B303 Molecular biological and community level physiological profile analysis of soil microbial community during bioremediational process

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To investigate the effect of bioremediational treatment on the changes in soil microbial community, molecular biological and community level physiological analysis were performed. First, simple method for extracting DNA from soil directly to amplify a gene sequences in soil by PCR was developed and PCR conditions were optimized. Microgram quantities of DNA per gram soil were recovered with modified SDS-based and freeze-and-thaw procedure. The average DNA fragment size was >23kb. 16S rRNA gene fragments were successfully amplified by our modified combinational methods. Then PCR-SSCP analysis of 16S rDNA and amplified ribosomal DNA restriction pattern analysis (ARDRA) were carried out. Community level physiological profile (CLPP) was analyzed using Biolog GN microtiter plate employing the soil suspension directly. Soil microbial community consisted of high diverse phylogenetic and functional groups and they are very stable to environmental stress or disturbance. Stable indigenous bacterial populations were not affected by the environmental stress such as the addition of phenanthrene, bioaugmentation, and biostimulation. Phenanthrene itself do not significantly change both phylogenetic and functional structure of soil bacterial community. Biostimulation and bioaugmentation cause slight shifts in community structure after most added phenanthrene was degraded. Bioaugmentation temporarily decrease the functional diversity and activity of soil microbial community. However, this transient variation can be recovered immediately.

B304 Enhanced biodegradation of polycyclic aromatic hydrocarbons by introduced PAH-degrading bacteria and stimulation of indigenous microorganisms in soil

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Treatability of PAH-contaminated soil was investigated by using bioaugmentation or biostimulation. The former was materialized by the introduction of isolated PAH-degrading bacterial strain to the object soil, and the later by the stimulation of indigenous soil microorganisms by controlling environmental parameters. In the sterile soil, PAH-degrading strain degraded 51% of total added phenanthrene during the 14 days of the treatment. The degradation rate increased when the biostimulation treatments were conducted simultaneously. More than 99% of phenanthrene added were degraded after 19 days of the treatment. In the non-sterile soil, PAH-degrading strain exhibited similar degradation pattern. The degradation rate, however, was dramatically increased in the case when biostimulation treatment was done simultaneously with inoculation. After 4 days of incubation, more than 99% of phenanthrene was degraded by this combined treatments. The number of strain KS14 was maintained well in the soil during treatment. Most effective and essential treatment constituents to enhance the degradation of phenanthrene were the adjustment of moisture content and aeration. The bioremediational treatment is evidently efficacious in removing PAHs from soil and will be an attractive method for restoring polluted environments. However, some problems caused by the existence of other organic or inorganic matter or toxic material, and site-specificity should be solved prior to that bioremediational treratments are applied to the environments practically.