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Original Reserach Article

Effects of Cadmium on Aquatic Plant *Lemina minor*

Ahmed Hatem Ali[1]*, Tabarek Abdul Kareem Sangoor[1], Fatima Saeed Kadhim[1], Zahraa Falah Hasan[1]
[1]Collage of Environment Science, Al-Qasim Green University, Babylon 51013, Iraq

***Corresponding Author:** Ahmed Hatem Ali
Collage of Environment Science, Al-Qasim Green University, Babylon 51013, Iraq

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Abstract: This study's goal was to determine the amount of total chlorophyll and its protein content by subjecting aquatic plants Lemina minor to different levels of cadmium [10, 20, and 30 mg/L] for a month. This was done in order to assess how these salt concentrations affected the plants' physiological states. As the study came to a close, the components' quantities in the water plants used for the analysis increased differently than in the control sample, according to the investigation's findings. We looked at the protein and chlorophyll concentrations of water plants that were subjected to heavy metals.

Keywords: Physiological State, *Lemina minor*, and Heavy Elements.

INTRODUCTION

Cadmium is a very toxic heavy metal. It is similar to zinc in terms of atomic electronic distribution. It is found in nature and is often associated with other compounds such as chlorides and sulfates. It has a high resistance to oxidation, which has made it used in many industries [1]. Cadmium is the most abundant heavy metal in the world [2]. It is considered a toxic metal from all types of natural and industrial sources and causes acute and chronic effects [3]. Cadmium is found in large quantities in soil, where it constitutes 0.1 of the earth's crust per part per million, and is spread during volcanic activities. It is also produced by metal extraction and smelting operations, where it is found as impurities in lead and zinc deposits. Because of its high resistance to oxidation, it is used as a stabilizing agent in many industries, including alloys, paint, and... Nuclear reactors, in the manufacture of batteries that can be recharged, and in the production of iron and steel. Because of its danger, many restrictions have been placed on its use in many developed countries such as the United States [4]. Humans are exposed to toxic cadmium through inhalation or eating it with contaminated animal or plant food. It rarely enters the body through the skin, and its danger to workers in places where it is discarded increases. After inhalation or swallowing, cadmium is transported into the body through blood circulation, causing injury to the liver and kidneys, and accumulating in tubular cells, causing bladder cancer [5]. Its concentration in the human body increases with age, and the half-life of cadmium inside the body is from 15 to 20. In general, it supports the proliferation of cancer cells, contributes to their rapid spread, affects DNA repair and prevents programmed cell death. It affects the respiratory system and causes lung problems and allergic diseases. Cadmium also causes low fetal weight and premature births when the pregnant woman is exposed during pregnancy [6]. Its toxicity arises from its association with thiol groups in enzymes and proteins, and it causes denaturation of proteins. It also interferes with calcium and zinc metabolism and has a destructive effect on cellular membranes [7].

MATERIALS AND METHODS

In this experiment, 50 g of Lemina minor were weighed, and each plant was planted in ten plastic pots with fifteen litres of water. Each jar contains ten litres of pond water that is free of chlorine. According to the necessary test, weekly plant samples were taken from the ponds to measure the quantities of protein, chlorophyll, and heavy metals. For five weeks, growth and sampling were conducted. Additionally, the study employed three different concentrations of cadmium (10, 20, and 30 mg/L) [8]. The Bradford method was used to measure the

quantity of protein in aquatic plant tissues, and a chlorophyll meter was used to measure the total amount of chlorophyll [9].

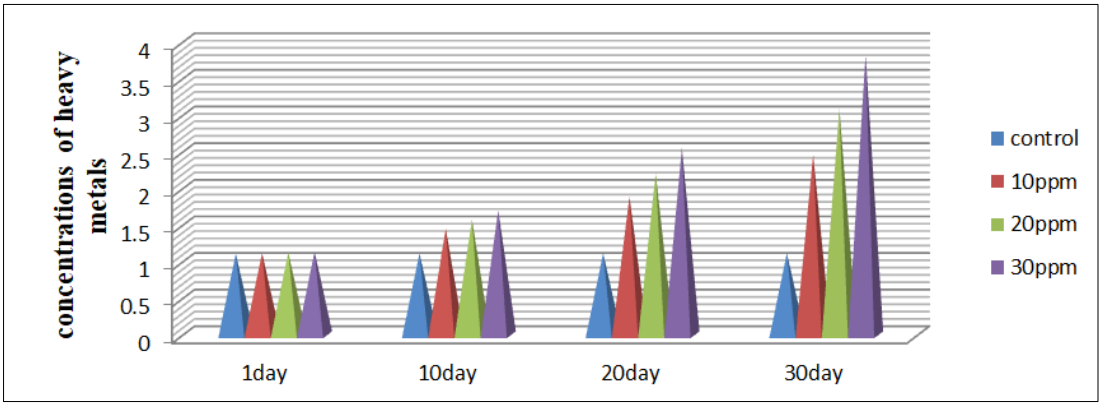

Figure 1: Three different concentrations of Cadmium during the experiment period in *Lemina minor* tissue

