

Anthocyanins as Markers of Enhanced Plant Defence in Maize (Zea Mays L.) Exposed to Copper Stress

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Abstract : Anthocyanins are important plant pigments having roles in many physiological and ecological functions; that are controlled by numerous regulatory factors. The accumulation of anthocyanins in Z. mays cause the plants stems to exhibit red coloration when encountering gradually increasing copper treatments (1, 5, and 10 mM of Cu in a period of 5 days) on maize seedlings. Stress injury was measured in terms of chlorophyll (a and b), carotenoid and anthocyanin contents, malondialdehyde (MDA), hydrogen peroxide (H₂O₂). Carotenoid and anthocyanin contents dramatically increased by increasing concentrations of Cu stress. MDA and H₂O₂ levels were found to significantly increase at high Cu treatments (5 and 10 mM of Cu). Chlorophyll content was observed to be highest at 1 mM Cu and then decreased at 5 and 10 mM of Cu. In addition, significant increases were determined in the activities of catalase (CAT), superoxide dismutase (SOD), glutathione reductase (GR) and ascorbate peroxidase (APX) under high Cu concentrations, while glutathione S-transferase (GST) and peroxidase (POX) activities showed no change. Treatments above 5 and 10 mM of Cu triggered copper stress in maize seedlings. The results of this study provide evidence that maize seedlings represent a high tolerance to gradually increasing copper treatments. Improved copper tolerance may relate to high anthocyanin, and carotenoid content besides antioxidant enzyme activity may improve the metal chelating ability of anthocyanin pigments. Data presented in this study may also contribute to a better understanding of phytoremediation studies in maize exposed to high copper containing soils.

Keywords : anthocyanin, copper, maize, antioxidant

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