

Effect of Clay Deposits and Irrigation levels on Growth and Water Use Efficiency of Wheat in Sandy Calcareous Soils of Saudi Arabia

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WATER research studies in the kingdom clearly showed that groundwater depletion was severely observed. Therefore, the scientifically applied research programs related to water saving and conservation in agriculture is essential, where agricultural activities account for more than 80% of the total consumed water. The undertaken study is a part of project on the use of natural clay deposits and organic matter to conserve irrigation water. In this study, two natural clay deposits at rates of (0, 1, 2, 3%) and one organic matter at rate of (0, 20, 40, 60 ton/ha) were used in the field experiment during 2000-01 and 2001-02 seasons. The materials were mixed with the top 20 cm of the soil surface of plots (2mx2m). Three irrigation levels were applied based on an ID/CPE ratio, where ID is irrigation depth as 60 mm for each irrigation, and CPE is cumulative evaporation from USWB class A pan. Three replicates were carried out for each treatment with the total plots of 108. Through the growing season, irrigation water was calculated and soil samples were collected for salinity evaluation and soil moisture was monitored.

Results indicate that bentonite clay (B2) gave the best yield of wheat (*Triticum aestivum*, c.v. yacora rajo) followed by organic matter (OM), when compared to the control. Grain yield increased 30% with B2 and 10 % with OM from that of the control. The results also indicated that B2 at 2% rate increased the biological yield and grain yield by 36% and 40%, respectively. Thus resulted in an increase of water use efficiency and conserved water. Also, results showed that these conditioners have a capacity to store water in the root zone. Salts were accumulated in the root zone area particularly at the non-stressed treatment as a result of using saline irrigation water (3.88 dSm⁻¹). Such accumulation was more pronounced in the organic matter treatments.

Keywords: Soil conditioning, Clay deposits, Irrigation levels, Sandy calcareous soil, Wheat.