

Research Paper :

Performance evaluation of three different types of micro-sprinklers

P.V. PATIL, M.S. PATIL AND U.S. KADAM

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ABSTRACT

Laboratory Studies on hydraulic performance of micro-sprinklers was undertaken to study the pressure discharge relationship, manufacturers coefficient of variation and precipitation pattern for the operating heads in the range of 1.0 to 2.40 kg/cm² with increment of 0.2 kg/cm². Pressure discharge relationship of form $Q=aH^b$ were developed for all three micro-sprinklers under study. The discharge exponents (b) were found as 0.5487, 0.5036 and 0.6459 proportionality constants (a) as 72.424, 49.807 and 32.216 for S-1, S-2 and S-3 micro-sprinklers, respectively. High value of coefficient of correlation R^2 greater than 0.97 indicated the close goodness of fit. Manufacturer's coefficient of Variation for S-2 and S-3 Micro-sprinkler recorded in the range of 0.0262 to 0.0462 and 0.0236 to 0.0356, respectively reflecting better precision in their manufacturing whereas, the S-1 micro-sprinkler, recorded the value in the range of 0.2516 to 0.3654 indicating it's poor manufacturing quality from above results, no definite trend was observed between the operating pressure and manufacturer's coefficient of variation.

See end of the article for authors' affiliations

Correspondence to:

P.V. PATIL

Department of Agricultural Engineering, College of Agriculture, Baramati, PUNE (M.S.) INDIA
Email : pallavigokulpatil@rediffmail.com

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Water is a prime natural resource, a basic human need and a precious national asset. Therefore, efficient utilization of water for irrigation is necessary. Water is the most important input among all inputs required by the plant to fulfill its water requirement for its biological activities. As water is scarce, its efficient utilization is the need of time. Irrigation is nothing but the artificial application of water to soil for the purpose of crop production and to supplement the water available from rainfall and soil moisture from ground water.

Drip and sprinkler systems are the leading pressurized irrigation systems. In Drip irrigation system, after limited use it requires more maintenance due to clogging and the vast pipe network.

The sprinkler irrigation systems require high energy and high investment and, therefore, limitations for adoption on the fields. The micro-sprinkler irrigation systems have the advantages over sprinkler and drip irrigation system. This is intermediate irrigation system over drip and sprinkler.

Micro-sprinklers are designed to distribute water in the form of a fine rain like shower. By applying the right amount of water at the correct irrigation rate, there will be neither seepage beyond root zone nor problem of aeration in the root zone caused by water logging.

Micro-sprinklers wet only about 40 to 80 per cent of the soil surface in a mature orchard. The area wetted by the micro-sprinklers can be adjusted according to the development of root system without any additional expenses.

Visual inspection of the micro-sprinklers is simple and fast, less time is required for inspection as compared to several system. A large mesh filter screen used in micro-irrigation allows for longer operating time between cleaning. Fertilizers are directly applied to the root zone of the plants. Even elements of low soil mobility *i.e.* (N.P.K) shows good distribution in the soil when applied through micro-sprinkler.

Micro-sprinklers give better results in orchards and due to this, it has great scope in Maharashtra. Govt. provides 75% subsidy on micro-sprinklers for oilseed, pulses, cereals and cotton and 50% for horticulture crops.

Considering the several benefits/advantages of micro-sprinkler irrigation system over drip and sprinkler irrigation system, for efficient utilization the special attention need to be given to the design of system. Therefore, it was felt necessary to evaluate the hydraulic parameter of micro-sprinkler with the following objectives which are useful for proper design of system.

– To establish the pressure discharge relation-ship