

Effect of Continuous Deficit Irrigation of Soybean [*Glycine max* (L.) Merrill] in a Semi-arid Environment of Argentina

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Abstract

An important challenge of irrigated agriculture is to increase irrigation water productivity since there is worldwide scenario of reduced availability of water for irrigation and an increased demand for food production. Continuous and regulated deficit irrigation (CDI and RDI, respectively) could be the appropriated irrigation strategies to tackle this challenge. With the objective of evaluating the effect of different strategies of SDI in soybean, a field experiment was implemented at the INTA-Santiago del Estero Exp. Station. For two contrasting sowing dates (SD), 12/22/2011 and 01/25/2012 five irrigation treatments or water regimes (WR) (T100, T75, T50, T25 and T0%), were applied, restocking 100, 75, 50, 25 and 0% of crop evapotranspiration. Yield Crop (Y), the Actual Crop Evapotranspiration (ETa), and Total Irrigation Depth belong to all treatments were used to calculate two Water Productivity data for each treatment. The first one was calculated as ratio Y and ETa (WPETa), and the second one was determinate as ratio Y and Total Irrigation Depth (WPirrigation). The crop responses to treatments, were independent of the SD (SD*WR interaction was not significant at $p = 0.05$ for all variables). Y was significantly associated with ETa ($Y = 0.01 \cdot ETa^2 + 14.36 \cdot ETa - 1479$; $R^2 = 0.81$; $p < 0.05$), with both Y and ETa significantly different ($p < 0.05$) between WR and SD. The T75% highlighted among treatments, since its ETa and Y were less or equal than those from T100%, with no significant differences between WR ($p = 0.05$). Conversely, WPirrigation showed significant differences, being higher in treatments with lower irrigation depth. At second SD, yield was lower but both WPETa and WPirrigation significantly increased ($p < 0.05$) due to the lower evaporative demand of the atmosphere (ETo decreased 8%). Results indicate that irrigation water depth could be reduced by 25% without any significant yield losses and that PAETa could be increased with selected SD.

Keywords: continuous deficit irrigation, water productivity, soybean