

TRIAL RESULTS

RICE

JIANGSU, CHINA (2014)



TRIAL OBJECTIVES

To determine the efficacy of POLY4 as a K_2O source compared to MOP.

HIGHLIGHTS

4% INCREASE IN YIELD

38% INCREASE IN POTASSIUM UPTAKE

NO ANTAGONISTIC NUTRIENT UPTAKE SHOWN BETWEEN PHOSPHORUS AND CALCIUM

INCREASE IN N, P, Mg, Ca AND S UPTAKE

26% REDUCTION IN ALUMINIUM UPTAKE – A POTENTIALLY TOXIC ELEMENT

5-27% IMPROVEMENT IN MICRO NUTRIENT UPTAKE

TRIAL DESIGN

PARTNERS: NANJING INSTITUTE OF SOIL SCIENCE, CHINESE ACADEMY OF SCIENCE

LOCATION: JIANGSU, CHINA

YEAR: 2014

- Potassium fertilization is a key factor for field crops production, especially in China, where the supply is not sufficient and stable.
- Rice is a staple food in China, around 60% of the population utilise rice for survival¹.
- Rice accounts for approximately a third of grain crops produced in China².
- POLY4 and MOP treatments were trialled in a rate response study at application rates of 45, 90 and 130 kg K_2O per hectare.
- Treatments were set out in a complete randomised block design.



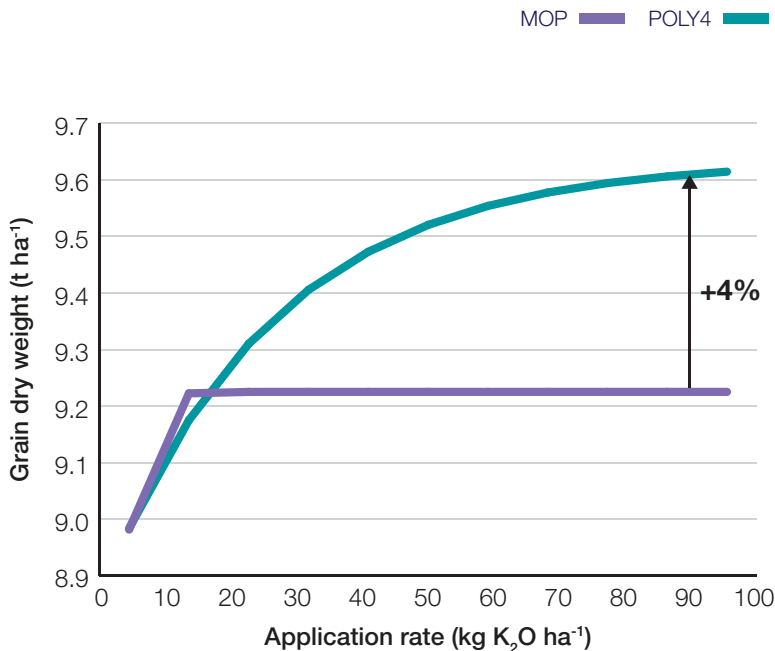
TREATMENT TABLE (kg ha⁻¹)¹

| NUTRIENT | AVERAGE NUTRIENT APPLIED IN TRIAL (kg ha ⁻¹) | | | | | | |
|----------|----------------------------------------------------------|-------------------------------|------------------|-----|-----|-----|----|
| | N | P ₂ O ₅ | K ₂ O | MgO | CaO | S | Cl |
| Control | 140 | 200 | 0 | 0 | 0 | 0 | 0 |
| MOP | 140 | 200 | 90 | 0 | 0 | 0 | 72 |
| POLY4 | 140 | 200 | 90 | 38 | 109 | 123 | 19 |



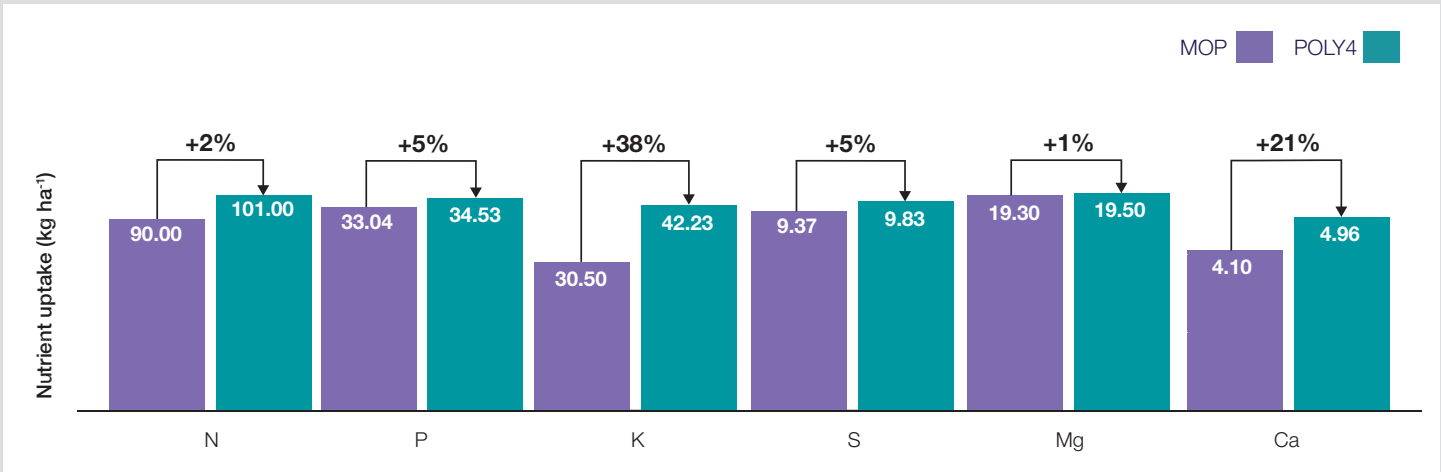
YIELD RESULTS (t ha⁻¹)

