

Hydrolysis and characterization of sugar recovery from bakery waste under optimized subcritical water conditions

ABSTRACT

Subcritical water hydrolysis process for sugar recovery from leftover croissants (LC) and leftover doughnuts (LD) was optimised using response surface methodology with three process parameters as dependent variables and sugar yield as the response. The process parameters: temperature (160-200 °C), time (5-15 min), and solid loading (10-50%), on the sugar yield were investigated. For the LC sample, the optimised process conditions were determined to be: 200 °C, 6.17 min, and 10% solid loading producing an 80% hydrolysis yield of 466.11 ± 0.67 mg/g. Comparatively, the LD sample optimisation parameters were: 200 °C, 5 min, and 10% solid loading producing a 76.18% hydrolysis yield of 394.34 ± 0.33 mg/g. The sugar extracts were further characterise; which through scanning electron microscopy revealed the LC had most starch granules rupture during hydrolysis, while Fourier-transform infrared spectroscopy detected the presence of monosaccharides and oligosaccharides for both LC and LD. 5-hydroxymethylfurfural (5-HMF), a sugar degradation by-product, was also detected with 39.16 ± 0.61 and 20.59 ± 0.81 mg/g for the LC and LD, respectively, at optimal conditions.

Keyword: Food waste; Monosaccharides; Oligosaccharides; Subcritical water hydrolysis; Sugar