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**Original Research Article**

# Remove Nickel Chloride and Cobalt Chloride by *Elodea Canadensis* and *Myriophyllum verticillatum*

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**Abstract:** The aim of this study was to remove various amounts of heavy metal salts, such as nickel and cobalt chloride, from aquatic plants, specifically *Elodea Canadensis* and *Myriophyllum verticillatum*, over the course of a month. The findings of the investigation demonstrated that the components' concentrations in the test aquatic plants rose towards the conclusion of the study in a manner distinct from that of the control sample.

**Keywords:** Nickel chloride and Cobalt chloride, *Elodea Canadensis* and *Myriophyllum verticillatum*.

## INTRODUCTION

Using live plants to purify land, air, and water that have been tainted by dangerous pollutants is known as phytoremediation [1]. It is referred to 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] Using the capacity of plants to concentrate elements and compounds from the environment and to detoxify a variety of chemicals, phytoremediation is suggested as an economical plant-based remediation method [3]. Certain plants, known as hyper-accumulators, have the capacity to bio-accumulate substances, which Nickel chlorides to the concentrating effect. The impact of cleanup is very different.

Phytoremediation has been used successfully to restore abandoned metal mine workings and sites where polychlorinated biphenyls have been dumped [4]. While toxic heavy metals cannot be degraded, organic pollutants can and are generally the primary targets for phytoremediation. Several field trials have confirmed the feasibility of using plants for environmental cleanup.

Around the world, phytoremediation programs have reduced the levels of contaminants like metals, herbicides, solvents, explosives, and crude oil and its derivatives. Numerous plants have been shown to be effective for hyper-accumulating pollutants at toxic waste sites, including pigweed, hemp, alpine pennycress, and mustard plants. Different plant physiologies prevent some plants from accumulating organic contaminants or heavy metals [6]. Even cultivars of the same species can acquire contaminants in different ways. This technology has been used at locations where the soils contain Nickel chloride, uranium, and arsenic contamination and has been studied more and more. A significant drawback of phytoremediation is that it necessitates a long-term commitment because it depends on a plant's capacity to grow and survive in an environment that is not optimal for typical plant growth, even if it has the benefit of treating environmental issues in situ [7].

## MATERIALS AND METHODS

The purpose of the experiment was to test the ability of two plants, Myriophyllum verticillatum and Elodea Canadensis, to remove varying concentrations of salts (nickel chloride, manganese chloride, cobalt chloride, and zinc chloride). Each plant was given 50 g of fresh weight, and the plants were grown in ten plastic containers with a combined capacity of fifteen litres. Ten litres of water with three distinct quantities of salts (10, 20, 30 mg/liter) Nickel chloride and Cobalt chloride are contained in each container. To ascertain the elimination percentage, samples of the experiment's plants

were taken a month later and subjected to varying element salt concentrations [8]. Flame atomic spectrometry was used to quantify the heavy elements in plant and water samples [9].

