UAS MULTISPECTRAL IMAGE BASED DETECTION OF 2,4-D INJURY IN COTTON

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Abstract

New cotton varieties were introduced in 2016 that allow auxin herbicides like 2,4-D for use postemergence to control broadleaf weeds. However, non-2,4-D tolerant cotton varieties are highly sensitive to 2,4-D and exposure can negatively impact lint yield and quality. The use of remote sensing tools like Unmanned Aerial Systems (UAS) have the potential to aid in detecting the extent and severity of off-target herbicide exposure. Research was conducted to detect cotton response to low rates of 2,4-D using UAS-based multispectral imagery. The study was conducted at the Texas Tech University New Deal Research Farm near New Deal, TX. Seven treatments (0.032 fl oz ac^{-1}, 0.064 fl oz ac^{-1}, 0.32 fl oz ac^{-1}, 0.64 fl oz ac^{-1}, 3.2 fl oz ac^{-1}, and 32 fl oz ac^{-1}) plus a non-treated control were evaluated. Herbicide treatments were applied with a CO_2 pressurized backpack sprayer to DP 1822XF at first square plus two weeks. Weekly flights at an altitude of 100 feet were conducted using a DJI Matrice 100 equipped with a SlantRange 3P multispectral imaging sensor starting the day of application. Several vegetation indices were applied to the multispectral imagery and differences between treatments were assessed with and without the soil background at three spatial resolutions (0.51 in pixel^{-1}, 2.0 in pixel^{-1}, and 4.1 in pixel^{-1}). The highest rate of 2,4-D caused the greatest cotton injury and all vegetation indices with p-values less than 0.05 showed differences between the highest rate and the other treatments. Differences were observed between the non-treated control and the low rates when compared to the full rate starting at 15 days after application. Five vegetation indices: GSAVI, MNLI, MSAVI2, RDVI and SAVI showed similar results with and without the soil background and at all three spatial resolutions at 15 days after application. Injury in the treated plots increased as the cotton continued to grow after herbicide exposure, which resulted in greater treatment separation later in the season.