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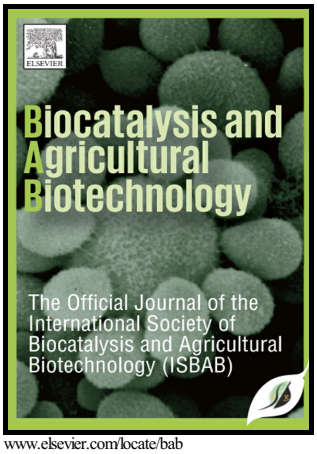

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Acid and Deep Eutectic Solvent (DES) extraction of pectin from pomelo (*Citrus grandis* (L.) Osbeck) peels

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Abstract

Pectin was extracted from pomelo peel using citric acid. A Box–Behnken design was employed to optimize the yield and the Degree of Esterification (DE) of pectin. The effects of pH, temperature, extraction time and liquid-solid ratio on the yield were investigated. It was found that under optimized conditions at pH 1.80, extraction time of 141 min, temperature of 88 °C and a liquid-solid ratio of 29:1 mL/g, a pectin yield of 39.72% and a DE value of 57.56% were obtained. The results indicate that the pectin extracted from pomelo peel is a slow set high methoxyl type of pectin. pH was found to have the greatest influence on pectin yield and DE. Varying pH at a narrow range between 1 and 2 interestingly showed the formation of diverse pectin functional groups with different structural modifications. The findings suggest that extraction conditions could influence pectin extraction performance, chemical structure, as well as morphological and gelling properties. This study also explored various acid based Deep Eutectic Solvents (DESs) in pectin extraction. The lactic acid−glucose−water DES with a ratio of 6:1:6 gave the highest pectin yield of 23.04%. Citric acid was found to have a better yield performance and more energy saving as compared to DES in pectin extraction.

Keywords

Pomelo peel; Pectin; Citric acid; Extraction and optimization; Physicochemical properties; Deep Eutectic Solvent

1. Introduction

Pectin is a complex heteropolysaccharide consisting mainly of α-(1,4)-linked D-galacturonic acid as the backbone with different Degrees of Esterification (DE) (Mohnen, 2008; Yuliarti et al., 2015). Depending on the DE, pectin can be classified as high methoxyl pectin (HM) with DE ≥ 50 or low methoxyl pectin (LM) with DE < 50. HM pectins can be further divided into rapid set (RS) and slow set (SS) pectin, with respective commercial applications. The rate of setting is specific in such a way that enables RS pectins to be used for different jams and jellies involving processes that require suspension of matter.

It is reported that some waste materials such as peels of citrus (e.g. orange, lime and lemon) as well as apple pomace and sugar-beet pulp are good sources of pectin (Arslan and Kar, 1998). Pomelo (*Citrus grandis* (L.) Osbeck) being the largest citrus fruit, with its peel approximately 40% of its fruit weight, can be considered for pectin extraction from an industrial view point as it may mitigate disposal problem.

Pectin is commonly extracted using strong mineral acids as the acidic extraction agents allow for reasonable extraction yield and are time efficient (Lim et al., 2012). However, pectin extracted through this technique is susceptible to degradation. In addition, high acidity accelerates corrosion of equipment and triggers