ASSESSMENT OF COTTON GROWTH USING GROUND-BASED AND UAV REMOTE SENSING

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Abstract

Simple and efficient measurement methods and devices are required to assess plant spatial and temporal variability for precision crop management. Plant height and canopy spectral reflectance characteristics are important growth parameters. We measured cotton plant height and canopy reflectance using ground-based and UAV (Unmanned Aerial Vehicles) remote sensing methods in 2014 and 2015 season in a research field in Mississippi Delta. Experiments were conducted in cotton plots with substantially varied plant vegetation conditions. A ground-based plant health sensing system (PHSS), equipped with ultrasonic sensor, multispectral sensor, and GPS receiver, was employed to scan the plant canopy in the plots for cotton plant height and canopy reflectance in four wavebands (blue, green, red, and near infrared). Meanwhile, RGB images of the same plots were acquired using an UAV-mounted camera, and analyzed for the plant height and canopy reflectance. Spectral reflectance measurements from the PHSS and UAV systems were compared and used to calculate the plant Normalized Difference Photosynthetic Vigor Ratio (NDPVR). Sensor-measured plant height was compared with the manually-measured plant height. Results indicated that the plant heights estimated by the PHSS and UAV systems were strongly correlated with each other and with the manually-measured plant height as well. These two remote sensing methods were able to be used for rapid assessment of cotton plant height and canopy spectral reflectance for precision crop management.