- POLY4 delivered a 4% yield premium at the recommended rate of 90kg K₂O per hectare.
- An increase in yield from the same nutrient application rates means an improved fertilizer use efficiency.
- In this straight potassium substitution trial the benefits of additional magnesium, sulphur and calcium become apparent.
- Root zone chloride has harmful effects on root nitrate uptake which may account for part of the difference.



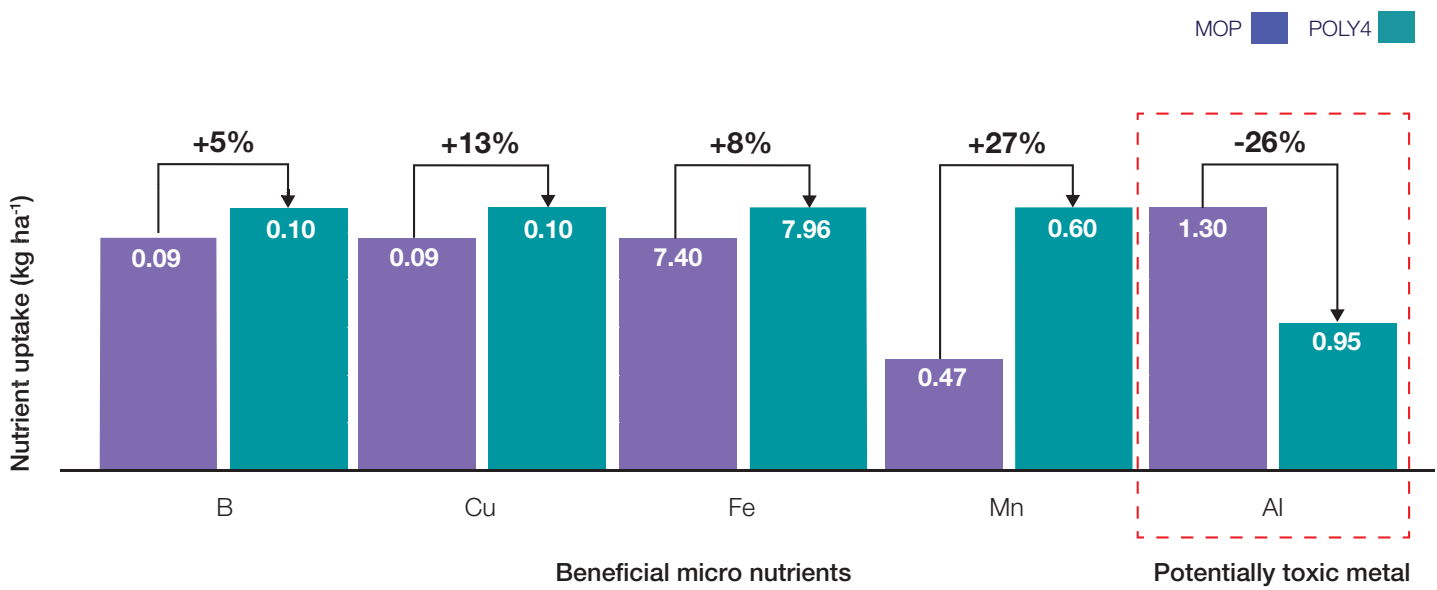
MACRO NUTRIENT UPTAKE (kg ha⁻¹)^{3,5}

- Rice grown in high-intensity farming systems require large amounts of nitrogen – approximately 20–25 kg per tonne of yield – POLY4 supports nitrogen uptake promoting larger yield potential.
- POLY4 shows no antagonistic nutrient uptake between phosphorus and calcium.
- POLY4 supports an above average 38% increase in potassium uptake which is vital for plant cell wall strength.
- Potassium, sulphur and calcium play important roles in combatting heavy metal uptake and toxicity.



MICRO NUTRIENT UPTAKE (kg ha⁻¹)^{3,5}

- Boron is a key nutrient for the maintenance of cell wall integrity.
- Copper is a co-factor in enzyme systems which function in protein metabolism, respiration and pollen formation.
- Manganese is involved in the redox reactions of photosynthesis and respiration. POLY4 increases manganese uptake by 27% mitigating against iron toxicity seen as bronzing of crop foliage.
- Aluminium toxicity can be a constraint on some soils: POLY4 is shown to assist by a 26% reduction in uptake.



1) USDA 2014; 2) Based on Chinese Statistical Handbook data for 2015; 3) All plots received 140 kg N ha⁻¹ and 200 kg P₂O₅ ha⁻¹ from Urea and MAP; 4) GENSTAT regression analysis; 5) GENSTAT means. Initial soil analysis P 13 mg kg⁻¹, K 43 mg kg⁻¹, Mg 37 mg kg⁻¹, Ca 34 mg kg⁻¹, S 27 mg kg⁻¹.

2) Source: USDA; Chinese Statistical Yearbook (2016); Nanjing Institute of Soil Science, Chinese Academy (20000-CAS-20010-14)

Source: University of Minnesota (2015) 20000-CAS-20010-14