Trial Type: Nutrition
Growing Season: 2025

Project Objective: Iron deficiency is a problem affecting yield potential for a large portion of Iowa farmers. Products and tools which can alleviate the underlying causes of iron availability to crops were tested for impact on yield.

Project Insights:

1. No statistical difference in yield was observed between the Untreated control and the strips that were treated with Soileos and Soygreen Pro in 2025.
2. Trials showed low risk for Iron Deficiency Chlorosis (IDC) pressure.

Project Results 2025

The following graph shows the yield response for the 6 successful trials and the overall mean for each treatment (Figure 1). We did not have any statistical significance for yield between treatments in any of the individual trials or in the combined results. Untreated was the highest yielding treatment with an average yield of 69.7 bu/acre followed by Soygreen Pro at 69.1 bu/acre and Soileos at 66.7 bu/acre. Based on yield response, average product costs, and a sale price of $10.06 per bushel, ROI for the Soygreen Pro and Soileos were both negative. Variability within treatments is why the yield differences observed were not statistically significant.

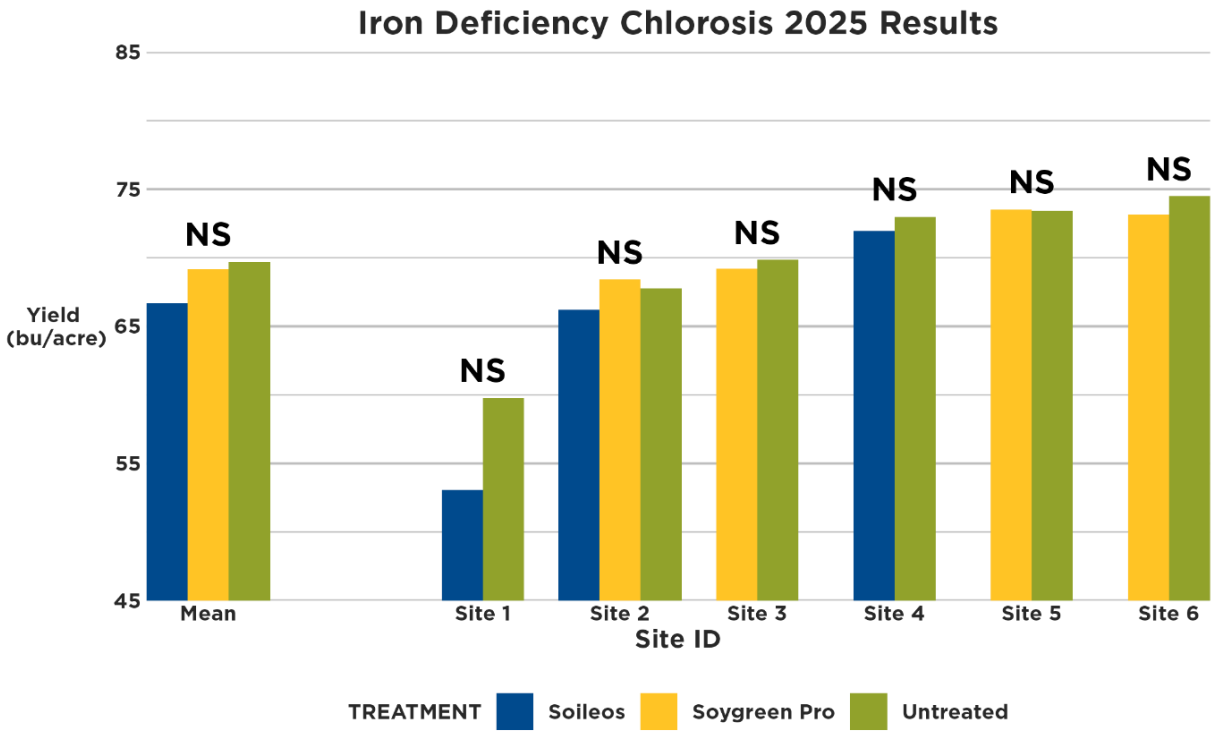

Figure 1. Yield results for 2025 trials. NS indicates no statistical significance.

Below is a map of the trial distribution and locations across the state (Figure 2). For 2025, 6 trials were successfully conducted.

