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### Abstract

Enhancing plant productivity on contaminated soils by using natural supplementations are urgently seeking. Two main field trials were conducted to study the potential effects of moringa seed (MSE; 0.5%) extraction growth and yield, physio-biochemical components, antioxidant defense system, and contamination of pepper plants grown on heavy metals-contaminated saline soil. MSE was applied in two single treatments (i.e., with drip irrigation water; SA or as foliar spray; FS) or in integrative (i.e., MSE-SA + MSE-FS) treatment. The results showed that all single or integrative treatments significantly increased plant growth and yield, leaf contents of leaf photosynthetic pigments, free proline, total soluble sugars, N, P, and  $K^+$ , ratio of  $K^+/Na^+$ , and activities of CAT, POX, APX, SOD and GR, while significantly reduced contaminants;  $Na^+$ , Cd, Cu, Pb and Ni contents in plant leaves and fruits compared to the control (free from MSE). Additionally, the integrative MSE-SA + MSE-FS treatment significantly exceeded all single treatments in this concern. The integrative MSE-SA + MSE-FS treatment was the best that it had been recommended for maximizing pepper fruits with minimizing contaminants on heavy metal-contaminated saline soils.