Effects of Nickel and Edta on Pisum Sativum L. Plants

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Abstract:

Soil contamination by heavy metals is considered one of the major environmental problems in recent years because it poses a threat to human health and agricultural production due to their harmful effects on plant growth, food quality and environmental health. Heavy metal pollution involves metal ions that are not always essential to plants because they affect growth and development. Our work aims to study remediation of soils contaminated by Nickel and is particularly interested in phytoremediation and particularly chemically enhanced phytoextraction. This technique allows certain plants to amplify their capacity to absorb ETMs from the soil through the use of certain chemical chelates, such as EDTA (Ethylene diamine tetra acetic acid), which increase the solubility of metals in the soil, facilitate their diffusion in the rhizosphere, and increase their phytoavailability.

Our results showed that nickel has a negative impact on peas (Pisum sativum L.) because they affect their germination rate, plant growth and protein content. EDTA itself also causes the same negative effects as the nickel since it is a toxic xenobiotic substance. The combination of this chelator with Ni amplified the action of this heavy metals on the different parameters studied. Oxidative stress is manifested by the accumulation of reactive oxygen species and MDA which are an indication of damage to cell membranes. The enzymatic activities of catalase, APX, SOD and GPOX were stimulated by EDTA, nickel or a combination of both. Additionally, glutathione S-transferase activity was significantly increased in response to EDTA and the nickel. Our work also showed that there was absorption and accumulation of Ni in the leaves of Pisum sativum in the absence of EDTA.

Keywords:

EDTA, lead, nickel, oxidative stress, Pisum sativum, pollution, phytoextraction.