Abstract

Petroleum hydrocarbons are one of the organic contaminants which pollute the soil. These compounds cause stress and different problems for plants. Plants presence and root development in petroleum contaminated soils may increase density and activity of soil microorganisms and contaminant degradation. In this study, in order to find the proper plants for growth in hydrocarbon contaminated soils, germination of three native ornamental plants, desert wheatgrass (*Agropyron desertorum*), Melica (*Melica persica*) and bulbous bluwgrass (*Poa bulbosa*) have been studied in soil with different petroleum sludge levels. Treatments were T1 (uncontaminated soil), T2, T3 and T4 (soil contaminated with 20%, 40% and 80% $V_{petroleum\ sludge}/V_{soil}$ equal to 2.1%, 3.87% and 12.25% $W_{petroleum\ hydrocarbons}/W_{soil}$ respectively). This research was carried out in a randomized complete block with three replications. The results showed that 20% petroleum sludge in soil has no significant effect on germination percentage and germination rate of *A. desertorum*, while decreases the germination percentage and germination rate of two other plants. At the end of this experiment, *A. desertorum* is chosen for future experiments on growth and phytoremediation ability in comparison with two native and nonnative bermudagrass species because of the highest germination percentage and germination rate in contaminated soils. A factorial experiment with randomized complete block design with three replications was used for this research was done in the greenhouses of college of agriculture of Isfahan University of Technology. The results showed an increase in *A. desertorum* growth in soil polluted with 20% petroleum sludge compare to control, while the growth of bermudagrass species decreased significantly. The turf quality (color, density and texture) decreased with soil contamination. Generally the best turf quality in contaminated soils was related to nonnative bermudagrass. Total chlorophyll content had no significant difference with control and 20% sludge treatment in *A. desertorum*, while decreased significantly in bermudagrass species with 20% petroleum sludges. The proline content increased significantly in contaminated soils compare to uncontaminated soil. On the other hand catalase and superoxide dismutase activity increase and then decrease when soil pollutants increase. At the end of the experiment, highest and lowest root biomass was in native bermudagrass and *A. desertarum* respectively. Root growth of *A. desertarum* decreased in 20% and 40% petroleum sludge, but increased in bermudagrass species. Root penetration and density of *A. desertarum* decreased, while they were increase in two bermudagrass species in contaminated soils. Significant increase in MOs activity was observed in the presence of sludge and plants in soil compare with uncontaminated soil without plants and the highest microbial respiration have been observed in the rhizosphere of bermudagrass species in 80% sludge treatment. Plants had an important and significant role in degradation of soil contaminants and TPH degradation in rhizospheres was higher than unvegetated soil. The soils of bermudagrass species had significantly less residual TPHs than soils of *A. desertarum*. Finally due to the higher turf quality and phytoremediation ability in contaminated soils, nonnative bermudagrass seems to be the best turfgrass for using in landscape with hydrocarbon contamination.