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Detection of androgenic-mutagenic compounds and potential autochthonous bacterial communities during *in-situ* bioremediation of hazardous distillery waste

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Sugarcane-molasses-based distillery waste is well known for its toxicity and complex mixture of various recalcitrant organic pollutants, but the chemical nature of these pollutants is unknown. Distilleries release 12 to 15 liters of spent wash per liter of alcohol produced. Currently, there are more than 319 distilleries in India, reflecting the magnitude of the problem due to the presence of various complex pollutants in anaerobically digested distillery waste. This study revealed the presence of toxic organic acids (butanedioic acid bis(TMS)ester; 2-hydroxysocaproic acid; benzenepropanoic acid, and other recalcitrant organic pollutants (2-furancarboxylic acid, 5-[[(TMS)oxy] methyl], TMS ester; and tricarballylic acid 3TMS, dodecanoic acid, octadecanoic acid, n-pentadecanoic acid, hexadecanoic acid, β-sitosterol, stigmasterol, β-sitosterol trimethyl ether, heptacosane, dotriacontane, lanosta-8, 24-dien-3-one, 1-methylene-3-methyl butanol, 1-phenyl-1-propanol, 5-methyl-2-(1-methylethyl) cycohexanol, and 2-ethylthio-10-hydroxy-9-methoxy-1,4 anthraquinone which are listed as endocrine-disrupting chemicals. In addition, several major heavy metals were detected, including Fe (163.947), Mn (4.556), Zn (2.487), and Ni (1.175 mg l^{-1}). Bacterial community analysis by restriction fragment length polymorphism (RFLP) revealed that *Bacillus*, *Stenotrophomonas* and *Enterococcus* were dominant autochthonous bacterial communities belonging to the phylum Firmicutes and γ-*Proteobacteria*. The presence of *Bacillus Stenotrophomonas* and *Enterococcus* species in highly toxic environments indicated its broad range adaptation. These findings indicated that these autochthonous bacterial communities were pioneer taxa for *in situ* remediation of this hazardous waste during ecological succession. Further, a toxicity evaluation showed a reduction of toxicity in degraded samples of distillery waste, confirming the role of autochthonous bacterial communities in the bioremediation of distillery waste *in situ*.

Biography

Ram Chandra is currently a Professor in the Department of Microbiology at Babasaheb Bhimrao Ambedkar Central University, Lucknow, India. He has international lead on degradation and detoxification of melanoidins of post methanated distillery effluent (PMDE) and chloro-lignin compounds of pulp and paper mill waste. He has published more than 120 original research papers in peer review journals, 06 books, 32 book chapters, and several technical reports. He has completed 25 major research projects. He is fellows of several scientific societies including Association of Microbiologists of India, The Biotech Research Society, India and The Academy of Environmental Biology, India. His research interests include bioremediation and biodegradation.

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