Comparing Remotely-Sensed Data for Estimating Palmer Amaranth and Soybean Canopy Cover

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Introduction

Palmer amaranth is among the most troublesome weeds in Kansas soybean fields[1]

Cultural management practices that result in rapid canopy closure, including narrow row spacing, can suppress Palmer amaranth growth[2]

Remote sensing has been investigated as a tool to increase the efficiency of Palmer amaranth management[3]

Objective

Compare the effectiveness of excess green index and maximum likelihood supervised classification of remotely-sensed data to differentiate Palmer amaranth and soybean canopy cover in Kansas

Methods

Data were collected from an experiment located in Scandia, KS designed to investigate the interaction of planting date and row spacing on weed management in Kansas soybeans

Image collection was done using a DJI 1000 Unoccupied Aerial Vehicle (UAV) equipped with a Micasense RedEdge multi spectral sensor flown at 20m above ground level (AGL) on July 20, 2022

Figure 1. DJI M-100 quadcopter and Micasense RedEdge Multispectral Sensor

Canopy classifications from the spectral data were delineated through two methods

(1) the excess green index (EGI)
(2) maximum likelihood supervised classification (MLSC)

Weed control was estimated by visual assessment on July 26, 2022

Canopy classification fit was compared to weed control in 38- and 76-cm rows, as well as for the entire experiment using Pearson's correlations[4]

References

1. Van Wychen L (2022) Survey of the most common and troublesome weeds in broadleaf crops, fruits & vegetables in the United States and Canada. Weed Science Society of America National Weed Survey Dataset.
2. Hay, Marshall M., J. Anita Dille, and Dallas E. Peterson. "Integrated pigweed (*Amaranthus* spp.) management in glufosinate-resistant soybean with a cover crop, narrow row widths, row-crop cultivation, and herbicide program." *Weed Technology* 33, no. 5 (2019): 710-719.
3. Sanders, John T., Eric AL Jones, Robert Austin, Gary T. Roberson, Robert J. Richardson, and Wesley J. Everman. "Remote Sensing for Palmer Amaranth (*Amaranthus palmeri* S. Wats.) Detection in Soybean (*Glycine max* (L.) Merr.)." *Agronomy* 11, no. 10 (2021): 1909.
4. R Core Team. 2022. The R Stats Package.

Results

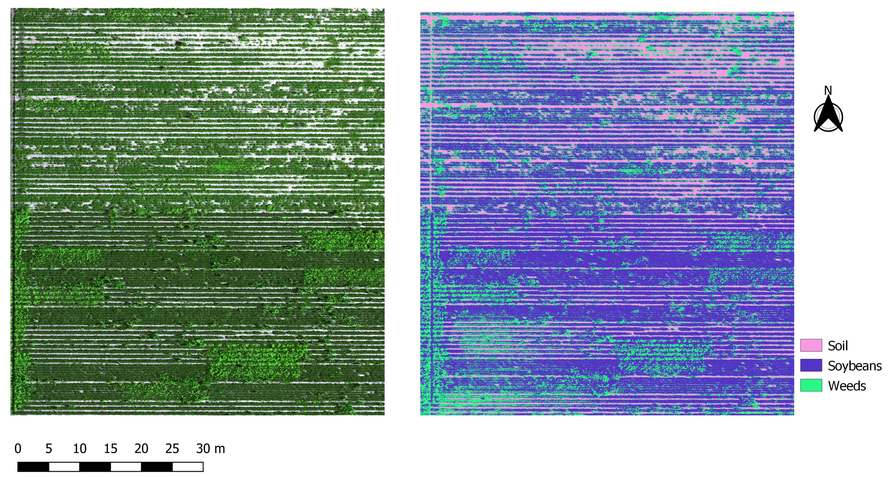

Figure 2. (A) RGB othromosaic image and (B) MLSC image from Scandia KS on 2022-07-20

Table 1. *Correlation of canopy classifications and weed control ratings*

Dataset	Method	Pearson's corr coeff	t	p-value
Full experiment	EGI	-0.50	-5.6	<0.0001
	MLSC	-0.65	-8.22	<0.0001
38-cm rows	EGI	-0.64	-5.7	<0.0001
	MLSC	-0.57	-4.7	<0.0001
76-cm rows	EGI	-0.40	-2.96	<0.0001
	MLSC	-0.72	-7.01	<0.0001

Conclusions

Both excess green index and maximum likelihood supervised classification distinguished Palmer amaranth from soybean

Both methods were correlated with visual estimates of weed control

Maximum likelihood supervised classification resulted in a stronger relationship with weed control in 30" rows

Excess green index was better correlated in 15" rows

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