REFLECTANCE RESPONSE PATTERNS OF CORN AS AFFECTED BY PRE AND POST HERBICIDE APPLICATIONS. Wesley J. Everman, Thomas T. Bauman, and Case R. Medlin, Graduate Research Assistant, Professor of Weed Science, Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907-1155; Assistant Professor of Weed Science, Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK 74078-6028

To increase the ease of research being conducted in site-specific weed management and weed species identification via remote sensing, the impacts of herbicides on corn reflectance response patterns are being researched. It may be possible to find reflectance response patterns of individual weed species that would open the future to a broad expanse of possibilities in these fields. The identification of herbicides that do not impact the spectral response pattern of corn could be used for weed control over a large experiment area, with weeds of interest being established in untreated areas. This would reduce hand-weeding costs required to study reflectance response patterns of weed/crop population dynamics.

Experiments were conducted at the Agronomy Research Center near West Lafayette, IN. PRE corn herbicide treatments evaluated were 3.6 kg a.i./ha acetochlor, 2.2 kg a.i./ha atrazine, 880 g a.i./ha flufenacet + 220 g a.i./ha metribuzin, 120 g a.i./ha isoxaflutole, 2.1 kg a.i./ha metolachlor, and 2.0 kg a.i./ha pendimethalin. POST corn herbicide treatments evaluated were 1.7 kg a.i./ha atrazine + .95 L/ha COC, 560 g a.i./ha bromoxynil + 1% v/v COC, 798 g a.i./ha. 2,4-D, 212 g a.i./ha dicamba + 83 g a.i./ha diflufenzopyr + 0.25% v/v NIS, 70 g a.i./ha nicosulfuron + 1% v/v COC, and 40 g a.i./ha primisulfuron-methyl + 0.25% v/v NIS. The herbicides were selected to represent a large percentage of the chemicals used in the Midwest and those that have varying modes of action that can result in various symptoms on the corn plants. This range of symptomology has the potential to create a broad range of plant reflectance response patterns.

Multispectral aerial images composed of three bands of reflectance were collected over the test areas from 6 to 11 weeks after planting, with ranges: band 1: 80 nm, band 2: 70 nm, and band 3: 30 nm. Ground-based reflectance data were also collected with a GER 2600 field spectrometer mounted 7m above the crop canopy 5 weeks after planting. Five readings per plot were collected near solar noon with <5% cloud cover. The GER 2600 collected measurements from over 500 bands of reflectance between 355 and 2600 nm.

SAS PROC STEPDISC and PROC DISCRIM were used to identify and model up to twelve bands of reflectance from the data most useful for differentiating between individual herbicide treatments and untreated plots. The Fisher linear discriminant classifier in MultiSpec was used to classify treated plots in pair-wise comparisons with the untreated plots. Results show isoxaflutole and metolachlor PRE treated corn have the least effect on the spectral response. Pendimethalin treated plots were highly separable from untreated plots using SAS and image classification techniques. POST herbicide treatments atrazine and primisulfuron-methyl were found to have little or no impact on the spectral reflectance of corn. 2,4-D and dicamba + diflufenzopyr were found to have the greatest effect on the spectral properties of corn.

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