



## **Introduction and Objectives**

Previous field-based tests have utilized the reaction of orthophosphate (PO $_{4}^{3-}$ ) in soil extracts with an acid-molybdate solution. This solution is reduced to form a molybdenum-blue complex which is analyzed by colorimetry.

One method, known as the "spot test," uses the acid-molybdate-orthophosphate reaction on filter paper without the need for an extraction. Results from this method, however, are qualitative.

Our objective was to develop and test a fast and reliable method for detecting phosphate by combining the spot test with portable VIS-reflectance spectrophotometry.



Konica-Minolta **VIS-reflectance** spectrophotometer

# **Materials and Methods**

We measured PO<sup>3-</sup>-P concentrations in spiked solutions, extracts, and air-dried soil samples using the spot test.

Two reagents are used in this procedure:

Reagent A - 5 g (NH<sub>4</sub>)<sub>6</sub>Mo<sub>7</sub>O<sub>24</sub> 4H<sub>2</sub>O + 30 mL 6N HCl / 130 mL

Reagent B - 0.5 g  $C_6 H_8 O_6 / 100 \text{ mL}$ 

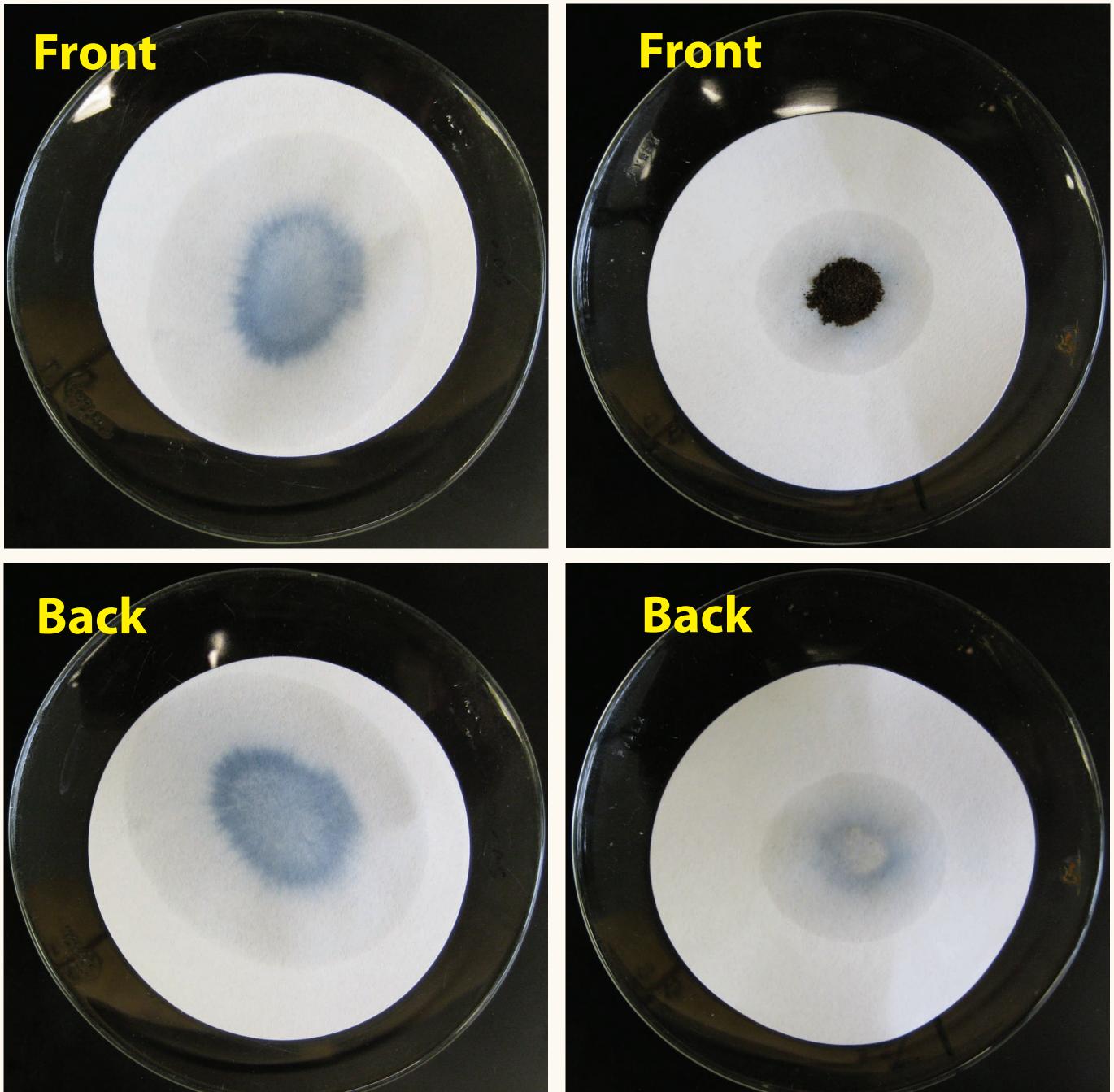
Either 150  $\mu$ L of spiked solutions and extracts or 150 mg of air-dried soil was transferred to the center of 90 mm Whatman #40 filter paper placed on acidwashed watchglasses. Two drops of reagent A were added followed by two drops of reagent B 30 seconds later.

