Oil pollution as an environmental challenge has been widespread during production, storage and transport activities. Although, there are several chemical and physical methods for remediation of oil contaminated soil and water resources, biological methods are promising and cost effective tools for large scale remediation. Bioremediation as an environmental friendly method uses capability of microorganisms and/or plants (i.e. phytoremediation) to degrade, remove, stabilize and reduce environmental pollutants depending on selected strategy and type of pollutants. In the case of organic pollutants such as petroleum hydrocarbons, microorganisms can mostly use them as a source of carbon, while plants can indirectly enhance microbial activity in the rhizosphere zone through the secretion of various compounds (e.g. carbohydrates, organic acids, enzymes). Additionally, plants improve physical properties of the rhizosphere which affect activity of oil-degrading microorganisms [1].

Although bioremediation/phytoremediation has a lot of benefits, it has also some disadvantages. Cleaning soils using biological methods may take several years. The time depends on type and amounts of petroleum hydrocarbons present, size and depth of polluted area and type and conditions of contaminated soil. In this regard, low-permeability soils with very high contaminant concentrations which may be toxic to microorganisms and plants are very difficult to treat and reclaim. Usually, bioremediation of very light and heavy fractions of petroleum hydrocarbons is difficult, former due to high toxicity and latter because of low bioavailability and recalcitrant properties. Recently, several researches have been carried out to enhance bioremediation efficiency of oil contaminated soils. These approaches are including using transgenic microorganisms/plants, selection of microorganisms with the ability of biosurfactant production, combination methods considering plant-microorganisms symbiosis (e.g. mycorrhiza, plant-endophytic bacteria/fungi interactions). Meanwhile, increasing the ability of microorganisms to tolerate and degrade petroleum hydrocarbons can boost bioremediation efficiency of oil-polluted sites [2].

However, due to complex nature of oil-polluted soils, it may necessary to apply several remediation techniques including both physicochemical and biological methods to reduce the concentrations of petroleum hydrocarbons to acceptable levels.

References