Use of thermal imaging for discrimination of maize genotypes submitted to water deficit stress

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Plant responses to drought have been discriminated by using parameters derived from canopy temperature. The principle underlying this practice is based on the observation that, under drought stress, plants close the stomata and, consequently, reduce transpiration. Since water loss through stomatal transpiration is one of the main mechanisms of leaf cooling, restriction to water loss leads to increased leaf temperature. Plants tolerant to drought can regulate canopy temperature more effectively than sensitive ones. Based on these assumptions, plants (pre-flowering stage) of four maize genotypes were submitted to drought by water withholding. These plants were evaluated by the standard method of gas exchange and also by thermal imaging. As expected, the stressed plants dramatically reduced the rates of stomatal conductance, transpiration and net CO_2 assimilation. In parallel, there was an increase in the canopy temperature of the stressed plants in comparison to the control ones. Although one cannot compare data obtained in such a small area (6 cm^2) of the metabolically more active leaf, such as those obtained by gas exchange, with data obtained in the whole canopy of plants, such as thermography, it was expected that there would be some coherence between the two sets of data. However, depending on the selected temperature range or measure of central tendency (arithmetic mean, median or mode) used to express the plants canopy temperature, the discrimination of genotypes based on canopy temperature presented different results. This is a recurrent problem in most studies that use data generated from thermal imaging for discrimination of plant responses to stresses.

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