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Determination of hydraulic characteristics of porous pipe irrigation laterals and water distribution pattern in sandy oil

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Determination of hydraulic characteristics of porous pipe **...** - [Traduzca esta página]
... sensitive to pressure with discharge exponent ranging from 0.93 to 1.04 for the "Precision" porous pipe, and from 1.04 to 1.48 for the "**Poritex**" porous pipe. **...**
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Abstract

Irrigation systems are well known for their low efficiencies. Microirrigation system is becoming popular even in humid areas because of the many advantages it offers. Microirrigation is really the first irrigation method that can potentially maximize productivity while conserving soil, water and fertilizer resources and simultaneously protecting the environment. Since a micro irrigation system can achieve very high application efficiency, it should be further explored even for supplemental irrigation in a high-rainfall tropical country like Malaysia, with annual rainfall exceeding 2500mm. Porous pipe is useful both for surface and subsurface micro irrigation systems and it can be used in a variety of ways to meet any irrigation need. However very little information is available about the discharge uniformity, operating characteristics and the moisture distribution pattern of porous pipe irrigation laterals. This research work on the hydraulics of two types of porous pipe was carried out to determine such performance criteria as the pressure-discharge relationship, pressure headloss, friction factor Reynolds number relationship and water dispersion in the soil. The water distribution pattern was observed in a soil box. Several lengths of imported porous pipes were subjected to various upstream pressure inputs to determine the average discharge along the lateral and the associated pressure losses.
The flow in the emitter lateral was found to be highly sensitive to pressure with discharge exponent ranging from 0.93 to 1.04 for the "Precision" porous pipe, and from 1.04 to 1.48 for the "Poritex" porous pipe. The discharge along the porous pipe is exponentially related to pressure head variation. The average discharge rate is low (<3 L/h/m for "Precision" and <5 L/h/m for "Poritex" porous pipe) for the pipe lengths tested in this study with operating pressures up to 1 bar. The study found high head loss due to rough inner pipe wall especially in "Precision" porous pipe though for good irrigation uniformity head loss should be small. Result from the moisture distribution pattern study in a fine-medium sand indicated that the wetted strip was oval shape with greater vertical movement rather than lateral spread. Based on the results of the study, graphs were developed to facilitate design of porous pipe irrigation laterals for various applications. The friction factor was found to be 387 %. for "Poritex" and 285 % for "Precision" porous pipes above than that of the smooth pipe. The placement of an impervious pvc channel 15 cm under the porous pipe increased lateral spread by 10%.

Keywords

Determination; hydraulic; characteristics; porous; pipe; irigation; laterals; water; distribution; pattern; sandy; oil