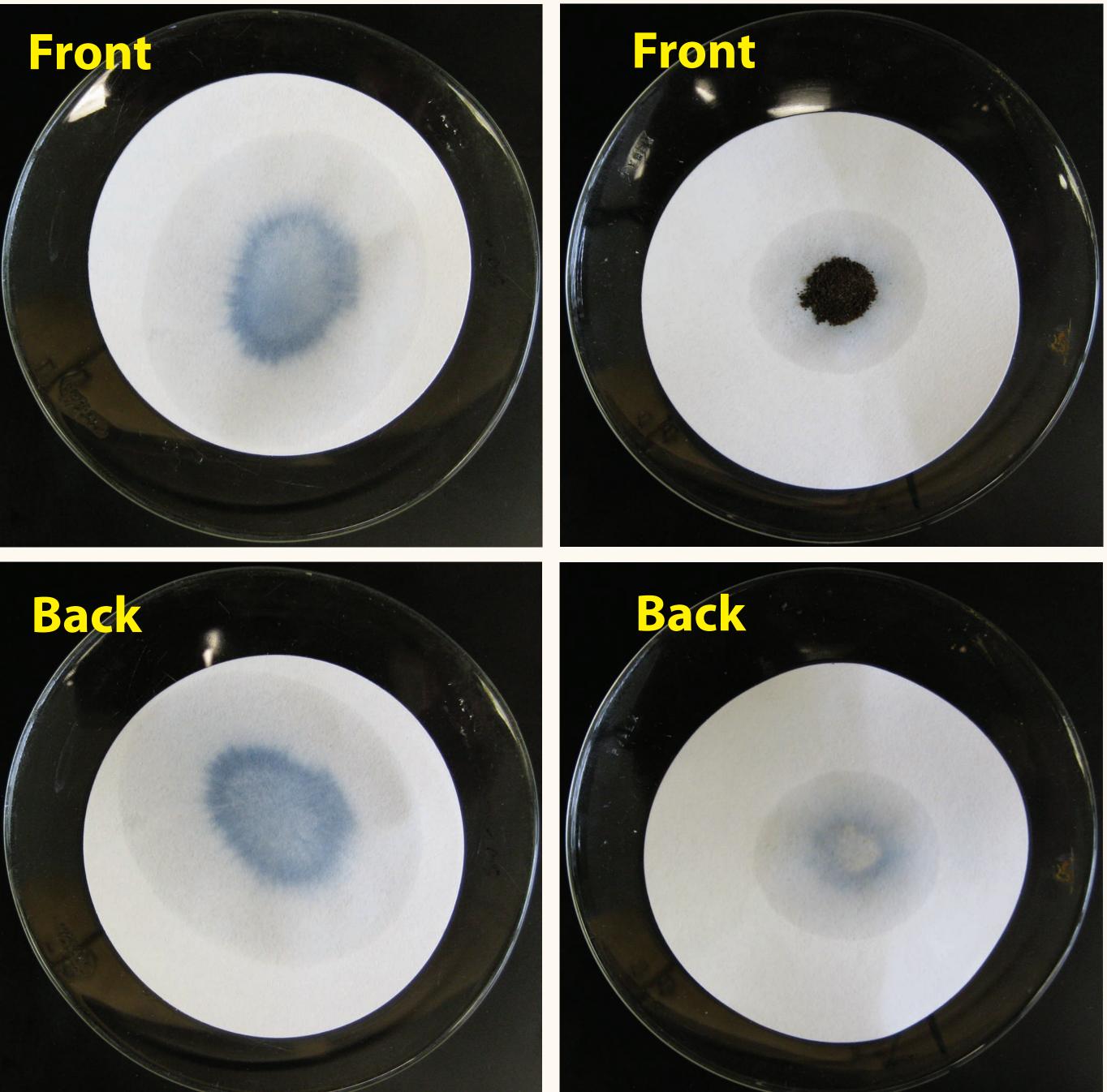
# **A Rapid and Accurate Field Test for the Analysis of Soil Phosphate Eric J. Zautner<sup>1</sup>, Daniel R. Hirmas<sup>1</sup>, and Jason de Koff<sup>2</sup>**

