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Evaluation of Plant- Compost -Microorganisms Synergy for the Remediation of Diesel contaminated Soil: Success Stories from the Field Station
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Total petroleum hydrocarbons (TPH) contain a mixture of crude oil, gasoline, creosote and diesel is one of the most common groups of persistent organic pollutants. TPH enters into the ecosystem (soil, water and air) through leakage of underground storage tanks (LUST), accidental oil spills, transportation losses and industrial processes. Pollution associated with diesel oil and its refined products is of great concern worldwide due to its threats/damages for human and ecosystem health, soil structure and ground water quality. Extensive soils pollution with petroleum hydrocarbons results in extreme harsh surroundings, produce hydrophobic conditions and infertile soils that ultimately lead towards less plant and microorganisms growth. Among biological methods, bioremediation and phytoremediation are promising technologies that have both technical and ecological benefits as compared to convention methods. Within phytoremediation, rhizoremediation based on stimulation of degrading microorganism's population influenced by plant rhizospheric effect is known as main mechanism for phytoremediation of petroleum polluted soils.
Composting along with rhizodegradtion was used to remediate freshly spilled soils at Lysimeter station Siebersdof, Austria. Experiment was started in July 2013 and will be monitored up to September 2016. Field station has 12 Lysimeter in total; each has length, width and depth of 100 cm respectively. Each Lysimeter was filled with normal agricultural soil from Siebersdof (0-70 cm), sand (70-85 cm) and stones (85-100cm). Sand and stones were added to support the normal leaching and percolation of water as we collected leachate samples after regular intervals. After filling, commercial diesel oil (2% w/w of 0-70 cm soil) was spilled on top of each Lysimeter as accidental spill occurs in filed. Compost was added at 0-15 cm layer (5% w/w of soil) to stimulate plant as well as microorganisms growth. Whole Lysimeter station was divided into three treatments and four replicates; T1 was only planted with Lolium multiflorum and Lotus corniculatus, T2 was planted with both above mentioned plants inoculated with microbial consortium (mixture of strains: Pantoea sp. strains, ITSI10, BTRH79 and Pseudomonas sp. strain, MixRI75)and T3 was kept unplanted to support bioremediation.
Germination percentage (GP) was monitored weekly until three weeks after seed sowing. Biometric parameters (plant height, fresh and dry weight of shoots) and leaf chlorophyll content were recorded in periodic intervals. Soil samples were taken in regular intervals (after every 6 month) and PHC content was measured by GC-FID. In the presentation we will report about the development of plants and the degradation of petroleum hydrocarbons in Lysimeter. The degradation of TPH will be reported for 7 layers inside each Lysimeter as well as in leachate samples.