

TRIAL RESULTS

# CARROT

**SÃO PAULO, BRAZIL (2016)**

## HIGHLIGHTS

POLY4 fertilizer treatment outperformed both MOP and SOP options.

POLY4 improved root yield by 5% compared to SOP.

POLY4 increased root nutrient concentrations including: N by 47%, P by 34%, K by 6%, S by 28%, Mg by 41% and Ca by 42% compared to the MOP option.

Up to US\$2,025 increase in financial margin.

# TRIAL OBJECTIVE

To compare the efficiency of POLY4 with MOP and SOP as a K fertilizer for carrots.

## TREATMENT TABLE<sup>2</sup>

Treatment	Nutrients applied (kg ha <sup>-1</sup> )						
	N	P <sub>2</sub> O <sub>5</sub>	K <sub>2</sub> O	CaO	MgO	S	Cl <sup>-</sup>
N + P	140	180	0	0	0	0	0
MOP option	140	180	180	0	0	0	144
SOP option	140	180	180	0	0	65	11
POLY4 option	140	180	180	215	77	245	38

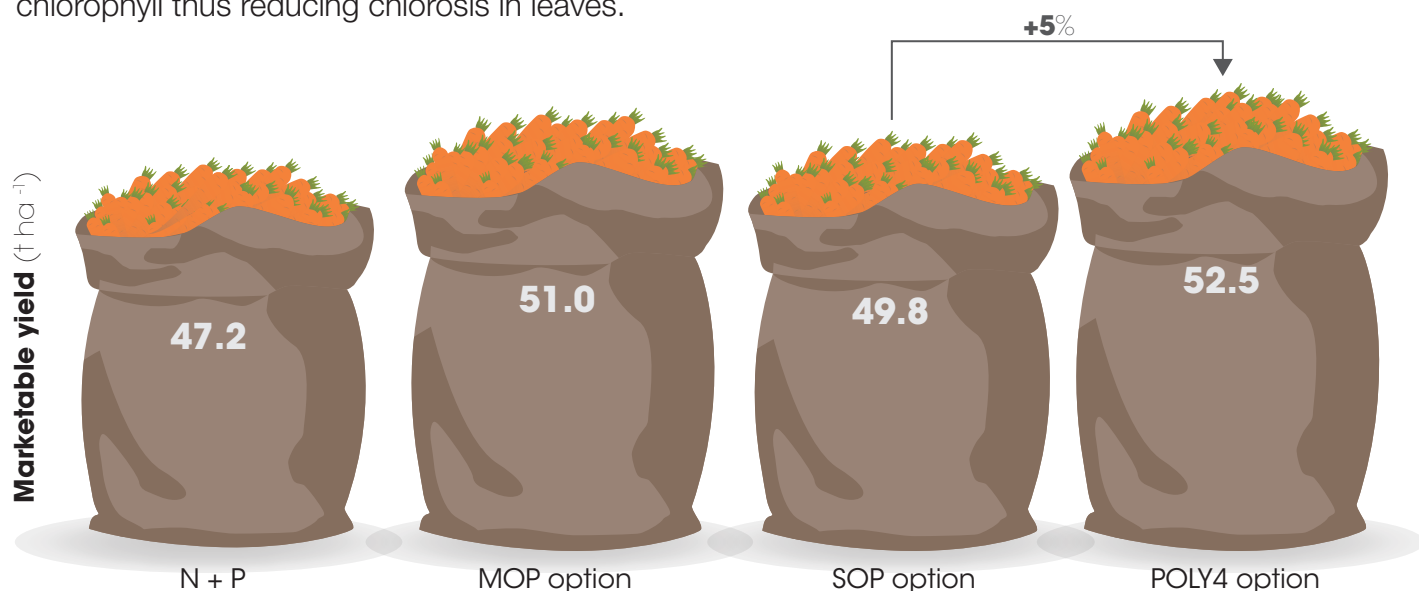
# OVERVIEW

**PARTNER:** UNIVERSITY OF SÃO PAULO  
**LOCATION:** SÃO PAULO, BRAZIL  
**YEAR:** 2016

- Carrots are one of the most widely-grown vegetables in Brazil with São Paulo leading the production.<sup>1</sup>
- Carrots typically receive 60 to 180 kg K<sub>2</sub>O ha<sup>-1</sup> in São Paulo.
- About 50% of K is usually broadcast pre-planting.
- The trial was a randomised complete block design with four replications.

