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Corn crop water stress index under different redroot pigweed (*Amaranthus retroflexus* L.) densities and irrigation regimes

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Crop water stress index (CWSI) is a valuable index for quantifying water stress. To evaluate the CWSI of corn under redroot pigweed densities, a study was conducted at Shiraz University during 2008. The main objective was to develop baseline equations, which could be used to calculate CWSI for monitoring water status of corn under weed competition. Six weed densities and three irrigation treatments were selected. Six lower baselines with different slopes and intercepts between $Tc - Ta$ (canopy-air temperature difference) and VPD (vapor pressure deficit) were fitted for each weed density. With increasing redroot pigweed density, lower baseline slope and its intercept were significantly increased due to more limitation in water. Monthly and seasonal mean CWSI were lowest in weed free and T2 treatment (high water supply) and highest in 80 weeds m^{-2} and T3 (water stress) treatment, which could show higher competition between corn and redroot pigweed at higher weed densities. An average of mean seasonal CWSI (about 0.12) in weed free and T2 treatment produced the maximum kernel yield. Predicting yield response to seasonal mean CWSI is important in developing strategies for farmers, and researchers for irrigation management under limited water conditions.

Keywords: baselines equations; water status; seasonal mean CWSI; kernel yield

Introduction

Canopy temperature is a part of the canopy energy balance. As solar radiation is absorbed by leaves, leaf temperatures increase. Leaf cooling takes place as some of the thermal energy drives transpirational water loss. Under water deficit conditions, stomata close in response to loss of turgor pressure (Kramer 1983), causing a lowering of transpiration rate and an increase in canopy temperature. Idso et al. (1981) defined the Crop Water Stress Index (CWSI) based on the empirical linear relationship between midday canopy-air temperature difference and vapor pressure deficit under high net radiation, non-water-stressed conditions. The CWSI has been frequently used to quantify crop water stress based on canopy temperature over the past three decades (Gardner et al. 1992), and has also been used for irrigation management (Nielsen and Gardner 1987; Nielsen 1990). Jackson et al. (1981, 1988) revised Idso's CWSI definition using a theoretical analysis based on the canopy energy balance and the Penman-Monteith equation. Other researchers have modified

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