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Detection of Wildfire Disease by Hyperspectral and RGB Imaging in Soybean (*Glycine max* L.)

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[Introduction]

Soybean (*Glycine max* L.) is an important oil seed crop in the world and in South Korea. The occurrence and severity of bacterial wildfire caused by *Pseudomonas syringae* pv. *tabaci* have progressively increased, which poses a serious risk to soybean production. Under favorable conditions, the spreading of wildfire can lead to a devastating entire crop. Therefore, it is crucial to accurately identify early, asymptomatic/symptomatic wildfire infection. In this study, we aim to test the possibility of early detection of wildfire infection by emerging imaging approaches such as the hyperspectral and Red, Green and Blue (RGB) method.

[Materials and Methods]

We used 16 soybean cultivars to investigate against the wildfire disease infection at the vegetative growth stage and replicated (n=9) experiments were conducted in the plant growth chambers. The hyperspectral and RGB images were collected continuously for 8 days after inoculation (8 DAI). The hyperspectral images were analyzed by the software of (ENVI V.5.5.3) and the RGB images were analyzed with the (WinDIAS) image system.

[Results and Discussion]

Our findings showed that the disease ratio of all the cultivars appeared to symptom 2 DAI, then the disease ratio started decreasing from 4 DAI in all the cultivars except the Uram cultivar which showed high symptoms (12.31%) at 2 DAI and started reducing ratio from 3DAI. The results obtained from the RGB images showed that Taekwang was a susceptible cultivar to the disease infection (36.77%) and showed a significant difference in the disease ratio compared to other cultivars. Likewise, the visual scoring showed a high score with Taekwang indicating a weak responding cultivar to the disease infestation same as to the disease ratio pattern. Similarly, there was a significant difference between the leaf's reflectance with the disease ratios at wavelength 526.57 nm, 550.02 nm, 573.54 nm, and 597.13 nm. These results indicated that identified wavelength may be important for wildfire disease detection. In addition, RGB visible analysis can able to identify the most resistant and tolerant cultivar. Further research towards identifying precise wavebands may help to predict the wildfire disease occurrence in soybean at the vegetative growth stage.

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