

## Promotive Role of 5-Aminolevulinic Acid on Chromium-Induced Morphological, Photosynthetic and Oxidative Changes in Cauliflower (*Brassica oleracea Botrytis L.*)

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**Abstract :** Chromium (Cr) is one of the most toxic pollutants among heavy metals that adversely affect living organisms and physiological processes in plants. The present study investigated the effect of without and with 15 mg L<sup>-1</sup> 5-Aminolevulinic acid (ALA) on morpho-physiological attributes of cauliflower (*Brassica oleracea botrytis L.*) under different Cr concentrations (0, 10, 100 and 200  $\mu$ M) in the growth medium. Results showed that Cr stress decreased the plant growth, biomass, photosynthetic pigments, and gas exchange characteristics. Chromium stress enhanced the activities of enzymatic antioxidants, catalase (CAT), superoxide dismutase (SOD), and guaiacol peroxidase (POD), and caused oxidative stress, as observed by increased level of malondialdehyde (MDA), hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>), electrolyte leakage (EL), in both leaves and roots of cauliflower. Chromium concentrations and total Cr uptake increased in roots, stem and leaves of plants with increasing Cr levels in the growth medium. Foliar application of ALA increased plant growth, biomass, photosynthetic pigments and gas exchange characteristics under Cr stress as compared to without ALA application. As compared to Cr stress alone, ALA application decreased the levels of MDA, H<sub>2</sub>O<sub>2</sub> and EL while further enhanced the activities of antioxidant enzymes in both leaves and roots. Chromium concentrations and total Cr uptake decreased by the ALA application as compared to without ALA. These results showed that foliar application of ALA might be effective in reducing Cr uptake and toxicity in cauliflower.

**Keywords :** antioxidant enzymes, cauliflower, photosynthesis, chromium, ALA, hydrogen peroxide, electrolyte leakage

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