
Effect of combined contaminants (i.e., microplastics and heavy metals) on the enzymatic activity of soils

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Abstract

Emission of heavy metals, resulting from civilization development, has a negative impact on soil environment, causing its pollution. This problem occurs locally and globally. Also recently, a new foreign substance, i.e., microplastic receiving increased attention as a harmful environmental pollution. Microplastic have received global awareness due to their ubiquitous presence in the environment and unknown hazards to organisms. The simultaneous occurrence of metals and microplastic in soils raises the question of whether there are connections and interactions between these two groups of pollutants. Microplastics and heavy metals are not only acting as persistent pollutants, but their combined pollution also poses a new threat to the world.

The aim of the research was to determine the toxicity of both, metals and microplastic demonstrating their effect on soil enzyme activity. The research was carried out depending on the concentration and exposure time of pollutants. Toxicity in soil was assessed based on an enzymatic test that measures the activity of soil dehydrogenases. The effect of soils contaminated separately with metals and microplastics and their combined version in different concentration configurations was investigated. Additionally, the time of exposure of pollutants to the activity of dehydrogenases was investigated.

It was shown that the combination of both pollutants together, significantly reduces the enzymatic activity in soil, compared to soil samples contaminated with only one pollutant (at the same concentration). Also, the results showed that the addition of fresh microplastics had little effect on dehydrogenases activity. As the aging process progressed, significant decreases in enzyme activity were observed. Such dependency was not observed in the samples with heavy metals. This highlights an important aspect of the context dependency of microplastic effects in soil and on soil health.

Keywords: soil contamination, microplastic, heavy metals, enzymatic activity

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