

Physiological and Molecular Characterizations of Ricinus Communis Genotypes under Cadmium Stress

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Abstract : Cadmium (Cd) is a poisonous trace metal, which is responsible for excess reactive oxygen species generation (ROS) in plants, thereby adversely affecting their productivity and commercial potential. Ricinus communis (castor) is an industry-efficient non-edible bioenergy crop used for phytoremediation and re-vegetation. We have determined the total Cd content in castor genotypes and established a relationship between the Cd tolerance mechanism and physiological parameters like chlorophyll fluorescence, the total photosynthetic activity, chlorophyll and carotenoid content as well as ROS generation and malondialdehyde content. This study is an effort to comprehend the interrelation between Cd toxicity (control, 250 μ M and 500 μ M), proline, various ROS scavenging enzymes (anti-oxidative in nature), nicotianamine synthase (NAS) and Natural resistance-associated macrophage protein (NRAMP) gene. The antioxidant enzyme activity increased for WM hence conferring Cd toxicity in this genotype. RcNRAMP genes showed differential expression in GCH2 and WM genotypes; this can also be one of the reasons for Cd toxicity and sensitivity in WM and GCH2, respectively. The cause of pronounced Cd tolerance in WM leaves can be because of enhanced expression of RcNAS1, RcNAS2 and RcNAS3 genes. Our results demonstrate that there is an interrelation between Cd toxicity (control, 250 μ M and 500 μ M), proline, various ROS scavenging enzymes (anti-oxidative in nature), NAS and NRAMP gene.

Keywords : ricinus communis, cadmium, reactive oxygen species, nicotianamine synthase, NRAMP, malondialdehyde

Conference Title : ICPB 2023 : International Conference on Plant Biology

Conference Location : Vienna, Austria

Conference Dates : June 19-20, 2023