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Water Application Uniformity of a Subsurface Drip Irrigation System at Various Operating Pressures and Tape Lengths

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Abstract: Subsurface irrigation has been the focus of attention mainly because of its low evaporation rate and deep percolation losses. Uniformity of water applications and its stability, however, are still a matter of controversy and deserve more investigation. An experiment was conducted at the research station of Tabriz University to evaluate discharge variation among emitters and uniformity after 3 years of operation at different pressures, as well as to determine the optimum length for irrigation tapes. Four hydraulic pressures, 50, 90, 150, and 200 kPa, 4 irrigation tapes 34 m long (used tape) installed at a depth of 10 cm, and 5 new irrigation tapes (unused) 34, 50, 80, 100, and 120 m long comprised the experimental treatments. The used tapes were chosen from a subsurface irrigation system that operated for 3 years for onion irrigation. The new tapes (unused) were the same as the used ones and were laid on the soil surface during the experiment. Emitter discharge and pressure were measured every 2 m along both the used and unused tapes at the above mentioned operating pressures, and data were analyzed to compute several uniformity criteria using traditional and ASAE EP458 methods. In both used and unused tapes, emitter performance (V_{pf}) at 150 kPa was better than at 50, 90, and 200 kPa. The maximum uniformity coefficient (UC) values of the unused and used tapes 34 m long were 96.9% and 91.8%, respectively. Considering the variation in UC with tape length and an engineering approach toward the performance of the system for used tape, the 80-m length was determined as a suitable length for irrigation tape. The result indicated that both traditional and ASAE methods are suitable for the evaluation of subsurface drip irrigation systems. The ASAE method, however, showed slightly lower uniformity in both unused and used tapes (1.6% and 3.65%, respectively).

Key Words: Subsurface drip irrigation, emitter discharge, uniformity coefficient, emitter performance

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