

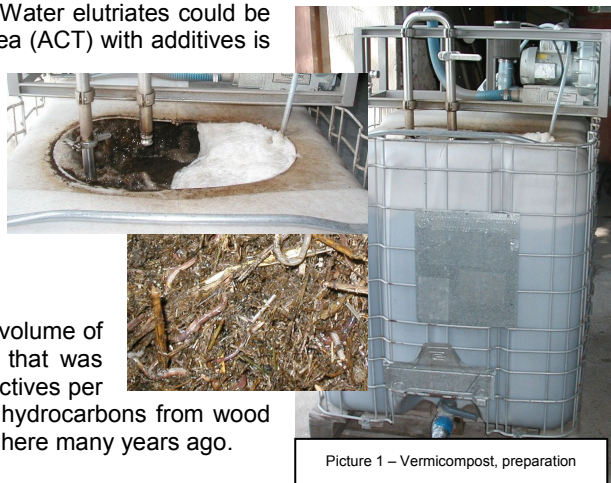
Ecotoxicity of Hydrocarbon-Contaminated Soil Remediated by Vermicompost Tea

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Introduction

Vermicompost is compost made by earthworms (*Eisenia foetida*, *Eisenia andrei*, *Lumbricus rubellus*, e.g.). It has a rich microbial diversity and contains substances, which are beneficial for plant growth. Water elutriates could be used to enhance plant condition and soil fertility. Aerated vermicompost tea (ACT) with additives is recommended to be produced to enhance the growth of beneficial and suppress pathogenic micro-organisms.

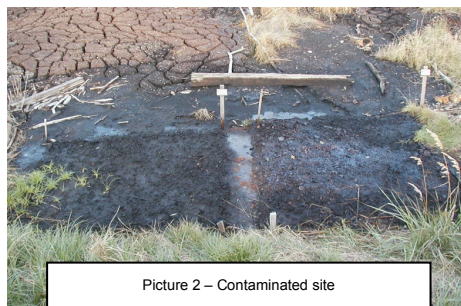
The main objective of this research was to find out the influence of ACT on ecotoxicity of hydrocarbon-contaminated soil in remediation process. The main assumptions were that micro-organisms in ACT would speed up the remediation process.



Picture 1 – Vermicompost, preparation

Materials and methods

Aerated vermicompost tea was produced in an extraction vessel with the volume of 850 litres from 10 litres of compost. Research was performed on soil that was intensively contaminated by hydrocarbons (25 – 33 mg of non-polar extractives per gram of soil). The site was at a landfill of liquid industrial waste. Waste hydrocarbons from wood impregnation were landfilled here many years ago.



Picture 2 – Contaminated site

Ecotoxicity of samples was measured as an indicator of remediation. Ecotoxicity tests were performed by cress (*Lepidium sativum*), according to OECD guidelines 208 “Terrestrial Plant, Growth Test”; duckweed (*Lemna minor*) according to ISO/CD 20079 “Duckweed Growth Inhibition Test” and daphnia (*Daphnia magna*) according to OECD guidelines 202 “Daphnia sp., Acute Immobilisation Test”.



Picture 3 – Cress results, ecotoxicity before and after 12 months

Results

There is an evident proof of ecotoxicity decrease due to ACT application after the period of 12 months under external conditions at the contaminated sites by hydrocarbons. The ecotoxicity of the contaminated substrate decreased to the non-quantifiable level monitored by *Daphnia magna* (Fig 1 and 2), *Lemna minor* (Fig. 3 and 4). Ecotoxicity determined by *Lepidium sativum* was reduced from $EC_{50} = 0,061$ to $EC_{50} = 0,110$ (Picture 3).

Conclusions

Aerated vermicompost tea has proved its positive impact in the remediation process of soil site contaminated by specific hydrocarbons pollutants with high concentration. Results were reached under external conditions, thus they are applicable in broad practice.

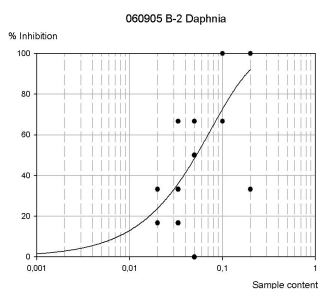


Fig. 1: Ecotoxicity of hydrocarbon-contaminated soil before the first application of ACT, determined by *Daphnia magna*. $EC_{50} = 0,0522$

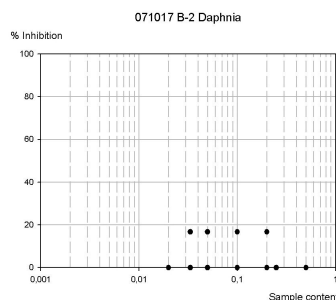


Fig. 2: Ecotoxicity of hydrocarbon-contaminated soil after all applications of ACT, determined by *Daphnia magna*. $EC_{50} = n.d.$

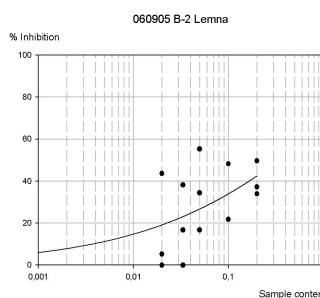


Fig. 3: Ecotoxicity of hydrocarbon-contaminated soil before the first application of ACT, determined by duckweed (*Lemna minor*). $EC_{50} = 0,3439$

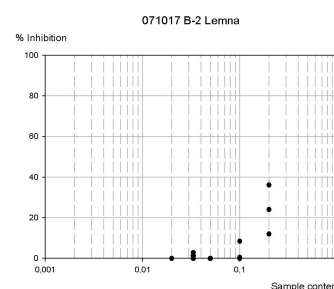


Fig. 4: Ecotoxicity of hydrocarbon-contaminated soil after all applications of ACT, determined by duckweed (*Lemna minor*). $EC_{50} = n.d.$

Acknowledgments

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