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Original Research Article

Effect of Zinc and Manganese Chlorides on *Schoenoplectus litoralis and Elodea Canadensis* Physiological Status

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Abstract: This study was determine effect different concentrations of heavy element salts on physiological status of aquatic plants *Schoenoplectus litoralis and Elodea Canadensis*. It was used three different concentrations of zink chloride and manganese chloride (10, 20, 30 ppm) for a month in order to measure the amount of total chlorophyll and its protein content. The results of the investigation showed that, in contrast to the control sample, the concentrations of the components in the water plants used in the analysis rose near the end of the investigation. The effects of heavy metal exposure on the protein and chlorophyll levels of water plants were studied.

Keywords: Zink Chloride and Manganese Chloride, Physiological, *Schoenoplectus Litoralis and Elodea Canadensis*.

INTRODUCTION

The term "phytoremediation" describes technologies that employ living plants to remove dangerous toxins from soil, water, and air [1]. It is described as "the use of green plants and the associated microorganisms, along with proper soil amendments and agronomic techniques to either contain, remove or render toxic environmental contaminants harmless" [2]. A low-cost plant-based remediation method called phytoremediation is suggested, which makes use of plants' capacity to concentrate elements and chemicals from the surrounding environment and to detoxify a variety of substances. The capacity of certain plants, known as hyper-accumulators, to bio-accumulate substances leads to the concentrating effect [3]. In environments with static water or contaminated soil, phytoremediation can be used. The restoration of abandoned metal mine workings, the mitigation of ongoing coal mine discharges that lessen the impact of contaminants in soils, water, or air, and sites where polychlorinated biphenyls were dumped during manufacture are examples of successful applications of phytoremediation. Phytoremediation initiatives around the world have mitigated contaminants such metals, herbicides, solvents, explosives, and crude oil and its derivatives [4]. Numerous plants, including hemp, pigweed, alpine pennycress, and mustard plants, have been shown to be effective in hyper-accumulating pollutants in toxic waste sites. Because plants differ in their physiologies, not all of them are able to acquire organic contaminants or heavy metals [5]. Variations exist even among cultivars of the same species. This method is being studied more and used in locations where lead, uranium, and arsenic-contaminated soils exist. One significant drawback of phytoremediation is that it necessitates a long-term commitment because the procedure depends on a plant's capacity to grow and survive in an environment that is not optimal for regular plant growth, despite the fact that it has the advantage of treating environmental concerns in situ [7].

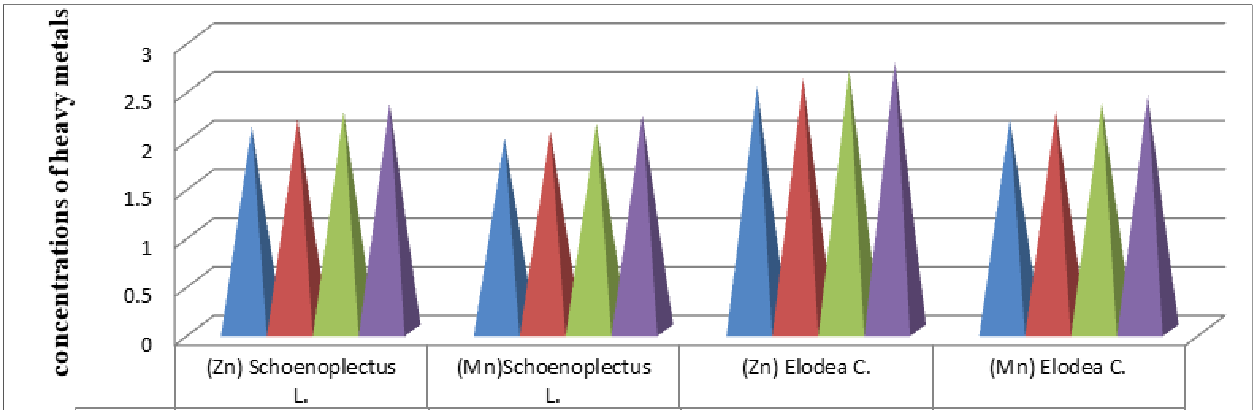
MATERIALS AND METHODS

The research study was designed to determine the ability of some aquatic plants, such as *Schoenoplectus litoralis and Elodea canadensis*, to remove some heavy metals. A weight of 500 grams was used for each plant, and they were grown individually in plastic containers with a capacity of 15 liters. Each container contained 10 liters of water contaminated with three different concentrations (10, 20, 30) mg/liter of Zink chloride and Manganses chloride [8]. The study continued for a month according to the required test, and samples were taken every 10 days. Plant samples were collected from the ponds for the purpose of estimating the concentrations of heavy metals and the amount of chlorophyll and protein. The protein level in plant tissues was determined using the Bradford method [9], and the total chlorophyll content in aquatic plant tissues was estimated using the chlorophyll meter [10].

