Abstract

Pakistan is characterized as a nation with a predominantly agrarian economy. But heavy metal pollution is a great challenge impacting crop yield and increased food insecurity. Cadmium is toxic heavy metal which can lead to toxicity. The primary objective of this study was to alleviate the adverse effects of cadmium toxicity on maize (*Zea mays* L.) by the use of silicon and *Trichococcus* sp. In this study *Trichococcus* sp. was isolated from rhizospshere of wheat crop and then pot experiment was conducted in botanical garden of "Government College University, Lahore." This study consist of total eight treatments, each with three replicates. The plants were harvested after a period of 40 days. Various metrics, including FSW, FRW, photosynthetic pigments, ion leakage, MDA, CAT, APX, proteins, and phenolics, were employed to assess the impact of these treatments. A comprehensive investigation was conducted to examine several physiological characteristics and the adsorption rate of copper in both plants and soil. All of the amendments had improved outcomes in reducing the impact of cadmium toxicity. However, the combined application of silicon and *Trichococcus* sp. exhibited the highest level of effectiveness. Application of combined treatments exhibited a reduction in malondialdehyde (MDA) content by a factor of one, concomitant with a corresponding increase in catalase (CAT) activity in the leaf tissue of the plant. Therefore, the plant's response to stress was enhanced, resulting in a reduction in cadmium content by 17.97% and 17.38% in plant's root and shoot respectively. Therefore, it can be inferred that the utilization combined application of silicon and *Trichococcus* sp. has resulted in an improvement in plant resilience to copper- induced stress and an augmentation of soil fertility. Additional research should be conducted at the field level to address the problem of heavy metals, particularly cadmium, by the use of silicon and *Trichococcus* sp.