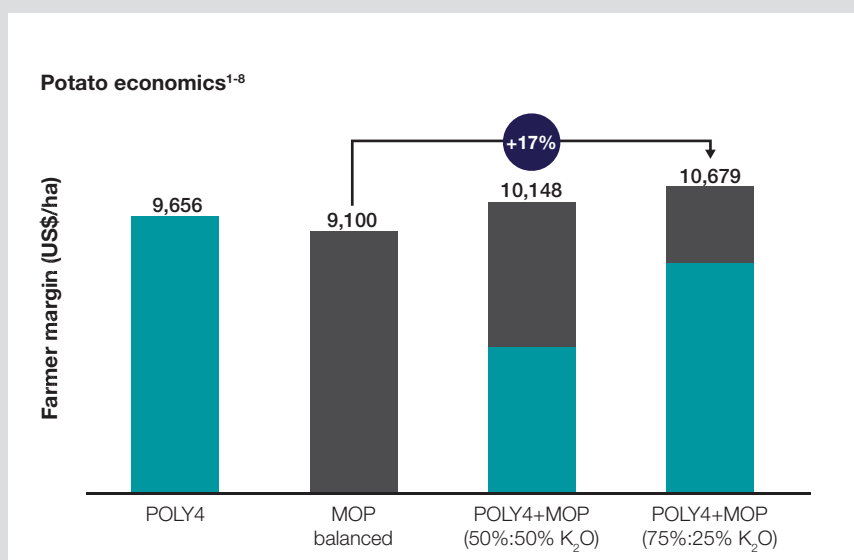
POTATO QUALITY²⁻⁵

- High specific gravity reflects tuber dry matter indicating superior fry quality.
- The nutrient source has little effect on glucose content of tubers.
- MOP balance was found to have the lowest yield and lowest dry matter content.

FERTILIZER PLAN	QUALITY PARAMETER				
	Specific gravity adjusted (%)	Tuber dry matter (%)	Bud end glucose (mg g ⁻¹)	Stem end glucose (mg g ⁻¹)	Dry matter yield (t ha ⁻¹)
POLY4	1.07	20.4	0.36	3.22	11.73
MOP balanced ³	1.07	18.8	0.37	2.36	9.90
POLY4 + MOP (50%:50% K ₂ O) ⁴	1.07	20.1	0.27	3.51	11.71
POLY4 + MOP (75%:25% K ₂ O) ⁴	1.07	20.4	0.28	3.73	12.73

POTATO ECONOMICS

- Changing the nutrient inputs has financial implications for growers.
- A crop margin assessment indicates the importance of nutrient sources on costs vs returns³.
- Spreader costs are included to account for the different weights of fertilizer applied⁴.
- MOP with gypsum and kieserite showed the worst economic returns due to yield limitations and moderate input costs.
- Use of POLY4 with MOP showed higher economic returns driven by higher yields.



Notes: 1) FAOSTAT (2017); 2) POLY4 and MOP were used in a ratio to meet K₂O requirement; 3) All treatments received 268 N kg ha⁻¹ and 152 kg P₂O₅ ha⁻¹, 2.2 kg Zn ha⁻¹, 0.6 kg B ha⁻¹ from UAN, ESN, MAP, Zinc Chloride and Boric acid; 4) MOP balanced treatment contains lime and kieserite; 5) GENSTAT means; 6) Fertilizer prices based on US Mid-West 2016 annual prices: MOP (US\$214/t), POLY4 (US\$200/t), Lime (US\$25/t), Kieserite (US\$250/t); 7) Analysis accounts for yield changes and fertilizer application cost of US\$16.16/t; 8) Potato price USDA National 2016 US\$197.58/t. Initial soil analysis: Soil organic matter 1.12%, N 4.8%, P 37 mg kg⁻¹, K 83 mg kg⁻¹, Ca 266 mg kg⁻¹, Mg 46 mg kg⁻¹, S 3.5 mg kg⁻¹.

Sources: USDA, University of Minnesota (2015) 14000-UMN-14011-15

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