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"Bridging the gap between increasing knowledge and decreasing resources"

Does Combining Canopy Reflectance and Canopy Temperature Allow Identifying Drought Resistance Strategies in Potato?

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Abstract

Changes in seasonal precipitation patterns lead to variations in water availability for different development stages of agricultural crops. Potato has been classified as sensitive to even minor drought spells partly due to its shallow root system. Increasing demand for potatoes and increase of the global production area, increases the need for resistant potato varieties to seasonal water deficits. Tolerance of potato to drought may comprise a number of traits representing different strategies, such as deeper rooting for better access to water or leaf level adaptation to avoid early drought induced senescence. Evaluation of yield or yield reductions alone does not allow identifying the underlying resistance strategies. Thermographic evaluation of canopy temperature allows estimating stomatal control over transpirational water losses and changes in crop surface reflectance indicate leaf senescence levels. Whereas thermography alone allows estimation of leaf surface temperature, only the combination with crop surface reflectance provides information on rooting depth. To evaluate the suitability of this combination as a screening tool for drought resistance in potato, 56 potato clones from CIP's advanced breeding population were grown between October 2013 and February 2014 in a costal arid region of southern Peru. Plants were subjected to two irrigation treatments: fully watered (340mm per 4 month season) and terminal drought (withholding irrigation 68 days after planting). At 10-day intervals after withholding irrigation crop surface reflectance (FieldSpec, ASD) was measured and surface infrared temperature was taken with a thermo camera (B335, FLIR). Rooting depth and yield were determined at harvest.

Drought induced genotypic responses in reflectance and leaf temperature in relation to yield reduction and rooting depth will be presented. Potential genotypic strategies for drought resistance will be evaluated and the potential of the combined measurements as an early screening tool will be discussed.

Keywords: Genotypic responses, hyperspectral reflectance, root system, *Solanum tuberosum*, vegetation index

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