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## ENHANCING SOIL PROPERTIES AND CROP GROWTH IN VARIED-TEXTURE SOILS: EVALUATING THE EFFICACY OF BIOCHAR IN MITIGATING IRRIGATION WATER SALINITY

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### Abstract

The dwindling freshwater resources and escalating pressure on them have underscored the imperative of utilizing low-quality saline water for irrigation. Nevertheless, this practice often exacts a toll on soil quality and leads to a decline in crop yield and quality. Consequently, there is an urgent demand for innovative, environmentally sustainable approaches to safeguard soil health and crop productivity when utilizing saline water for irrigation. Pyrolyzed biomass, commonly known as biochar, emerges as a promising and eco-friendly soil amendment with the potential to withstand the rigors of salinity stress. In light of this, our study aims to assess the impact of different rates of biochar application in mitigating the effects of varying levels of irrigation water salinity across diverse soil textures. We investigate alterations in soil properties, enzymatic activities, mineral content, as well as the physiological and morphological attributes of tomato plants. The objective is to comprehensively understand the potential of biochar to ameliorate salt stress under different soil conditions. Our findings indicate that biochar, when employed in conjunction with NaCl-laden irrigation water, enhances the physiological and morphological characteristics of tomato plants, augments the concentrations of essential nutrients such as N, P, and K, and fosters the development of soil aggregate stability. Furthermore, biochar positively influences pH levels, organic matter content, total N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, cation exchange capacity (CEC), and soil enzyme activities. Importantly, it fortifies the crop's resilience to salinity stress. Significant disparities between soil textures are discerned in all assessed parameters; however, biochar consistently exhibits its salinity-mitigating efficacy across all soil types. In summary, our research underscores biochar as a promising and universally applicable solution for mitigating stress and enhancing the quality of tomato crops and soil health when confronted with the challenge of saline water for irrigation.

*Key words:* biochar, irrigation water salinity, soil properties, soil texture, tomato

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