

## Abstract

In developing countries crop irrigation at heavy metal polluted soil is a common practice that causes multiple human health consequences. A comparative study with two cultivars of maize was performed to investigate the efficiency of rice husk biochar (BC) and three fungal species such as Trichoderma harzianum (F1), Trichoderma asperellum (F2) and Trichoderma viride (F3) to improve growth and physiology of Zea mays L. plants grown on soil contaminated with Cu and Ni. Initially, to test the heavy metal removal efficiency of three fungal species F1, F2 and F3 a biosorption trial was conducted. Among three fungal isolates, F2 sp. showed maximum Cu<sup>+2</sup> and Ni<sup>+2</sup> removal efficiency. Followed by a pot experiment conducted with two cultivars spring corn (V1) and footer corn (V2) having 11 different treatments each such as T1=Control, T2=Cu (300 ppm), T3=Ni (100 ppm), T4=T. asp, T5=BC (2%), T6=T. asp + Cu (300 ppm), T7=T. asp + Ni (100 ppm), T8=BC (2%) + Cu (300 ppm), T9=BC (2%) + Ni (100 ppm), T10=T. asp + BC (2%) + Cu (300 ppm) and T11=T. asp + BC (2%) + Ni (100 ppm) having three replicates. The results demonstrated that the plant length, fresh and dry weight were significantly ( $p \leq 0.05$ ) influenced by genotypic variations under applied heavy metal stress. Similarly, significant differences ( $p \leq 0.05$ ) in plant APX, CAT, SOD and POD activities were observed after analyzing the data, using a two-factor factorial design and LSD. Maximum decrease in leaf Chl a. (53%), Chl b. (84%) and proteins (63%) were reported in footer corn with applied Cu stress. The combined application of biochar and F2 increased leaf CAT (96%) in spring corn with treatment relative to Cu stress. Similarly, under (BC+T. asp+Cu) treatment maximum decrease (86%) in leaf MDA was reported in spring corn relative to Cu stress. Altogether, it was found that application of BC along with F2 species showed maximum efficiency to combat Cu and Ni stress in soil and spring corn cultivar of Zea mays L. plant compared to footer corn. Overall, combined application of BC with F2 sp. proved to be the most appropriate treatments and can be used in developing countries to limit the deleterious effects of total Cu and Ni pollution.