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Benzo(a)pyrene degradation and microbial community responses in composted soil (Article)

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Abstract

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Benzo(a)pyrene degradation was compared in soil that was either composted, incubated at a constant temperature of 22 °C, or incubated under a temperature regime typical of a composting process. After 84 days, significantly more (61%) benzo(a)pyrene was removed from composted soil compared to soils incubated at a constant temperature (29%) or at composting temperatures (46%). Molecular fingerprinting approaches indicated that in composted soils, bacterial community changes were driven by both temperature and organic amendment, while fungal community changes were primarily driven by temperature. Next-generation sequencing data revealed that the bacterial community in composted soil was dominated by Actinobacteria (order Actinomycetales), Firmicutes (class Bacilli), and Proteobacteria (classes Gammaproteobacteria and Alphaproteobacteria), regardless of whether benzo(a)pyrene was present or not. The relative abundance of unclassified Actinomycetales (Actinobacteria) was significantly higher in composted soil when degradation was occurring, indicating a potential role for these organisms in benzo(a)pyrene metabolism. This study provides baseline data for employing straw-based composting strategies for the removal of high molecular weight PAHs from soil and contributes to the knowledge of how microbial communities respond to incubation conditions and pollutant degradation. © 2016, Springer-Verlag Berlin Heidelberg.

Reaxys Database Information

View Compounds

Author keywords

Amplicon sequencing | Benzo(a)pyrene | Bioremediation | Composting | Microbial community | PAH | Soil

Indexed keywords

GEOBASE Subject Index: bacterium | biodegradation | bioremediation | community response | composting | fungus | metabolism | microbial community | PAH | pollutant removal | pyrene | soil amendment | soil microorganism

Species Index: Actinobacteria | Actinomycetales | Alphaproteobacteria | Bacilli (class) | Bacteria (microorganisms) | Firmicutes | Gammaproteobacteria | Proteobacteria | unclassified Actinomycetales

EMTREE drug terms: benzo[a]pyrene | polycyclic aromatic hydrocarbon | soil | soil pollutant

EMTREE medical terms: Actinobacteria | Alphaproteobacteria | bioremediation | fungus | metabolism | microbiology | soil | soil pollutant | temperature

MeSH: Actinobacteria | Alphaproteobacteria | Benzo(a)pyrene | Biodegradation, Environmental | Fungi | Polycyclic Aromatic Hydrocarbons | Soil | Soil Microbiology | Soil Pollutants | Temperature

Chemicals and CAS Registry Numbers:

benzo[a]pyrene, 50-32-8;

Benzo(a)pyrene; Polycyclic Aromatic Hydrocarbons; Soil; Soil Pollutants

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