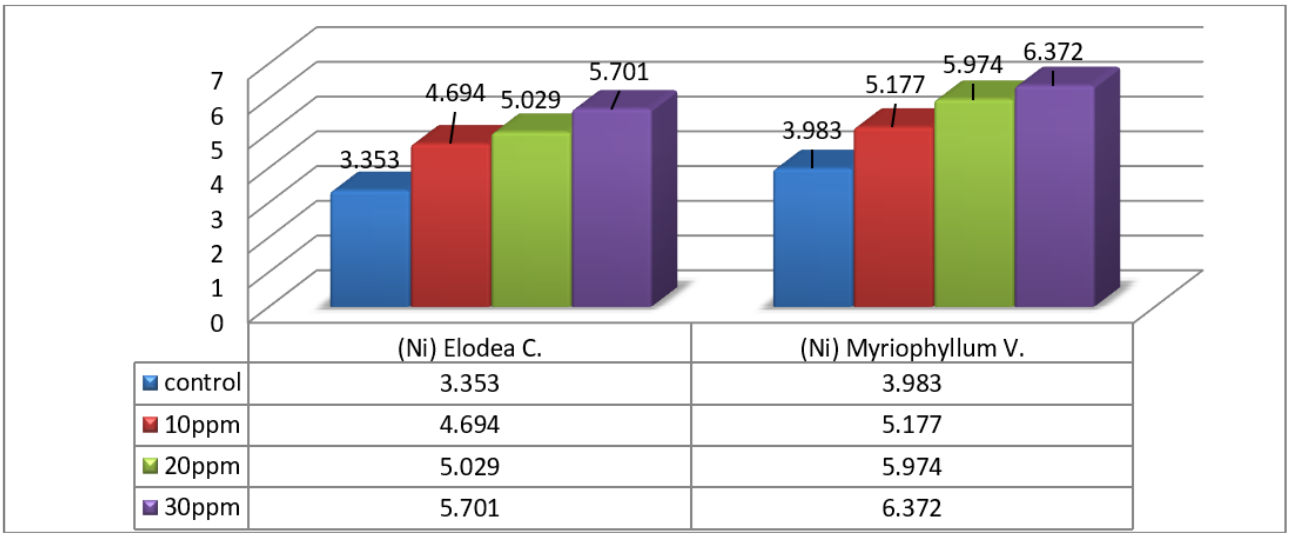
## RESULTS & DISCUSSION

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, as Figure (1) showed the accumulation of Nickel chloride in the aquatic plant Myriophyllum verticillatum (3.215, 2.795, 2.423) respectively compared to the control, while the concentration of Nickel chloride in the plant Elodea Canadensis (4.731, 4.132, 3.594) respectively compared to the control.

The results of the study also showed an increase in the concentration of heavy elements in the studied aquatic plants at the end of the experiment, as Figure (2) showed the accumulation of Cobalt chloride in the aquatic plant Myriophyllum verticillatum (3.215, 2.795, 2.423) while the concentration of Cobalt chloride in the plant Elodea Canadensis (4.731, 4.132, 3.594) respectively compared to the control.

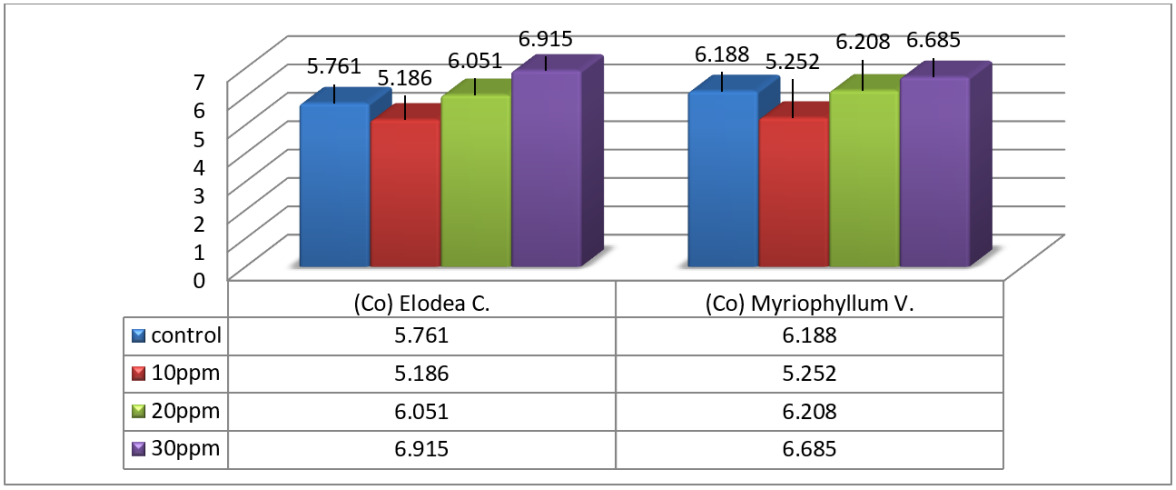
The results of the study showed the percentage of removal of heavy elements in the aqueous solution at the end of the experiment, as Figure (3) showed the percentage of Nickel chloride removal in the aquatic plant Myriophyllum verticillatum (3.215, 2.795, 2.423) respectively compared to the control, while the percentage of Nickel chloride removal in the plant Elodea Canadensis (4.731, 4.132, 3.594) respectively compared to the control. Figure (4) also showed the percentage of Cobalt chloride in removal in the aquatic plant Myriophyllum verticillatum (3.215, 2.795, 2.423) while the percentage of Cobalt chloride in removal in the plant Elodea Canadensis (4.731, 4.132, 3.594) respectively compared to the control.