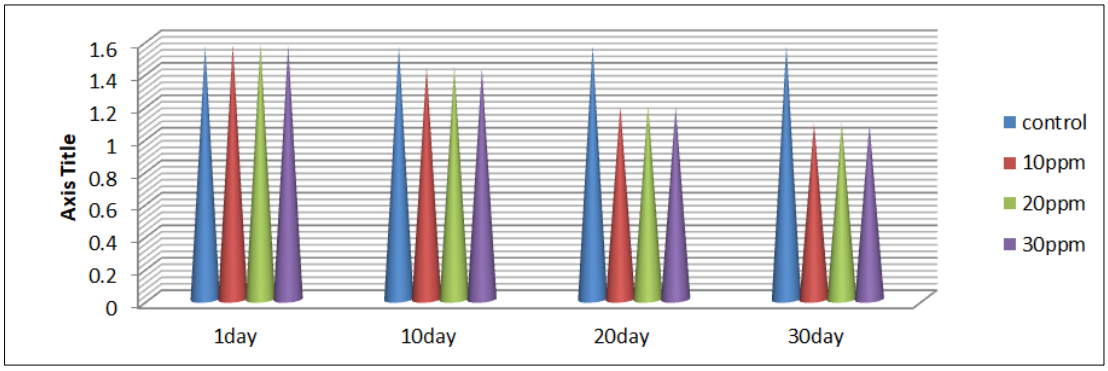

Figure 2: Effect concentrations of Cadmium during the experiment period on chlorophyll in *Lemina minor* tissue

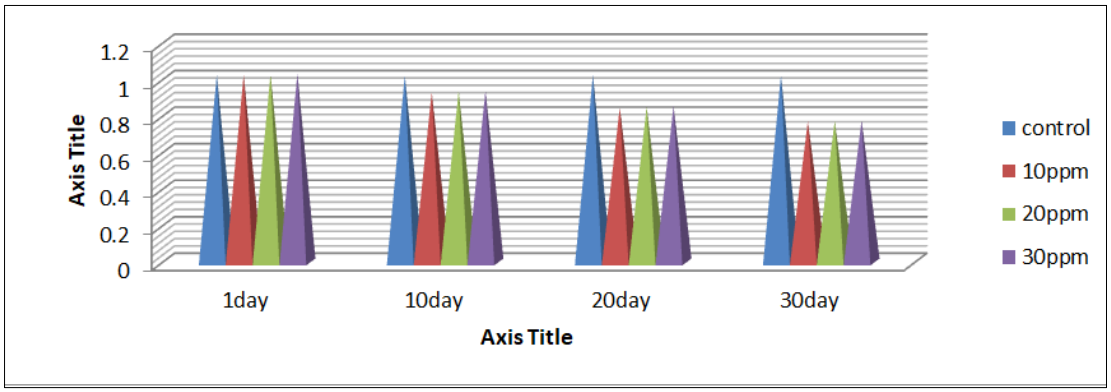

Figure 3: Effect concentrations of Cadmium during the experiment period on protein content in *Lemina minor* tissue

RESULTS AND DISCUSSION

According to the study's findings, the concentration of heavy metals in the aquatic plants under investigation increased towards the conclusion of the experiment. Cadmium buildup in the aquatic plant Lemina minor is depicted in Figure 1 in comparison to the control. This shows that the aquatic plants under study have the capacity to accumulate this element within their tissues, that they have a unique defense mechanism against high element concentrations, or that they absorb high concentrations of cadmium and convert them into inactive forms of gaps [10]. Species, physiological state, and sensitivity to the element may all influence the variations in the amount of cadmium stored in plant bodies [11].

Figure (2) illustrates the concentration of chlorophyll in the aquatic plant Lemina minor in comparison to the control. The study's findings indicated a decrease in the overall concentration of chlorophyll in the aquatic plant at the conclusion of the experiment. Due to the presence of these extremely poisonous chemicals, which have the ability to build up in plant tissue, the quantities of chlorophyll in the experimental plants have decreased [12].