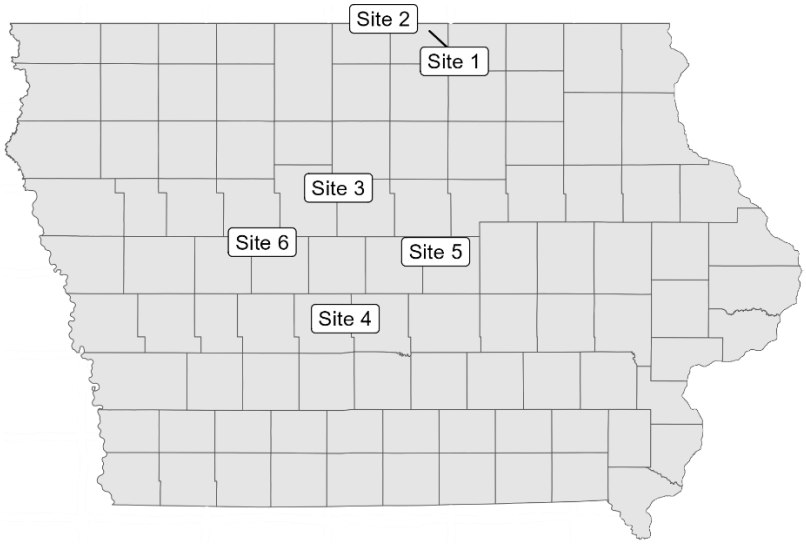

Figure 2. Trial locations for 2025.

Lab Analysis

Iron deficiency chlorosis (IDC) occurrence is influenced by several soil and environmental factors. Amount of Iron in the soil is not a good way to determine potential for IDC because soil often contains plenty of Iron, but much of that Iron is not available for uptake by the plant. This is because most Iron in the soil is in the less soluble Fe^{3+} form where soybeans prefer the more soluble Fe^{2+} form. Better ways to assess risk of IDC is through the pH of the soil and the amount of bicarbonate and nitrate present in the soil. This is why a soil sample from each treatment strip was collected at R3-R6 growth stage at a depth of 0-8 inches.

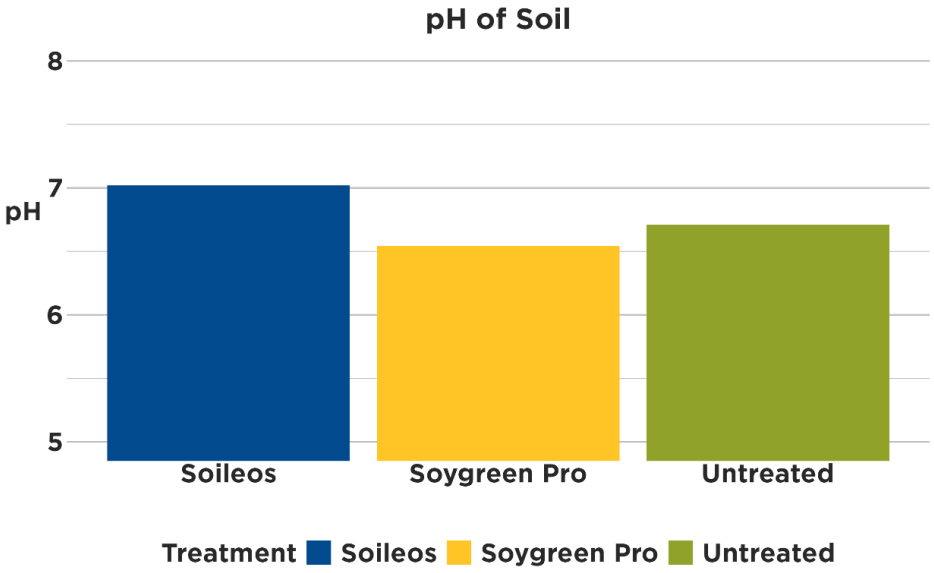

Figure 3. pH content for soils sampled in each treatment. Differences between treatments were not significant.

When soil pH is greater than 7.3 the risk of IDC is increased. Overall treatment means all fell below the 7.3 threshold (Figure 3). The pH values observed here are typical for Iowa soils in general.

