

Soil Quick Test for Improved Precision of N Fertilization

Jessica Schweiger, Phillip Mayo, Nicholas Clark, Steve Orloff, Steve Wright, Bob Hutmacher, & Mark Lundy, University of California Cooperative Extension

Overview and Objectives

- In-season monitoring of crop and soil nitrogen (N) status can improve decisions about N fertilizer management and thereby improve the yield, protein content, fertilizer use efficiency and profitability of spring wheat. Simple, accurate, and cost-effective methods of measuring in-season soil nitrate-N status will provide complementary information to proximal plant sensing tools. Together these in-field tools can deliver site-specific, real-time information about relative crop biomass, real-time N status and the potential future crop demand for fertilizer N.
- This preliminary study evaluates the accuracy of a modified in-field, quick-test procedure as compared to a laboratory KCl extraction to determine soil nitrate-N concentration in real-time. The objective of this work is to simplify soil nitrate quick test procedures presented elsewhere such that the determination of in-season soil nitrate-N can become a more widely used tool to inform N topdress decisions in spring wheat.

Method

- Dry soil samples (0-12" taken at tillering) from 3 spring wheat sites with varying soil texture, SOM content, and pre-plant fertilizer application rates were measured for nitrate-N using a laboratory KCl extraction and the Water Works nitrate quick test strips as depicted here. The nitrate quick test method detailed by Hartz (2011) and Smith (2010) was **modified to use a larger volume of solution, and eliminate calcium chloride and settling time.**

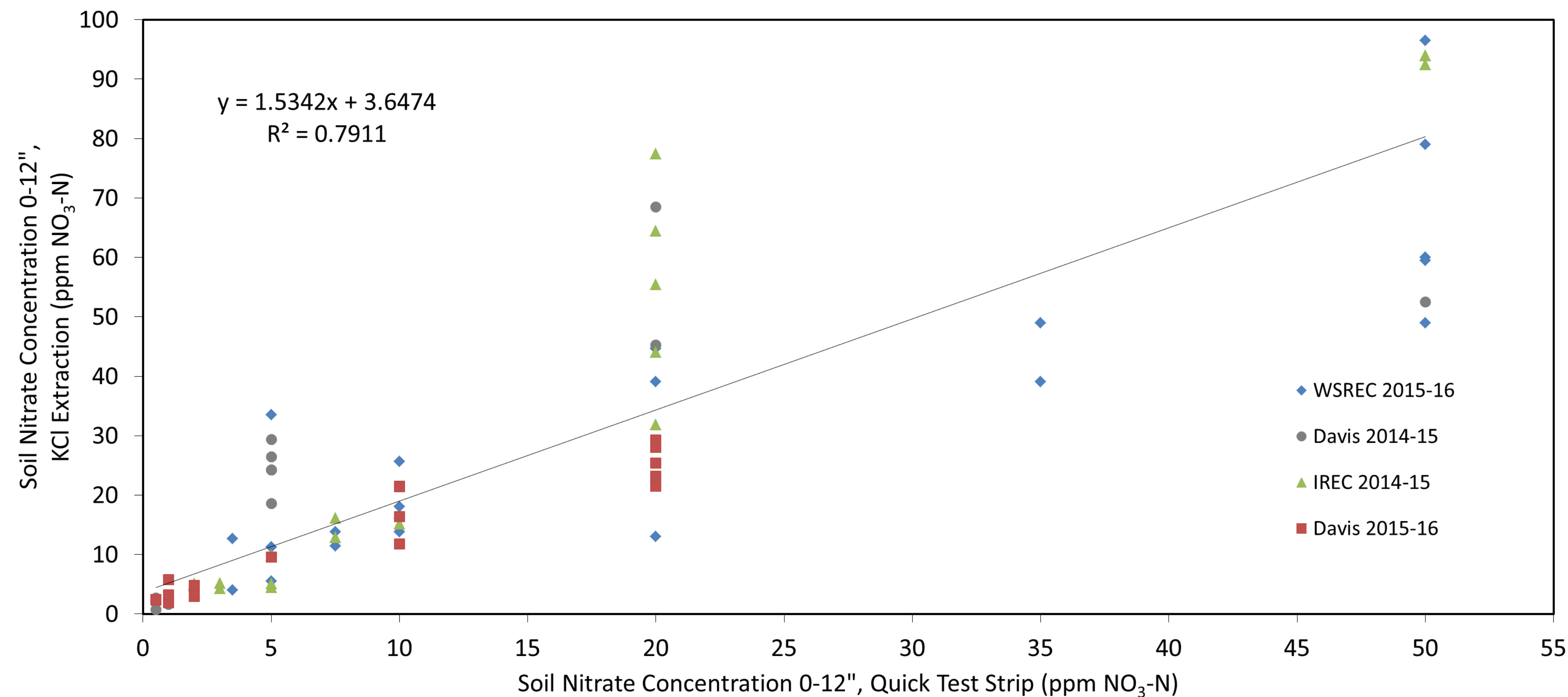
Results & Interpretation

- Preliminary results suggest a positive correlation ($P < 0.01$, $R^2 = 0.79$) between soil nitrate-N estimated by strips using the modified procedure and nitrate-N measured by KCl extraction, where:

$$\text{Strip reading (ppm NO}_3\text{-N)} * 1.53 = \text{ppm NO}_3\text{-N in dry soil}$$