## YIELD<sup>3</sup>

- POLY4 outperformed traditional forms of potash and resulted in improvement in carrot yield.
- Being a low-chloride source of potassium, POLY4 satisfied the sulphur, calcium and magnesium needs of carrot crop. In addition, POLY4 was the only fertilizer to offer Ca, that encourages root growth, and Mg, that helps to produce sufficient chlorophyll thus reducing chlorosis in leaves.

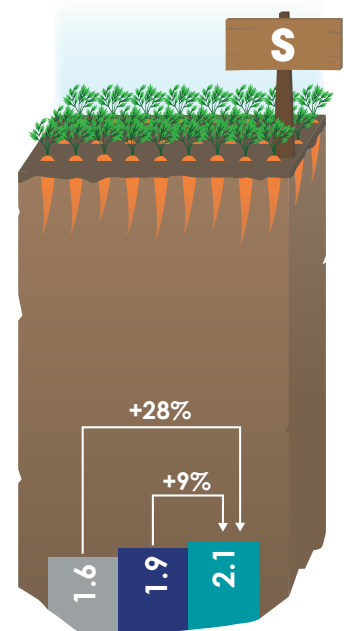
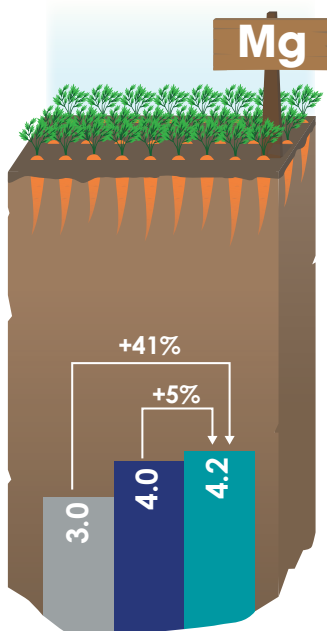
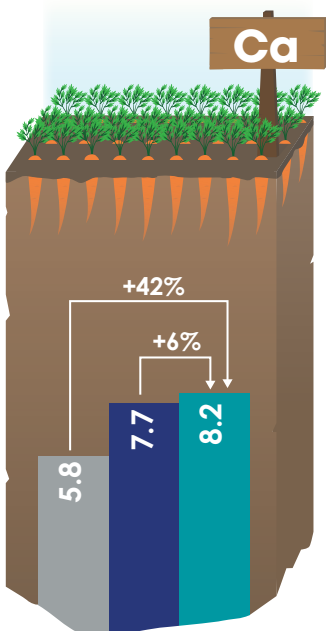
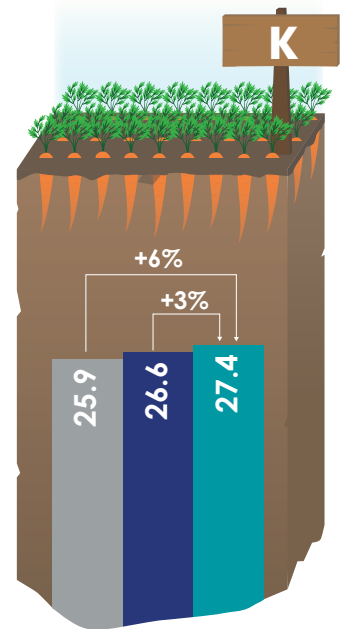
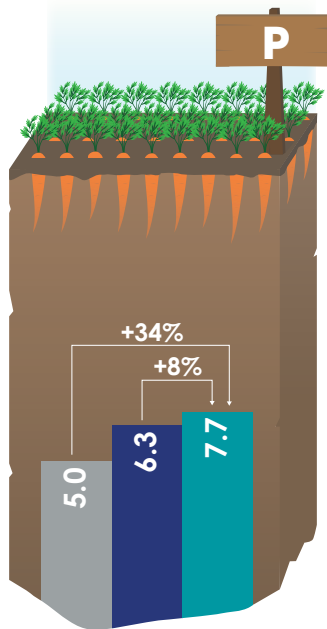
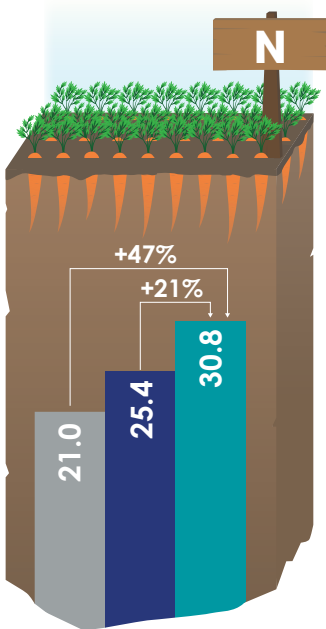


# ROOT NUTRIENT CONCENTRATION<sup>3</sup>

- The POLY4-fertilized carrots had the greatest concentration of nutrients in the roots.
- All treatments received the same N and P fertilizer. However, POLY4 treatment achieved a higher concentration of these nutrients. Nitrogen deficiency stunts plant growth and phosphorous deficiency affects root growth.
- Nutrients supplied by POLY4 encouraged the growth of a healthy carrot plant, both root and foliage. Nutrient deficiencies can cause various problems: K deficiency causes reddish leaf discoloration and poor disease resistance; Ca deficiency can severely reduce root size; Mg deficiency can result in early leaf fall; S deficiency results in younger leaves turning yellow and in small, stunted plants.