Department of Geography, University of Kansas, Lawrence, Kansas; <sup>2</sup> USDA-ARS, Fayetteville, Arkansas

A blue ring forms (usually within 30 s) as a result of the reaction spreading away from the source on the filter paper.

### **Extraction Run**

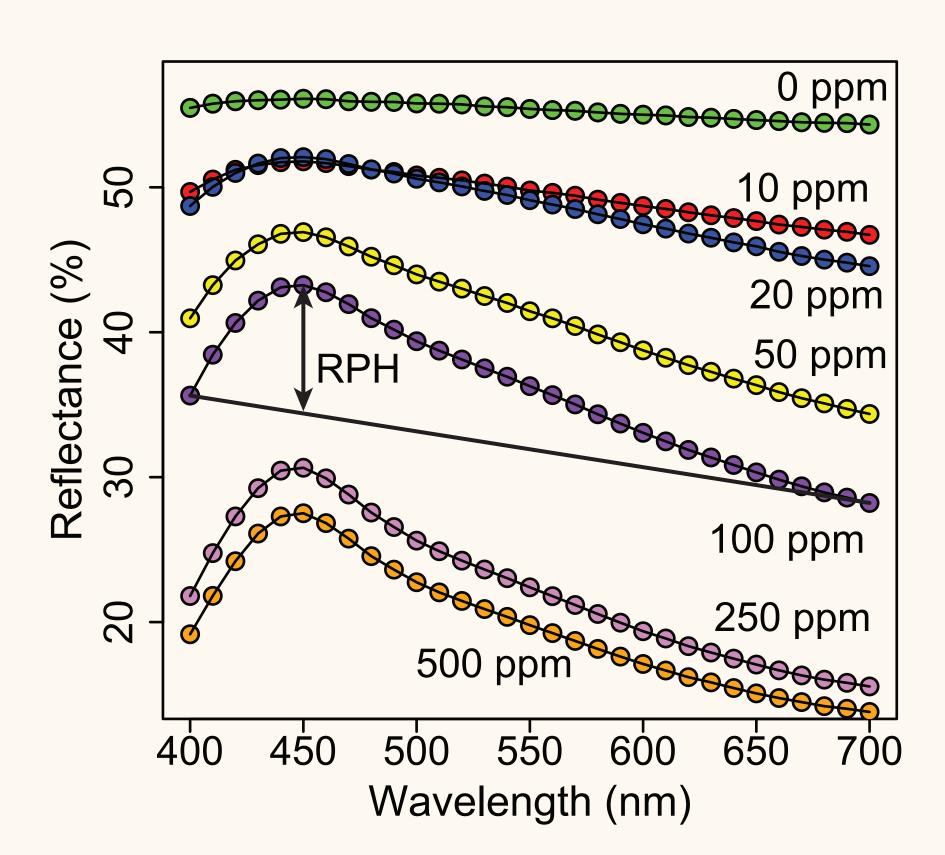




The filter paper was turned over and three locations on the ring which had the darkest colors were scanned with a Konica-Minolta VIS-reflectance spectrophotometer.

