

Biodesulfurization of Petro-diesel by a Novel Hydrocarbon Tolerable *Paenibacillus glucanolyticus* HN4

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Abstract – The presence of sulphur in petro-diesel has negative impact on engine performance and environment. In this work, a novel hydrocarbon tolerable *Paenibacillus glucanolyticus* HN4 denoted NCBI Gene Bank Accession No. MT645230; has been isolated from oil polluted sediment sample collected from Egyptian Red sea shoreline. Two-phase system enrichment medium containing 100 mg/l dibenzothiophene (DBT) dissolved in n-hexadecane (1/4 oil/water v/v) was used for selective enrichment and isolation of biodesulfurizing bacterium. HN4 desulfurized DBT as a model sulphur compound without affecting its hydrocarbon skeleton via the 4S-pathway producing 2-hydroxybiphenyl (2-HBP) as a dead end product. HN4 proved to be a hydrocarbon tolerant, biosurfactants(s) producer and endorsed a unique enzymatic system capable of desulfurizing both BTs and DBTs. Where, it desulfurized broad range of thiophenic compounds and expressed an efficient desulfurization activity against the recalcitrant alkylated DBTs. One-Factor-At-A-Time (OFAT) optimization technique illustrated approximately 90% biodesulfurization efficiency (%BDS) in an oil-water two-phase batch process at optimal operational conditions of; 120 h, 0.05 wt.% S-content model oil (DBT dissolved in n-hexadecane), 30°C, pH7 and 1/1 oil/water phase ratio. HN4 decreased the sulphur content of a petro-diesel from 0.2 wt.% to 0.04 wt.%, in an 1/1 (v/v) oil-water two-phase batch BDS process, without affecting its calorific value. Consequently, that novel strain is recommended to be promising candidate for BDS as a complementary process for hydrodesulfurization technique in oil refinery.

Keywords: Biodesulfurization; Dibenzothiophene; Two-phase system; *Paenibacillus*, Hydrocarbon tolerance; Biosurfactants producer; Model oil; Petro-diesel oil.