Frequency of Deep Tillage and Residual Sodium Carbonate Neutralization of Sodic Water on Soil Properties, Yield and Quality of Clusterbean and Wheat Grown in a Sequence

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Abstract Use of sodic water for irrigation deteriorates the soil and adversely affects the yield and quality of crops. While use of gypsum for amelioration of sodic water effects is well established, the effect of frequency of deep tillage along with residual sodium carbonate (RSC) neutralization through application of gypsum on clusterbean (Cyamopsis tetragonolob L.)—wheat (Triticum aestivum L.) crop sequence irrigated with sodic water is not very well understood. The results of a field experiment designed to study these effects revealed that deep tillage significantly increased the grain and straw yields and improved the grain quality of clusterbean and wheat. Two years gap in deep tillage significantly reduced the grain and straw yields of clusterbean and wheat during the third year of experimentation when compared with continuous tillage or 1 year gap in deep tillage practices. The yield and quality of clusterbean (crude protein and gum content of grain) and wheat (protein, starch and lysine content of grain) were positively influenced by the application of gypsum @ 50 and 100% RSC neutralization of sodic irrigation water and good quality irrigation water compared to untreated sodic irrigation water. The infiltration rate decreased with sodic water irrigation under farmer’s practice of tillage. Application of gypsum @ 50 and 100% RSC neutralization of sodic water and good quality irrigation water improved significantly infiltration rate after harvesting of wheat, compared with sodic water irrigated plots. Similarly, deep tillage also significantly influenced infiltration rate. Sodic water irrigation for 4 years significantly increased electrical conductivity, pH and sodium adsorption ratio of soil compared to 50 and 100% neutralization of RSC and good quality irrigation water. This study shows that only up to 1 year gap in deep tillage in the month of May and 100% RSC neutralization through gypsum application at the beginning of monsoon had a positive effect on yield and quality of clusterbean and wheat in sodic water irrigated conditions.