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Infrared temperature to assess plant transpiration reduction

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A low soil moisture content is one of the environmental factors which leads to stomatal closure. A direct effect of stomata closure is increased stomatal resistance leading to reduced transpiration and CO2-uptake rate. Indirect consequences are a reduction in energy dissipation and photosynthesis and an increase in leaf temperature. Therefore, leaf temperature measurements can be used to evaluate plant water status and transpiration reduction. Infrared canopy temperature measurements allow to continuously monitor leaf temperature in a non destructive way.

We determined how the difference between leaf and air temperature were related to atmospheric and soil water status for a common bean (Phaseolus vulgaris L.) canopy. A field experiment with common beans was carried out in Piracicaba, Brazil (UTM 253,300E, latitude 153,400N, 550 m above sea level) between June and August, 2010. There were two plots corresponding to two water treatments: a fully irrigated plot and a plot where irrigation was suspended during the development stage. Each plot was monitored by an infrared thermometer, a psychrometer and six polymer tensiometers installed at two observation points and three depths: 0.05 m, 0.15 m and 0.3 m. These tensiometers allow measuring preassure heads in the entire agronomic range, from saturation to wilting point.

At present, results are being analyzed; more complete results are expected during the next months. It is expected to show how both atmospheric and soil moisture status determine leaf temperature.