APPLICABILITY OF MICROCALORIMETRY TECHNIQUE AS A TOOL IN THE PHYTOTOXICITY ASSESSMENT OF PETROLEUM CONTAMINATED SOIL

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Petroleum hydrocarbon (PH) contamination of soil has become one of the emerging environmental issues on the Earth. As highly toxic chemicals for biota are in petroleum as a mixture, efficient phytotoxicity assessment of PH contaminated soil is considered as highly important in the characterization of ecological risk which is vital in the management of contaminated sites. Microcalorimetry plays a significant role with its thermodynamic capacity across a broad range of environmental research fields. Although it has been applied to study the metabolic process of plants, not enough attention has been turned towards the applicability in the phytotoxicity assessments. The objective of the present study was to explore the applicability of microcalorimetry as a tool in the phytotoxicity assessment of PH contaminated soil. According to the standard methods (ISO, OECD), seeds (10 seeds per replicate, n=3) of the selected species, *Lactuca sativa* and *Zea mays* were incubated in pH contaminated soils with different contamination levels (1, 1.5, 2 and 2.5 % w/w PH respectively) and uncontaminated soil. Following the respective incubation periods, metabolic heat emission rate (MHER) of germinated seeds of each species was measured as the heat production rate (μW 0.1 g^{-1} DW) over 24 h at 28^{0}C, using a microcalorimeter. The calculated percentage of metabolic heat emission rate inhibition (MHERI) was considered as a toxicity end point and compared with the measured inhibition of seed germination and root elongation as typical toxicity end points from the selected species. The microcalorimetric analysis shows that the dose dependant impact on seedlings due to the imposed phytotoxicity of tested soil is *Z. mays* < *L. sativa*. This is in complete agreement with the order of susceptibility of the tested species to the measured phytotoxicity of PH contaminated soil on the basis of considered typical toxicity end points. Therefore, considering both obtained results and the simplicity of the non destructive experimental procedure, microcalorimetry can be an efficient tool to assess the phytotoxicity of PH contaminated soil. The finding of this study will be highly important in planning phytotoxicity assessment for PH contaminated soils and screening species for phytoremediation program.

Keywords: Metabolic process, Microcalorimetry, Petroleum hydrocarbon, Phytotoxicity