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Production of rhamnolipid surfactant and its application in bioscouring of cotton fabric

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Abstract

In the present study, a biosurfactant was synthesized by using a bacterial strain of *Pseudomonas aeruginosa* in minimal media provided with *n*-heptadecane as sole carbon source under shake-flask conditions. The biosurfactant was isolated (by acid precipitation, solvent extraction and rotary evaporation), purified (by column chromatography and TLC), identified (by FAB-MS, FTIR and 1D-^{1}H NMR) and chemo-physical characterized (by tensiometry). Two principal rhamnolipid congeners were identified as dirhamnolipid $RRC_{10}C_{10}$ and monorhamnolipid $RC_{10}C_{10}$ with a CMC of 50 mg/L. The biosurfactant, hence produced, was applied in sole and in combination with pectinase in scouring of cotton fabric in contrast to conventional scouring agents of NaOH and anionic surfactant SDS. The scoured cotton fabric was investigated for its weight loss, residual oil and grease, wettability, whiteness and tensile strength. The results were compared both for conventional and biological approaches. The scouring with biosurfactant plus pectinase was equivalent to or better in efficiency than conventional alkaline scouring. The former process is additionally environmental friendly and bio-compatible. Scanning electron microscopy of cotton fabric showed that the alkaline scouring deteriorates the fabric texture whereas bioscouring with biosurfactant plus pectinase gently removes hydrophobic impurities from the cotton fabric.

Keywords: Bioscouring, Pectinase, Rhamnolipids, Surfactants, Textile

Running title: *Rhamnolipid for bioscouring of cotton fabric*

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1. Introduction

The cotton fiber is a single biological cell with a multilayer structure. These layers are structurally and chemically different, and contain approximately 10% by weight of non-cellulosic substances such as lipids, waxes, pectins, minerals, proteins/nitrogenous substances,