

# Evaluation of PRS Probes for Monitoring Soil Nutrients in Potato Production

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## Background

- Nutrients are intensively monitored in potato production due to high crop value, nutrient demand, and potential for loss.
- Plant Root Simulator (PRS™) probes are ion-exchange membranes in plastic supports that are convenient for *in situ* monitoring of soil nutrients.
- Preliminary tests were conducted in 2012 to evaluate the use of PRS probes for nutrient monitoring in potato production.

## Monitoring of Fertilizer and Compost Nutrients

- Does supplemental fertilizer or compost increase nutrient supply throughout growing season?

### Methods

- Field experiment conducted at three locations in Manitoba
  - Shilo (pH 7.8), Carberry (pH 5.5) and Winkler (pH 7.8)
  - Sandy loam soils, irrigated
- Four treatments
  - Check: field fertilizer rate (all treatments)
  - Extra Fert: + 38-205-88-11 kg N-P-K-S per ha
  - Two compost rates: + 40 and 80 tonnes per ha
- Measurements
  - Soil nutrient supply rates (PRS probes, 3 x 1-week)
  - Petiole nutrient concentrations at end of 2<sup>nd</sup> burial period

### Results and Discussion

## Monitoring of P Fertilizer Type and Timing

- Is pre-plant P fertilizer still available during tuber fill?
- Does liquid P applied in-crop move into soil?

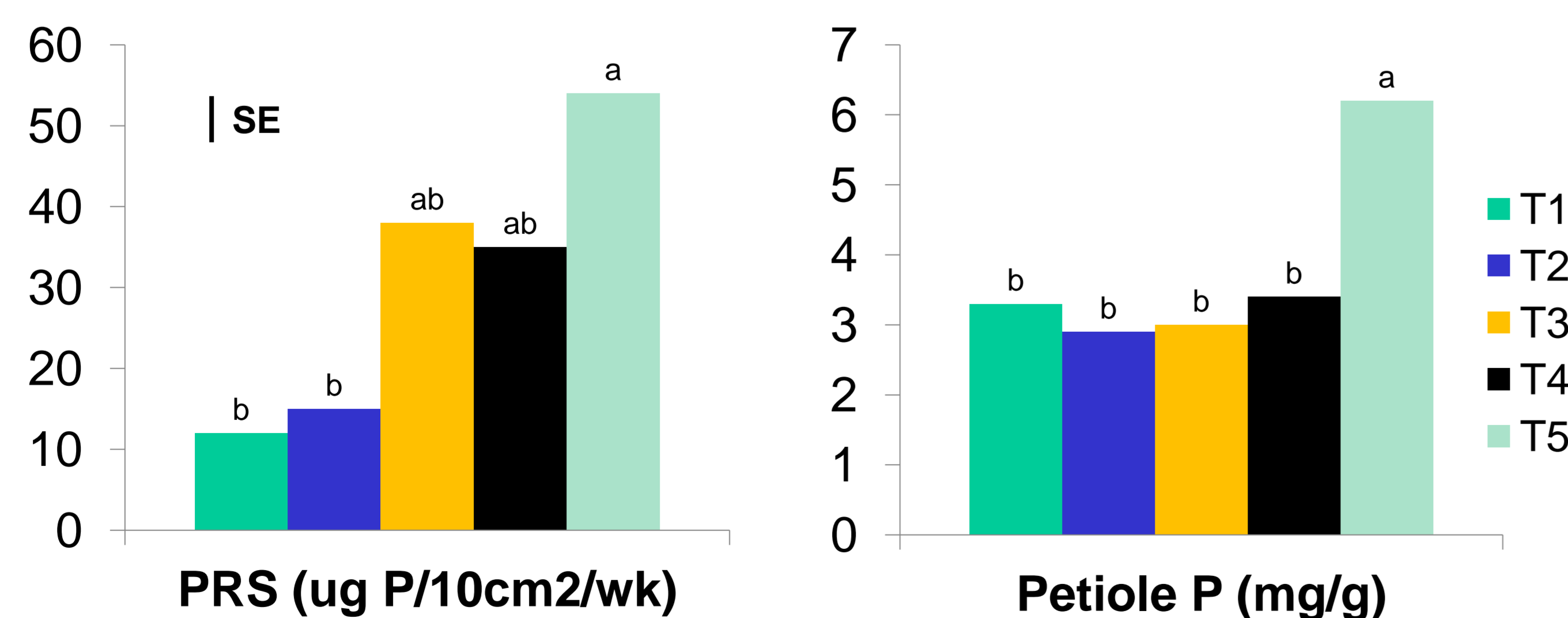
### Methods

- Field experiment at Hermiston, OR (sandy soil, irrigated)
- Treatments

T#	P applied at planting		P applied in-crop	
	kg P ha <sup>-1</sup>	Form	kg P ha <sup>-1</sup>	Form
T1	0	None applied	0	None applied
T2	96	MESZ Fertilizer (12-40-0-10S-1Zn)	0	
T3	48	Monoammonium Phosphate (11-52-0)	48	Liquid Ammonium Phosphate (10-34-0)
T4	48		48	
T5	96		96	

