Sustainable Environment

Biosurfactant from *Gordonia* sp. *IITR100* an alternative to chemical emulsifiers

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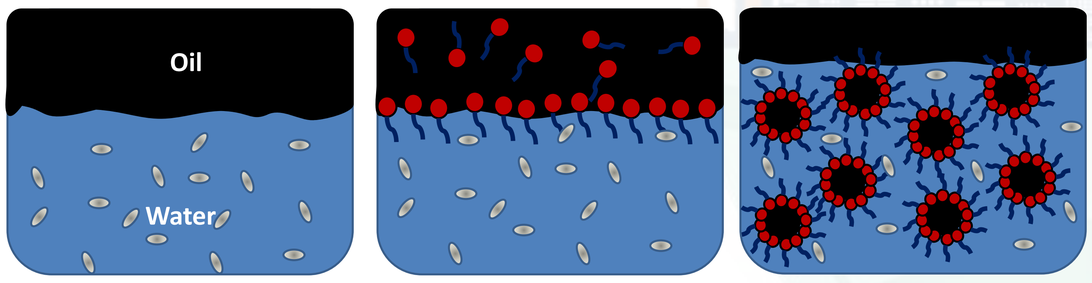
ABSTRACT

In the current study, we describe production and characterization of a biosurfactant produced by *Gordonia* sp. Strain IITR100. Biosurfactant production was determined by performing oil spreading assay, drop-collapse assay, E_{24} assay, surface tension reduction and BATH assay. Emulsion stability at different temperatures, pHs and salt concentrations was determined by performing E_{24} assays under these conditions. Chromatographic analysis of extracted biosurfactant was performed to determine the nature of the biosurfactant. Chemical characterization of biosurfactant was done by performing LCMS of the extracted biosurfactant. Data obtained from LCMS was analysed using METLIN to identify the biosurfactant. The results of LCMS studies were confirmed by performing FTIR and NMR of the extracted biosurfactant. The biosurfactant was successful in reducing the surface tension of the aqueous media by 40%.

INTRODUCTION

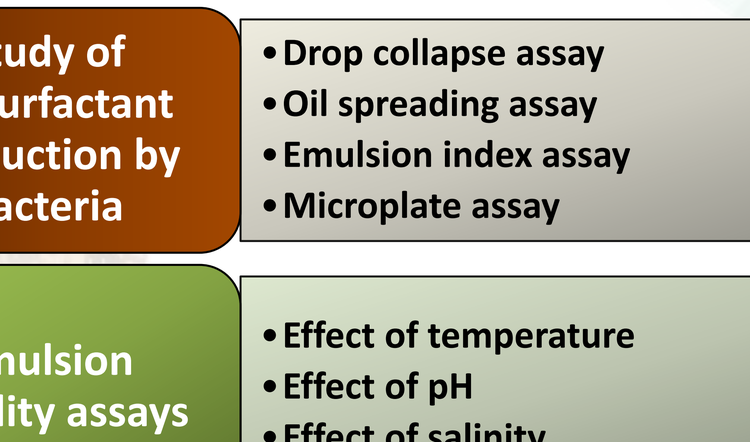
- Biosurfactants are a class of amphipathic molecules that form a boundary layer preferentially at the interface of two phases to reduce interfacial tension between them.
- Applications: Petroleum industry, detergents and soap industry, food and beverage industry and healthcare industry.



MATERIALS AND METHODS

Study of biosurfactant production by bacteria	• Drop collapse assay • Oil spreading assay • Emulsion index assay • Microplate assay
Emulsion stability assays	• Effect of temperature • Effect of pH • Effect of salinity
Identification of biosurfactant	• Determining the nature of biosurfactant by chromatographic studies • Chemical identification of biosurfactant by LCMS, FTIR and NMR studies.

INDUSTRIAL SIGNIFICANCE



CONCLUSION

- The strain produces biosurfactant which can reduce the surface tension of aqueous media by about 40%.
- The biosurfactant produced has been identified as Sorbitan palmitate.
- The biosurfactant can be used in petroleum industry to reduce mass transfer problems between oil and hydrophilic entities (soil, rocks and microbes)

TECHNOLOGY READINESS LEVEL

- Studies have been performed in shake flasks.

