Stimulatory And/ Or Inhibitory Effects of Heavy Metals-Contaminated Effluents on Biochemical Characteristics of Some Selected Cyanobacteria

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Abstract

Heavy metals are among the most frequently identified pollutants in aquatic environments. Either essential or non-essential, many heavy metals are reported to be toxic at high concentrations and have a direct influence on various physiological and biochemical processes such as reduction in growth, photosynthesis and chlorophyll content or inhibition of enzyme activities. Growth inhibition and/or stimulation, protein synthesis, ultra-structure changes of the six cyanobacterial species were investigated under the effects of 3 elevated concentrations of the five selected heavy metals.

The selected cyanobacteria exhibited different orders of resistance against the tested metals which is mainly attributed to the type of the metal and its specific toxicity. Results also showed that toxicity of the tested metals on the growth of the selected cyanobacteria (chlorophyll a, carbohydrates and protein synthesis) was dependent absolutely on species and metal concentration up to the tested levels. For the same species, the same metal exerted different toxicities on the different tested growth parameters where it could inhibit chlorophyll a more than protein or carbohydrates and vice versa. In general, although some toxicity resulted in growth inhibitions in the selected cyanobacteria, the present selection manifested excellent

resistance against the tested metals especially the toxic ones (Pb^{2+}, Cd^{2+} and Cu^{2+}). Toxicity order of these metals on cyanobacterial growth slightly differed but generally Pb^{2+} was the most toxic followed by the other four in different orders according to parameter measured. The high heavy metals resistance possessed by the cyanobacterial selection explained their high capabilities for uptake and removal of such metals.

In conclusion, the selected cyanobacterial species proved that they are a very promising candidates for metal removal considering species variations among them with at least two of them (*Tolypthrix ceytonica* and *A. variabilis*) considered as excellent agents for decontaminating metal-polluted systems.

Key Words: Cyanobacteria, Growth, Heavy Metals, Industrial Effluents, Stimulation, Toxicity