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Abstract

This study evaluates a hyperspectral imaging (HSI) technique to identify herbicide-resistant kochia (Bassia scoparia) biotypes to support weed management in cropping systems. The experiment was conducted under controlled-environment where glyphosate was applied to six different kochia populations. For each population (72 cell tray of plants), half of the plants were sprayed with Glyphosate 900 g ae ha-1 , while the other half remained an untreated control. Hyperspectral images were acquired over five time points spanning from glyphosate treatment to 15 days after treatment (DAT) using a proximal HSI system (Specim-IQ) with 204 spectral bands from 397nm to 1003nm. The average reflectances were extracted from plants that were characterized as glyphosate-resistant or-susceptible. We first analyzed the temporal variations of the spectra with and without the application of herbicide. The spectral profile exploits the advantages of temporal features in biotype discrimination. Random forest algorithms were used to classify the glyphosate-resistant and-susceptible populations, by using reflectance at optimal wavelengths (near-infrared) and various vegetation indices with high correlations with visual ratings. Based on the classification accuracy, the most important wavebands and vegetation indices were determined to classify the weed biotypes. Preliminary results show that: 1) For the untreated plants, the reflectance at red-edge to near-infrared reached the highest level on 8 DAT, revealing the highest chlorophyll content in the leaves. Then, the reflectance declined until 15 DAT. 2) In contrast, strong effects of glyphosate were captured on 8 DAT for the three herbicide-susceptible populations. For the three glyphosate-resistant populations, reflectance at red-edge to near-infrared did not increase from 1 to 8 DAT, which was opposite of the controlled plants.

Multitemporal hyperspectral imaging to classify herbicide-resistant and -susceptible kochia (*Bassia scoparia*)

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