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Interaction between the Effects of Deficit Irrigation and Water Salinity on Yield and Yield Components of Rice in Pot Experiment

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Abstract: Water scarcity and salinity are important limitations for agricultural production in semi-arid region. The purpose of this research is to study the interaction between the effects of water salinity and deficit irrigation on yield as grain per pot and yield components in greenhouse conditions. The irrigation treatments were continuous flooding (control), intermittent flooding (intervals of 1 or 2 d); W_0 , W_1 , and W_2 , respectively. The salinity levels of irrigation water were 0.6 (control), 1.5, 3.0, 4.5 and 6 dS m^{-1} in year of 2005 and 0.6 (control), 1.5, 2.5, 3.5 and 4.5 dS m^{-1} in the year of 2006, which are referred to as S_0 , S_1 , S_2 , S_3 and S_4 , respectively. A local cultivar (Kamphiroozi) was planted in pots in a greenhouse in 2005 and 2006. The results indicated that grain weight per pot was not significantly different between continuous flooding and intermittent flooding at 1-d intervals. The volumetric water contents of soil before each irrigation in the intermittent flooding at 1- and 2-d intervals were 0.36 and 0.34 $\text{cm}^3 \text{cm}^{-3}$ with a corresponding matric head of -431 cm and -594 cm, respectively. The grain weight per pot was not reduced significantly by salinity level of 1.5 dS m^{-1} in W_0 and W_1 , while it decreased significantly at salinity levels higher than 2.5 dS m^{-1} in W_2 . With increasing irrigation water salinity levels from S_0 to S_1 , the straw weight per pot increased significantly. Generally, increased irrigation water salinity reduced 1000-grain weight, but water stress mitigated the reduction of 1000-grain weight by salinity. With increasing irrigation salinity beyond threshold (1.5 dS m^{-1}), deficit irrigation resulted in significantly higher number of spikelets per panicle compared with flooding irrigation. Increased salinity with deficit irrigation resulted in a higher percent of unfilled grain.

With increasing salinity level of irrigation water beyond the threshold values (1.5 dS m^{-1}) the deficit irrigation resulted in a lower percent of unfilled grain, respectively. The reduction of average grain weight per pot per unit increase of salinity of saturation extract was 14.5% per dS m^{-1} in continuous flooding, and 11.0% per dS m^{-1} in intermittent flooding (1-d and 2-d intervals) in the two years of study. The average reduction of grain weight per pot per unit increase in irrigation water salinity was 38.0% per dS m^{-1} in continuous flooding, 17.0% per dS m^{-1} in intermittent flooding (1-d and 2-d interval) during the two years of study. Finally, it is concluded that with saline water at $2.5\text{--}3.0 \text{ dS m}^{-1}$, intermittent irrigation is preferable for rice production and with saline water at 3.5 dS m^{-1} or higher continuous flood irrigation failed to produce grains, but intermittent irrigation produced some grains whose weight per pot was about 50% of that in non-saline irrigation water.

Keywords: [Matric and osmotic head](#), [Saline water](#), [Water saving irrigation](#)

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