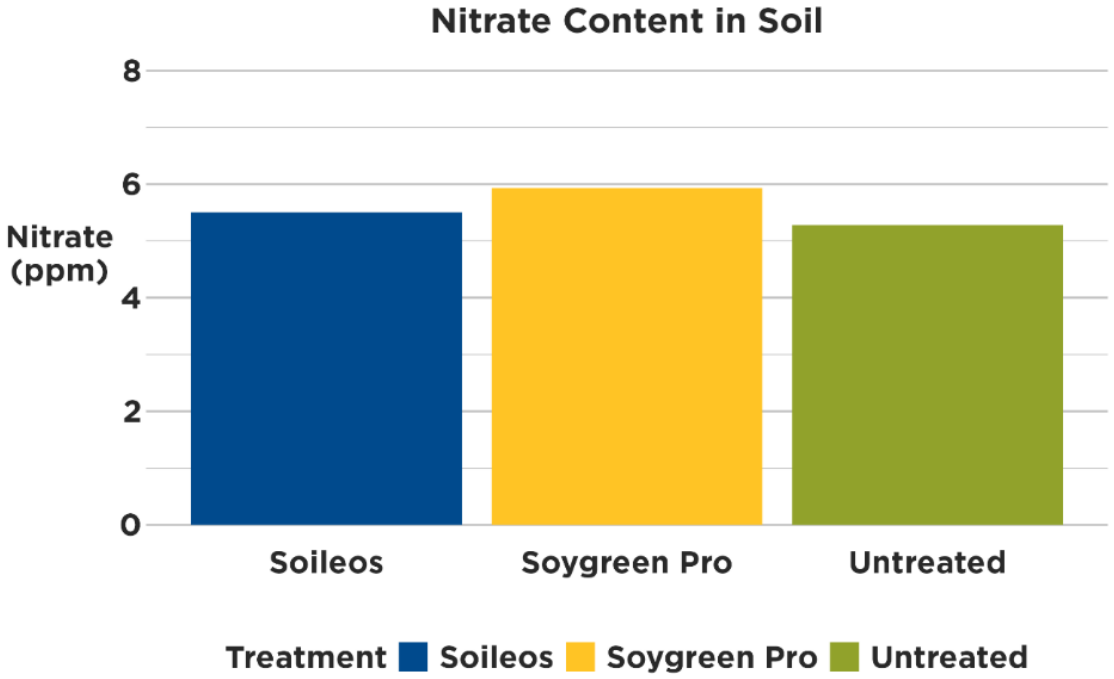

Figure 4. Nitrate (NO_3^-) content for soils sampled in each treatment. Differences between treatments were not significant.

Elevated levels of residual nitrate in the soil can increase the severity of IDC. The nitrates can increase severity of IDC because when a plant root uptakes the nitrate it exchanges with a bicarbonate ion increasing the pH of the soil and slowing iron reduction. The nitrate also must be converted to ammonium in the plant which increases the pH of the plant sap leading to a decrease in the rate of Iron reduction to plant available Iron. The trials we conducted did not have excess amounts of nitrates observed (Figure 4).

Landscape Effects

The most likely landscape to observe IDC in Iowa is in the Des Moines Lobe region of North-Central and Central Iowa (Figure 5). The Des Moines Lobe contains numerous frequently ponded depressions that contain and retain water especially in wet periods. The water that is in these depressions then evaporates and leaves behind bicarbonate in the soil. This is why the Harps soil series has a higher risk for IDC severity because it is a soil that is found on the rims of the closed depressions (Okoboji) (Figure 6). Being on the rim of depressions leads to increased water being evaporated through the soil leaving behind bicarbonates. The Harps soil series is identified by its increased levels of bicarbonates that fizz when an acid is applied to the soil. Using an acid on the soil surface to test the amount of bicarbonate can give insight into the risk of IDC in a field.

