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Study the Relationship Between Photosynthesis Efficiency, Photochemical Reaction and Growth of Pomegranate under Deficit Irrigation and Alternate Partial Root Zone Drying

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In this experiment the photosynthetic water use efficiency and photochemical reaction of pomegranate to deficit and alternate partial root zone drying irrigation were investigated. The experiment was carried out in a randomized complete block design (RCBD) with treatments including 1- full flood irrigation (with regard to crop water requirement) (T1) 2- flood irrigation with 100% of crop water requirement as alternate partial root-zone irrigation (T2) 3- flood irrigation with 50% of crop water requirement as regulated deficit irrigation (T3) 4- full two- side drip irrigation (with regard to crop water requirement) (eight drippers with 2 L/h flow by two different individual network) (T4) 5- alternate partial root-zone drip irrigation with 100% of crop water requirement (T5) 6- regulated deficit drip irrigation with 50% of crop water requirement (T6) in every irrigation period. The highest flower intensity, fruit set, yield and water use efficiency based on statistical analysis were belong to both PRD treatments i.e. alternate partial root-zone drip irrigation with 100% of crop water requirement and alternate partial root-zone flood irrigation with 100% crop water requirement, respectively. Partial root drying irrigation in both traditional flood irrigation and drip irrigation systems caused a significant increment of water use efficiency in pomegranate trees (up to 78.34 and 71.4%) in comparison with control. Increment of vegetative growth under full two-side drip irrigation and full flood irrigation treatments i.e. tree diameter (by 2.64 and 2.21 cm per year) and number of current season shoots (to 4.65 and 4.75 on one-year-old branches), showed the allocation of more photosynthetic material to vegetative growth that could reduce the yield and in consequence water use efficiency in pomegranate. Because of higher photosynthesis efficiency, yield and water use efficiency in alternate partial root-zone drip irrigation, it application is recommended for the region.

Keywords: Irrigation, Photosynthetic water use efficiency, Pomegranate, Vegetative growth, Water use efficiency, Yield.

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