THE EFFECT OF A FERTILIZER ON THE ABUNDANCE OF MICROORGANISMS IN SOILS SUBJECTED TO REMEDIATION

Postolachi O.[1], Rastimesina I.[1], Vorona V[1]., Bogdevich O.[2]
[1]*Institute of Microbiology and Biotechnology, Republic of Moldova*
[2]*Institute of Chemistry, Republic of Moldova*
e-mail: oleseap@yahoo.com

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An important factor, which often limits the effectiveness of current biodegradation techniques, is the poor ability of the microbial communities inhabiting the contaminated environments to degrade the pollutants. Therefore, addition of fertilizers of organic and mineral origin, which trigger the metabolic processes of microorganisms and, as a result, stimulate their growth, is a common practice. The aim of our research was to evaluate the effect of a fertilizer on the abundance of microorganisms during soil remediation.

The object of study was a soil polluted by a POP complex, that was collected from the territory of a former pesticide storage, located near the village of Slobozia-Dușca, the Criuleni district, the Republic of Moldova. The bioremediation experiments were done in plastic jars, each containing 1,000 g of contaminated soil. The contaminated soil without remediation treatments was used as a control. The experiments were conducted under oxic (Variant 1) and cycled anoxic/oxic conditions (Variants 2-4). Under the oxic conditions the soil moisture was kept constant at 60%. The anaerobic conditions were created by saturating the contaminated soil with water at 80% of the water holding capacity in plastic jars sealed with black polyethylene. The bioremediation experiments were focused on stimulating the indigenous soil microflora by applying a fertilizer. The tested fertilizer contained 50.0% of wood sawdust, 40.0% of iron filings, 10.0% of organic compounds, and was introduced in the amounts of 3.0% (Variant 3) and 6.0% (Variant 4). Thus, for the bioremediation of the polluted soil, there were in total 4 experimental variants. The dynamics of the microbial population in the soil subjected to bioremediation was evaluated during five cycles by the spread plate method. Estimating the total number of microorganisms in the soil samples after 5 cycles of bioremediation showed that the addition of fertilizer significantly stimulated the growth of microorganisms. Most actively the microbial population grew in variant 4 (Figure). Comparing to the polluted soil control, the population of microorganisms in Variant 4 increased by 155 times, and comparing to Variant 1 – by 25.4 times. The remediation by cycled oxic-anoxic conditions (Variant 2) did not have considerable effects on the microorganisms, while the addition of the fertilizer (Variants 3 and 4), under the same conditions, significantly stimulated their abundance.

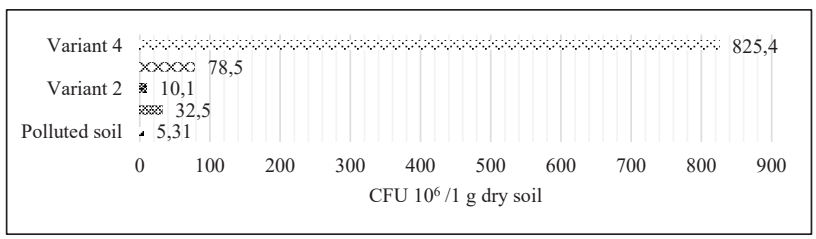

Figure 1. The total number of microorganisms in the soil samples after five cycles of bioremediation

Thus, it was established that the tested fertilizer can serve as a bioremediation factor in cyclic anoxic/oxic conditions, stimulating the development of the microbial community in the soil contaminated by POP complexes. Under the conditions of our experiment the best fertilizer concentration was 6.0%.

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