Samples were related to Mehlich III extractable PO<sup>3-</sup>-P concentration using known soil and extract standards which were run with the same procedure.

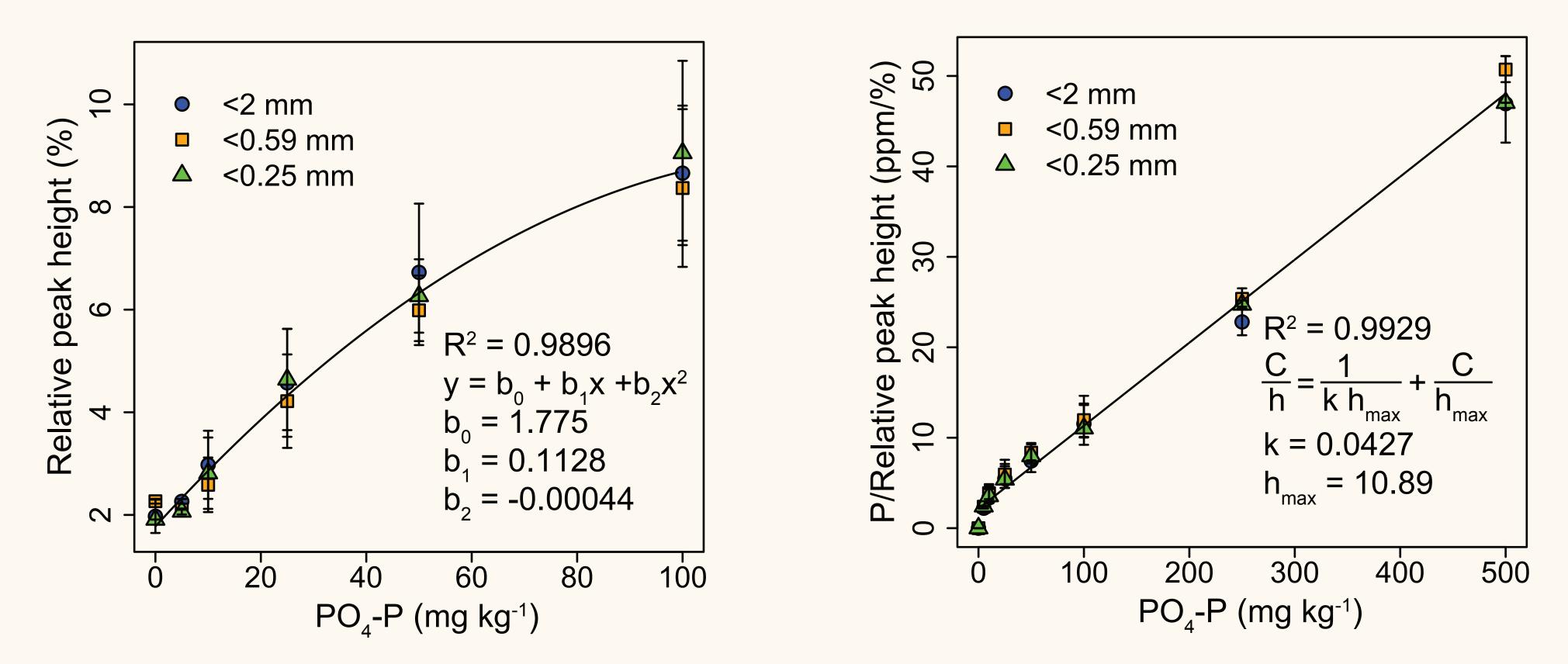
 $PO_{3}$ -P was related to relative peak height (RPH) at 450 nm measured from the resulting spectral curves.

