

# DO SOIL NITROGEN TESTS RELATE TO NITROGEN MINERALIZATION IN FIRST-YEAR CORN FOLLOWING ALFALFA?

Zane T. Walker<sup>1</sup>, Matt A. Yost<sup>2</sup>, Michael P. Russelle<sup>1</sup>, Rodney Venterea<sup>3</sup>, Jeffrey A. Coulter<sup>1</sup>, Antonio P. Mallarino<sup>4</sup>, Joseph G. Lauer<sup>5</sup>

<sup>1</sup>Univ. of Minnesota, St. Paul, MN; <sup>2</sup>USDA-ARS, Columbia, MO; <sup>3</sup>USDA-ARS, St. Paul, MN; <sup>4</sup>Iowa State Univ., Ames, IA; <sup>5</sup>Univ. of Wisconsin-Madison, Madison, WI

## ABSTRACT

Corn (*Zea mays* L.) is the most frequent first-year crop grown following alfalfa (*Medicago sativa* L.) in the Upper Midwest. In the majority of cases, first-year corn does not respond to fertilizer N, but sometimes large amounts are needed to optimize yield. The pre-sidedress and Illinois soil N tests (PSNT and ISNT, respectively) are early-season tests used to predict corn yield response to fertilizer N. These tests measure specific fractions of soil N and define a critical concentration to separate sites that should and should not respond to N additions. Under many conditions the PSNT and ISNT have proven useful at predicting corn response to fertilizer N; however, these tests frequently over-predict response to N for first-year corn following alfalfa. It is possible that these early-season soil tests do not account for significant N mineralization that occurs after the test is taken. Thus, fine-textured soils collected from 17 sites of first-year corn following alfalfa in Iowa, Minnesota, and Wisconsin were evaluated using a controlled-environment experiment to determine whether PSNT and ISNT concentrations at the six-leaf collar corn stage (V6) relate to cumulative net soil N mineralization (NO<sub>3</sub>-N + NH<sub>4</sub>-N) over a 19-wk period (representing V6 through corn maturity). Soil samples were maintained at or near field capacity and incubation temperatures were adjusted to mimic seasonally-average weekly soil temperatures. Net soil N mineralization was measured 11 times at weekly or biweekly intervals. Measurements of net mineralized soil N ranged from 45 to 61 lb N/acre at week 1 (representing the time when corn is V6), 181 to 371 lb N/acre at week 11 (when corn is silking), and 229 to 399 lb N/acre at week 19 (when corn reaches maturity). Neither the PSNT nor the ISNT concentrations were related to net soil N mineralization at week 11 (PSNT,  $r = 0.26$ ,  $p = 0.26$ ; ISNT,  $r = 0.55$ ,  $p = 0.13$ ) and at week 19 (PSNT,  $r = 0.60$ ,  $p = 0.12$ ; ISNT,  $r = 0.09$ ,  $p = 0.37$ ). These results indicate that the PSNT and ISNT are insufficient for predicting N mineralization potential when corn follows alfalfa. Future research should identify reliable methods by which soil N mineralization can be estimated prior to fertilizer N application.

**PROCEEDINGS OF THE**

**45<sup>th</sup>**

**NORTH CENTRAL**

**EXTENSION-INDUSTRY**

**SOIL FERTILITY CONFERENCE**

**Volume 31**

**November 4-5, 2015**  
**Holiday Inn Airport**  
**Des Moines, IA**

**PROGRAM CHAIR:**

**John E. Sawyer**  
**Iowa State Univ**  
**Ames, IA 50011**  
**(515) 294-7078**  
**jsawyer@iastate.edu**

**PUBLISHED BY:**

**International Plant Nutrition Institute**  
**2301 Research Park Way, Suite 126**  
**Brookings, SD 57006**  
**(605) 692-6280**  
**Web page: [www.IPNI.net](http://www.IPNI.net)**

**ON-LINE PROCEEDINGS:**

**<http://extension.agron.iastate.edu/NCE/>**