

DETERMINATION OF CROP INJURY FROM AERIAL APPLICATION OF GLYPHOSATE USING VEGETATION INDICES AND GEOSTATISTICS

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ABSTRACT

Injury to crops caused by off-target drift of glyphosate can seriously reduce growth and yield, and is of great concern to farmers and aerial applicators. Determining an indirect method for assessing the levels and extent of crop injury could support management decisions. The objectives of this study were to evaluate multiple vegetation indices (VIs) as surrogate variables for glyphosate injury identification and to evaluate the combined use of Geostatistical methods and the VIs to assess the level and extent of crop injury. The experiment evaluated glyphosate injury between the cotton and corn crops. Cotton and corn were planted on July 23, 2009 in eight row strips spaced 102-cm apart and 80 m long with four replications. A single aerial application of glyphosate was made on August 12, 2009 using an Air Tractor 402B airplane equipped with fifty-four CP-09 spray nozzles. Multispectral images were collected from the same airplane using a MS 4100 camera at 1, 7, 14 and 21 days after the glyphosate application. On the same days as the image collections, plant damage data including visual injury ratings, plant height, chlorophyll content and shoot dry weight were collected from all eight rows in a 0.5-m-wide band centered over the sampling location selected within each experimental unit. Seven VIs, calculated from the images, were entered along with the plant damage data into a canonical correlation analysis (CCA). Semivariograms were computed for each vegetation index/crop and replication. The range of spatial correlation derived from the semivariograms was used to evaluate differences in the extent of injury between replications and crops/replications. The results suggest that vegetation indices, especially the Chlorophyll Vegetation Index (CVI), can be used as surrogate for glyphosate injury identification, and the range of spatial correlation indicated the extent of crop damage.