DETECTION, CLASSIFICATION, AND QUANTIFICATION OF HERBICIDE DRIFT UTILIZING SPECTRAL DATA

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Abstract

The increased use of non-selective herbicides in transgenic cotton has led to increased herbicide drift onto non-transgenic cotton. Increased interest in the use of remote sensing in agriculture has heightened interest in the potential for the detection and quantification of herbicide drift using hyperspectral imagery. These images have the potential to provide not only evidence of drift events but may also quantify degree of injury and potential yield reductions. In previous research, plant height was found to be a leading indicator of herbicide injury and yield reduction where no visual injury was observed. The use of hyperspectral imagery for assessing large areas for herbicide drift may be useful in discerning small differences that are not discernable by visual inspection.

Research was conducted in 2000 to evaluate the potential use of data obtained from hand held spectroradiometers in detection of drift as compared to visual injury ratings and reduced cotton yields. The experimental design was a randomized complete block with a two factor factorial arrangement of treatments. Factor A was Roundup Ultra (glyphosate) applied at rates of 0.375, 0.187, 0.093, 0.046, and 0.023 lbs ai/A. Factor B consisted of application timings at cotyledon, pinhead square, and first bloom. Visual injury ratings were taken on seven day intervals after treatments were applied. Spectroradiometer data were taken on fourteen day intervals using a FieldSpec Pro. Data were analyzed using the Proc Discrim feature in SAS with cross validation (leave one out testing) and resubstitution options. This procedure was used to classify each treatment by spray and no-spray, application timing, and high and low rates based on spectral data.

The cotton displayed no visual injury at any rating interval. When spectroradiometer data were analyzed, treatments were classified by injury correctly 65-66% of the time even when no visual injury was observed. When classified according to timing, the untreated could be distinguished from the cotyledon and square treatments 81% of the time. These preliminary data indicate that hyperspectral data may be useful in detection and quantification of drift injury in nontransgenic cotton.

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