# POTENTIAL OF DIFFERENT LEGUMINOUS PLANTS FOR FUEL OIL CONTAMINATED SOIL PHYTOREMEDIATION


Meištininkas[1], J. Žaltauskaitė[2], N. Pedišius[3]

[1]Lithuanian Energy Institute, Kaunas, Breslaujos str.3, LT-44403, Lithuania

[2]Vytautas Magnus University/Lithuanian Energy Institute, Vileikos str.8/Breslaujos str.3, LT-44404/44403, Kaunas

[3]Lithuanian Energy Institute, Kaunas, Breslaujos str.3, LT-44403, Lithuania


## Introduction

Fig.1: Petroleum hydrocarbons contaminated area

**Petroleum hydrocarbons are among the most common soil and water pollutants in the world. Due to the wide variety of compounds, their different ecotoxicity and persistence for degradation, petroleum hydrocarbons can be identified as priority soil contaminants.**

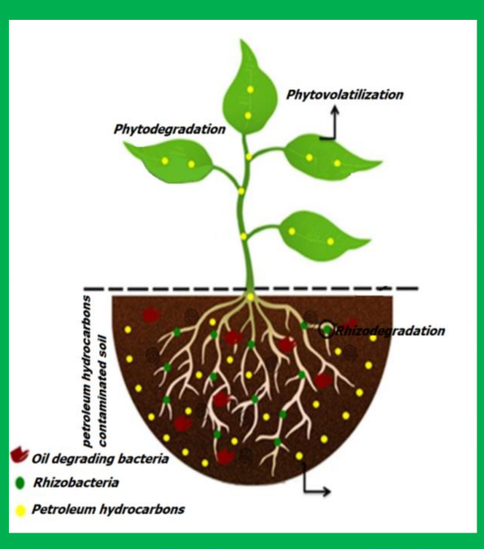


Fig.2: Soil phytoremediation effects

**Many different chemical, physical methods are used to remediate soil contaminated by petroleum products. More environmentally friendly biological methods, such as phytoremediation, are highly encouraged in practice. 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.**

## Methods

Fig.3: Leguminous plants phytoremediation experiment

**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 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.**

Fig.4: Gas chromatograph “SHIMADZU GC-2010 Plus”

**Laboratory equipment used for the experiment:**
**Scales "SHIMADZU ATX84";**
**Shaker "EKROS PE-6410";**
**Centrifuge "Hettich BENCHTOP UNIVERSAL 320";**
**Gas chromatograph "SHIMADZU GC-2010 Plus".**

