ASSESSMENT OF HEAVY METAL (CD, CU, NI AND ZN) ACCUMULATION IN AQUATIC HYPERACCUMULATOR PLANT EGERIA DENSA, AND THEIR EFFECTS ON PHOTOSYNTHETIC PIGMENT CONCENTRATIONS

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Abstract- Industrial or anthropogenic based heavy metals in water ecosystems pose a significant threat for aquatic organisms with serious consequences. Present study has investigated the accumulation levels of different concentrations (100, 200 and 400 µM) of heavy metals (Cd, Cu, Cr and Zn) in aquatic plant Egeria densa Planch., and analyzed the effects of these heavy metals on photosynthetic pigment concentrations. Heavy metal analyses were performed by using ICP-OES using whole plant. It was revealed that heavy metal levels in E. densa have increased with increasing heavy metal treatments. All samples demonstrated considerable amounts of heavy metal accumulation. Results demonstrated that E. densa has accumulated 239.3 times more Cd in 400 µM treatments. Besides, chlorophyll a level was observed to decrease in relation to control group in all three treatments. However, an inverse correlation was also available between chlorophyll a level and heavy metal concentrations. Chlorophyll b concentrations demonstrated a fluctuation; a slight decrease of chlorophyll b was observed in all samples, except for 200 µM treatment. The changes in total chlorophyll (C_{a+b}) and carotenoids concentrations showed similarity to that of chlorophyll a. Thus, it was revealed that heavy metals could affect the photosynthesis rate in plants. In addition, based on recent studies, a plant could be regarded as hyperaccumulator and used in phytoremediation if it accumulates ≥100 mg/kg Cd, 300 mg/kg Cr and Cu, and 3000 mg/kg Zn according to dry weight. Therefore, E. densa made an implication as hyperaccumulator for Cd and Cu metals, with an ultimate goal of phytoremediation purposes.

Keywords- Hyperaccumulation, abiotic stress, aquatic plant, phytoremediation