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Determination of Hydraulic Performances of In-Line Emitters

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Abstract: The efficiency of trickle irrigation systems depends directly on the uniformity with which water is discharged from the emission devices throughout the system. Ideally, all emitters in the system should discharge equal amounts of water. One major cause of flow rate difference between two identical emitters from the same manufacturer is the manufacturing variation. In this study, manufacturers' rated discharges and coefficient of manufacturing variation values were compared with tested values for various in-line emitters. Discharge rates from 12 different types of trickle irrigation emitters were collected at six different operating pressure levels. Pressure compensating emitters were tested at 50, 100, 150, 200, 250, and 300 kPa. Nonpressure compensating emitters were tested at 75, 100, 125, 150, 175 and 200 kPa. Coefficient of manufacturing variation, emitter exponent and discharge exponent values were evaluated to determine the flow regime of each emitter. At the suggested operating pressure only nine of the twelve emitters had flow rates within 10% to those claimed by the manufacturers. All the noncompensating emitters had flow rates much higher than expected. Measured values of coefficient of manufacturing variation were higher for compensating emitters, and unexpectedly they were slightly sensitive to pressure differences.

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