Remote sensing of maize development and yield response to environmental stress across planting dates in South Africa

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Abstract

Thermal remote sensing has been introduced as a robust technology for monitoring water status in plants, in a real-time and non-destructive approach, under a variety of environments. Canopy temperature is a key indicator of water stress and is extensively used for the determination of the water status in crops. A previous planting date study conducted in South Africa revealed a large decline in yields between December and January regardless of cultivar or location. This study aims to monitor crop water status and plant health across the four monthly planting dates and four weekly planting dates between December and January. The trial was designed as a split plot with three replicates arranged in complete randomized blocks in Pretoria, South Africa. A Thermal sensor fixed to a UAV is used to monitor water status of maize across planting dates and will be correlated with ground truth data. Aerial and ground truth data were taken from week four to physiological maturity at a weekly interval. Analysis of variance was used to determine the influence of late planting on maize physiological traits. Preliminary results revealed that planting date affected stomata conductance (sg), photosynthesis (A) and transpiration (Tr). At the third weekly planting (WPD3), plants were exposed to water stress, which led to a decrease in photosynthesis, stomatal conductance and transpiration. These preliminary findings will be correlated with thermal data and crop water stress index calculated to understand changes in water status across planting dates.

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