

ABSTRACT

Design Strategy for Effective Passion Fruit Waste Bioconversion with Crude Fungal Enzyme Extracts

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The objective of this study was to investigate the key factors that influence performance of crude enzyme cocktails in passion fruit peel hydrolysis. Enzyme extracts were obtained from a newly isolated strain of *Aspergillus niger* KWM. The Box-Behnken Design (BBD) model was developed to determine the optimal conditions for peel hydrolysis. The effect of surfactants and metal ions on the efficacy of enzyme extracts was also investigated. The BBD model predicted maximum galacturonic acid (GalA) yield of 65.3 mg/g at temperature of 50 °C, pH medium of 7.5, substrate loading of 2% (v/v), and an incubation period of 10 h. However, experiments conducted under similar conditions produced GalA that was 2.7% higher than predicted value. Surfactants and metal ions, on the other hand, increased GalA yield even more, with Tween 20 and 2 mM Mg²⁺ increasing yield by 10.6% (w/v) and 11% (w/v), respectively. The highest GalA yield of 77.8 mg/g dwb or 16% increase, was reported when Mg²⁺ and Tween 20 were used at a ratio of 0.06. This study revealed that, in addition to optimising key process parameters, the proper proportion of suitable surfactants and metal ions is critical for better performance of crude enzyme cocktails in biomass hydrolysis.

Keywords: design strategy, passion fruit, waste bioconversion, crude, fungal enzyme extracts.