POLY4
A SIRIUS MINERALS PRODUCT

TRIAL RESULTS

TOMATO

SÃO PAULO, BRAZIL (2015)

HIGHLIGHTS

Increase in commercial yield.

Greater leaf nutrient concentrations.

Lower cost of fertilizer programme.

Improved financial efficiency.

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OVERVIEW

- FAOSTAT reported that 177 Million metric tonnes (Mmt) of tomatoes were grown globally in 2016, with approximately five million hectares of crop planted. The largest producers were China, the United States and India.
- Brazil usually is ranked as the sixth tomato producer worldwide. FAOSTAT reported that in 2016 growing season, Brazil harvested 63,980 hectares producing over four million tons of tomatoes.
- São Paulo is the largest producer of fresh market tomatoes in southeast region of Brazil.[1]
- In São Paulo state, the soils are highly weathered with low fertility. As a result, farmers apply large quantities of fertilizers to meet the nutrient requirements of tomatoes.

NEED FOR POLY4

- POLY4 can provide K, S, Mg and Ca that tomatoes frequently need in the region.
- Low-chloride content of POLY4 is also beneficial for tomato growth and health.

TRIAL OBJECTIVE

To compare POLY4 blends with commercial alternatives for tomato production in Brazil.

PARTNER: University of São Paulo
LOCATION: São Paulo State, Brazil
YEAR: 2015

METHODOLOGY

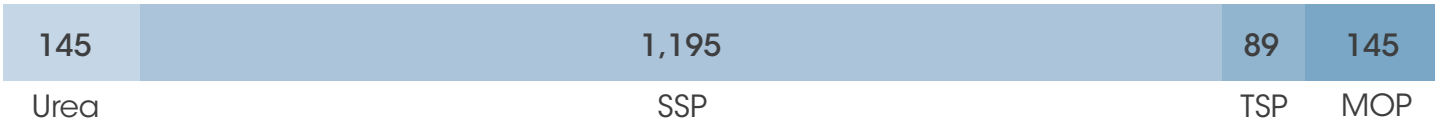
- The trial was a complete randomised block design with five replications.
- Basal and side dress blends were formulated with commercial fertilizers to provide equivalent NPKs. Blend nutrient inputs:
  - MOP, urea and SSP (MOP + SSP blend);
  - SOP, urea, gypsum, kieserite and MAP (synthetic blend);
  - POLY4, urea and MAP (POLY4 blend).
- Each blend was applied to determine the response of tomatoes to K.[2]

TREATMENT TABLE[3-5]

Treatment	Nutrients applied (kg ha^{-1})						
	N	P_2O_5	K_2O	CaO	MgO	S	Cl^-
N + P (control)	300	656	0	0	0	0	0
MOP + SSP blend	300	656	250	443	0	182	200
Synthetic blends	300	656	250	303	107	374	16
POLY4 blends	300	656	250	303	107	339	53

NPK BLENDS COMPOSITION (PRE-PLANTING)[3-5]

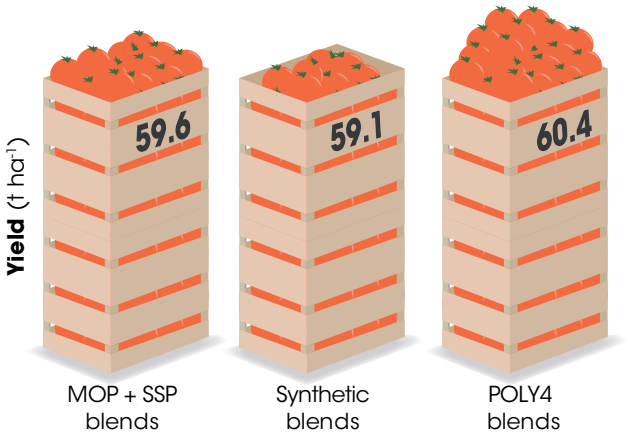
MOP + SSP blend (4:14:5.3) (kg of input ha^{-1})

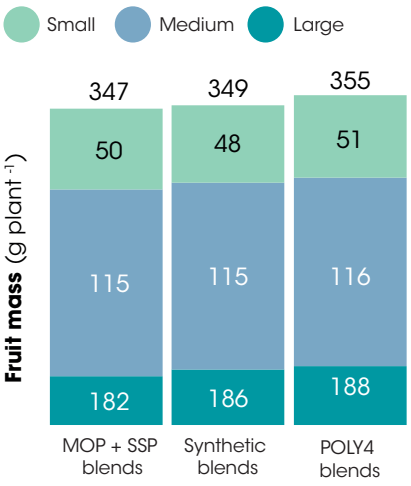


Synthetic blend (4:14:5.3) (kg of input ha^{-1})

