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Determination of the potential evapotranspiration and crop coefficient for saffron using a water-balance lysimeter

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Agriculture is the major consumer of water and it is possible to decrease water consumption in this sector by proper irrigation scheduling. Irrigation scheduling is based on crop water requirements. Saffron is an important crop in Iran. The main purpose of this study was to determine the potential evapotranspiration and crop coefficient for saffron using single and dual crop coefficients, in Badjgah region, College of Agriculture, Shiraz University, Shiraz, Iran. Three water-balance lysimeters were used for this experiment in a two-year study. Total saffron potential evapotranspiration values were 523 and 640 mm in the first and second growing seasons, respectively. The maximum evapotranspiration rates for saffron were 4.5 and 6.1 mm d^{-1} in the first and second growing seasons, respectively. Based on the results of this study, different saffron growing stages for evapotranspiration were 30, 40, 70 and 60 days. Crop coefficient (K_c) values for the initial, mid- and late-season growth stages were 0.41–0.45, 0.93–1.05 and 0.29–0.31 in both years, respectively. Basal crop coefficient (K_{cb}) values for the initial, mid- and late-season growth stages were 0.15–0.16, 0.41–0.65 and 0.15–0.17 in both years, respectively.

Keywords: saffron; evaporation; transpiration; crop coefficient; evapotranspiration

Introduction

Determining irrigation water requirements and irrigation scheduling requires a reliable estimate of crop water use. Evapotranspiration is the loss of water vapor from both plant and soil surfaces. Evaporation of water from soil and plant surfaces, and transpiration from the stomata of plants account for >98% of crop water use.

Crop coefficients (K_c) are used with reference evapotranspiration (ET_0) to estimate specific crop evapotranspiration rates (ET_c) and are defined as the ratio of ET_c to ET_0. Crop coefficients vary with crop type, the growth stage of the crop, weather and irrigation method, and with some cultural practices.

There are two approaches to determining the crop coefficient. The first is the single crop coefficient. In this approach, the effect of both crop transpiration and soil evaporation are integrated into a single crop coefficient. The K_c value incorporates crop characteristics (Allen et al. 1998). The second approach is the dual crop coefficient. In this approach, there are two coefficients, the basal crop coefficient

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