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UTILIZING AERIAL IMAGERY TO MAKE SITE-SPECIFIC DEFOLIATION APPLICATIONS TO COTTON

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Remote sensing can be defined as the ability to gather information about an object without coming into contact with that object. The use of remote sensing can be effectively utilized to easily acquire information about the vegetative growth and development of a crop. The implications of this technology can be to allow for timely data collection as well as the ability to spatially monitor plant growth and development throughout an entire field. Since cotton defoliation is often associated with vegetative growth, an easy and affective method to differentiate spatial variability of cotton growth is essential. This is important because current defoliation applications are often applied in a broadcast manner that only take an average of the field. In order to address this problem a three year study was designed to examine the ability aerial remote sensing to differentiate cotton growth and development and to compare site-specific defoliation applications based on these data to single-rate broadcast applications. The study was conducted in 2003, 2004, and 2005 at the Blackbelt Research Station in Brooksville, MS on two separate upland cotton fields (22 and 18 acres, respectively). Cotton defoliation applications included combinations of Finish® (cyclanilide plus ethephon), Drop® (thidiazuron), and Def® (tribufos) each year of the study. Site-specific defoliation applications zones were separated into three levels (high, mid, low) based on NDVI (normalized difference vegetative index) calculated from aerial imagery. The areas that were classified as high received the highest rate combination of defoliants, while the areas classified as low received the lowest combination. The single-rate broadcast applications zones were made based on an average of each cotton field at 60% open boll. The results indicated that cotton plant heights were correlated to NDVI (>81%, >76%, and >81% in 2003, 2004, and 2005, respectively). NDVI was also useful for determining defoliation between each of the application zones and an indicator of how effective the variable-rate zones were. The study showed that the variable-rate application resulted in the highest percent NDVI change in the high vegetative class (30%, 44%, and 27% in 2003, 2004, and 2005, respectively) indicating high levels of defoliation and the lowest NDVI change in the low class (10%, 23%, and 20% in 2003, 2004, and 2005, respectively). Seed cotton yield data collected from an optical yield monitor equipped with a GPS (global positioning system) indicated significant differences between the variable rate application zones and the broadcast zones in 2003 with1300 lbs/A and 750 lbs/A, respectively. However, there were no significant differences between variable rate applications and broadcast applications in 2004 and 2005. Based on the results of this study, cotton growth can be accurately depicted through remotely sensed data. These data can be used for effectively making defoliation recommendations to cotton to address spatial variability of cotton growth in the field. Furthermore, applying adjusted defoliant rates that are based on NDVI may allow for increased efficacy by optimizing cotton production through minimizing chemical input to areas that require little defoliant and maximizing rates in areas of excess vegetative growth.