Kołwzan, B. Assessment and Choice of Inoculants for the Bioremediation of Soil Contaminated with Petroleum Products. *Ochrona Srodowiska* 2008, Vol. 30, No. 4, pp. 3–14.

Abstract: The paper addresses the problem of selecting inoculants in order to aid the bioremediation of soil that has been contaminated with petroleum products being components of diesel oil spills. Bacterial preparations based on indigenous microflora (BIO-1) and preparations obtained from our own culture, containing active foreign strains of *Pseudomonas putida* (K3), *Acinetobacter lwoffi* (K29) and *Rhodococcus erythropolis* (K45), were tested for activity. The tests were conducted in lysimeters by the *in situ* method. The initial content of diesel oil in the soil amounted to 10%. The results have demonstrated that the use of active strains of the species *Acinetobacter lwoffi* and *Pseudomonas putida* accelerated only the degradation of easily biodegradable diesel oil components at the first stage of the bioremediation process. It took a long time to adapt those biopreparations to the biodegradation of the other compounds, and in this way it was possible to equalize the overall time of biodegradation for the petroleum products, irrespective of the type of the inoculant used. The second stage of bioremediation proceeded at a slow rate, which is attributable to the poor biodegradability of aromatic and alicyclic compounds. It has been found that the bioremediation process can be accelerated, and that the efficiency of pollutant removal can be enhanced by re-inoculating the soil with *Rhodococcus erythropolis*, which has the capacity for utilizing petroleum products that are difficult to biodegrade. When the soil was inoculated with *Acinetobacter lwoffi*, the content of petroleum products was reduced to 114.1 mg/kg (approx. 0.01%); upon inoculation of the soil with indigenous microflora, the content of petroleum products decreased to 409 mg/kg (approx. 0.04%). The best results were obtained, however, when the soil inoculated with *Pseudomonas putida* was made subject to re-inoculation; the final content of petroleum products then totalled 31.4 mg/kg (approx. 0.003%). Observations made in the course of the remediation procedure have revealed that the growth of the majority of the soil microorganisms (which represent the physiological groups chosen) was stimulated. Enhancement was also observed in the enzymatic activity of the soil microorganisms with respect to the biodegradation of a large quantity of organic substances. Exceptions were actinomycetes, free nitrogen fixing bacteria and nitrifying bacteria, whose numbers were reduced substantially as compared to the control. Analysis of the variations observed in the bacterial counts in particular lysimeters suggests that the introduction of the inoculant prepared on the basis of the indigenous microflora of the contaminated soil brought about the least substantial changes in the quantitative and qualitative structure of the bacterial population. For that reason inoculants of this type should be regarded as suitable for bioaugmentation, since their application can restore the ecological equilibrium in the contaminated soil.

Keywords: Petroleum products, soil, bioremediation, inoculant, *Pseudomonas putida*, *Acinetobacter lwoffi*, *Rhodococcus erythropolis*.