Effect of Salinity and Amount of Irrigation Water on Forage Sorghum Yield in Sistan Plain

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Abstract

The main factor for managing and scheduling irrigation in dry area, is the plant response to drought stress. The majority of irrigation water in these areas contains soluble salts, therefore, salinity stress should be considered at the same time. Hence, this study was conducted in order to obtain the optimum depth of irrigation, considering drought and salinity stress individually and simultaneously, at three cutting times of forage sorghum in Sistan plain.This experiment used split plot in time in a factorial design with three levels of salinity (2, 5, and 8 $dS.m^{-1}$) and four irrigation levels (50%, 75%, 100%, and 120% water requirement) at three cutting stages, with three replications. The depth of the water was determined for salinity levels and at various cuttings. In order to determine the separate and combined effects of salinity and irrigation water, the following criteria were used were used in each cutting: the index of final production compared to irrigation water depth (MP_I), the final production compared to the salinity (MP_{ECw}), marginal rate of technical replacement for salinity and water ($MRTS_{I,\ ECw}$), the final output value of the irrigation water depth (VMP_I), and the final output value of the salinity (VMP_{ECw}). MP_I index showed that for each one centimeter increase in irrigation water depth, the first cutting had the least change in production(1.22 $ton.ha^{-1}$) and the third cutting had the maximum amount (9.2 $ton.ha^{-1}$). MP_{ECw} index showed that in the low salinity treatments, the second and third cuttings had, respectively, the lowest and the highest yield loss. MRTS index showed that in order for production to stay the same with one unit increase in salinity, the irrigation water depth must increase in the first, second, and third cuttings by, respectively, 5.86, 1.97 and 1.72 centimeter. Also, with increasing salinity levels in the all three cutting, optimum irrigation depth increased and in the all salinity levels, optimum irrigation depth in the first cutting was more than the second cutting, and in the second cutting it was more than the third cutting.

Keywords: Optimum irrigation depth, Assessment indicators, Output value.

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