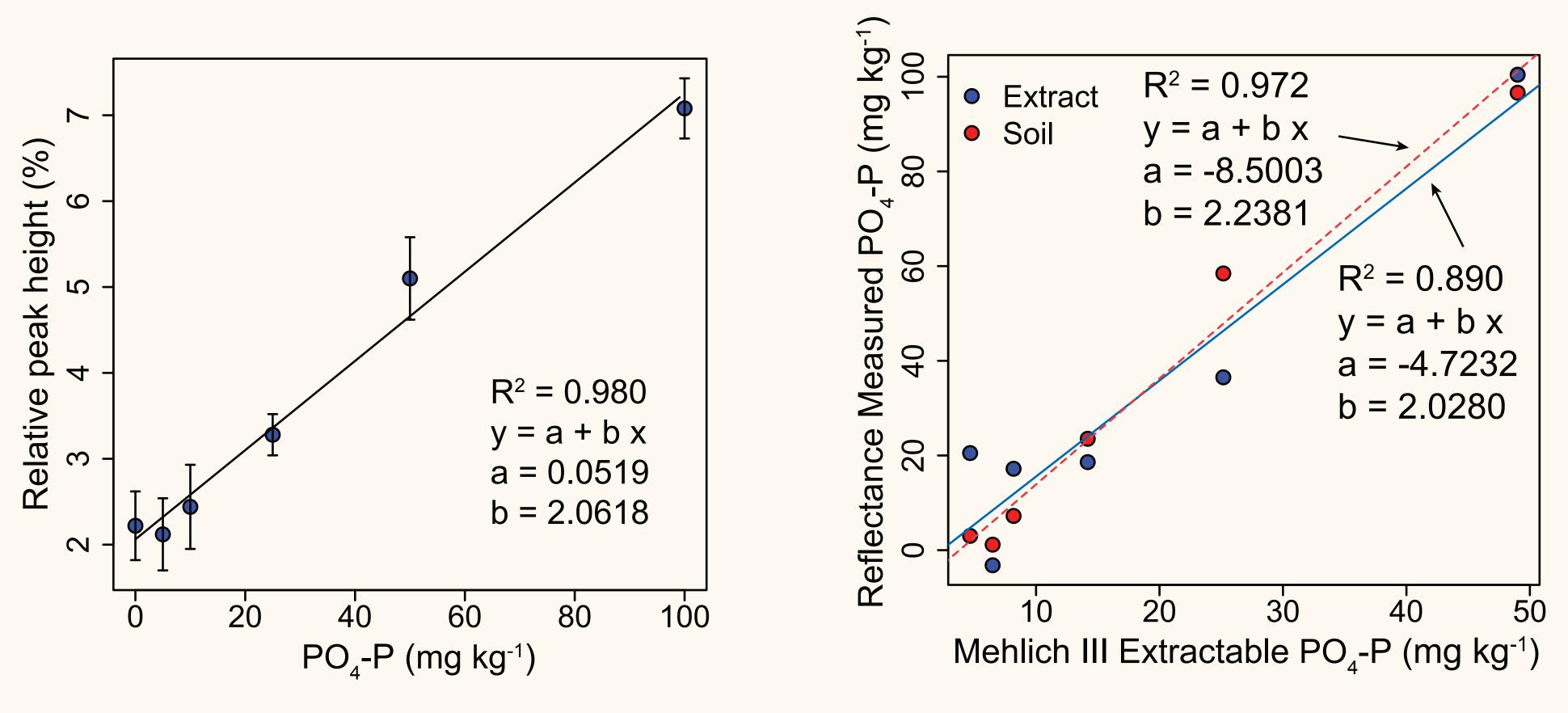




# Results

We ran soil crushed to 3 mesh-sizes and found that grinding had no significant effect on the results. In addition, the data linearized on a Langmuir plot which suggested that reagent B was being completely consumed in the reaction.





# **Conclusions and Future Work**

Our results suggest that combining the spot test with VIS-reflectance spectrophotometry may provide a method for determining PO<sup>3-</sup>-P concentration rapidly in the field. Future work is to test this technique in the field.

# Acknowledgements

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Raising the concentration of ascorbic acid (0.75 g/0.1 L) linearized the relationship between peak height and PO $_{3}$ -P concentration. We spiked soil aliquots with varying concentrations of PO $_{A}^{3-}$ -P and found a strong relationship between the  $PO_{3}^{3}$ -P measured from the spot test and Mehlich III extracts.