## Root nutrient concentration (g kg<sup>-1</sup>)

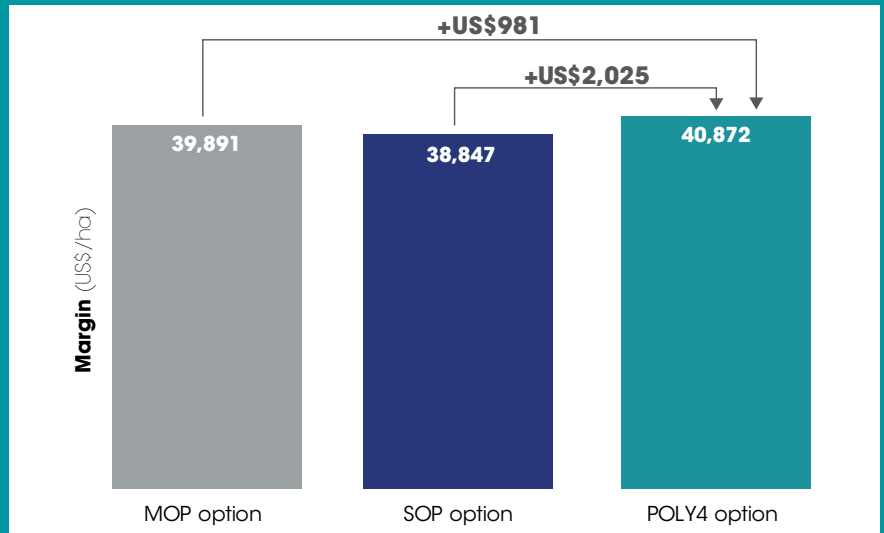
■ MOP option ■ SOP option ■ POLY4 option





# FERTILIZER MARGIN<sup>3-6</sup>

- The POLY4 option increased financial margin over both MOP and SOP. The higher root yield meant greater margins and increased economic benefits to a farmer.



# FLAVOUR<sup>7,8</sup>

- Evaluation of flavour was scored using the following five-point scale:
  - No difference in taste to N + P;
  - Taste slightly different to N + P;
  - Moderately different flavour to N + P;
  - Taste very different from N + P;
  - Extremely different from N + P.
- The flavour of carrots fertilized with POLY4 was preferred by most judges from a sensory panel of 31.
- N + P treated carrots were described as “bland” while POLY4 ones were described as having a “slightly spicy” flavour.

## Flavour score

These are average scores based on the five-point scale.

### 2.3 POLY4

1.9 SOP

1.9 MOP

1.6 N + P



Note: 1) Final trial report (University of São Paulo (2016)); 2) Initial soil analysis: pH 5.2, 78 mg K kg<sup>-1</sup>, 430 mg Ca kg<sup>-1</sup>, 138 mg Mg kg<sup>-1</sup>, 29 mg S kg<sup>-1</sup>; 3) Results presented are based on a K<sub>2</sub>O rate of 180 kg ha<sup>-1</sup>; 4) Fertilizer prices were obtained from CRU and are 2016 annual CFR prices for Brazil: urea (US\$216/t), MAP (US\$351/t), MOP (US\$232/t), SOP (US\$527/t), POLY4 (US\$200/t). Analysis accounts for fertilizer application or spreading cost of US\$13.07/t; 5) Carrot price = US\$787/t (based on 2015 average price for South America obtained from FAO); 6) Margin = crop output minus (cost of fertilizer material + cost of fertilizer application); 7) Carrot N + P samples were scored by a team of 31 judges selected for sensory acuity in relation to flavour; 8) Significance is p < 0.05 by Fishers LSD.

Sources: University of São Paulo (2016) 4000-USP-4020-16

[siriusminerals.com](http://siriusminerals.com) | +44 1723 470 010 | [commercial@siriusminerals.com](mailto:commercial@siriusminerals.com)

Registered Address: 3rd Floor Greener House, 66–68 Haymarket, London SW1Y 4RF, UK

Company Registered Number: 4948435

