



Effect of cobalt chloride on the protein content and chlorophyll for *schoenoplectus litoralis* and *elodea canadensis*

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Abstract

The objective of this study was to test the effects of varying cobalt chloride salt concentrations on the physiological characteristics of some aquatic plants by measuring the total chlorophyll and protein content of *Schoenoplectus litoralis* and *Elodea canadensis* tissues after being exposed to three different concentrations of cobalt chloride (10, 20, and 30 ppm) during a month. The study findings showed increases in the concentration of cobalt chloride and decreases in protein content and chlorophyll levels in *Schoenoplectus litoralis* and *Elodea canadensis* tissues compared with the control.

Keywords: Cobalt chloride, physiological, *schoenoplectus litoralis* and *elodea canadensis*

Introduction

The term "Bioremediation" describes technologies that 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 [1]. It is 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 [2]. The viability of employing plants to clean up the environment has been demonstrated by several field tests [3]. Phytoremediation initiatives around the world have mitigated contaminants such as 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 hyperaccumulating pollutants in toxic waste sites [5]. Because of variations in the cellular structure, certain plants cannot acquire organic contaminants or heavy metals. Pollutant accumulation varies even within cultivars of the same species [6]. 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]. The aim of study was known effects of cobalt chloride exposure on the protein and chlorophyll levels of water plants *Schoenoplectus litoralis* and *Elodea Canadensis*

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

cobalt 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 cobalt chloride 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 heavy elements in the aquatic plants *Schoenoplectus litoralis* tissues (3.068, 3.972, 5.132) and *Elodea Canadensis* tissues (3.968, 4.698, 5.772) compared with the control (1.798 and **2.671**) respectively. This shows that the aquatic plants under investigation are able to keep this material in their tissues, or that they have developed a special tolerance to a significant number of elements, or that they absorb high concentrations of elements that become inactive forms of gaps [11]. Different plant species, physiological states, and responsiveness to the element could be the cause of changes in the concentration of elements accumulated within plant bodies [12]. The sources claim that plants exposed to heavy metals grow plant clams, which prevent the plants from eliminating toxins and preserving a balanced concentration of heavy elements. This is caused by the enzyme phytochelatin synthase, which activates the presence of heavy ions by using glutathione as a base material. [13] noted that a range of environmental factors, including temperature, light intensity, salinity, pH level, and the effectiveness of complex organic and inorganic compounds, as well as their effects on physical and chemical processes that control the rate at which heavy metals accumulate in an organism's tissues, as well as metabolic processes, Bioaccumulation is also influenced by environmental factors and the element's concentration in the natural environment [14].

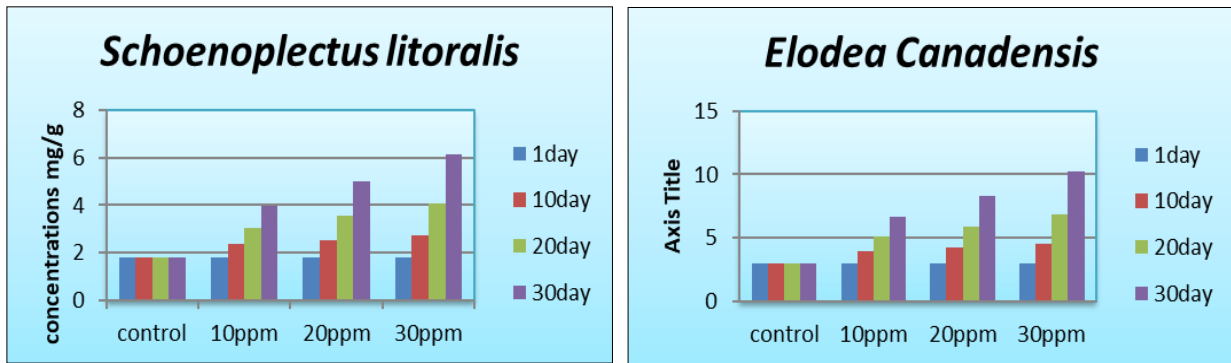


Fig 1: Three different concentrations of cobalt chloride during the experiment period in *Schoenoplectus litoralis* and *Elodea Canadensis* tissues

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 *Schoenoplectus litoralis* tissues (0.134, 0.104, 0.082) and *Elodea Canadensis* tissues (0.104, 0.081, 0.064) compared with the control (0.233 and 0.183) respectively. These exceedingly hazardous compounds, which have the potential to accumulate in plant tissue, are the cause of the drop in chlorophyll concentrations observed in the experimental plants [15]. By inhibiting the activities of the enzymes that cause it, such as aminolevulinic acid dehydratase and porphobilinogen deaminase, it prevents the creation of porphyrin [16].

Research has shown that the synthesis of chlorophyll, photosynthesis, and other colors like as efficacy and carotenoids can all have an impact on the levels of certain heavy metals [17]. The enzymatic system is affected by these components in the ways listed below: [18]. The total amount of protein and chlorophyll in the plant tissues that were used in the investigation and exposed to the various concentrations of heavy elements used throughout the investigation, This may be the result of the enzymes that produce carotene and chlorophyll being inhibited when the concentration of heavy metals in plant tissues increases, resulting in a reduction of chlorophyll in the plant tissues [20]. Nasser installs a few enzymes that aid in chlorophyll synthesis [21].

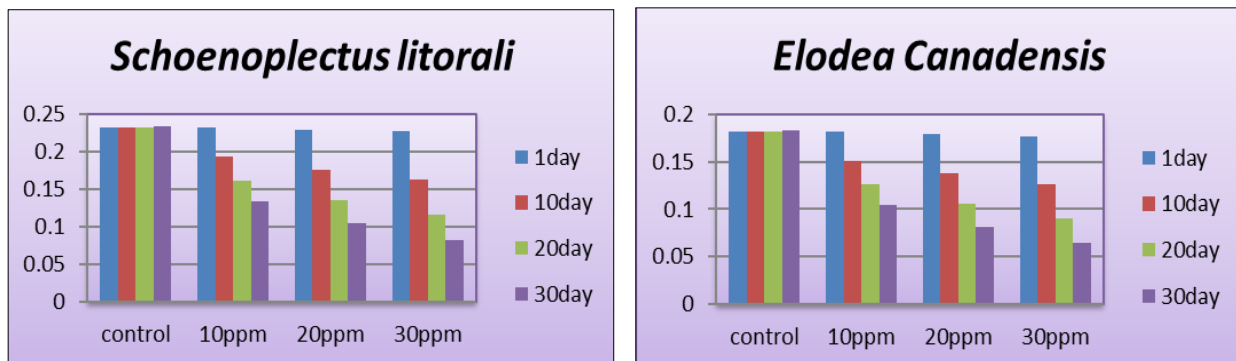


Fig 2: Three different concentrations of cobalt chloride during the experiment period on the concentration of chlorophyll in *Schoenoplectus litoralis* and *Elodea Canadensis* tissue

Figure (3) shown The protein content in *Schoenoplectus litoralis* tissues (2.877, 2.569, 2.138) and *Elodea Canadensis* tissues (2.931, 2.815, 2.491) compared with the control (2.983 and 3.103) respectively. The reasons for the decline in all plants' protein content, which reduces the

proportion of protein content in their tissues, are either the consumption of the protein content in these plants' tissues for specific essential activities or the metabolic processes that occur within them to withstand the concentration of the elements [22]. This fraction decreases as exposure duration increases until the event ends [23].

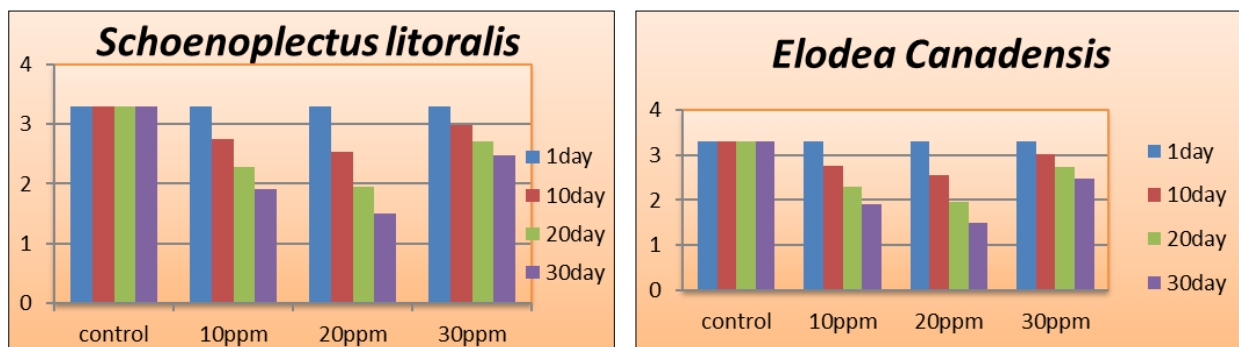


Fig 3: Three different concentrations of cobalt chloride during the experiment period on protein content in *Schoenoplectus litoralis* and *Elodea Canadensis* tissues

Conclusion and Recommendations

The detrimental effects of cobalt chloride on essential development processes increase in a time-dependent manner with the concentration of contamination. cobalt chloride have effects on lowering the levels of chlorophyll and protein in *Schoenoplectus litoralis* and *Elodea Canadensis* tissues, 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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