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Temporal and Spatial Changes in Photosynthetic Parameters in Rainfed Peanut

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Abstract

Peanut (*Arachis hypogaea* L.) is prone to variations in the photosynthetic process as a response to soil and climate conditions. Stomatal conductance and thylakoid reactions are limiting factors for photosynthetic efficiency under water deficit conditions depending on the duration and severity of the stress that the peanut plant is undergoing. The temporal and spatial variability of photosynthetic parameters in a rainfed peanut field and their relationships with soil matric potential and soil texture have not been fully documented. The objectives of this research were to pinpoint the photosynthetic parameter that most influence variability in a rainfed peanut field as well as the impact of soil texture and soil matric potential on the parameter's temporal and spatial variability. The experiment was conducted on a commercial rainfed peanut field in Pearson, Georgia. The experiment was arranged in a completely randomized design with 31 plots and three subplots. A LI-600 was used biweekly to measure stomatal conductance (g_{sw}), actual quantum yield of photosystem II (Φ_{PSII}), electron transport rate (ETR), transpiration (E), and leaf temperature (T_{leaf}). Findings showed that Principle Components 1 and 2 (PC1 and PC2) accounted for 71% of the variance in the data. Stomatal conductance was the photosynthetic parameter that had the greatest impact on variability, contributing 53% of the total. The spatial variability in g_{sw} for this field was unaffected by soil matric potential or soil texture, whereas the temporal variability in g_{sw} for leaves was unaffected by air temperatures or rainfall as well.

Keywords: (Stomatal conductance, thylakoid reactions, soil)