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(In the Field of Irrigation & Drainage)

Optimization of Drip-tape Irrigation System in Winter Wheat Cultivation

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Abstract

Proper design of the effective factors in hydraulic operation appropriate to the field and crop are of the most basic conditions for success in a drip-tape irrigation system. Important and sensitive parameters in this regard include lateral spacing, emitter spacing and emitter discharge. Incorrect selection of any of these parameters affects the performance of a type drip irrigation system and wastes resources. Therefore, the present study aimed to investigate the effect of different parameters of a drip-tape irrigation system including irrigation lateral spacing, emitter spacing, emitter discharge and different levels of irrigation on yield and its components and water use efficiency in wheat, were conducted in three separate sets of experiments at the Research Farm of the Soil and Water Research Institute of Mashkinadasht, Karaj, Alborz province. The first experiment aimed to investigate the effect of lateral spacing (at three levels of 30, 45 and 60 cm), emitter spacing (at three levels of 10, 20, and 30 cm) and the interaction of these two factors, The second experiment aimed to investigate the effect of lateral spacing (at three levels of 30, 45 and 60 cm), Deficit Irrigation (at three levels of 100, 75, and 50% water requirement) and the interaction between these two factors and the third experiment aimed to investigate the effect of lateral spacing (at three levels of 30, 45 and 60 cm), emitter discharge (at three levels of 2, 1.5 and 3 liters per hour) and the interaction of these two factors. In order to compare the strip irrigation system with surface irrigation system, three surface irrigation treatments with 100, 75 and 50% water requirement were also considered. All experiments were performed as factorial with two factors based on randomized complete block design with four replications. The results showed that lateral spacing had a direct effect on wheat yield, so that wheat yield decreased with increasing the lateral spacing. In most of the indices studied, the emitter spacing of 20 cm (E2) was superior to the different laterals spacing. 45 cm lateral spacing, in spite of lower grain yield than 30cm lateral spacing treatment, was more economical than the other two lateral spacings in accordance with the situation of farmers (crop rotation of forage maize and wheat) that can be used in wheat cultivation. So more attention should be paid by the wheat farmers. The results also showed that yield decreased with decreasing irrigation level. But the decreasing slop for lateral spacing of 30 cm was greater than 45 and 60 cm. Water use efficiency also decreased at a lateral spacing of 30 cm with decreasing irrigation levels. The results of this study showed that the most suitable type of discharge under preset experiment field conditions was 2 liter/hr.

Keywords: Drip-Tape Irrigation, Irrigation Tapes, Water Productivity, Deficit Irrigation