

Impact of Sulfate-Rich Water and Organic Manures on Wheat Grown in Arid Soils

A. S. MODAIHSH
W. A. AL-MUSTAFA
A. E. ABDALLAH
A. A. EL-SHALL

Soil Science Department
College of Agriculture
King Saud University
Riyadh, Saudi Arabia

*A pot experiment with four replicates was conducted to study the effect of sulfate-rich water and organic manures on wheat (*Triticum aestivum* L. cv. Yecora rojo) grown in highly calcareous ($\text{CaCO}_3 = 26.5\%$) loamy sand soil. Two sources of organic manures, farmyard manure (FYM) and sewage sludge, were applied at three rates (0, 25, and 50 Mg ha^{-1}). All pots received the recommended amounts of inorganic fertilizers. Three concentrations of sulfate waters were utilized: 30, 60, and 90 mM SO_4^{2-} . Each concentration had the same EC (5 dS m^{-1}), and the sodium absorption ratio (SAR) was 6.0. Irrigation was practiced with a 30% leaching fraction. Irrigation with sulfate water affected the values of pH and EC and improved the availability of nutrients in soil. Application of either FYM or sewage sludge enriched the soil with nutrients, especially at the higher application rate. The usage of sulfate water at 60 mM SO_4^{2-} significantly ($P < 0.05$) increased wheat yield and yield components. Application of FYM gave a higher yield response compared with the sludge treatment. No response was obtained with increasing the rate of FYM or sewage sludge application up to 50 Mg ha^{-1} . Sulfate-rich water may be safely used for irrigation at high concentrations (90 mM SO_4^{2-}) whenever organic manuring is practiced.*

Keywords sulfate waters, farmyard manure, sewage sludge, wheat, water quality

The usage of sulfate-rich water to irrigate crops grown in arid and semiarid regions is commonly practiced. However, little information is available in the literature concerning this approach. The harmful effect that might arise due to irrigation water high in sulfate is still questionable, as plant genotypes may differ widely in their tolerance. Papadopoulos (1986) studied the effect of sulfate-rich irrigation water on soil salinity and yields of tomato and eggplant. Irrigation with water high in sulfate (38.8 mM SO_4^{2-}) had subsequent adverse effects on yield and/or quality of both crops. In contrast, Modaihsh and Al-Sadon (1994) showed that tomatoes could tolerate up to 90 mM SO_4^{2-} . Hilal et al. (1990), in an analogous study on the response of wheat and fodder plants to sulfur,

Received 30 September 1993; accepted 2 February 1994.

Address correspondence to A. S. Modaihsh, Soil Science Department, College of Agriculture, King Saud University, P.O. Box 2460, Riyadh 11451, Saudi Arabia.