Utilizing High-Throughput Phenotyping for Identifying Metribuzin Tolerance in Winter Wheat

Melinda Zubrod[1], Andrew W Herr[1], Pia M Spychalla[2], Elijah Pearson-Godon[3], Ian C Burke[1], and Arron H Carter[1]

[1]Departmenet of Crop and Soil Sciences, Washington State University
[2]School of Integrative Plant Science, Corenell University
[3]Kansas City Medical Society Foundation

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Melinda Zubrod[1], Andrew W. Herr[1], Pia M. Spychalla[2], Elijah Pearson-Godon[3], Ian C. Burke[1], Arron H. Carter[1]

[1]Departmenet of Crop and Soil Sciences, Washington State University, Pullman, WA, United States

[2]School of Integrative Plant Science, Corenell University, Ithaca, NY, United states

[3]Kansas City Medical Society Foundation, Merrian, KS, United States

ORCiD: 0000-0001-7024-8421

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Weed competition with crops is the number one cause of yield loss worldwide. Plant breeders combat this issue by breeding herbicide tolerant varieties. The Aggressor (Group1) and Beyond (Group 2) herbicides are commonly used to control weeds in the Pacific Northwest. Many weed species are developing tolerance to group 1 and 2 herbicides. Metribuzin is a group 5 herbicide that is labeled for use in wheat, but application results in severe plant injury. Release of winter wheat variety tolerant to Metribuzin would provide producers an alternate mode of action to control weeds. Historically breeders visually rate injury in breeding plots, these ratings can be variable and subject to individual bias. This study aims to improve the accuracy and efficiency of selecting herbicide tolerant lines in a breeding program by utilizing a drone mounted multispectral sensor. Multispectral data was collected on paired rows and advanced generation lines grown in yield trails. The vegetative indices calculated from the wavelengths measured by the multispectral sensor in this study include NDVI, NDRE, TCARI, NWI, and MTVI. Visual injury scores, plant height, and yield were also measured. Correlations between reflectance indices and yield were stronger than correlations between visual injury ratings and yield. There were also moderate to strong correlations observed between visual injury rating and vegetative indices as well as plant height difference and vegetative indices. The results of this study suggest that multispectral analysis on the plot level is an accurate indicator of herbicide injury in winter wheat.