

***“Degradation and Characterization of HMW polycyclic aromatic compounds
(Anthracene, Coronene and Naphthalene) by indigenous bacterial strains from
hydrocarbon contaminated (Oil Refineries) sites”***

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SUMMARY

Soil polluted with petroleum oil from Mathura and Baruni Oil Refinery, India were used for isolation of indigenous microbial communities. These microbial communities were grown on three polycyclic aromatic hydrocarbon compounds were identified by 16S-rRNA, morphology by SEM and biochemically. Five identified isolates VIZ (*Bacillus licheniformis* strain MBOR, *Bacterium* CT BORL, *Bacillus pumilus* BORS, *Paenibacillus lautus* MORL and *Bacillus acidovorans* MORS) having accession no. KX376312, KX376311, KX376310 KX376309 and KX376308 were submitted to NCBI. All five screened isolates were capable to grow on different concentrations of three PAHs (Anthracene 50mg/l, Coronene 20mg/l and Naphthacene 50mg/l) at temperature 30⁰C-35⁰C and pH 6.5-7.5. The best degraders' bacterial isolates *Bacillus licheniformis* MBOR and *Paenibacillus lautus* MORL were shown maximum degradation at concentration 50mg/l of anthracene, naphthacene and 20mg/l of coronene. The most promising bacterial strain were enhance the degradation by supplementation of surfactant/emulsifier (tween 20, tween 80, and triton x100) to enhance its qualities of degradation.

Bacterial isolates from soils contaminated with a large range of petroleum organic pollutants of oil refinery Mathura and Baruni were tested for their ability to metabolise, mineralized and degrada the selected recalcitrant PAHs (anthracene , coronene and naphthacene) as their sole energy and carbon source. Plating of soil microorganisms isolated from 50 petroleum-contaminated soils on solid medium (MSM), supplemented with the PAH (50 mg/l anthracene, 20mg/l coronene and 50mg/l naphthacene) as sole carbon source, yielded 58 PAH degrading bacterial strains, of which most potent isolates was selected and were further characterized. By different parameters, identified 5 of the 58 colonies as potentially competent in HMW PAH degradation (anthracene, coronene and naphthacene). The 5 bacterial isolates were further screened by UPLC for their capacity to mineralize three HMW PAHs serving as their sole carbon and energy source. Under such conditions, bacterial isolate of five strains cumulatively mineralized 98% of anthracene, 95% of naphthacene, and 97% of coronene after 30-days incubation period period, but could not degrade coronene (24%) as much compare to naphthacene and coronene.

Three different characterisation approaches were applied to five isolate (*Bacillus licheniformis* strain MBOR, *BacteriumCT* BORL, *Bacillus pumilus* BORS *Paenibacillus lautus* MORL and *Bacillus acidovorans* MORS in Genbank): (i) micro/macromorphological study by phase-contrast microscopy showed five isolates to be a Gram variable rodcooccus; produced creamy yellow, whitish and circular colonies that were catalase-positive, except *Paenibacillus lautus* all bacteria was gram positive (ii) SEM for morphological and structural analysis (iii) molecular species confirmed by others' 16S rRNA gene sequence analysis. Among five strains *BacteriumCT* BORL mineralization of PAH also showed it to be new and unique PAH-degrading bacteria.

This multidisciplinary study highlights the fact that five strains shows a great potential to be useful in biodegradation of high molecular weight PAHs., and strongly supports the general concept of *Bacillus licheniformis* MBOR, *BacteriumCT* BORL, *Bacillus pumilus* BORS *Paenibacillus lautus* MORL and *Bacillus acidovorans* MORS having a significant role in PAHs-biodegradation, bioremediation, and biotransformation in contaminated environment, Petroleum refinery and hazardous compounds effluents of industry

Keywords: Polycyclic- SEM, UPLC, FTIR, Aromatic- Hydrocarbon (anthracene, naphthalene and coronene) – Biodegradation-Pollution.