RESULTS & 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 zinc chloride and manganese chloride (2.331 and 2.212) compared with the control (2.098 and 1.977) respectively in the aquatic plant *Schoenoplectus litoralis* tissues where concentrations of zinc chloride and manganese chloride in the aquatic plant *Elodea Canadensis* tissues (2.757 and 2.413) compared with the control (2.512 and 2.174) respectively. So that Zinc chloride accumulation in the aquatic plant *Elodea Canadensis* tissues is higher compared to the aquatic plant *Schoenoplectus litoralis* while manganese chloride accumulation in the aquatic plant *Schoenoplectus litoralis* tissues is higher compared to the aquatic plant *Elodea Canadensis*.

This indicates the capacity of the investigated aquatic plants to maintain this substance within the tissue of the plant, or that they have a unique way to tolerate a substantial amount of elements, or that they take in elements with high concentrations, which transform into inactive forms of gaps [11]. The variations in the concentration of elements collected within plant bodies may be because of differences in plant species, plant physiological status, and receptivity to the element [12]. According to the sources, plants that are exposed to heavy metals develop plant clams, which obstruct the plants' ability to remove toxicity and maintain a healthy balance of heavy elements. The enzyme phytochelatin synthase is responsible for this, as it uses glutathione as a base material to activate the presence of heavy ions [13], observed that a variety of external conditions, such as salinity, pH level, the efficiency of complex organic and inorganic compounds, and their impact on physical and chemical processes that regulate the pace of heavy metal accumulation in the organism's tissues, as well as metabolic processes such as oxygen content, light intensity, and temperature, Additionally, the level of the element in the natural environment and the characteristics of the environment affect bioaccumulation[14].

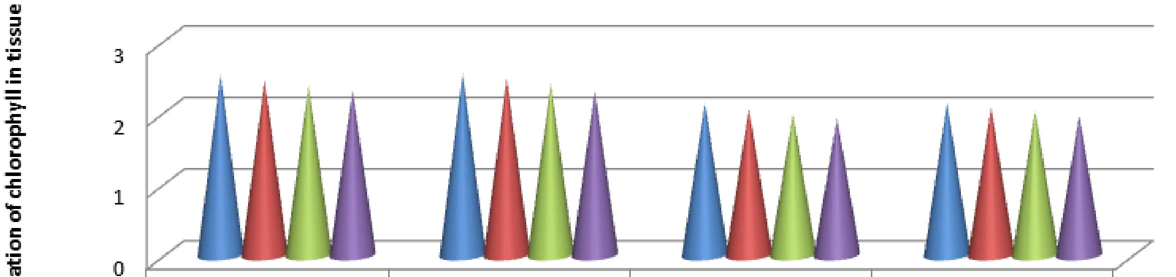


	(Zn) Schoenoplectus L.	(Mn)Schoenoplectus L.	(Zn) Elodea C.	(Mn) Elodea C.
control	2.098	1.977	2.512	2.174
10ppm	2.169	2.046	2.594	2.253
20ppm	2.252	2.124	2.675	2.344
30ppm	2.331	2.212	2.757	2.413

Figure 1: Concentrations of heavy metals in *Schoenoplectus litoralis and Elodea Canadensis* tissues

The results of the study showed a decrease in the total concentration of chlorophyll in the studied aquatic plants at the end of the experiment, figure (2) shown the concentration of chlorophyll in the aquatic plants *Schoenoplectus litoralis* in concentration 30 ppm of zinc chloride and manganese chloride (2.304 and 2.296) compared with the control (2.525 and 2.544) respectively in the aquatic plant *Schoenoplectus litoralis* tissues where concentrations of zinc chloride and manganese chloride in the aquatic plant *Elodea Canadensis* tissues (1.917 and 1.945) compared with the control (2.129 and 2.138) respectively.