It demonstrates how the aquatic plants being studied can either absorb large quantities of the element and change into inactive vacuoles, accumulate this element in their tissues, or have a special ability to endure high concentrations of the element [10]. The natural equilibrium of heavy metals in plants. The enzyme phytochelatin synthase does this by activating the presence of heavy element ions using glutathione as a basic material [11]. There are many external factors that affect the concentration of heavy metals in living organisms' tissues, including salinity, pH, the effectiveness of complex organic and inorganic molecules, and their effects on the physical and chemical processes that control the rate of metabolic processes, including temperature, oxygen content, and light intensity [12]. The element's ambient concentration, environmental characteristics, organism type, and exposure length all have an impact on bioaccumulation [13]. The results of the study showed that at the end of the trial, the total amount of chlorophyll in the aquatic plants under examination had dropped. This is due to the presence of these highly poisonous compounds in the experimental plants, which can accumulate in plant tissue [14]. It does this by inhibiting the enzymes that make it, such as aminolevulinic acid dehydratase and porphobilinogen deaminize, which creates porphyrin [15]. The production of chlorophyll, photosynthesis, and the manufacture of additional colors like as carotene and efficacy have all been found to affect specific heavy metals [16]. enzymatically affected by these substances [17]. This may be explained by the fact that the enzymes that help produce carotene and chlorophyll are blocked when the quantity of heavy metals in plant tissues increases, resulting in a decrease in the amount of chlorophyll in those tissues. Nasser installs certain enzymes that facilitate the synthesis of chlorophyll [18].



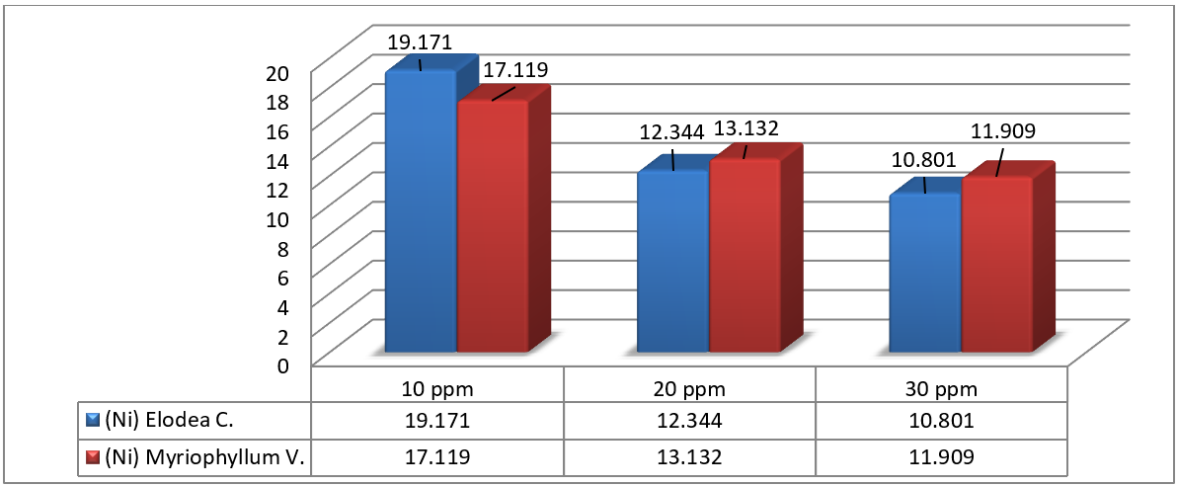

| | (Ni) Elodea C. | (Ni) Myriophyllum V. |
|---|---|---|
| control | 3.353 | 3.983 |
| 10ppm | 4.694 | 5.177 |
| 20ppm | 5.029 | 5.974 |
| 30ppm | 5.701 | 6.372 |

