BOOK OF ABSTRACTS

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13th International Epidemiology Workshop

Foz do Iguaçu - Brazil

9 to 12 April 2024

Interludium Iguassu Convention

Organizers:

Emerson M. Del Ponte

Eduardo S. G. Mizubuti

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Organizing Committee

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Building a hyperspectral library of common bean diseases

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Sensors attached to unmanned aerial vehicles can detect diseased plants before they become symptomatic, according to differences in their reflectance. Despite the advances in hardware and methods for detecting infections with remote sensing, using these tools to scout common bean diseases is still incipient. The objectives of this study were: 1) to evaluate the effectiveness of a hyperspectral sensor in the diagnosis of common bean diseases; 2) verify differences in the spectral signatures in different genotypes with healthy or infected plants; and 3) to investigate if mulch used in no-tillage can influence the spectral signatures. Since 2022, we have conducted field experiments following randomized block design with factorial arrangement in the Brazilian Center-West region. The experimental factors were soil cover, bean genotypes with different reactions to diseases of epidemiological importance, and inoculation or not of seeds or plants. A multirotor drone DJI M600Pro equipped with a Nano-Hyperspec® VNIR hyperspectral sensor (400 to 1000 nm) for push-broom scanning of 271 spectral bands at 2.2 nm intervals was used to capture images in all experiments. In each one, two flights were carried out at 40m and 80m before and after the onset of visual symptoms. We searched for spectral bands with $R^2 > 0.6$ and the lower AIC. Wavelengths meeting these requisites were submitted to linear regression analysis to investigate relationships between response (previously selected spectral bands) and predictor variables (genotype, inoculation and soil cover) with significance at 5%. Best-quality images were normally obtained with flights at 80m. The results indicate that early detection of root rots is possible, identifying causal agents (*Fusarium* spp. and *Rhizoctonia solani*) and common bean cultivars according to their reaction to the disease. In the case of the *Cowpea mild mottle virus* (CPMMV), early detection can anticipate disease control measures by approximately 14 days, compared to the visual diagnosis after symptom appearance. Mulch is a cause of variation that must be considered when scouting early-cycle diseases such as root rots and CPMMV with hyperspectral sensors. These results demonstrate that hyperspectral image analysis is a promising tool to advise common bean disease management. This approach facilitates better crop health management and the reduction of yield losses.

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