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Abstract

The applications of effective microorganisms (EMs) and/or nitrogen (N) have a stimulating role on plants against abiotic stress conditions. The aim of the present study was to determine the impact of the co-application of EMs and N on growth, physio-biochemical attributes, anatomical structures, nutrients acquisition, capsaicin, protein, and osmoprotectant contents, as well as the antioxidative defense system of hot pepper (*Capsicum annum* L.) plants. In the field trials, EMs were not applied (EMs^-) or applied (EMs^+) along with three N rates of 120, 150, and 180 kg unit N ha^{-1} (designated as N_{120}, N_{150}, and N_{180}, respectively) to pepper plants grown in saline soils (9.6 dS m^{-1}). The application of EMs and/or high N levels attenuated the salt-induced damages to pepper growth and yield. The application of EMs^+ with either N_{150} or N_{180} increased the number, average weight and yield of fruits by 14.4 or 17.0%, 20.8 or 20.8% and 28.4 or 27.5%, respectively, compared to pepper plants treated with the recommended dose ($EMs^- \times N_{150}$). When EMs^+ was individually applied or combined with either N_{150} or N_{180}, we observed increased accumulation of capsaicin by 16.7 or 20.8%, protein by 12.5 or 16.7%, proline by 19.0 or 14.3%, and total soluble sugars by 3.7 or 7.4%, respectively, in comparison with those treated with the integrative $EMs^- \times N_{150}$. In addition, the non-enzymatic contents (ascorbate, and glutathione) and enzymatic activities (catalase, superoxide dismutase, and glutathione reductase) of the antioxidant defense systems significantly increased in pepper plants treated with EMs^+ alone or combined with N_{150} or N_{180} under salt stress conditions. Higher accumulation of nutrients (N, P, K^+, and Ca^{2+}) along with reduced Na^+ acquisition was also evidenced in response to EMs^+ or/and high N levels. Most anatomical features of stems and leaves recovered in pepper plants grown in saline soils and supplied with EMs^+ and N. The application of EMs and N is undoubtedly opening new sustainable approaches toward enhancing *abiotic stress* tolerance in crops (e.g. hot pepper).