

Screening biosurfactant-producing actinomycetes: Identification of *Streptomyces* sp. RP1 as a potent species for bioremediation

Abstract

This study aimed to isolate biosurfactant-producing and hydrocarbon-degrading actinomycetes from different soils using glycerol–asparagine and starch–casein media with an antifungal agent. The glycerol–asparagine agar exhibited the highest number of actinomycetes, with a white, low-opacity medium supporting pigment production and high growth. Biosurfactant analyses, such as drop collapse, oil displacement, emulsification, tributyrin agar test, and surface tension measurement, were conducted. Out of 25 positive isolates, seven could utilize both olive oil and black oil for biosurfactant production, and only isolate RP1 could produce biosurfactant when grown in constrained conditions with black oil as the sole carbon source and inducer, demonstrating in situ bioremediation potential. Isolate RP1 from oil-spilled garden soil is Gram-staining-positive with a distinct earthy odor, melanin formation, and white filamentous colonies. It has a molecular size of ~621 bp and 100% sequence similarity to many *Streptomyces* spp. Morphological, biochemical, and 16 S rRNA analysis confirmed it as *Streptomyces* sp. RP1, showing positive results in all screenings, including high emulsification activity against kerosene (27.2%) and engine oil (95.8%), oil displacement efficiency against crude oil (7.45 cm), and a significant reduction in surface tension (56.7 dynes/cm). *Streptomyces* sp. RP1 can utilize citrate as a carbon source, tolerate sodium chloride, resist lysozyme, degrade petroleum hydrocarbons, and produce biosurfactant at 37°C in a 15 mL medium culture, indicating great potential for bioremediation and various downstream industrial applications with optimization.

Keywords

16S rRNA gene sequencing; Actinomycetes; Biosurfactant; In situ fermentation; Soil bacteria