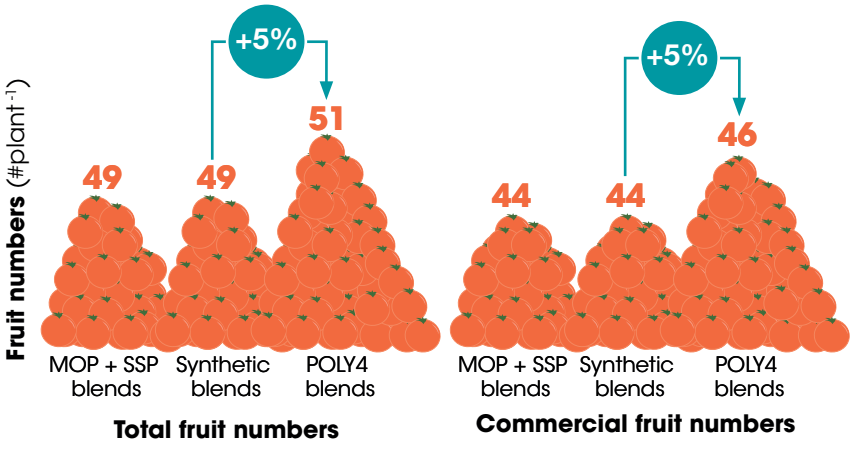
POLY4 blend (4:14:5.3) (kg of input ha^{-1})

IMPROVEMENT IN COMMERCIAL YIELD AND FRUIT QUALITY[3-5]



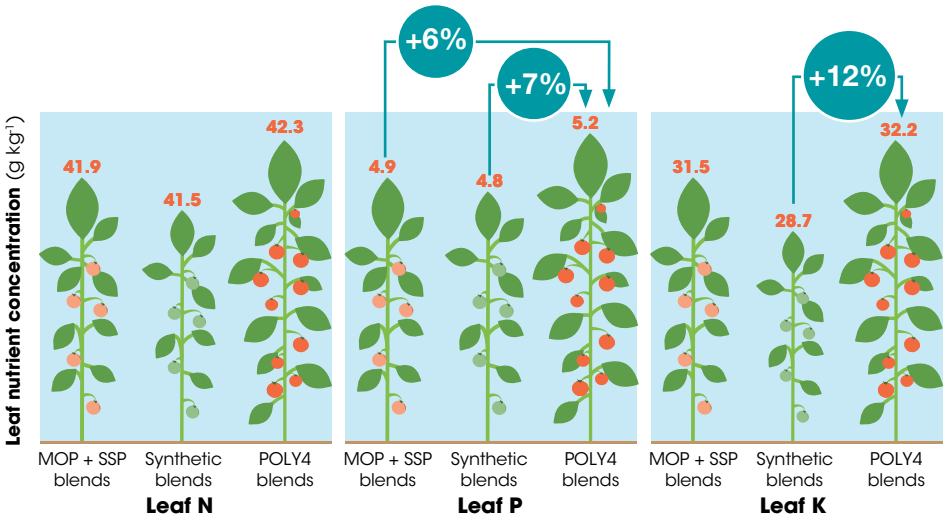


- The POLY4 blends had the greatest total and commercial fruit numbers compared with MOP and SOP blends.
- Increased availability of N, P and K encouraged blossoming and increase fruit set of tomatoes.
- The POLY4 blends achieved heavier tomatoes per plant compared with the MOP and SOP blends. Improved fruit weight subsequently increased tomato value.



GREATER LEAF NUTRIENT CONCENTRATIONS[3-5]