RESULT

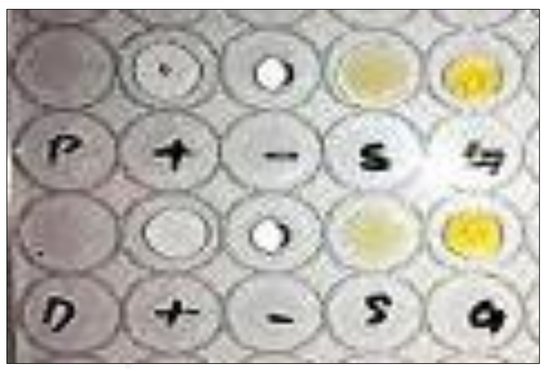


Fig: Drop collapse test
+ (SDS), - (water), s (+), G (*Gordonia* surfactant)

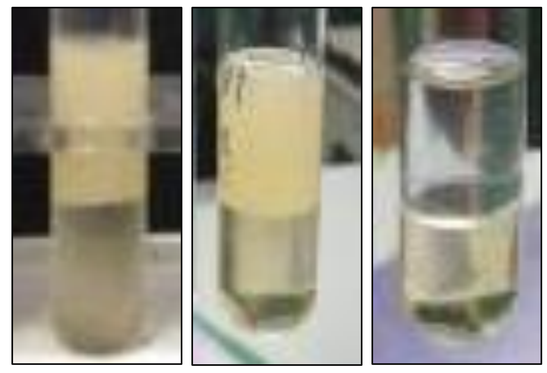


Fig: Emulsion index assay
a(+), b(*Gordonia* biosurfactant), c (water)

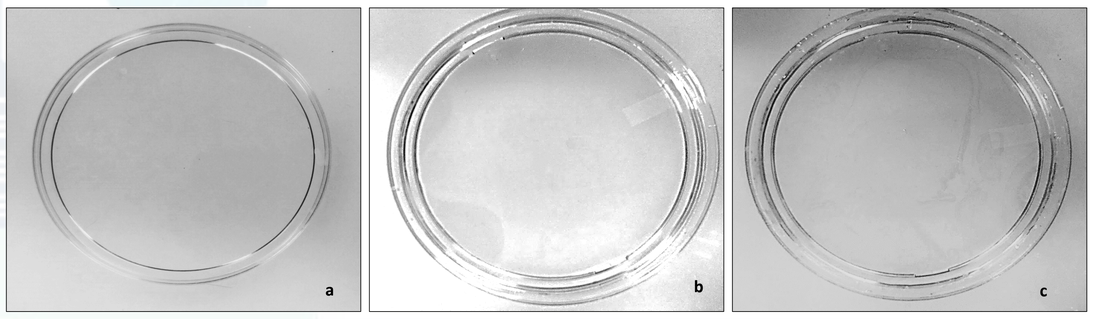


Fig: Oil spreading assay
a) *Gordonia* biosurfactant b) Positive control (SDS) c) Negative control (water)

