Abstract

NaCl stress alleviation in cereal crops under hydroponics with pristine and mineral-enriched biochar can be a more effective approach to address food security issues. The present study was aimed at alleviating NaCl stress in wheat through pristine and zinc-enriched biochar (PBC and Zn-En-BC respectively) under a deep water culture (DWC) hydroponic system. Wheat plants were grown in plastic pots with 6 treatments (Control, NaCl, PBC, Zn-En-BC, NaCl + PBC, and NaCl + Zn-En-BC). Plants were harvested after 40 days and subjected to different growth, physiological and biochemical tests. A significant decrease in the concentrations of malondialdehyde (MDA) (24.9% in the root and 8.9% in the shoot) and hydrogen peroxide (H_2O_2) (38.2% in the root and 18% in the shoot) was observed in NaCl + Zn-En-BC as compared to NaCl. It was due to the significant increase in the activities of ascorbate peroxidase (APX) (56.8% in the root and 190.3% in the shoot) and catalase (CAT) (310% in the root and 293.6% in the shoot). Zn-En-BC also resulted in a significant increase in the concentration of Zn under NaCl stress. Hence, Zn-En-BC proved to be the best treatment for the wheat plant to survive under NaCl stress. Furthermore, Zn-En-BC not only alleviated NaCl stress in wheat but also increased Zn's nutrition of it. This study recommends that cereal crops be grown in soilless saline environments using PBC and Zn-En-BC.

Keywords: NaCl stress, Hydroponics, Wheat, Pristine Biochar, Zinc-Enriched Biochar, Reactive Oxygen Species, Antioxidant Enzymes, Zinc Nutrition, Soilless Saline Environment.