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Agronomy Journal Abstract - REMOTE SENSING

Detection of Phosphorus and Nitrogen Deficiencies in Corn Using Spectral Radiance Measurements

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Abstract

Applications of remote sensing in crop production are becoming increasingly popular due in part to an increased concern with pollution of surface and ground waters due to over-fertilization of agricultural lands and the need to compensate for spatial variability in a field. Past research in this area has focused primarily on N stress in crops. Other stresses and the interactions have not been fully evaluated. A field experiment was conducted to determine wavelengths and/or combinations of wavelengths that are indicative of P and N deficiency and also the interaction between these in corn (*Zea mays* L.). The field experiment was a randomized complete block design with four replications using a factorial arrangement of treatments in an irrigated continuous corn system. The treatment included four N rates (0, 67, 134, and 269 kg N ha^{-1}) and four P rates (0, 22, 45, and 67 kg P ha^{-1}). Spectral radiance measurements were taken at various growth stages in increments from 350 to 1000 nm and correlated with plant N and P concentration, plant biomass, grain N and P concentration, and grain yield. Reflectance in the near-infrared (NIR) and blue regions was found to predict early season P stress between growth stages V6 and V8. Late season detection of P stress was not achieved. Plant N concentration was best predicted using reflectance in the red and green regions of the spectrum, while grain yield was estimated using reflectance in the NIR region, with the particular wavelengths of importance changing with growth stage.

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