AERIAL PHOTOS CAN PREDICT CORN YIELD LOSS DUE TO N DEFICIENCY

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Introduction

Fields that experience wet weather after N fertilizer is applied may lose N and consequently lose yield. Replacing N may be difficult or expensive after corn is too tall for tractor clearance. A tool to assess the degree of potential yield loss would help corn producers decide how much expense is justified in making late N applications.

Objective

Our objective is to develop a general relationship between aerial photo color and yield loss that could be applied to an unknown field to predict yield loss due to N deficiency.

Methods

- Five production corn fields were selected in 2001, a year with a wet spring and visual N deficiency symptoms in many corn fields. All fields had uniform fertilizer history.
- The rectified aerial photo was broken into polygons corresponding to each yield monitor point.
- Reference green and reference yield values were based on the darkest 20% of polygons.
- Relative green (observed green/reference green) was calculated for each polygon, and polygons were divided into color classes (five to twelve bins with equal class interval).
- Average relative green, relative yield, and yield loss were calculated for each color class.
- Regression was used to relate relative yield and yield loss to relative green value in the photos.
- The green/red ratio was found to be useful to identify areas with a high relative green value for a reason other than N deficiency, e.g., areas with cutworm damage. These areas were removed based on the green/red criterion (green/red < 1.2) before analyzing the color-yield loss relationship.
- Relative green was a highly significant predictor of relative yield and of yield loss in each field, with R^2 values ranging from 0.62 to 0.92.

When results were combined across the five fields, relative green was a highly significant predictor of relative yield ($R^2 = 0.64$; $P = <.0001$) and yield loss ($R^2 = 0.66$; $P = <.0001$).

Use of aerial photos appears promising to predict yield loss due to N deficiency in wet years and to inform management decisions about supplemental N.

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Our cover: To world food security and agricultural production, the Haber-Bosch process has been the most economical means for fixation of nitrogen for fertilizer. Fritz Haber won the Nobel Prize for Chemistry in 1918 and Carl Bosch shared the prize in 1931.