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WATER DISTRIBUTION PATTERN, DISCHARGE UNIFORMITY AND APPLICATION EFFICIENCY OF LOCALLY MADE EMITTERS USED IN A TRICKLE SUBUNIT

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ABSTRACT

The experiments were conducted at the experimental site near the Faculty of Agricultural Engineering, Sindh Agriculture University, Tandojam. A trickle irrigation system was installed in a 25 m long and 14.5 m wide plot. The plot was equally divided into three subunits and 18 laterals, each with 8 m length, were laid in each unit. Two types of locally made trickle emitters (smooth and spiral) were tested. The hydraulic performance of emitters was based on water flow, uniformity coefficient, application efficiency, and water losses through deep percolation.

The flow volumes along the lateral length were fairly consistent and the variation was diminutive under both types suggesting uniform distribution of water. Due to reasonably constant emitter discharges, the system achieved rationally high distribution uniformity (D_U), uniformity coefficients (C_U), and application efficiencies (E_a). The uniformity coefficient (C_U) values for randomly selected laterals using smooth emitters averaged to 81.7% and spiral emitters averaged to 87.4%. The D_U values averaged to 75.4% for the smooth emitters, and averaged to 81% for the spiral emitters. The overall application efficiencies achieved were 82.7% and 89.4% for the smooth and spiral emitters, respectively. The higher values of C_U, D_U, and E_a with spiral emitters as compared to smooth emitters suggest that they performed better and could be preferred to achieve uniform water distribution.

Water movement below the emission point was more pronounced in the vertical rather than in the horizontal direction. In most cases, the wetting front followed an axially symmetric pattern. The water movement pattern showed that the wet area was about 0.35 m wide and 0.56 m deep. The root zone for many short rooted crops is located in this range hence the percolation losses would practically be negligible under such situations.

Keywords: Design parameters, emitters, percolation, trickle irrigation, uniformity coefficient

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