Determination of crop water requirement, crop coefficient and water use efficiency of greenhouse-grown cucumber and tomato (Case study: Urmia region)

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Abstract

This experiment was conducted to determine evapotranspiration, crop coefficient and water use efficiency of cucumber and tomato for a period of six months in the Resarch Greenhouse of Urmia University. Daily evapotranspiration of cucumber, tomato and reference crop was measured using lysimeter method. Based on the results, cucumber evapotranspiration for growth period of 130 days was 272.4 mm and for growth period of 180 days for tomato was 358.6 mm. Based on the reference crop evapotranspiration, the average crop coefficients at the initial, development, mid-season and late season stages of tomato were calculated as 0.2, 0.65, 1.29 and 1.0, respectively, and for cucumber were calculated as 0.19, 0.64, 0.99 and 0.81, respectively. In order to investigate the effects of deficit irrigation on crop yield and water use efficiency, in addition to full irrigation treatment, two levels of deficit irrigation were considered (90 and 80 percent of full irrigation). Maximum yield of tomato and cucumber was obtained under full irrigation as 197.3 and 144.6 ton/ha, respectively. Evapotranspiration water productivity of tomato and cucumber was calculated as 55.04 and 53.1 kg/m^3, respectively. Application of deficit irrigation caused a reduction in water use efficiency and crop yield of both crops. Water use efficiency of tomato and cucumber under 80% of full irrigation treatment was 43.7 and 36.2 kg/m^3, respectively, which indicated a reduction of about 20 and 31 percent as compared to full irrigation treatment.

Keywords: Evapotranspiration, Crop coefficient, Water use efficiency, Greenhouse, Lysimeter.

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