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Effects of Engine Oil Soil Contamination on Two-species System

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Extended Abstract

Agroecosystems contamination by petroleum derivatives may be a threat of invertebrate inhabitants (Tang et al., 2011). Biochemical responses of animals might be helpful in monitoring soil contamination. They may be connected with activity of microsomal enzymes, and antioxidant enzymes such as glutathione transferases (GST), superoxide dismutase (SOD) or catalase (CAT) (Singh et al., 2010).

The aim of our study was to compare an effect of engine oil on detoxification processes of organisms from a single-species and two-species systems. We have chosen soil inhabitants: *Lumbricus terrestris* (important in soil remediation) and *Porcelio scaber*. We examined microsomal enzymes: ethoxycoumarin-O-deethylase, NADPH-cytochrome P450 reductase and cytosolic ones: CAT, SOD and GST. Significant toxic effects of engine oil on both animals species were presented in earlier examinations (Gospodarek, 2012).

The soil, used in the experiment, was collected one year after contamination (surface: one m^3 soil; dose: 6 g kg^{-1} of dry soil; place: Kraków, Poland; 50.0815°N, 19.84730°E). Twenty mature individuals of *P. scaber* and twenty mature individuals of *L. terrestris* were reared for four weeks, separately and together, in 3L containers, filled with soil (air dried, sieved), moisture approximately to 78-80 % rH. The preparation of microsomal fractions and cytosolic fractions from homogenates of whole animals and the enzymes activity measurements are described in Kafel et al. (2012).

The differences in pattern response of animals from single-species and two-species systems were mainly found in the case of antioxidant enzymes changes in *P. scaber*. The examples are changes in CAT (in control conditions) and SOD activity (under engine oil exposure).

At the beginning of exposure to the contaminants, we found a decrease in: SOD response in *P. scaber* and GST response in *L. terrestris* from a two-species system when compared with appropriate control conditions and a single-species system with contaminants exposure. It may be connected with bioremediation action of *L. terrestris*. The lower amounts of PAHs in contaminated soil inhabited by earthworms were measured with time (unpublished data, Kafel).

The microsomal ethoxycoumarin-O-deethylase, as less sensitive to the applied contaminants, does not seem to a suitable biomarker of engine oil contamination in opposition to other examined enzymes.

According to their reaction it seems that CAT is a good biomarker of overall toxicity of oil engine contaminants, while GST and NADPH-P450 reductase seem to be biomarkers of early response, especially when measured in *L. terrestris*.

References

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