Potential of different leguminous plants for fuel oil contaminated soil phytoremediation

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Soil contamination by oil products is a globally problem. Only in Europe, according to the European Environment Agency, the number of suspected contaminated soil hot spots is around 2.5 million (COM (2012) 46). The soil pollution in the identified sites consists of various pollutants, but in most cases oil products predominate.

Many different chemical, physical methods are used to remediate soil contaminated by petroleum products, however they have numerous drawbacks. More environmentally friendly biological methods, such as phytoremediation, are highly encouraged in practice. Phytoremediation as a biological soil treatment method is relatively inexpensive and does not generate secondary pollution comparing to non-biological methods (Cheng *et all*, 2019). Implementation of leguminous plants for soil phytoremediation is very promising, because they have an ability to fix nitrogen directly from the atmosphere and stimulate the degradation of the oil products in the rhizosphere. Moreover, this type of plant doesn't have to compete with other plants for nitrogen resources, which are often limited in contaminated and degraded soils. During the growing of leguminous plants soil is decontaminated and at the same time the soil fertility and the amount of organic matter may be increased. The efficiency of legumes based phytoremediation depends on the plant species, the composition and concentration of the contaminants, soil type and other environmental factors (Riskuwa *et all*, 2017).

The main point of this research was to test eight different leguminous plant species for fuel oil contaminated soil phytoremediation and evaluate their potential to decontaminate the soil at different concentration levels of fuel oil.

Leguminous plants were grown under laboratory conditions in soil with different levels of fuel oil pollution (control, 2500 mg/kg, 4000 mg/kg) for 90 days. In order to evaluate the morphometric parameters of the plants, the height of the stems was periodically measured, and the above-ground and underground plant biomass were measured at the end of the experiment. To evaluate the decomposition potential of fuel oil, the residual concentration of fuel oil in the soil was measured by gas chromatography at the end of the experiment.

Different species of legumes had different resistance to fuel oil, *Medicago sativa, Melilotus albus, Pisum sativum, Lotus corniculatus* had the highest resistance to oil products, *Lens culinaris* and *Phaseolus vulgaris had moderate resistance* while *Onobrychis visiifolia* and *Galega orientalis* were the most sensitive to fuel oil pollution Some results are shown in Figure 1.

Figure 1. Resistance of legume species to soil pollution by fuel oil (control, 2500 mg/kg, 4000 mg/kg)

In summary, the phytoremediation potential of legumes to decompose fuel oil depends on the plant's resistance to the pollutant itself and has certain limits. In order to use this soil remediation method in practice, it is necessary to select the most pollutants resistant plant species and to assess the maximum tolerance limits for the process to be effective.

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