Effect of deficit irrigation on evapotranspiration, water use efficiency, yield and growth of Hamadanian pepper in greenhouse cultivation

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Abstract

Effect of deficit irrigation on evapotranspiration, yield, water use efficiency and some growth parameters of Hamadanian pepper (Bivar) using a completely randomized design (CRD) with a full irrigation treatment (FI) and three deficit irrigation treatments (85, 70 and 55% application of water requirement; DI_{85}, DI_{70}, and DI_{55}, respectively) in five replications was examined. Evapotranspiration in the FI, DI_{85}, DI_{70}, and DI_{55} treatments during the 66 days of the deficit irrigation application, were 337.8, 307.5, 281.1 and 244.2 mm and in the whole growth period were 396.2, 365.9, 339.5 and 302.6 mm, respectively. The plant's morphological characteristics were decreased with decreasing the soil water content. However, in 79% of the cases, the difference between FI and DI_{85} treatments was not significant. Whereas, in all the cases, the difference between DI_{55} treatment and FI and DI_{85} treatments was significant. Applying deficit irrigation decreased the number of good-shaped fruits from 33.0/plant in the FI treatment to 15.6/plant in the DI_{55} treatment and similarly increased the number of bad-shaped fruits from 5.4 to 18.0 per plant. Crop yield and water use efficiency in the FI treatment were 18.98 ton/ha and 4.79 kg/m^3, which did not have significant difference with the DI_{85} treatment (which had a yield of 17.75 ton/ha and a water use efficiency of 4.85 kg/m^3). While there is not a statistically significant difference between the crop yields of FI and DI_{85} treatments, the DI_{85} treatment uses less water and gives crop yield very close to that of full irrigation treatment. Hence, the DI_{85} treatment can be recommended in the cultivation of Hamadanian pepper. In the severe water-scarce conditions, the DI_{70} treatment could be used to yield 13.48 ton/ha, which is 29% less than the FI treatment. Also, water use efficiency in the DI_{70} treatment was decreased by 17% compared to the FI treatment. Irrigation efficiency was 61.9, 65.3, 69.6 and 73.4% in the FI, DI_{85}, DI_{70}, and DI_{55} treatments, respectively.

Keywords: Water stress, Bivar pepper, Irrigation water use efficiency, Irrigation efficiency.

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