

Optimized irrigation of sweet pepper using soil-moisture sensors

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The operation of irrigation systems according to the changing soil water potential may suggest a regime that follows the physiological state of the crop, thus being more accurate and water saving. A sensor, which represents the soil water content on-line, may provide the data required for automatic update of the irrigation program. An experiment was executed during the 2006/7 season in a sweet pepper greenhouse in Paran (Zer farm) in order to test the effects of the applied water quantity when irrigation signal comes from the tensiometer, on the irrigation frequency, plant development and yield, and on the seasonal water consumption. Three independent treatments were examined, where the amounts of 2, 3, and 4 mm (L/m^2) were applied upon a signal. In order to learn the crop response to irrigation amounts, two additional treatments were operated according to the sensor of the 3 mm treatment (dependent), in one 2mm were applied and in the second 4 mm.

The average daily quantity of irrigation water had a significant effect on the plant height already at the beginning of October, two weeks after the treatments had been administered; plants receiving the least quantity, 2 mm while the others were getting 3 mm and more, were remarkably shorter than the others. The effect on the yield was obvious on early February, when the 2 mm treatment obtained only 5.6 as compared to the 6.5 kg/m^2 obtained by the others and the difference remained as such to the end of the season. In the independent treatments, the average daily water quantities were equal from late November, gradually declining to a level of 1-1.5 mm on late January. The irrigation frequency was the lowest at the 4 mm, and the highest at the 2 mm treatment. Measurements of the soil extracts indicated on mid January nitrogen depletion at the two treatments of 2 mm per pulse. No indication for any increase in soil solution EC at the rhizosphere (10-15 cm deep) was found. In Soil samples taken on 18/01/07 the Chloride concentration at the layer 0-15 cm was higher in the 2 mm dependent treatment.

Our results demonstrate that the operation of an irrigation system upon a signal of a soil-moisture sensor is feasible and allows for an efficient and appropriate management of the irrigation regime. The method, whenever adopted by the growers, will surely bring about significant water saving, as related to the present irrigation habits. Notably, however, is the fact that an average daily water quantity smaller than 3 mm from mid September to mid December has slowed down the plant growth rate and has brought about a yield decrease.