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Effect of drip irrigation circuits design and lateral line length on: II-flow velocity and velocity head

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ABSTRACT

The objectives of the work were to study the effect of drip irrigation circuits (DIC) and lateral lines lengths (LLL) on: Flow velocity (FV) and velocity head (VH). Laboratory tests were conducted at Irrigation Devices and Equipments Tests Laboratory, Agricultural Engineering Research Institute, Agriculture Research Center, Giza, Egypt. The experimental design of laboratory experiments was split in randomized complete block design with three replicates. Laboratory tests carried out on three irrigation lateral lines 40, 60, 80 m (LLL₁, LLL₂; LLL₃) under the following three drip irrigation circuits (DIC): a) one manifold for lateral lines or closed circuits with one manifold of drip irrigation system (CM₁DIS); b) closed circuits with two manifolds for lateral lines (CM₂DIS), and c) traditional drip irrigation system (TDIS) as a control. Concerning FV values, DIC and LLL treatments could state in the following ascending orders: TDIS < CM₁DIS < CM₂DIS and LLL₁ < LLL₂ < LLL₃, respectively. FV varied from 0.593 m·sec⁻¹ to 1.376 m·sec⁻¹. i.e FV < 5 ft·sec⁻¹ and this is necessary to avoid the effect of water hammer in the main and sub-main lines, but in lateral line, it can cause silt and clay precipitation problems. The differences in FV among DIC and LLL were significant at the 1% level. The effect of interaction: DIC X LLL on FV values, were significant at the 1% level. The maximum and minimum values of FV were noticed in these interactions: CM₂DIS X LLL₃ and TDIS X LLL₁, respectively. The following ascending orders TDIS < CM₁DIS < CM₂DIS and LLL₁ < LLL₂ < LLL₃ expressed their effects on VH respectively. Differences in VH among DIC and/or LLL were significant at the 1% with few exceptions. The effects of interactions: DIC X LLL on VH were significant at the 1% level in some cases. The maximum and minimum values of VH were found in the interactions: CM₂DIS X LLL₃ and TDIS X LLL₁, respectively.

KEYWORDS

Drip; Irrigation; Circuit; Laterals; Flow; Head; Velocity

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