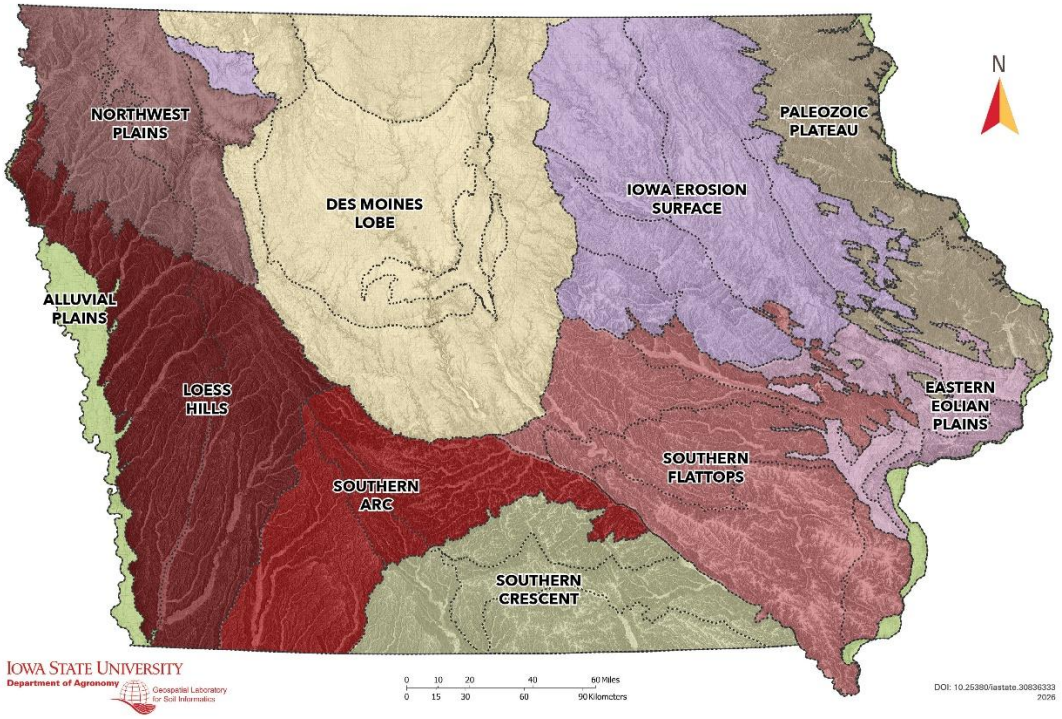

Figure 5. Physiographic Regions of Iowa map. The Des Moines Lobe region, where IDC risk is highest due to the topography being conducive to ponding water, is highlighted light tan (Bradley Miller and Lee Burras. Physiographic Regions of Iowa. https://www.agron.iastate.edu/glsi/gis-data/physiographic-regions-of-iowa/).

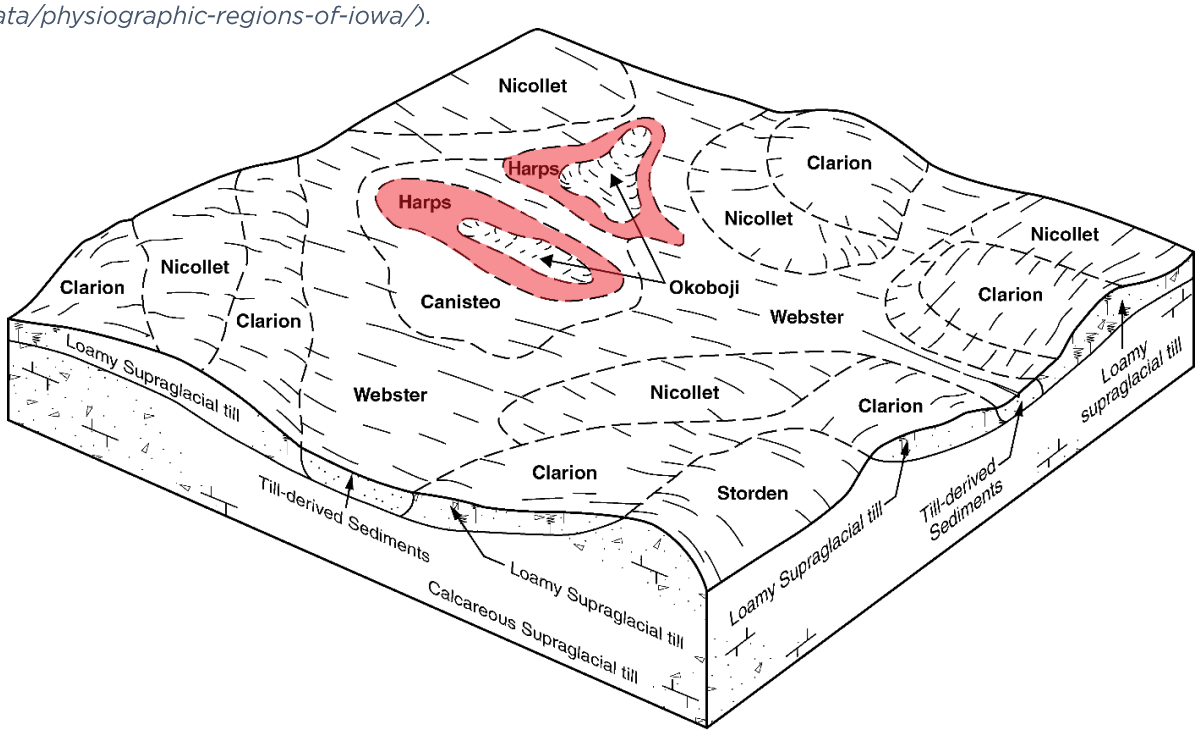

Figure 6. Block diagram of soils typically seen in the Des Moines Lobe region of Iowa. The topography of this landscape makes it more susceptible to IDC from the closed depressional soils (Okoboji) and their surrounding soil (Harps) that accumulate bicarbonates at a higher rate. The Harps soil is highlighted in red to highlight highest IDC risk (Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Official Soil Block Diagrams. Available online. Accessed [2/23/2026]).