

# **Hyperspectral Imaging for Early Detection of Herbicide-Resistant Weeds in Soybean**

Prashant Jha

## **Project Summary:**

A segment of the field of precision agriculture is being developed to accurately and quickly map different weed species and, more specifically, herbicide-resistant vs. herbicide-susceptible weed biotypes in crop fields using advanced optics and machine learning algorithms. This project is a partnership between the Weed Science program in the Department of Agronomy at Iowa State University and Optical and Remote Sensing Technology center in the Department of Electrical and Computer Engineering at Montana State University. This work builds on our prior success in using similar technologies to classify crops and weeds, focusing on weeds common to the U.S. Great Plains. In this project, however, we will collect hundreds of thousands of spectra of most troublesome weeds (common waterhemp and other pigweed species, giant ragweed, and marestail) in Iowa soybean production and differentiate herbicide-resistant vs. herbicide-susceptible biotypes of those weeds in-crop using a hyperspectral imager. Plants will be imaged in fields using ground-based and drone-based platforms. The spectra will be differentiated from one another using advanced machine learning algorithms to develop classification images. The ultimate goal will be to develop early-season UAV-based weed maps for site-specific weed management applications in soybean fields. We will also develop late-season weed maps by attaching a hyperspectral camera beneath the combine at the time of soybean harvest.