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Seasonal and Rotational Influences on Corn Nitrogen Requirements

John E. Sawyer
Iowa State University, jsawyer@iastate.edu

Daniel W. Barker
Iowa State University, dbarker@iastate.edu

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Abstract
This project is designed to study the N fertilization needs as influenced by location and climate in continuous corn and corn rotated with soybean. Multiple rates of fertilizer N are spring applied, with the intent to measure yield response to N within each rotation on a yearly basis, for multiple years at multiple sites across Iowa. This will allow the determination of N requirements for each rotation practice, differences that exist between the two rotations, responses to applied N across different soils and climatic conditions, and evaluation of tools used to adjust N application.

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John E. Sawyer, associate professor
Daniel Barker, research associate
Department of Agronomy

Introduction

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Materials and Methods

The first year of this research at the Southeast Research Farm was 1999. The study area was cropped to soybean in 1998. Therefore in the initial year, all yields follow soybean. The two rotations, continuous corn and corn rotated with soybean, were initiated in 1999. The soil at this location is Kalona silty clay loam.

Tillage is chisel plowing in the fall and disk/field cultivation before planting. Rates of N applied to corn are 0–240 lb N/acre in 40-lb increments. Urea-ammonium nitrate solution (28% UAN) fertilizer is the N source and is broadcast and incorporated with secondary tillage before planting. No N is applied with the planter. The farm superintendent chooses the corn hybrid and soybean variety. Weeds are controlled using practices typical of the region. Soil is sampled for routine soil tests; phosphorus, potassium, and lime are applied as indicated by soil tests.

Corn and soybeans are harvested with a plot combine. Yields are corrected to standard moisture. Corn ear leaf greenness, which is an indicator of chlorophyll and nitrogen, is measured with a Minolta SPAD meter at the R1 (silking) growth stage. Relative SPAD readings are calculated using the reading at 240 lb N/acre as 100%. The SPAD meter will not indicate excess N; therefore, readings typically do not increase above a maximum greenness even with additional N.

Results and Discussion

In 2001 response to applied N was greater in the C–C rotation compared with the C–S rotation (tables 1 and 2). Ear leaf greenness readings (SPAD) indicated response to approximately 160 lb N/acre for the C–C rotation and 80 lb N/acre for the C–S rotation. This is similar to the corn grain yield increase. Leaf greenness was high with zero applied N for the C–S rotation. Relative SPAD values over 95 often indicate that there will be no yield increase from additional N. Corn yields were relatively low in 2001 due to delayed planting (June 10). Despite the UAN being applied on April 27, before the wet May period, it appears loss was not large.

This study will continue, with the best value occurring after accumulation of multiple years of data. The results in this report cover only a few years and are not meant to represent N recommendations. They do, however, represent responses for the specific years.

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