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Identification and characterisation of oil sludge degrading bacteria isolated from compost

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Abstract

Oil sludge components (polycyclic aromatic hydrocarbons, PAHs) have been found to be cytotoxic, mutagenic and potentially carcinogenic and microorganisms such as bacteria and fungi can degrade the oil sludge to less toxic compounds such as carbon dioxide, water and salts. In the present study, we isolated different bacteria with PAH-degrading potentials from the co-composting of oil sludge and different animal manure. These bacteria were isolated on the mineral base medium and mineral salt agar plates as a growth control. A total of 31 morphologically distinct isolates were carefully selected from 5 different compost treatments for identification using polymerase chain reaction (PCR) of the 16S rDNA gene with specific primers (16S-P1 PCR and 16S-P2 PCR). The amplicons were sequenced and sequences were compared with the known nucleotides from the gene bank database. The phylogenetical analyses of the isolates showed that they belong to 3 different clades namely Firmicutes, Proteobacteria and Actinobacteria. These bacteria identified were closely related to genera Bacillus, Arthrobacter, Staphylococcus, Brevibacterium, Variovorax, Paenibacillus, Ralstonia and Geobacillus species. The results showed that Bacillus species were more dominant in all treated compost piles. Based on their characteristics these bacterial isolates have high potential to utilise PAHs of different molecular weights as carbon and energy sources. These identified bacteria are of special significance in their capacity to emulsify the PAHs and their ability to utilize them. Thus, they could be potentially useful for bioremediation of oil sludge and composting processes.

Keywords: Bioaugmentation, Biodegradation, Bioremediation, Composting, Oil sludge, PAHs, Animal manures.

Biography

Ubani Onyedikachi studied Biochemistry at Abia State University Uturu, Nigeria and Masters in Environmental Sciences at the University of South Africa and currently doing PhD in Environmental Science at the University of South Africa.