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Original Research Article

Effects of Lead on Physiological State of Aquatic Plant *Lemina minor*

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Abstract: The objective of this study was to measure the concentration of total chlorophyll and its protein content by exposing aquatic plants Lemina minor to varying concentrations of heavy elements [10, 20, and 30 mg/L] for a month in order to evaluate the effects of these salt concentrations on the physiological conditions of the plants. The results of the investigation showed that the concentrations of the components in the water plants used for the analysis rose toward the end of the study in a different manner than in the control sample. The response of water plants exposed to heavy metals was examined in terms of their protein and chlorophyll contents.

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

INTRODUCTION

Heavy metals are natural elements that enter into the composition of the earth's crust and are emitted during various natural activities such as volcanic activities, erosion processes, weathering, and rain [1]. There are more than 90 elements in nature, 21 of which are non-metallic materials, 16 are light metals, while 53 are one of them is heavy metals. Metals are considered heavy if their mass density increases to more than 5 g/cm3 and their atomic number is greater than 20. They are inorganic materials characterized by thermal and electrical conductivity [2].

Lead Pb is a toxic heavy metal that was used by humans 5,000 years ago. Since that time, lead pollution has increased from an estimated 10 tons to 1,000,000 tons annually, making it widespread and present everywhere, and its use in various industrial processes has made it a serious global health problem. It is found in the form of white or silver lead salts that are poorly soluble in water, which reduces its toxicity [3]. Lead poisoning is considered a traditional disease as a result of continuous exposure to it, and its effects affect all ages, from adults, children, and even the fetus during pregnancy. It affects the nervous and digestive systems, as the International Environmental Protection Organization describes it as a carcinogenic agent [4]. After entering the body, it flows with the blood, where red blood cells transport it throughout the body, and a large percentage of it, up to 95%, is deposited in the skeletal system, especially the bones and muscles. It competes with calcium and is able to accumulate within bone tissue [5].

Acute exposure to lead causes loss of appetite, insomnia, fatigue, arthritis, and dizziness, while chronic exposure causes weight loss, mental retardation, birth defects, allergic diseases, muscle weakness, and the risk of paralysis, as well as destruction of the kidneys and liver and loss of their functions [6]. In addition to its natural presence, industrial processes contribute to the release of large quantities of it because it is a corrosion-resistant metal that is used in the manufacture of many widely used materials such as dyes, household paint, construction materials, and multi-use plastics, including children's toys. Exposure to it is direct or indirect and repeatedly during the day. It is also discharged in the form of liquid waste from these industries, in addition to battery factories that are manufactured in the form of lead plates, and plastic pipe factories that are used to transport drinking water, where lead is used to a large extent [7].

MATERIALS AND METHODS

Lemina minor was tested in this experiment by weighing 50 g of the plant and planting each one separately in ten plastic containers that held fifteen liters of water. Each jar holds ten liters of pond water that is free of chlorine. According to the necessary test, plant samples were taken weekly from the ponds to estimate the levels of protein, chlorophyll, and heavy metal concentrations. Growth monitoring and sampling continued for five weeks. In addition, three different quantities of elemental at 10, 20, and 30 mg/L were employed in the experiment [8]. The Bradford method was used to measure the amount of protein in plant tissues, and a chlorophyll meter was used to quantify the total amount of chlorophyll in aquatic plant tissues [9].

RESULTS AND DISCUSSION

The results of the study showed an increase in the concentration of heavy elements in the studied aquatic plants at the end of the experiment. Figure (1) shown accumulation of heavy elements in the aquatic plant Lemina minor compared with the control. This indicates the ability of the studied aquatic plants to accumulate this element within the plant tissues, or that they possess a special mechanism to tolerate high concentrations of elements or that they absorb the elements with high concentrations, which are transformed into inactive forms of gaps [10]. The differences in the concentration of elements accumulated in plant bodies may be due to differences in plant species, plant physiological status, and receptivity to the element [11]. The results of the study showed a decrease in the total concentration of chlorophyll in the studied aquatic plant at the end of the experiment, figure (2) shown the concentration of chlorophyll in the aquatic plant Lemina minor compared with the control. The decrease in chlorophyll concentrations in the experimental plants is due to the presence of these highly toxic substances and has the potential to accumulate in the plant tissue [12]. It inhibits its synthesis by inhibiting the action of the enzymes responsible for its production, such as the aminolevulinic acid dehydratase and Porphobilinogen deaminize, which is responsible for the formation of Porphyrin, This may be attributed to the fact that by increasing the concentration of heavy elements in plant tissues, their chlorophyll content decreases because of its inhibitory effect on the work of enzymes that contribute to the synthesis of chlorophyll and carotene. Nasser enters the installation of some enzymes that contribute to the building of chlorophyll [13]. Figure (3) shown the decrease in the protein content of plants Lemina minor is due to the consumption of the protein content found in the tissues of these plants in some vital activities or the metabolic processes that occur within it to resist the concentration of the elements, thus reducing the proportion of protein content in their tissues [14]. This percentage decreases with the duration of the exposure until reaching End of Experience [15].

