

Analysis of Water Distribution Uniformity for Two Types of Sprinklers used in Sprinkler Irrigation Systems under Various Climatic and Hydraulic Conditions

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Abstract

In order to increase the distribution uniformity of sprinkler irrigation systems, some influential parameters such as wind speed, arrangement, space and type of sprinklers must be studied and controlled. In this study, a set of experiments were conducted based on ISO 7749/2(1990) standard to evaluate the ADF 25⁰ and Nelson, F80APV sprinklers. To study the effects of wind velocity, operating pressure, various sprinkler layouts and spacing on water distribution uniformity, the experiments were conducted based on a single sprinkler method. Four operating pressures in the range of one recommended by the manufacturer for each sprinkler were applied and three sprinklers' spaces on lateral pipelines (22, 26, and 30 m) were simulated for square and rectangular layouts to estimate the water distribution uniformity. Results showed that the distribution uniformity of Nelson sprinkler in existing wind velocities and operating pressures had smaller changes than ADF sprinkler. The 4.5 bar pressure for ADF sprinkler was better than other pressures, and operating pressures for Nelson sprinkler did not have any significant effect on distribution uniformity. With the decrease of sprinkler spacing to the wetting diameter in the simulated space, uniformity coefficient was increased. The recommended sprinkler spacing to the wetting diameter for these sprinklers ranged from 0.4 to 0.5 for square and rectangular layouts.

Keywords: Distribution uniformity; Pressure; Sprinklers layout; Wind velocity.

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