

Copper accumulation, synthesis of ascorbate and activation of ascorbate peroxidase in *Enteromorpha compressa* (L.) Grev. (Chlorophyta) from heavy metal-enriched environments in northern Chile

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Abstract

Enteromorpha compressa is the dominant species in coastal areas of northern Chile receiving copper mine wastes. Copper remains as the main heavy metal in these coastal waters and it is accumulated in *E. compressa* growing at the impacted sites. Algae from these sites showed higher levels of lipoperoxides than from non-impacted sites, which suggests the occurrence of cellular damage resulting from oxidative stress. The strong activation of ascorbate peroxidase detected in this study probably occurs in order to buffer this oxidative stress. Unexpectedly, the activity of glutathione reductase, normally coupled to ascorbate peroxidase activity, was not affected by the chronic exposure to the mine wastes. Moreover, catalase, dehydroascorbate reductase and glutathione peroxidase, commonly reported to buffer oxidative stress in plants and algae, were not detected in *E. compressa* from any of the studied sites. Levels of total glutathione and phenolic compounds decreased in algae from mine-impacted sites. In contrast, high levels of dehydroascorbate were found in algae from impacted sites, whereas ascorbate remained unchanged. Therefore, it is suggested that *E. compressa* tolerates a copper-enriched environment, and the accompanying oxidative stress, through the accumulation of copper, activation of ascorbate peroxidase, synthesis of ascorbate (accumulated as dehydroascorbate) and consumption of glutathione and water-soluble phenolic compounds.