Biosystems Engineering (2006) **93** (2), 237–244
doi:10.1016/j.biosystemseng.2005.11.006
SW—Soil and Water

Effect of Irrigation Frequency on Rose Flower Production and Quality

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(Received 18 January 2005; accepted in revised form 14 November 2005; published online 28 December 2005)

A better understanding of the effects of irrigation frequency on flower production and quality of rose plants can help to propose optimal irrigation scheduling. For this purpose, experiments were conducted on a soilless rose crop (*Rosa hybrida*, cv. First Red), with a closed hydroponic system, in a greenhouse located near Volos, on the continental area of eastern Greece. The plants were grown following the bending technique, on rockwool slabs. Irrigation scheduling was based on crop transpiration, and irrigation was performed whenever accumulative solar radiation outside the greenhouse reached 1600 kJ m^{-2} [high irrigation frequency (HIF)] and 3200 kJ m^{-2} (low irrigation frequency). The amount of water applied was 0·2 and 0·4 mm for high and low irrigation frequencies, respectively. Accordingly, the total water applied was equal for both cases. In order to study the effects of irrigation frequency on rose crop, measurements of fresh and dry weight of the cut flower shoots, number of harvested flowers and flowering stem's length, as well as measurements of microclimate variables were carried out. The total period of measurements ended 100 days after the last severe shoot bending (which was performed 60 days after planting). The results showed that irrigation frequency influenced cut flower fresh and dry weight, since the total fresh and dry weight of cut flower shoots measured at the end of the experimental period was about 33% higher in the HIF treatment. Statistical analysis revealed that there was no significant difference between the mean fresh or dry weight of cut flower shoots of the two treatments. As far as the number of shoots harvested is concerned, the results showed that the higher the irrigation frequency, the higher the production, as the total number of cut flowers measured at the end of the experimental period was 20·7 and 16·2 per greenhouse m^{-2} for high and low irrigation frequencies, respectively, namely about 28% higher in the HIF. Furthermore, the results showed that the length of rose flowering shoots was not affected by the irrigation frequency. In conclusion, it seems that the higher irrigation frequency improved the biomass production but did not affect the quality of harvested flowers.

1. Introduction

Optimal irrigation scheduling of greenhouse soilless crops is very important since it influences the rhizosphere environment, media water potential, and salt accumulation, which in turn affects plant growth and photosynthesis, and consequently crop production and quality (Raviv & Blom, 2001).

Irrigation control involves the determination of both timing and quantity of water application. The most common and simple method used until now for scheduling irrigation consists in estimating the crop transpiration by means of the radiation-based method (Stanhill & Scholte, 1974). A solar integrator gives a starting signal to a water supply system after a previously set level of radiation is reached. An irrigation system controlled by a solar radiation method can appropriately supply nutrient solution to plants without unnecessary water and nutrient emissions (Roh & Lee, 1996). However, this method implies the knowledge of a 'crop coefficient', which varies in the function of the crop phenological stage. The fact that roses, unlike most other crops, are being constantly harvested and thereby exhibiting large fluctuation of the transpiring area must be taken into consideration when attempting to formulate any model for scheduling irrigation.

