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A PHENOTYPING TOOL FOR WATER STATUS DETERMINATION IN SOYBEAN BY VEGETATION INDEXES AND NIR-SWIR SPECTRAL BANDS

Patricia Braga[1]*, Luís Guilherme Teixeira Crusiol[2], André Luis Hartmann Caranhato[2], Martina Bianca Fuhrmann[3], Alessandra Koltun[2], Marcos Rafael Nanni[2], Alexandre Lima Nepomuceno[4], Norman Neumaier[4], José Renato Bouças Farias[4], Leandro Simões Azeredo Gonçalves[3], Liliane Marcia Mertz-Henning[4]

[1]Escola Superior de Agricultura "Luiz de Queiroz" - Universidade de São Paulo. [2]Universidade Estadual de Maringá. [3]Universidade Estadual de Londrina. [4]Embrapa Soja.

*liliane.henning@embrapa.br

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Water deficit is a major constraint to soybean yield. The current approaches for selecting drought-resistant genotypes are labor intensive and time consuming. Therefore, the development of fast and feasible phenotyping techniques accelerates the genetic improvement of soybean regarding this abiotic stress. The aim of this study was to correlate physiological variables such as relative water content (RWC) and gas exchange measurements, with vegetation indexes (VIs) and spectral bands in order to optimize tools for plant phenotyping. Trials were carried out in a growth chamber and in the field in randomized blocks, where treatments were arranged in a factorial scheme (water conditions and genotypes), with nine replicates. The water conditions were: control (irrigated) and water deficit, which was imposed during the vegetative stage V3 and R6, in the growth chamber and field experiment, respectively. The variables measured were RWC, leaf temperature, photosynthesis, transpiration, stomatal conductance and internal CO_2 content. The vegetation indexes $NDWI_{(1000-1600)}$, $NDWI_{(1000-2300)}$, NMDI, MSI and the spectral bands $SWIR_{1600}$, $SWIR_{2300}$, ρ1440, ρ1920, ρ1440+ρ1920, ρ1920-ρ1440 and SWIR-ρ1440 were obtained using the hyperspectral sensor Fieldspec 3 Jr. According to the results, the physiological measurements, the VIs and the spectral bands were able to differentiate the water conditions to which the genotypes were subjected, and in some cases the indexes and bands were more sensitive to detect the effect of genotype, compared to the physiological measures. The VIs presented a high correlation with the physiological variables, reaching 0.91 for the evaluation at the vegetative stage and 0.97 at the reproductive stage, for some variables. Thus, all indexes and bands were efficient to determine the water status of soybean plants, presenting a high correlation with the physiological parameters. These results demonstrate the feasibility of this method for plant phenotyping under water deficit, since it is a fast, simple and a non-destructive evaluation and data may be collected regardless of the environmental condition.

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