Physicochemical characterization of lactose-based ester as potential pharmaceutical biosurfactant

ABSTRACT

Enzymatic processes offer an alternative for the synthesis of biosurfactants 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 fatty acid sugar esters (FASEs) 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 (NER-CRL). The synthesis of FASEs or sugar-based biosurfactants was optimized via various reaction parameters before conducting product characterization and validation. In this study, an optimized esterification condition was employed for the synthesis of FASEs, specifically lactose ester. The synthesized lactose monocaprate with molecular formula C22H40O12 was physicochemically identified to examine their efficacy for industrial application. Interestingly, it was found that the new synthesized lactose caprate (biosurfactant) derived from green enzymatic esterification of lactose and capric acid had calculated HLB value of 14.88, which is suitable for the preparation of oil-in-water (O/W) emulsions. Furthermore, this non-ionic biosurfactant (yellowish) was found to behave like a water-soluble surfactant and an O/W emulsifier which potentially used for food, pharmaceuticals and detergent industries.

Keyword: Sugar ester; Lactose monocaprate; Immobilized lipase; Biosurfactant; HLB value; Pharmaceutical