

Optimization of enzymatic treatments to optimize technological properties of apple bagasse

OLGA M. (1), PEDRO E. (1), ALBA D. (1), GLORIA L. (1), ROBERT S. (1)

¹ Universitat de Lleida, Lleida, Spain

Huge amounts of by-products are wasted during the production of apple juice. These by-products, rich in dietary fibre (DF) and bioactive compounds, could be used to obtain natural ingredients and incorporate them into foods for human consumption. However, their direct incorporation could cause undesirable changes, due to their high content of insoluble DF. Therefore, this study was aimed at optimizing the enzymatic treatment of apple bagasse to maximize the technological properties and the DF contents using response surface methodology (RSM).

Apple (*Malus domestica* cv Golden Delicious) bagasse was treated with Viscozyme (Novozymes®). RSM with a three-factor-three-level Central Composite Design (CCD) was used to evaluate the effect of time (1- 4 h), concentration (0.05 – 0.5 %), and temperature (40 – 60 °C) on water retention capacity (WRC), oil retention capacity (ORC), swelling capacity (SC), solubility, uronic acid concentration (UA) and neutral sugar concentration (NS).

The interaction between enzyme concentration and time had a significant impact ($p < 0.05$) on WRC, ORC, and solubility. WRC and ORC decreased by 52 % and 77 %, respectively, when increasing treatment time and enzyme concentration. On the other hand, solubility was nearly two times higher than that of the untreated bagasse under such conditions. Higher UA (3798.10 ± 644 ppm) and NS (16.9 ± 2.8 mg/mL) concentrations were obtained with the application of Viscozyme (0.5 %) for 2.5 h at 50 °C. The increases in UA and NS contents and solubility suggest a higher content of soluble DF. The lack of fit of the model was not significant ($p > 0.05$), indicating a good fitting to the experimental data.

The optimal conditions to achieve the maximum levels of WRC (14.8 g/g), ORC (5.2 g/g), SW (-3.2 mL/g), solubility (65.7 %), UA (1914.3 ppm), and NS (15.0 mg/mL) were: 3.29 h, 0.44 % enzyme and 46.65 °C. Thus, these predicted-values suggest that the use of Viscozyme could be a potential strategy to obtain natural ingredients with improved technological properties and high soluble DF content from vegetables by-products.