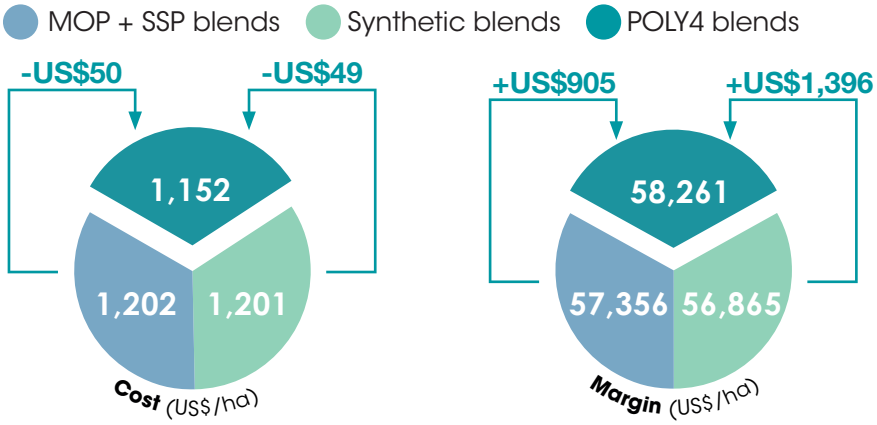
- The POLY4 blends had the greatest leaf N, P and K concentration in leaves. These nutrients are important for tomato's vegetative growth, establishment, flowering and fruit ripening.



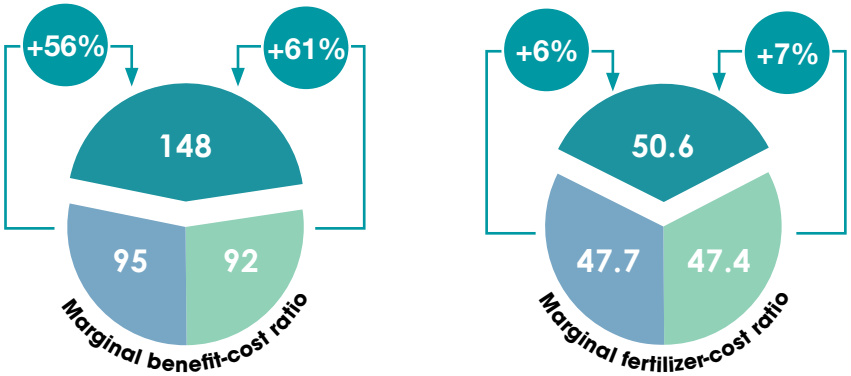
IMPROVED FINANCIAL EFFICIENCY

- The increased yield and lower cost of the POLY4 programme contributed to greater financial margins and offered tomato farmers a cheaper fertilizer programme.
- The marginal benefit-cost (MBCR) ratio and margin-fertilizer cost ratio (MFCR) describe efficiency of fertilizer expenditure. The highest MBCR and MFCR showed that expenditure on the POLY4 blends was more financially efficient and offered greater value for money.

Input cost and margin[4, 6-9]



Financial efficiency[4, 6-11]



Notes: 1) University of São Paulo (2015), Final Trial Report; 2) Data not supplied. 3) Initial soil analysis: pH 5.3, organic matter 0.5%, 22 mg P kg^{-1}, 23 mg K kg^{-1}, 220 mg Ca kg^{-1}, 48 mg Mg kg^{-1}, 4 mg available S kg^{-1}; 4) MOP Blend = 4:14:5.3 + 10:5:13.3 (MOP + urea + A-SSP) (pre-planting and side dressing); Synthetic blend = 4:14:2.7 + 5:2.5:6.7 Synthetic polyhalite + urea + MAP (pre-planting and side dressing); POLY4 blend = 4:14:5.3 + 5:2.5:6.7 (POLY4 + urea + MAP) (pre-planting and side dressing); 5) Results presented are based on data from Genstat regression analysis at average K_2O rate of 250 kg ha^{-1}; 6) Fertilizer input components: urea (46:0:0); SSP (0:0:16+11S); TSP (0:0:46+20CaO); MAP (11:52:0); MOP (0:0:60); SOP (0:0:50+18S); kieserite (0:0:0+12S+26MgO); gypsum (0:0:0+22S+33CaO); POLY4 (0:0:14+19S+6MgO+17CaO) 7) Fertilizer prices were obtained from CRU and are based on 2015 annual prices for Brazil: urea (US$330/t), MOP (US$359/t), POLY4 (US$200/t), SOP (US$533/t), MAP (US$504/t), gypsum (US$25/t), kieserite (US$250/t), SSP (US$298/t), TSP (US$408/t). Analysis accounts for fertilizer application or spreading cost of US$13.07/t; 8) The price of tomato from FAOSTAT: US$983/t; 9) Margin = crop output minus (cost of fertilizer material + cost of fertilizer application); 10) The marginal benefit-cost ratio was estimated using the output and cost of the control experiment as reference; 11) Margin-fertilizer ratio = margin divided by fertilizer cost.

Sources: University of São Paulo (2015) 4000-USP-4016-15.

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