## Results & Discussion

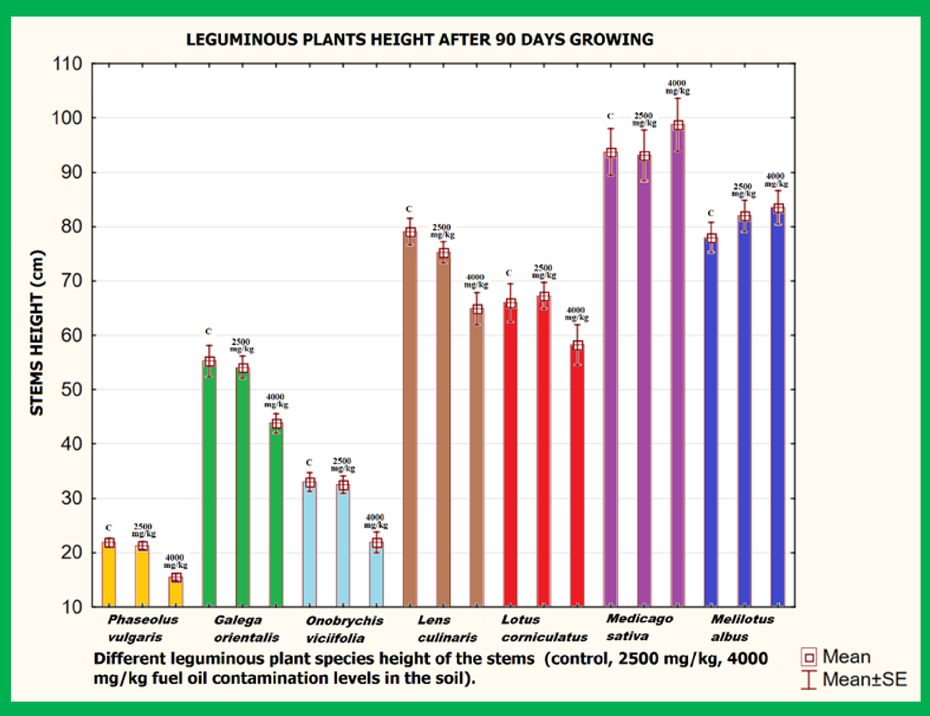


Fig.5. Leguminous plants height after 90 d. growing

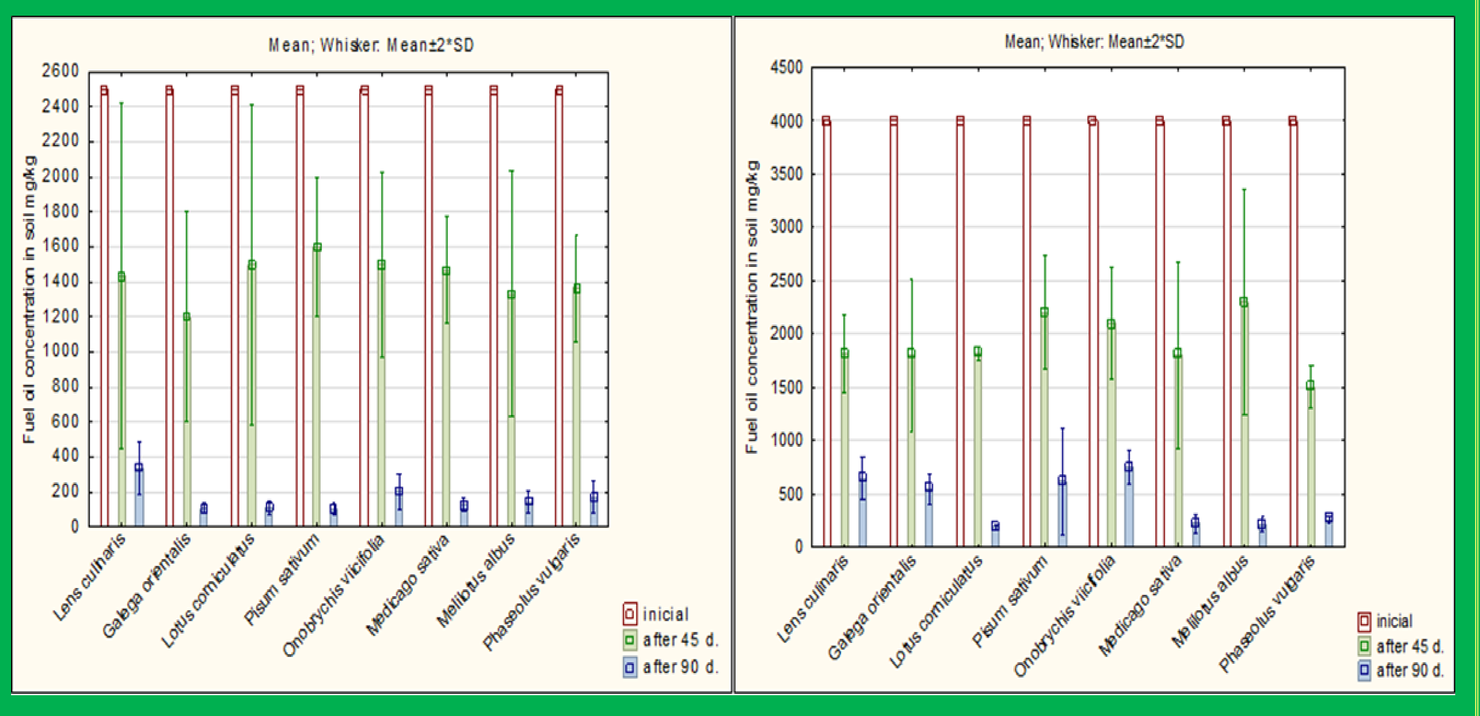


Fig.6. Fuel oil contamination reduction in soil during the experiment (8 plant species)

**Different species of legumes had different resistance to fuel oil, *Medicago sativa*, *Melilotus albus*, *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.**

**At the end of the experiment in the group of 2500 mg/kg initial fuel oil contamination all species showed similar results (Fig.6. left side). In the group of 4000 mg/kg initial contamination some legume species decomposed contaminant better than others and the levels of degradation differed more than in the first group with lower soil contamination (Fig.6. right side). The best reduction in fuel oil were obtained in pots with *Lotus corniculatus* (95.33 %), *Melilotus albus* (94.68 %) and *Medicago sativa* (94.43 %).**


Fig.7. Resistance of legume plant species to soil pollution by fuel oil (from the left: control, 2500 mg/kg, 4000 mg/kg)

## Conclusions

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