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Surface irrigation management in relation to water infiltration and distribution in soils

A.M. Amer, K.H. Amer

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Water infiltration and storage under surface irrigation are evaluated, based on the initial soil water content and inflow rate as well as on the irrigation parameters and efficiencies. For that purpose, a field experiment was conducted using fruitful grape grown in alluvial clay soil at Shebin El-Kom in 2008 grape season. To evaluate the water storage and distribution under partially wetted furrow irrigation in comparison to the traditional border irrigation as a control method, two irrigation treatments were applied. They are known as wet (WT) and dry (DT) treatments, at which water was applied when the available soil water (ASW) reached 65% and 50%, respectively. The coefficient of variation (CV) was 6.2 and 10.2% for WT and DT respectively under the furrow irrigation system as compared to 8.5% in border. Water was deeply percolated as 11.9 and 18.9% for wet and dry furrow treatments respectively, as compared with 11.1% for control with no deficit. The application efficiency achieved was 86.2% for wet furrow irrigation achieving a high grape yield (30.7 t/ha). The relation between the infiltration (cumulative depth, Z and rate, I) and opportunity time (t_0) in minutes for WT and DT treatments was: $Z_{WT} = 0.528 t_0^{0.6}$, $Z_{DT} = 1.2 t_0^{0.501}$, $I_{WT} = 19 t_0^{-0.4}$, $I_{DT} = 36 t_0^{-0.498}$. Also, empirical power form equations were obtained for the measured advance and recession times along the furrow length during the irrigation stages of advance, storage, depletion, and recession.

Keywords:

grape yield; infiltration parameters; irrigation evaluation; linear distribution; soil water storage; surface irrigation (furrow/border); water use efficiency

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Ing. Markéta Knížková
Executive Editor
phone: + 420 227 010 373
e-mail: swr@cazv.cz

Address

Soil and Water Research
Czech Academy of Agricultural
Sciences
Slezská 7, 120 00 Praha 2,
Republic

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