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Development of a Mathematical Model Using Dimensional Analysis for Predicting the Friction Losses in Drip Irrigation Laterals with Cylindrical Type In-Line Emitters

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Abstract: This paper presents a prediction model developed using dimensional analysis for friction losses in drip irrigation laterals. Drip irrigation laterals with cylindrical type in-line emitters placed at different spacings ranging from 0.2 to 1 m were considered. The parameters affecting the variation in friction losses in laterals were defined as dimensionless terms using Buckingham's pi theorem. In order to develop a model, experimental friction loss data from 14 different drip irrigation pipes, and some domestic and some imported ones with the above-mentioned spacings were used. The model developed in this study accounted for 98.7% of the variation in the data. The results showed that the mathematical model may be used to determine friction losses in drip laterals with cylindrical type in-line emitters with spacings ranging from 0.2 to 1 m.

Key Words: Drip irrigation, emitters, friction loss, mathematical model, dimensional analysis

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