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## Optimization of spray drying process conditions for recombinant stem bromelain (Article)

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### Abstract

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Bromelain is a plant protease with numerous therapeutic, industrial and analytical applications. Spray drying of enzyme often leads to loss of enzymatic activity arising from thermal denaturation. Hence, the design of a suitable drying process should provide a great level of active enzyme. The present study examined the effect of operating parameters of a laboratory spray dryer on powder characteristics, so as to optimize the production of recombinant bromelain expressed in E. coli BL 21-AI. The recombinant enzyme was spray dried from maltodextrin (10 %w/v), $CaCl_2$ (0.2 % w/v) and sodium metabisulphite (2.5 % w/v) solutions using a laboratory-scale Büchi Mini Spray dryer B-290. The process parameters investigated were: drying air inlet temperature (100-120 °C), drying air volumetric flow rate - given as % of the maximum aspiration rate (80-100 %), feed volumetric flow rate- expressed as % of the maximum pump rate (10-15 %). On the other hand, the activity of bromelain (U/ml) served as the response of the design. Outlet temperature was maintained at 50 °C. All the studied process parameters had significantly affected the characteristics of the powdered bromelain, at a 95% confidence interval. The higher values of coefficient of determination (R2 = 99.95% and adjusted R2 = 99.84%) attained, showed that there is good compliance between the experimental and the theoretical values predicted by the model. Moreover, the graphical representations of the regression equation generated suggested that the examined independent variables interacted significantly. Thus, the corroboration of reality of the optimal conditions and the validity of the model had been ascertained. Consequently, under optimized process conditions, the study had produced powdered bromelain with greater quality in terms of moisture contents, residual activity and product recovery. 

### Author keywords

Aspirator setting Factorial design Inlet temperature Pump setting Recombinant bromelain

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