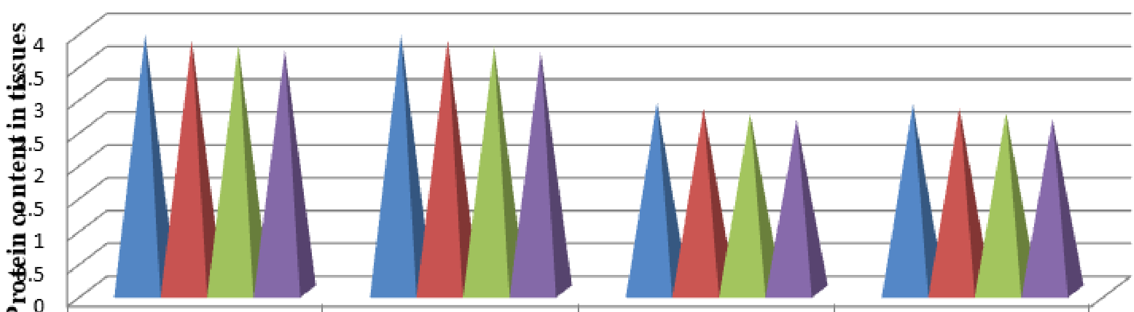
These very hazardous compounds, which have the ability to accumulate in plant tissue, are the cause of the reduction in chlorophyll concentrations in the experimental plants [15]. By inhibiting the activity of the enzymes that produce it, such as aminolevulinic acid dehydratase and porphobilinogen deaminize, which form porphyrin, it prevents its creation[16]. Research has shown that the formation of chlorophyll, the process of photosynthesis, and the synthesis of other colors like efficacy and carotenoids can all have an impact on certain heavy metals [17]. The impact of these components on the enzymatic system is [18]. The total amount of protein and chlorophyll in the tissues of the plants used in the experiment and exposed to the various concentrations of heavy elements used throughout the experiment was found to differ significantly at the probability level ($p < 0.05$) by [19]. The reason for this might be that when the concentration of heavy metals in plant tissues increases, the enzymes involved in the synthesis of carotene and chlorophyll are inhibited, resulting in a decrease in the amount of chlorophyll in the plant tissue s[20]. Nasser starts the process of installing a few enzymes that aid in the synthesis of chlorophyll [21].



	(Zn) Schoenoplectus L.	(Mn)Schoenoplectus L.	(Zn) Elodea C.	(Mn) Elodea C.
control	2.525	2.544	2.129	2.138
10ppm	2.448	2.463	2.05	2.071
20ppm	2.377	2.384	1.981	2.014
30ppm	2.304	2.296	1.917	1.945

Figure 2: Concentration of chlorophyll in *Schoenoplectus litoralis and Elodea Canadensis* tissues

Figure (3) shown The protein content in the aquatic plants ***Schoenoplectus litoralis*** in concentration 30 ppm of zinc chloride and manganese chloride (3.678 and 3.635) compared with the control (3.921 and 3.911) respectively in the aquatic plant *Schoenoplectus litoralis* tissues where concentrations of zinc chloride and manganese chloride in the aquatic plant *Elodea Canadensis* tissues (2.609 and 2.633) compared with the control (2.877 and 2.858) respectively. The consumption of the protein content in these plants' tissues for certain essential activities or the metabolic processes that take place within them to withstand the concentration of the elements are the causes of the decrease in all plants' protein content, which lowers the proportion of protein content in their tissues [22]. As exposure time increases until the end of experience, this proportion declines [23].



	(Zn) Schoenoplectus L.	(Mn)Schoenoplectus L.	(Zn) Elodea C.	(Mn) Elodea C.
control	3.921	3.911	2.877	2.858
10ppm	3.823	3.824	2.796	2.79
20ppm	3.755	3.733	2.701	2.723
30ppm	3.678	3.635	2.609	2.633

Figure 3: Protein content in *Schoenoplectus litoralis and Elodea Canadensis* tissues

CONCLUSION AND RECOMMENDATIONS

The Zinc chloride accumulation in the aquatic plant *Elodea Canadensis* tissues is higher compared to the aquatic plant *Schoenoplectus litoralis* while manganese chloride accumulation in the aquatic plant *Schoenoplectus litoralis* tissues is higher compared to the aquatic plant *Elodea Canadensis*. The metals that had the greatest effects on lowering the levels of chlorophyll in *Schoenoplectus litoralis* and *Elodea canadensis* and the levels of protein in *Schoenoplectus litoralis and Elodea canadensis*. The kind of contaminant and its concentration in the environment are taken into consideration when choosing plant species, as plants are an efficient biological instrument for eliminating pollutants from highly polluted areas.

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