

Measurement and modeling of water requirement and crop coefficient for cucumber, tomato and pepper using microlysimeter in greenhouse

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Abstract

Knowing crop evapotranspiration at any time is very important in management of irrigation systems for greenhouse. Changes in evapotranspiration during the crop growth period are described by crop coefficient (K_c), which is defined as the ratio between crop evapotranspiration and reference evapotranspiration. This study was conducted to determine the evapotranspiration of cucumber, tomato and pepper at Isfahan University of Technology greenhouse using micro-lysimeters for 7 months. Gravimetric method was used to determine the water balance of soil in micro-lysimeters. Simultaneously, reference crop evapotranspiration was estimated using drained lysimeters. Results indicated total reference evapotranspiration during the 7 months of the study in greenhouse was 824 mm. Total evapotranspiration for cucumber in 3.5 months of growth period was 202 mm, for tomato in 6 months was 524 mm and for pepper in 7 months was 667 mm. Weekly changes in crop coefficients of different crops in the growth period were variable. The average crop coefficients for cucumber at the initial, development, midseason and late season were obtained as 0.41, 0.69, 0.98 and 0.77, respectively. For the tomato, these values were 0.44, 0.68, 1.15 and 0.68, and for pepper were 0.25, 0.53, 1.03 and 0.75, respectively. To find the relationship between climatic data of greenhouse and crop evapotranspiration, the SPSS software was used to model the evapotranspiration process. Results indicated that the best proposed model is a nonlinear regression equation, based on the average daily air temperature, solar radiation and crop height.

Keywords: Greenhouse, Evapotranspiration, Soil moisture, Crop growth stage.

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