Biochemical production of fatty acid sugar-based biosurfactant (FASB) via green enzymatic route as potential application in pharmaceutical

ABSTRACT

Enzymatic processes offer an alternative for the synthesis of bio-surfactants through the employment of biocatalysts, which allow for a mild reaction condition and high selectivity. Fatty acid sugar esters, a group of biosurfactants, are produced by the esterification of sugars with fatty acids. They are odorless, non-toxic and non-irritant to the skin, making them suitable not only as emulsifiers for foods, but also in pharmaceuticals and cosmetics. Moreover, due to their high biodegradability and varied range of hydrophilic-lipophilic balance (HLB) values, the study and production of sugar esters have attracted keen attention from many researchers. A biochemical approach has been implemented through the use of lipase immobilized on an inexpensive carrier of mica clay as biocatalyst. The synthesis of fatty acid sugar esters or fatty acid sugar-based biosurfactants was optimized via various reaction parameters before conducting product characterization and validation. High enzyme stability and productivity were successfully performed through biocatalytic system. Furthermore, an optimized reaction parameters studied was achieved for the synthesis of fatty acid sugar sugar-based biosurfactants. The synthesized biosurfactant (or specifically lactose caprate, with molecular formula C22H40O12) was characterized to examine their efficacy for industrial application. This study showed that the biosurfactant derived from lactose and capric acid had an HLB value of 14.88, which is suitable for the preparation of oil-in-water emulsions. In addition, this non-ionic biosurfactant was found to behave like a water-soluble surfactant and an oil-in-water emulsifier which potentially used for food products, pharmaceuticals and detergent industries.

Keyword: Biochemical production; Fatty acid sugar-based biosurfactant (FASB); Green enzymatic route; Pharmaceutical