CANOPY SENSING ALGORITHM PERFORMANCE AND MODIFICATION

USING SOIL AND WEATHER INFORMATION

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ABSTRACT

Corn production across the U.S. Corn Belt can be often limited by the loss of nitrogen (N) due to leaching, volatilization and denitrification. Canopy sensors have proven effective in matching plant N requirements with periods of rapid N uptake (V7-V11), reducing N loss. However, N recommendation algorithms used in conjunction with canopy sensor measurements have not proven accurate. Objectives for this research were to determine if soil and weather information could be used to make the University of Missouri canopy reflectance sensing algorithm more accurate. Nitrogen response trials were conducted across eight states over two growing seasons, totaling 32 sites (four per state) with soils ranging in productivity. Reflectance measurements at ±V9 were used with the University of Missouri canopy sensor algorithm to calculate an in-season N fertilizer recommendation. This recommendation was related to the economic optimal N rate (EONR). The University of Missouri algorithm was mediocre in matching EONR, averaging within 61 kg N ha^{-1} of EONR when target corn received no N at-planting and within 74 kg N ha^{-1} of EONR when target corn received 45 kg N ha^{-1} at-planting. However, when this algorithm was adjusted using weather and either measured or USDA SSURGO soil, N fertilizer recommendations improved. The error as determined by the root mean square error (RMSE), for corn receiving 45 kg N ha^{-1} at-planting the RMSE was 74 kg N ha^{-1} without soil and weather and 54 kg N ha^{-1} with the soil and weather adjustment. This suggests the incorporation of soil and weather information into other canopy sensor algorithms may enhance their accuracy at predicting site-specific EONR.