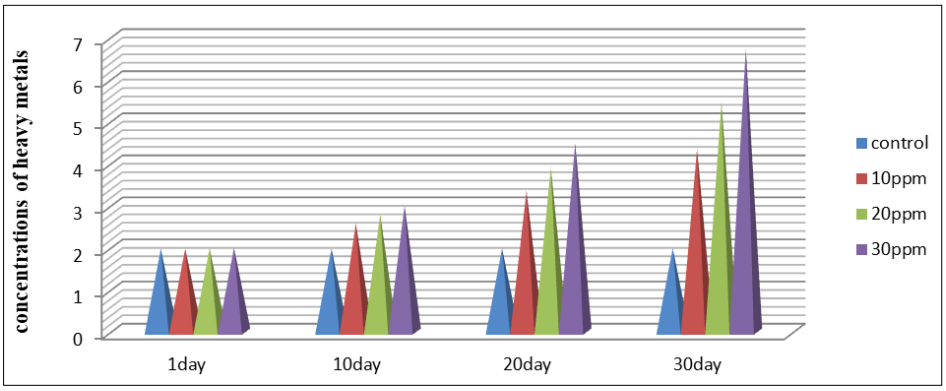

Figure 1: Three different concentrations of Pb during the experiment period in *Lemina minor* tissue

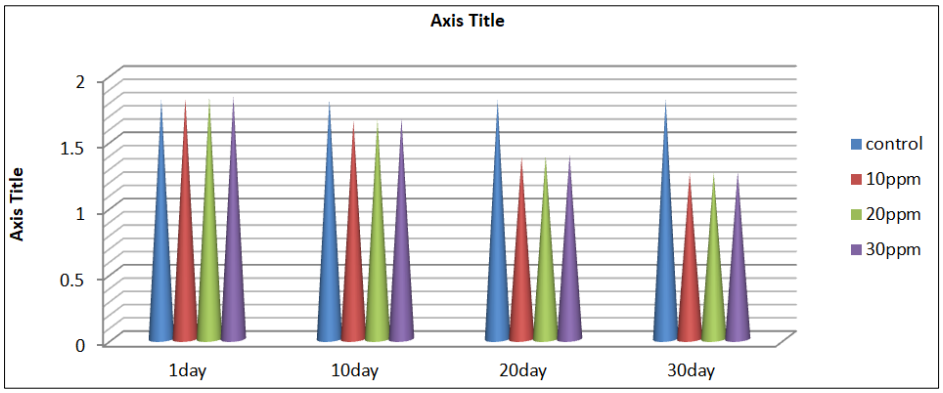

Figure 2: Effect concentrations of Pb during the experiment period on chlorophyll in *Lemina minor*

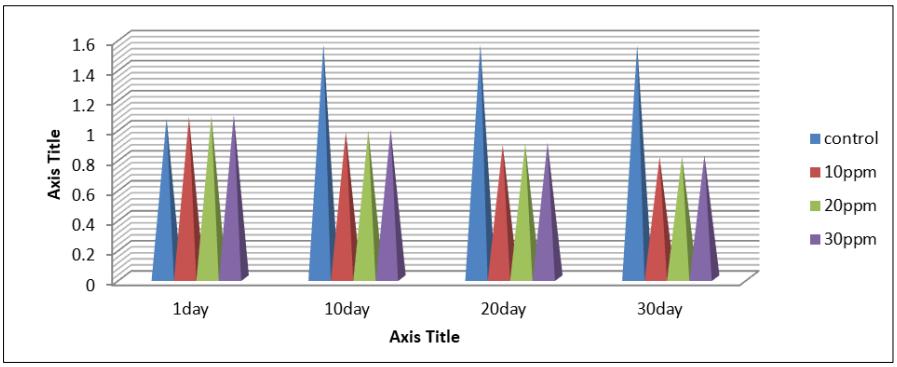

Figure 3: Effect concentrations of Pb during the experiment period on protein content in *Lemina minor*

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