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Potential of Enhancing Oil Recovery in Omani Oil Fields via Biopolymer Injection

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Abstract : Microbial enhanced oil recovery is one of the most economical and efficient methods for extending the life of production wells in a declining reservoir. There are a variety of metabolites produced by microorganisms that can be useful for oil recovery, like biopolymers-polysaccharides secreted by microbes, biodegradable thus environmentally friendly. Some fungi like Schizophyllum commune (a type of mushroom), and Aureobasidium pullulans are reported to produce biopolymers-schizophyllan and pullulan. Hence, we have procured a microbial strain (Schizophyllum commune) from American Type Culture Collection, which is reported for producing a biopolymer and also isolated several Omani strains of Aureobasidium pullulans from different samples. Studies were carried out for maintenance of the strains and primary screening of production media and environmental conditions for growth of S. commune and Omani A. pullulans isolates, for 30 days. The observed optimum growth and production temperature was ≤35 °C for S. commune and Omani A. pullulans isolates. Better growth was observed for both types of fungi under shaking conditions. The initial yield of lyophilized schizophyllan was ≥3.0 g/L, and the yield of pullulan was ≥0.5g/L. Both schizophyllan and pullulan were extracted in crude form and were partially identified by Fourier transform infrared spectroscopy (FTIR), which showed partial similarity in chemical structure with published biopolymers. The produced pullulan and schizophyllan increased the viscosity from 9-20 cp of the control media (without biopolymer) to 20 - 121.4 cp of the cell free broth at 0.1 s-1 shear rate at range of temperatures from 25–45 °C. Enhanced biopolymer production and its physicochemical and rheological properties under different environmental conditions (different temperatures, salt concentrations and wide range of pH), complete characterization and effects on oil recovery enhancement were also investigated in this study.

Keywords : Aureobasidium pullulans, biopolymer, oil recovery enhancement, Schizophyllum commune
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