**Figure 1: Showed the accumulation of Nickel chloride in *Myriophyllum verticillatum and Elodea Canadensis tissues***



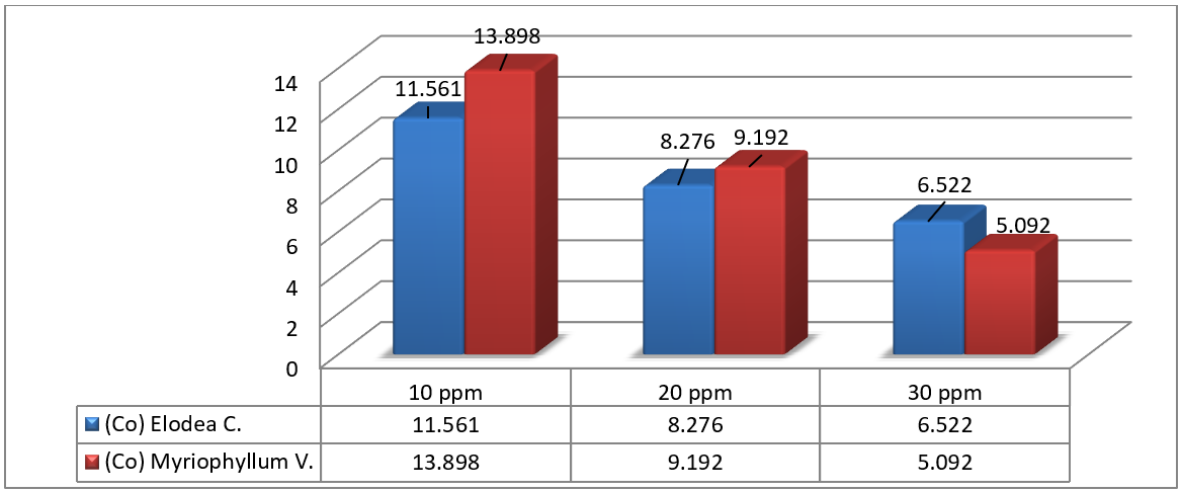

| | (Co) Elodea C. | (Co) Myriophyllum V. |
|---|---|---|
| control | 5.761 | 6.188 |
| 10ppm | 5.186 | 5.252 |
| 20ppm | 6.051 | 6.208 |
| 30ppm | 6.915 | 6.685 |

**Figure 2: Showed the accumulation of Cobalt chloride in *Myriophyllum verticillatum and Elodea Canadensis tissues***




| | 10 ppm | 20 ppm | 30 ppm |
|---|---|---|---|
| (Ni) Elodea C. | 19.171 | 12.344 | 10.801 |
| (Ni) Myriophyllum V. | 17.119 | 13.132 | 11.909 |

**Figure 3: Showed the percentage removal of Nickel chloride by *Myriophyllum verticillatum and Elodea Canadensis.***




| | 10 ppm | 20 ppm | 30 ppm |
|---|---|---|---|
| (Co) Elodea C. | 11.561 | 8.276 | 6.522 |
| (Co) Myriophyllum V. | 13.898 | 9.192 | 5.092 |

**Figure 4: Showed the percentage removal of Cobalt chloride by *Myriophyllum verticillatum and Elodea Canadensis tissues***

## CONCLUSIONS AND RECOMMENDATIONS

Heavy metals have a detrimental impact on essential growth processes, and the consequences worsen as the pollutant's concentration rises concurrently. The choice of plant species is based on the kind of pollutant and its concentration in the environment. Plants are an efficient biological agent for eliminating pollutants from highly polluted settings.

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