

عنوان مقاله:

A Mathematical Model for Hydraulic Characterization of Microtube Emitters Using Dimensional Analysis

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خلاصه مقاله:

A microtube emitter is a simple, low-cost emitter in which the length can be adjusted according to the distribution of pressures along an irrigation lateral line to deliver uniform discharge. To accurately design micro-irrigation systems using microtubes, it is necessary to use an equation that correlates hydraulic parameters, microtube characteristics, and fluid properties. Therefore, the objectives of this research were: (a) To develop an equation for design purposes using dimensional analysis by Buckingham's Pi theorem to represent the hydraulic processes in a microtube emitter operating in the laminar flow regime and (b) To compare the accuracy of the developed model against models that are currently used for microtube sizing. The data required to develop and validate the model was obtained experimentally in the laboratory by evaluating three types of microtubes with nominal diameters of 0.7, 0.8 and 1.0 mm. A model using pressure head, microtube length, flow rate, internal diameter, gravitational acceleration, and water properties was proposed and validated. The model for estimating hydraulic parameters in microtube emitters also presented better performance than other models available in the literature. Finally, an application example was presented and an irrigation lateral line using microtubes as emitters was designed using the proposed model.

کلمات کلیدی:

Buckingham's Pi theorem, Laminar flow, Micro-irrigation

لینک ثابت مقاله در پایگاه سیویلیکا:

