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Original Research Article

Effect of Nickel Chloride and Cobalt Chloride on Physiological Characteristics of *Myriophyllum Verticillatum and Schoenoplectus Litoralis*

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Abstract: The object of the research was to determine the adverse effects of different concentrations of nickel chloride and cobalt chloride (10, 20, and 30) mg/L for a month on the physiological characteristics of *Myriophyllum verticillatum and Schoenoplectus litoralis* as well as assess the concentration of total chlorophyll and protein content. The results of the study showed that the concentrations of the components increased at the end of the investigation in the water plants used for the examination as compared with the control sample, in addition to a decrease in the protein and chlorophyll levels of the water plants exposed to the effects of heavy metal.

Keywords: Nickel, Cobalt, Myriophyllum V, Schoenoplectus L, Protein and Chlorophyll.

INTRODUCTION

Pollution of the water in heavy metals represents a serious threat to the environment which needs to be solved using aquatic plants because they are of particular importance due to their basic function in affecting the aquatic ecosystem [1]. Because some plants have genetic, chemical, and physiological characteristics that do not negatively impact the environment—unlike chemicals, which are hazardous to the environment when used to treat contaminated water—using plants in treatment is a novel method of eliminating pollutants [2].

Due to the diversity of aquatic plants, their wide spread in water bodies, and their good tolerance to changing environmental conditions, different types of plant families have been used as biological evidence to study water pollution with heavy elements [3]. They have also become widely used in the field of biofiltration due to their ability to remove heavy elements from water and collect them in tissues [4]. The process of using plants to remove pollutants from soil, groundwater, surface water, and wastewater is called phytoremediation, as the biological processes of plants help in the treatment process called green treatment [5].

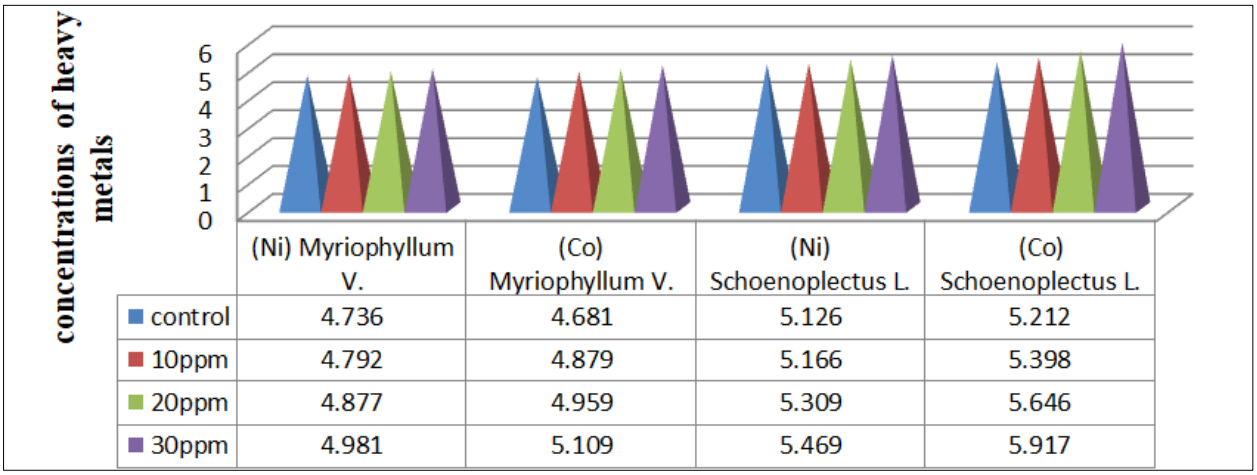
Since these plants can store heavy elements more in their tissues than in the aquatic environment, several of them offer solid evidence of heavy element pollution in water [6]. In addition to their quick development and ability to adapt to a variety of habitats with little environmental needs [7]. Depending on the plant species and the investigated plant organ, different quantities of heavy metals can accumulate in different plant bodies [8]. In natural systems, elements are not readily absorbed by the plant; instead, they are absorbed in the form of dissolved complexes, which is dependent on the chemical and physical conditions of the surrounding environment. This has a strong effect on processes related to the absorption of element ions [9]. Certain plants accumulate high concentrations of both essential and non-essential elements in their tissues due to interference in the ion transport system between the two types of elements caused by similarities in the chemical properties of minerals, making it impossible for the plant to distinguish between the two types of elements [10]. These plants are known as hyper-accumulators because they are able to remove elements from the medium at significantly faster rates than other plants [11]. These plants bind to Phytochelatin, which are peptides with the (-SH) group, in order to develop tolerance to high element concentrations [12]. This study aimed to investigate the effects of nickel chloride and cobalt chloride on the growth and physiological characteristics of *Myriophyllum verticillatum and Schoenoplectus litoralis*.

MATERIALS AND METHODS

The research study was designed to determine the ability of some aquatic plants, such as *Myriophyllum verticillatum and Schoenoplectus litoralis*, 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 [13]. Each container contained 10 liters of water contaminated with three different concentrations (10, 20, 30) mg/liter of nickel chloride and cobalt chloride [14]. 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 [15]. The protein level in plant tissues was determined according to method [16], and the total chlorophyll content in aquatic plant tissues was estimated according to method [17].

RESULTS AND DISCUSSION

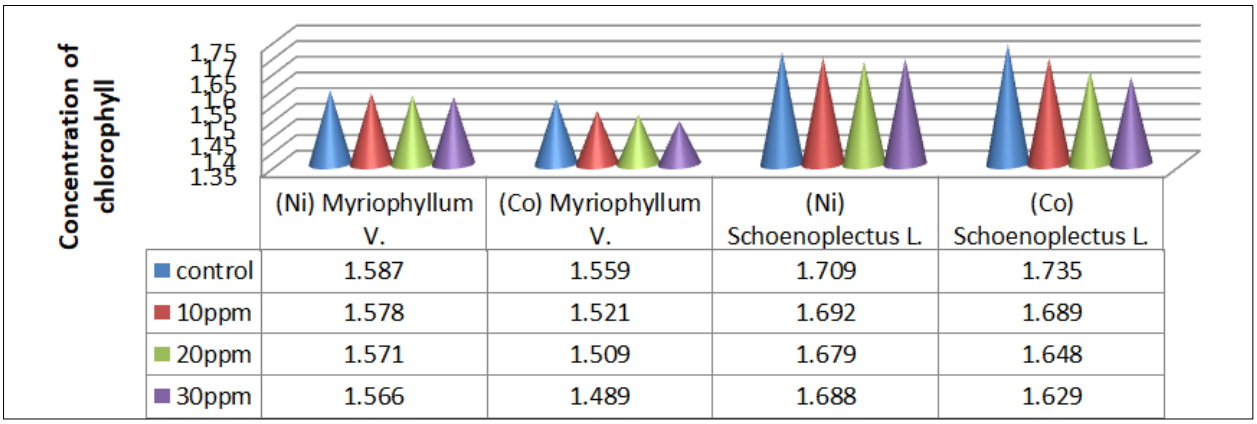
The results of the study showed an increase in the concentration of heavy elements in the studied aquatic plants at the end of the experiment. Figure (1) shown accumulation of nickel chloride and cobalt chloride (4.981 and 5.109) compared with the control (4.736 and 4.681) respectively in the aquatic plant *Schoenoplectus litoralis* tissues where concentrations of nickel chloride and cobalt chloride in the aquatic plant *Myriophyllum Canadensis* tissues (5.469 and 5.917) compared with the control (5.126 and 5.212) respectively. In other words, the aquatic plant Schoenoplectus litoralis has a higher lead chloride accumulation than the aquatic plant Myriophyllum Canadensis, but the aquatic plant Myriophyllum Canadensis has a higher accumulation of cadmium chloride in its tissues [18, 19].



	(Ni) Myriophyllum V.	(Co) Myriophyllum V.	(Ni) Schoenoplectus L.	(Co) Schoenoplectus L.
control	4.736	4.681	5.126	5.212
10ppm	4.792	4.879	5.166	5.398
20ppm	4.877	4.959	5.309	5.646
30ppm	4.981	5.109	5.469	5.917

Figure 1: Concentrations of nickel chloride and cobalt chloride in *Myriophyllum verticillatum and Schoenoplectus litoralis* tissues

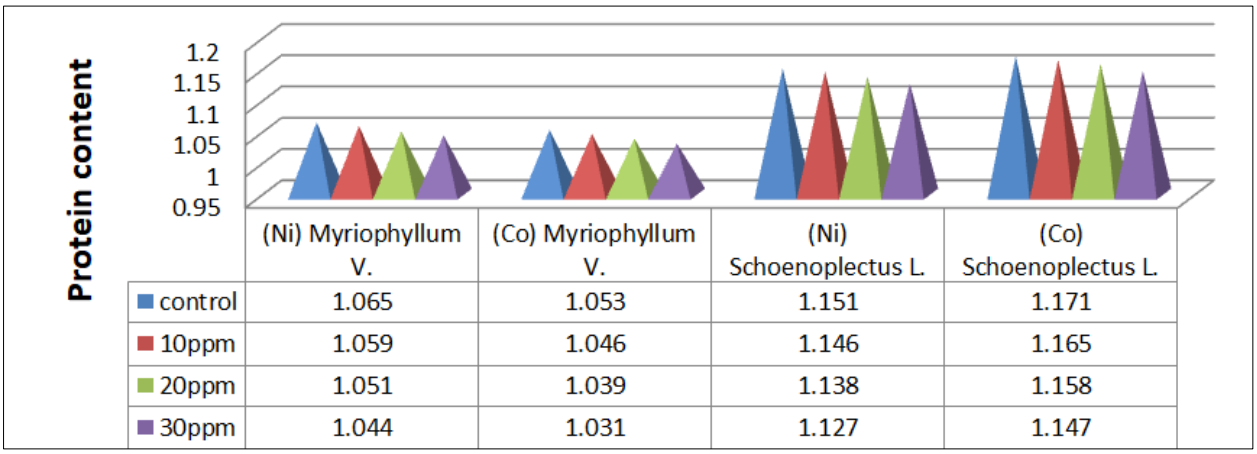
The results of the study showed a decrease in the total concentration of chlorophyll in the studied aquatic plants at the end of the experiment, figure (2) shown the concentration of chlorophyll in the aquatic plants *Schoenoplectus litoralis* in concentration 30 ppm of nickel chloride and cobalt chloride (1.688 and 1.629) compared with the control (1.709 and 1.735) respectively where concentrations of nickel chloride and cobalt chloride in the aquatic plant *Myriophyllum Canadensis* tissues (1.566 and 1.489) compared with the control (1.587 and 1.559) respectively [20].



	(Ni) Myriophyllum V.	(Co) Myriophyllum V.	(Ni) Schoenoplectus L.	(Co) Schoenoplectus L.
control	1.587	1.559	1.709	1.735
10ppm	1.578	1.521	1.692	1.689
20ppm	1.571	1.509	1.679	1.648
30ppm	1.566	1.489	1.688	1.629

Figure 2: Concentration of chlorophyll in *Myriophyllum verticillatum and Schoenoplectus litoralis* tissues

Figure (3) shown The protein content in the aquatic plants *Schoenoplectus litoralis* in concentration 30 ppm of nickel chloride and cobalt chloride (1.127 and 1.147) compared with the control (1.151 and 1.171) respectively in the aquatic plant *Schoenoplectus litoralis* tissues where concentrations of nickel chloride and cobalt chloride in the aquatic plant *Myriophyllum Canadensis* tissues (1.044 and 1.031) compared with the control (1.065and1.053) respectively [21].



	(Ni) Myriophyllum V.	(Co) Myriophyllum V.	(Ni) Schoenoplectus L.	(Co) Schoenoplectus L.
control	1.065	1.053	1.151	1.171
10ppm	1.059	1.046	1.146	1.165
20ppm	1.051	1.039	1.138	1.158
30ppm	1.044	1.031	1.127	1.147

Figure 3: Protein content in *Myriophyllum verticillatum and Schoenoplectus litoralis* tissues

CONCLUSION AND RECOMMENDATIONS

In comparison to Schoenoplectus litoralis, the aquatic plant Myriophyllum Canadensis exhibits a greater accumulation of cadmium chloride and lead chloride in its tissues. Conversely, Schoenoplectus litoralis exhibits a higher accumulation of nickel chloride and cobalt chloride in its tissues than Myriophyllum Canadensis. Schoenoplectus litoralis and Myriophyllum verticillatum levels of protein and chlorophyll were most significantly lowered by the metals. When selecting plant species, the type of contaminant and its concentration in the environment are taken into account because plants are an effective biological tool for removing toxins from heavily polluted areas.

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