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Model to Design Drip Hose Lateral Line

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Introduction

The design criterion for non-pressure compensating drip hose is normally to have 10% of flow variation (Δq) in the lateral line, corresponding to 20% of head pressure variation (ΔH).

Longer lateral lines in drip irrigation systems using conventional drippers provide cost reduction, but it is necessary to obtain to the uniformity of irrigation [1]. The use of Δq higher levels can provide longer lateral lines. [4] proposes the use of a 30% Δq and he found that this value resulted in distribution uniformity over 80%.

[1] considered it is possible to extend the lateral line length using two emitters spacing in different section. He assumed that the spacing changing point would be at 40% of the total length, because this is approximately the location of the average flow according with [2]. [3] found that, for practical purposes, the average pressure is located at 40% of the length of the lateral line and that until this point it has already consumed 75% of total pressure head loss (*hf*).

In this case, the challenge for designers is getting longer lateral lines with high values of uniformity.

Objective

The objective of this study was to develop a model to design longer lateral lines using non-pressure compensating drip hose. Using the developed model, the hypotheses to be evaluated were: a) the use of two different spacing between emitters in the same lateral line allows longer length; b) it is possible to get longer lateral lines using high values of pressure variation in the lateral lines since the distribution uniformity stays below allowable limits.

Methodology

A computer program was developed in Delphi® based on the model developed and it is able to design lateral lines in level using non-pressure compensating drip hose. The input data are: desired distribution uniformity (DU); initial and final pressure in the lateral line; coefficients of relationship between emitter discharge and pressure head; hose internal diameter; pipe cross-sectional area with the dripper; and roughness coefficient for the Hazen-Williams equation. The program allows calculate the lateral

line length with three possibilities: selecting two spacing between emitters and defining the exchange point; using two pre-established spacing between emitters and calculating the length of each section with different spacing; using one emitter spacing.

Results

Results showed that the use of two sections with different spacing between drippers in the lateral line didn't allow longer length but got better uniformity when compared with lateral line with one spacing between emitters. The adoption of two spacing increased the flow rate per meter in the final section which represented approximately 80% of the lateral line total length and this justifies their use. The software allowed DU above 90% with pressure head variation of 40% and the use of two spacing between emitters.

Conclusions

The developed model/software showed to be accurate, easy to handle and useful for lateral line design using non-pressure compensating drip hose.

References

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