Early Detection of Southern Stem Rot of Peanut Utilizing Spectral Reflectance and Thermal Imaging Technologies

X. WEI*, H.L. MEHL, D.B. LANGSTON, JR., Virginia Tech Tidewater Agricultural Research and Extension Center, Suffolk, VA 23437.

Southern stem rot (SSR), caused by *Sclerotium rolfsii* Sacc., is one of the most important soilborne diseases of peanut (*Arachis hypogaea* L.). Deep turning and crop rotation can both reduce losses to SSR, but often multiple applications of fungicides during the growing season are needed to provide adequate control. Fungicides can be applied on a calendar schedule or once disease symptoms and signs are noticed, but calendar sprays are often confounded by year-to-year differences in host and environmental factors and applying fungicides after disease onset can result in poor fungicide performance. Spectral reflectance and thermal imaging have been reported for the early detection of foliar diseases, but few studies have employed these technologies to detect soilborne diseases. Our objectives were to, i) identify spectral and thermal signatures of peanut infected with *S. rolfsii*, ii) determine the earliest time that SSR can be detected via spectral reflectance and thermal imaging.

In greenhouse experiments, *S. rolfsii* inoculated, and mock-inoculated lateral stems of peanut were inspected daily for disease symptoms, and measurements were taken with a Jaz spectrometer and forward-looking infrared (FLIR) camera to detect spectral reflectance and plant surface temperature, respectively. Foliar symptoms such as wilting of terminal leaflets were first observed approximately 1 week after inoculation. Reflectance spectra for leaflets on inoculated and mock-inoculated stems differed in both visible and near-infrared regions. Reflectance at 550 nm and 790 nm was used to calculate a spectral disease index of SSR (SSRI). About three days after first observation of foliar symptoms, inoculated stems demonstrated lower SSRI values and higher leaf temperatures compared to mock-inoculated stems. Results indicate signatures of SSR in peanut can be detected during early stages of symptom expression using spectral reflectance and thermal imaging technologies, and these signatures of SSR may have applications for early disease detection in the field.