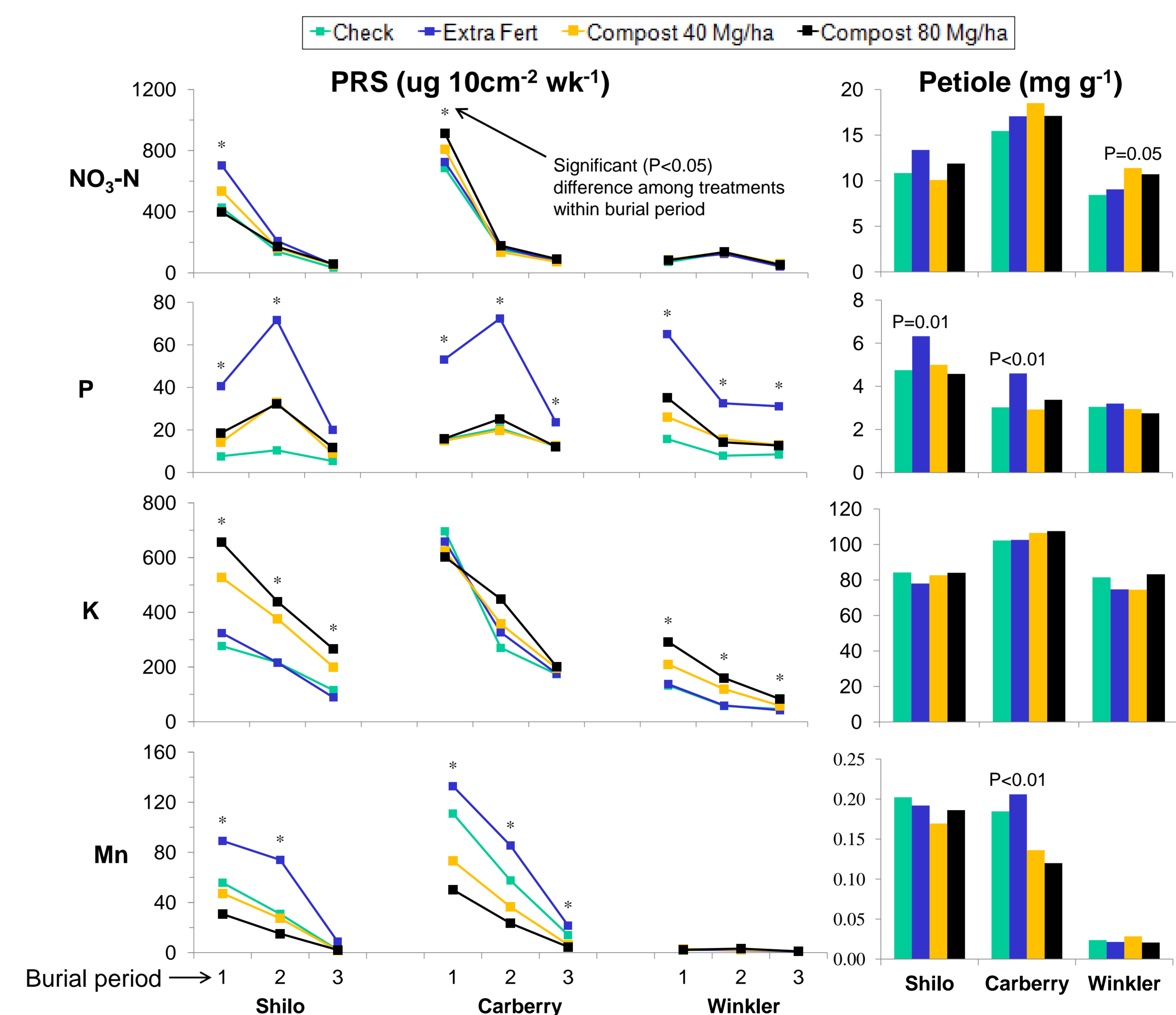
- Measurements (late July)
  - Soil P supply rates (PRS probes, 1-week)
  - Petiole P concentration

### Results and Discussion



**Fig. 1.** Effect of fertility treatment on soil P supply rate and petiole P concentration during tuber fill at Hermiston, OR.

- Pre-plant application of MESZ did not increase soil P supply or petiole P concentration during tuber fill, but high rate of liquid P application during growing season increased soil P supply and petiole P concentration.



**Fig. 2.** Effect of fertility treatment on soil nutrient supply rate and petiole nutrient concentration at three locations in Manitoba in 2012.

- PRS measurements were sensitive to fertility treatment: P was greater in extra Fert treatment and K was greater and Mn lower in compost treatments; N was only minimally affected by fertility treatment.
- A relationship between PRS and petiole measurements was evident for some nutrients (P, Mn), but not others (K), reflecting differences in type of measurement.

## Conclusions

- In situ* measurements of soil nutrients with PRS probes were sensitive to fertility treatments during tuber fill and supplemented information from petiole measurements.