The figure (3) displayed The reason for the decline in the protein content of Lemina minor plants is that the protein content in their tissues is consumed during essential functions or metabolic processes that occur within them to withstand the concentration of cadmium, which lowers the percentage of protein content in their tissues [13]. Until End of Experience is reached, this percentage falls as exposure time increases [14].

REFERENCES

1. Merey HA, Ramadan NK, Diab SS, *et al.,* Validated UPLC method for the determination of guaiphenesin, oxeladin citrate, diphenhydramine, and sodium benzoate in their quaternary mixture used in treatment of cough, in the presence of guaiphenesin-related substance (guaiacol)[J] Chem. Pap. 2018;72(9):2247–2254. doi: 10.1007/s11696-018-0454-2.
2. Qassim A. A. AL-Janabi, Saad Kadhim A. Al-Kalidy& Zaid B. Hameed (2021). Effects of heavy metals on physiological status for Schoenoplectus litoralis & Salvinia natans L 1st INTERNATIONAL VIRTUAL CONFERENCE OF ENVIRONMENTAL SCIENCES IOP Conf. Series: Earth and Environmental Science 722 (2021) 012012 IOP Publishing doi:10.1088/1755-1315/722/1/012012.
3. Cengiz, K., Nudrat, A., Akram, M., Ashraf, M., Nasser, A., Parvaiz, A. (2020) Exogenously supplied silicon (Si) improves cadmium tolerance in pepper (Capsicum annuum L.) by upregulating the synthesis of nitric oxide and hydrogen sulfide[J]. J. Biotechnol., p. 316.
4. Awasthi, P., Mahajan, V., Jamwal, V. L. *et al.,* (2016) Cloning and expression analysis of chalcone synthase gene from Coleus forskohlii. J. Genet.
5. Chen H, Zhang Q, Cai H, *et al.,* H_2O_2 mediates nitrate-induced iron chlorosis by regulating iron homeostasis in rice. Plant Cell Environ. 2018;41:767–781. doi: 10.1111/pce.13145.
6. Qassim Ammar Ahmood AL-Janabi, Ziad Bassim Hameed1 and Saad Kadhim AlaAllah Al-Kalidy(2019). Effect of Heavy Metals on the Protein and Chlorophyll Content of Phragmitus australis and Typha domingensis, Indian Journal of Ecology (2019) 46 Special Issue (8): 65-71.
7. Kohli, S. K., Khanna, K., Bhardwaj, R., Abd_Alla, E. F., Corpas, F. J. (2019) Assessment of subcellular ros and no metabolism in higher plants: multifunctional signaling molecules. Antioxidants, vol 8, no 12.
8. Meng Jie A, Hai Jiang W. Effects of modifiers on the growth, photosynthesis, and antioxidant enzymes of cotton under cadmium toxicity. J. Plant Growth Regulat. 2019;38:1196–1205. doi: 10.1007/s00344-019-09924-x.
9. Wei X, Wei YX, Guo D, Sun B, Wang XD, Liu C. Effects of different breaking dormancy ways on the photosynthetic characteristics and activities of protective enzymes of ‘misty’ blueberry leaves. Sci. Agric. Sin. 2015;48(22):4517–4528.
10. Chaabene Z, Hakim IR, Rorat A, *et al.,* Copper toxicity and date palm (Phoenix dactylifera) seedling tolerance: monitoring of related biomarkers. Environ. Toxicol. Chem. 2018;37(3):797–806. doi: 10.1002/etc.4007.
11. Ozfidan-Konakci C, Yildiztugay E, Bahtiyar M, *et al.,* The humic acid-induced changes in the water status, chlorophyll fluorescence and antioxidant defense systems of wheat leaves with cadmium stress. Ecotoxicol. Environ. Saf. 2018;155:66–75. doi: 10.1016/j.ecoenv.2018.02.071.
12. Liu QS, Vetukuri RR, Xu X, *et al.,* Transcriptomic responses of dove tree (Davida involucrata Baill) to heat stress at the seedling stage[J] Forest. 2019;10(8):656. doi: 10.3390/f10080656.
13. Yang LP, Zhu J, Wang P, *et al.,* Effect of Cd on growth, physiological response, Cd subcellular distribution and chemical forms of Koelreuteria paniculate[J] Ecotox Environ. Safe. 2018;160:10–18. doi: 10.1016/j.ecoenv.2018.05.026.
14. Zhang YL, Xing HW, Guo N, *et al.,* The physiological characteristics of ornamental kale for cold resistance[J] Act. Agric. 2016;31(4):168–176.