WATER USE EFFICIENCY OF SOYBEAN UNDER DIFFERENT TILLAGE AND IRRIGATION METHODS

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B.Sc. Agric.Sci. (Soil Science), Fac. Agric.,Cairo Univ., 2000

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ABSTRACT

Two field studies were carried out during two growing seasons of 2012 and 2013 at the Water Requirements Research Station, Water Management Research Institute, Kafer El-Sheikh Governorate. The study aimed to compare two irrigation methods, surge (SI) and alternate (AI) with traditional furrow irrigation method (FI) in relation to two tillage systems, conventional (CT) and no-tillage (NT) on water use efficiency and crop yield production of soybean. In both seasons, the lowest amount of irrigation water was applied with AI treatments, whereas, the highest amount of irrigation water was applied with FI treatments. The irrigation water amounts were saved by using AI and SI methods. The AI and SI saved about 29.0 % and 15.0 % of water applied in comparison with FI under CT and NT systems. Surge and alternative irrigation prove to be water saving methods.Irrigation water productivity (IWP) and crop water use efficiency (CWUE) were higher when applying AI compared to SI and FI under both tillage systems. Surge irrigation had the potential to improve irrigation application efficiency (IAE) followed by AI compared to FI. The highest seed yield and yield attributes were obtained with FI followed by SI and AI in both seasons, respectively. Significant differences in seed yield, yield attributes and plant growth characteristics were found only between FI and AI under CT and NT. The SI surpasses the AI in obtaining higher seed yield, yield attributes without any significant reduction of soybean yield. These results suggesting that an extra irrigation water amount may be saved without any significant loss in yield of soybean when applying SI method under both tillage systems. The results also showed the effect of CT on reducing applied water and increasing irrigation water productivity and crop water consumptive use compared to NT. However, no significant difference between the two tillage systems in yield and yield attributes was found. Values of ETc should be adjusted according to the used irrigation and tillage methods. The crop water stress index (CWSI) has proven to be a good indicator for monitoring and quantifying water stress of soybean with different irrigation methods and tillage systems. Economically, the highest net return was obtained under CT with (FI). Whereas, the highest net return from water unit was obtained with (AI) as compared to (SI) and (FI) under both tillage systems.

Key word: Surge irrigation, Alternative irrigation, Furrow irrigation, Conventional tillage, No-tillage, Water productivity, Crop water use efficiency, Crop water requirements, Yield, Yield attributes, Soybean

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