



“Gheorghe Asachi” Technical University of Iasi, Romania



MICROBIAL PARAMETERS AS BIOINDICATORS OF SOIL QUALITY DURING AIDED PHYTOSTABILIZATION OF METAL CONTAMINATED SOIL

Jacek Krzyżak¹, Grażyna Plaza^{1,2*}, Rosa Margesin³, Daniel Wasilkowski⁴,
Agnieszka Mrozik⁴

¹Institute for Ecology of Industrial Areas, Environmental Biotechnology Department, 40-844 Katowice,
6 Kossutha St., Poland

²Silesian University of Technology, Department of Environmental and Safety Management, 41-800 Zabrze,
66 De Gaulle St., Poland

³Institute of Microbiology, University of Innsbruck, Technikerstrasse 25, A-6020 Innsbruck, Austria

⁴University of Silesia, Department of Biochemistry, 40-032 Katowice, 28 Jagiellońska St., Poland

Abstract

Microbial properties such as enzyme activities, respiration and nitrification were measured to evaluate changes in soil quality during short-term remediation (28 weeks) with aided phytostabilization of soil heavily contaminated with metals. The soil contained 1291 ± 66 mg Pb kg⁻¹soil, 85 ± 2.53 mg Cd kg⁻¹ soil and 4506 ± 365 mg Zn kg⁻¹soil and was amended with a combination of 10 % (w/w) lignite and 2.5 % (w/w) lime and with fertilizers and vegetated with grass *Festuca arundinacea*.

Phytostabilization significantly increased enzymes activities, respiration and substrate-induced respiration (SIR). Activities of β -glucosidase, acid and alkaline phosphomonoesterase and dehydrogenase were significantly higher in treated soil than in the control (untreated) soil. Also, soil respiration and SIR were significantly higher in the treated soil compared to the control. Potential nitrification increased after 9 weeks of the experiment in the control soils and was detectable in the treated soil only after 28 weeks of the incubation. The mean value of the Enzymatic Soil Index (ESI) during 28 weeks was 62.2 in the treated soil and was about 3-fold higher than in the control soil. An ESI increase of 92 % was noted during the experiment. Also, the mean value of the Biochemical Soil Fertility Index (MW) was over 6 times higher in the treated soil compared to the control. On the basis of the obtained results, aided phytostabilization improved soil biological properties.

Key words: aided phytostabilization, bioindicators, enzyme activities, heavy metals contaminated soil, respiration

Received: April, 2012; Revised final: September, 2012; Accepted: September, 2012