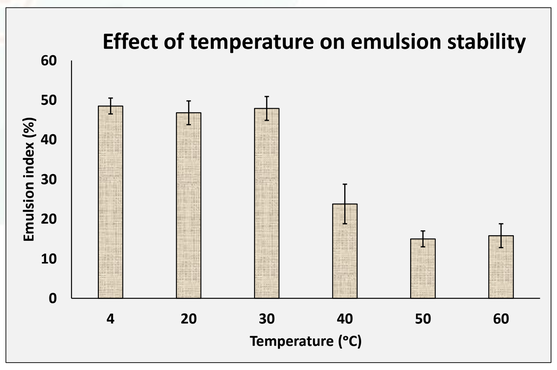


Fig: Emulsion stability at different temperatures

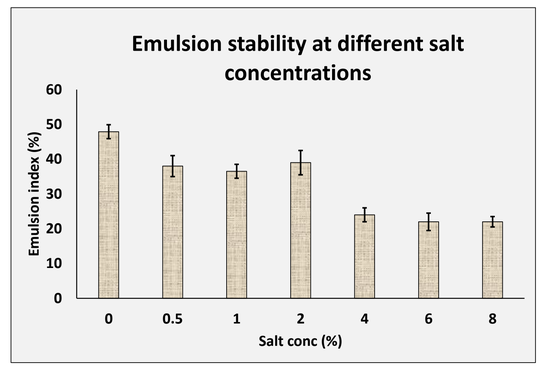


Fig: Emulsion stability at different salt concentrations

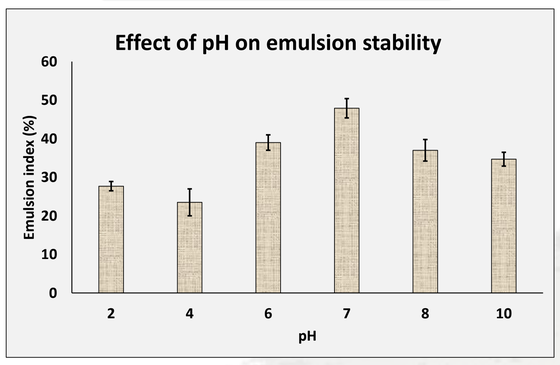


Fig: Emulsion stability at different temperatures

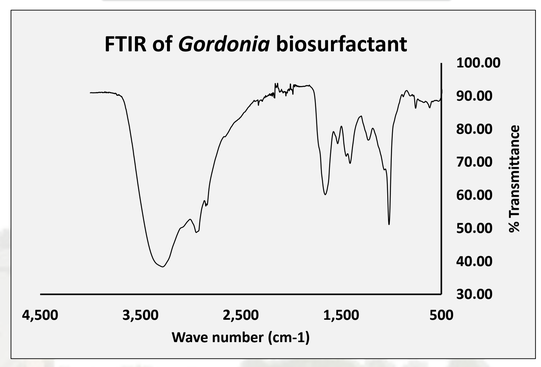


Fig: Fourier Transform-Infrared Spectroscopy study of biosurfactant

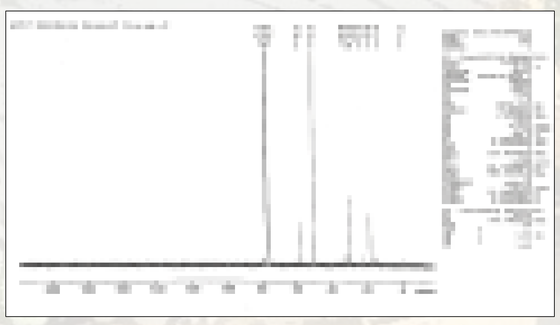


Fig: C^{13} NMR of biosurfactant.

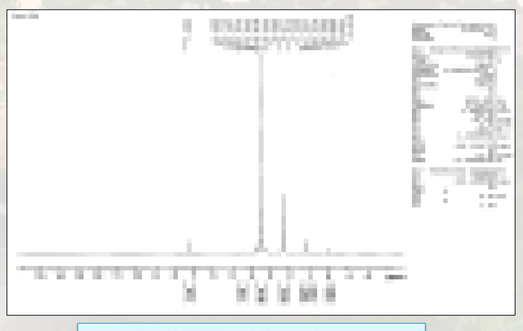


Fig: H^{1} NMR of biosurfactant.

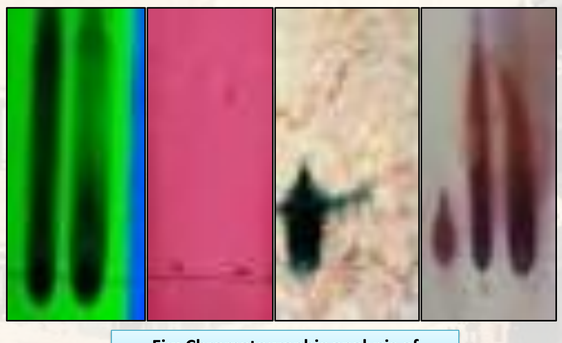


Fig: Chromatographic analysis of biosurfactant

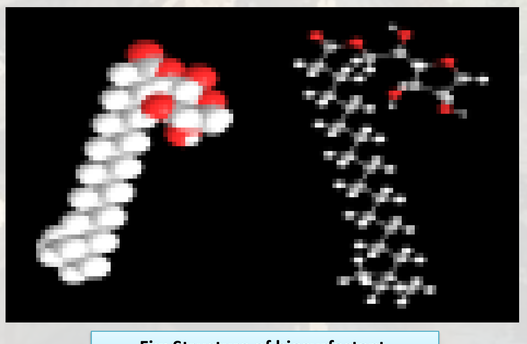


Fig: Structure of biosurfactant.

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