Effect of Different Levels of Irrigation and Nitrogen Fertilizer on Onion Yield and Water Use Efficiency in Three Irrigation Methods

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Abstract

In order to study the effects of different levels of irrigation, nitrogen fertilizer, and irrigation methods on yield and yield components of onions, a factorial split plot experiment was conducted in a randomized complete block design with three replications for two years at a research farm in Zahak, Iran. Fertilizer treatments included four levels of nitrogen from urea fertilizer (130, 97.5, 65 and 32.5 kg/ha). Onion seedlings were planted in 2014 and 2015 and irrigation was carried out in the form of surface gravity irrigation, surface drip irrigation and subsurface drip irrigation. The highest yield and water productivity were obtained in the subsurface drip irrigation system (28.42 ton/ha and 5.9 kg/m³/ha) and the least in surface irrigation (19 ton/ha and 33.3 kg/m³/ha). Reducing the amount of nitrogen fertilizer to less than plant requirement reduced the yield of bulbs and the efficiency of onions. The highest yield and water productivity were observed in 100% nitrogen application (31.59 ton/ha and 4.75 kg/m³/ha) and the lowest was in 25% nitrogen fertilizer treatment (16.12 ton/ha and 2.67 kg/m³/ha). The effect of irrigation water on the yield of onion tubers and its efficiency showed that decreasing the depth of irrigation water to values lower than the water requirement of the plant decreases yield and efficiency, but, no significant effect was observed between treatments 100% and 75% of the plant water requirement. Therefore, according to the results, due to the lack of water in the region, irrigation of this plant can be done with 75% of the plant water requirement, without a significant effect on the yield. Also, due to the high production potential in subsurface drip irrigation and reduction of evapotranspiration, this irrigation method could be used for onions in the region. The best treatment for nitrogen fertilizer use is the 100% nitrogen fertilizer requirement, especially in water tension. Considering the contamination of subsurface waters due to the excessive use of nitrogen fertilizers and the prevention of nitrate accumulation in the bulbs, it seems that using drip irrigation improves nitrogen fertilizer management.

Keywords: Water productivity, Onion bulb, Subsurface drip irrigation

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