Assessing Photosynthetic Response of Peanut to Different Planting Dates Using UAV-based Multispectral Images

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Remote sensing is an alternative method that can be used to evaluate physiological response to environmental conditions and plant status, which could potentially complement, reduce or replace manual measures. However, information on the use of remote sensing on the physiological response of peanut plants to environmental conditions is still needed. This study's objective was to identify vegetation indices calculated from UAV-based multispectral images that can strongly correlate with physiological processes in order to identify the status of peanut plants. The experiment was conducted in Tifton, Georgia using the cultivar Georgia-06G. The field was divided in three planting dates in order to simulate different environmental conditions, with 12 replications per planting date. Different photosynthetic component processes were evaluated. Chlorophyll a fluorescence transient and pigment contents were collected weekly starting when the plants had accumulated 1470 growing degree days (GDD) until 2300 GDD. Additionally, a 3DR solo with a Parrot Sequoia multispectral camera was flown weekly on the same day physiological measurements were obtained. Vegetation indices that could reduce or replace manual measures have been developed from UAV images. Overall, the VIs showed higher correlation with physiological parameters at the 3rd planting date. A strong non-linear relationship (R_2= 0.69) was observed between Modify Non-Liner Index (MNLI) and internal leaf CO_2 concentration. Simple Ratio and Non-linear Index showed strong relationship with stomatal conductance with R_2 of 0.63 and 0.73, respectively.