- There was evidence of a location interaction, which may indicate that the correction factor needed to convert the strip reading to a laboratory value may vary based on soil texture and SOM content. However, further testing of a larger sample set is needed to more precisely estimate site-specific correction factors. In addition, all measurements were made on dry soil and a further correction may be necessary for field-moist samples. Nevertheless, for making quick estimates of the real-time soil nitrate-N availability at a given location, the simplified method presented here can provide actionable information to growers and consultants considering a N topdress in spring wheat.

Soil Nitrate at Tillering, 0-12"



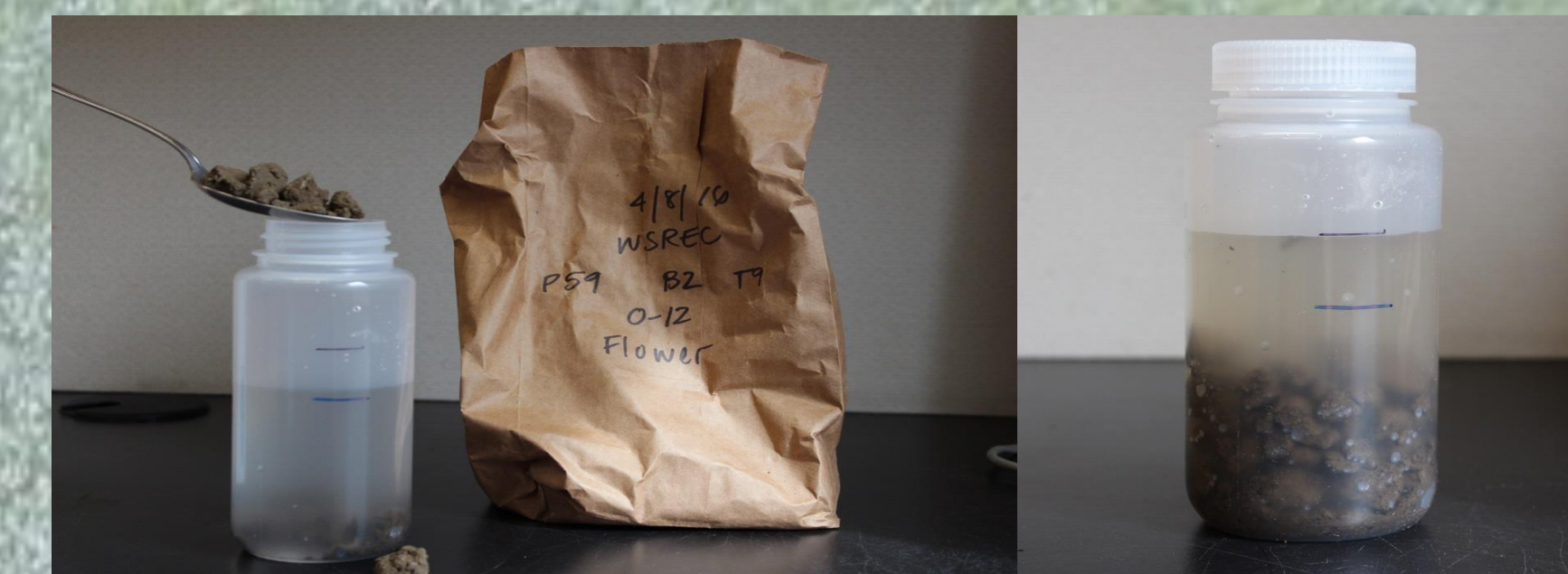
Nitrate Quick Test Strip Method

1 Start with a representative soil sample.

2 Fill a 500 ml Nalgene with 300 ml distilled water.



3 Add soil until water level rises to 400 ml.



4 Shake vigorously for 3 min.



5 Partly dip strip allowing solution to wick.



6 Wait 60 sec; compare to color chart on bottle.



ACKNOWLEDGEMENTS

Our thanks to the California Wheat Commission and the California Department of Food and Agriculture Fertilizer Research and Education Program for their partial funding this research. Thanks as well to the staffs of the Westside REC, Intermountain REC and the UC-Davis Agronomy Farm, and the following individuals who contributed to the research: Nicholas Clark, Ryan Byrnes, Jason Tschlis, Phil Mayo, Gerry Hernandez, Lalo Banuelos, Israel Herrera, Emma Torbert, Rika Fields, Katy Mulligan, Eric Lin, Dan Putnam, Chris de Ben, & Israel Herrera.

CONTACT: melundy@ucdavis.edu