REMOTE IDENTIFICATION OF INDIVIDUAL VOLUNTEER COTTON PLANTS

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Abstract

Although airborne multispectral remote sensing can identify fields of small cotton plants, improvements to detection sensitivity are needed to identify individual or small clusters of plants that can similarly provide habitat for boll weevils. However, when consumer-grade cameras are used, each pixel of the imaging sensor directly measures only one of the three spectral bands (red, green, and blue) and interpolates the remaining two spectral bands. We present an analytical technique that derives endmember sets from bimodal histograms of each spectral band for cotton, other vegetation types and soil, and identifies individual volunteer cotton plants using spectral matching based on exhaustive search unmixing analysis of the estimated contribution of cotton plants to the spectral reflectance measured by each pixel. Model validation achieved significant misclassification rates as low as 0.125 and 0.146 in frequently tilled plots for remote sensing identification of volunteer okraleaf and conventional cotton plants, respectively. Results of this study indicate that consumer-grade cameras can acquire multispectral images of sufficient spectral and spatial resolution to detect individual cotton plants at an early growth stage, which will aid boll weevil eradication programs in identifying and locating volunteer plants.