MEPIQUAT CHLORIDE CONFOUNDS SENSOR BASED NITROGEN RECOMMENDATIONS

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Abstract

Precision agriculture offers a means to improve nitrogen use efficiency (NUE) by real-time adjustments of nitrogen (N) rates based on estimation of crop needs. These estimated nitrogen rates are based on current leaf N status as well as in-field yield estimates that incorporate nitrogen rich vegetative strips. Leaf N status can be correlated to leaf chlorophyll content and normalized differential vegetative index (NDVI). The SPAD-502 chlorophyll meter (SPAD CM) and the GreenSeeker, a crop reflectance sensor that calculates normalized differential vegetative index (NDVI), are two sensors that can indicate chlorophyll content and NDVI, respectively. Recent attempts have been made to develop a sensor based nitrogen rate calculator utilizing real time sensor NDVI output. Since GreenSeeker output may be in part a measure of leaf area and greenness, it is sensitive to biotic and abiotic factors that affect greenness including the application of Mepiquat Chloride (MC). MC has been shown to increase leaf chlorophyll concentration and to decrease leaf area index (LAI); therefore, MC applications may have significant consequences on GreenSeeker and SPAD CM readings. Altered sensor readings without a corresponding change in yield may negatively affect sensor based nitrogen calculator rates. Consequently, a study was conducted at two locations (Goldsboro, NC and Tifton, GA) to determine the effects of MC applications on SPAD and GreenSeeker readings. Three MC rates (0, 16, and 32 ounces/acre) were applied at early bloom and three nitrogen rates (0, 40, and 80 lbs/acre) were applied at match head square (MHS) three weeks later. SPAD CM readings and GreenSeeker scans were taken weekly beginning one week prior to MHS and continued through defoliation, a total of 10 weeks. Seed cotton yields were also obtained at harvest. For the five consecutive weeks following MC application, all data was subjected to ANOVA means separation using Fisher's protected LSD at a significance level of $\alpha = 0.05$. SPAD meter readings are significantly affected and differentiated at all nitrogen levels for all weeks except the first and second week at Goldsboro, NC location where there was no difference between the 16 and 32 ounce/acre rate. SPAD CM readings were significantly higher when MC was applied, although no separation was found between the 16 ounces/acre and 32-ounces/acre rate, except for the last week at Tifton, GA where MC effects were insignificant. GreenSeeker NDVI output was significantly higher when nitrogen was applied, but there was no significant difference in NDVI output between the 40 lbs N/acre and the 80 lbs N/acre rate at both locations and all weeks combined. However, NDVI was unaffected by MC at all rates for both locations and weeks combined. Yield was significantly affected by nitrogen but not differentiated between 40 lbs N/acre and 80 lbs N/acre in Tifton, GA. Yield was not affected by nitrogen applications in Goldsboro, NC; perhaps, due to the prolonged droughty conditions at this site. Yield was unaffected by MC except where the 16 ounce/acre rate caused a significant yield boost at Goldsboro. These results indicate that ground based NDVI sensors are sensitive to nitrogen applications but insensitive to MC applications in cotton, suggesting that NDVI sensors may serve as a real time indication of leaf N status without worrying about MC use complications.