

Abstract

Salinity and heavy metal stress in plants have been creating challenges in the agricultural field due to their devastating and deteriorating effects on plants and environment. Salinity and copper stress increases the oxidative stress in plants and lead to the increased production of reactive oxygen species, decreases the production of anti-oxidant enzymes, lowers the rate of plant growth and imposes a negative impact on the health of plant root and shoot. Pea plants were grown in the botanical garden GCU, Lahore under stress i.e. salinity and copper and those plants were given the treatments of silicon nanoparticles and silicon nano-doped biochar. The salinity and copper effects were observed on different parameters of plant like ion leakage, ascorbate peroxidase/catalase, Chlorophyll (a/b) content, total phenolics (root/shoot) and total proteins (root/shoot), weight, length (root, shoot), vitality index, germination index, germination percentage and seed vigour index was measured. Silicon nanoparticles and silicon-doped biochar proved to be the most effective in improving seedling fresh weight (1.6%), shoot length (47.3%), germination index (16%), germination percentage (15.8%), seed vigor index (30.7%), and catalase (40.8%) under salinity and copper stress. Biochar, on the other hand, effectively improved root length (27%), total seedling length (37.97%), vitality index (30.3%), and catalase (26%). Silicon nanoparticles and biochar proved to be most effective in increasing shoot total phenolics (4%) and shoot total protein content (9%) respectively. Therefore, it is concluded that the application of Si-NPs and silicon-doped biochar can enhance plants resistance against saline-sodic and metal contaminated soil and can mitigating these stresses