

## Ability of some crops for phytoremediation of nickel and zinc heavy metals from contaminated soils

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### Original Article

#### Abstract

The present study was aimed at comparing the ability of three crop plants for phytoremediation of zinc (Zn) and nickel (Ni) from soils. A factorial (3×2×3) experiment based on RCBD was used to compare the treatments, and was repeated three times. The first factor was crop type (wheat, clover and rapeseed), the second factor was heavy metal types (zinc (Zn) and nickel (Ni)) and the third factor was heavy metal concentration in soil (0.0, 50 and 100 mg.kg<sup>-1</sup>). With regard to plant type and heavy metal, the highest uptake was recorded in wheat for nickel (Ni) uptake. The lowest uptake of heavy metal was seen in clover crop and nickel (Ni) heavy metal. The highest Ni uptake was observed in wheat at the concentration of 100mg.kg<sup>-1</sup>. Nickel (Ni) was more absorbed in its higher concentration where the uptake of nickel (Ni) at the concentration of 100.0mg.kg<sup>-1</sup> was 182% more than 50.0 mg.kg<sup>-1</sup>. Generally, the results of this experiment showed that it is possible to use phytoremediation as a suitable means for eliminating the excess concentration of zinc (Zn) and nickel (Ni). In this case, wheat was the superior crop and its mechanisms for removal of heavy metal require further investigation.

**KEYWORDS:** bioaccumulation, heavy metal pollution, toxic effect

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#### Introduction

Heavy metals are indestructible materials which have a great impact on environmental pollution. They also damage biological and physiological systems of organisms.<sup>1</sup> Heavy metals, which are defined as metals and metalloid with a density of over five g.cm<sup>-3</sup>,<sup>2</sup> are among the most important factors which pollute farming systems. Although small quantities of some heavy metals are essential for normal metabolism, but large amounts of heavy metals are toxic for humans. The toxic effects of high levels of heavy metals in plants can also be seen. Bioaccumulation, the increase in the concentration of a chemical material in an organism compared with its accumulation in the environment, is one of the specific characteristics which has a significant role in the incidence of toxic effects

of heavy metals.<sup>3</sup> Heavy metals which are biologically indestructible and irresolvable, remain indefinitely in the environment and ultimately affect soil quality and human health. Thus, the elimination, or at least reduction of heavy metal from farming soils is closely associated with human health.<sup>4</sup>

Some heavy metals are not required by plants and have no biological function. However, some other heavy metals, including zinc (Zn), are essential for normal plant growth and their low availability leads to the reduction of nitrogen metabolism and protein synthesis, internode length and, finally, plant growth.<sup>3</sup> However, zinc (Zn) has a toxic effect when it is absorbed by plants in high concentration which negatively affects physiological and biochemical processes of plant, thereby leading to reduction in plant growth and yield<sup>2</sup>. Nickel (Ni) improves the structure of some plant enzymes<sup>5</sup> and its low concentrations is essential for plant growth and

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