

**Model Kinetika dan Analisa Eksergi Proses Ko-Kristalisasi Gula Merah Jahe  
Kencur**

*(Kinetic Model and Exergy Analysis of the Ginger and Galangal Sugar Co-  
Crystallization Process)*

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***ABSTARCT***

*Ginger and kencur are biopharmaceutical commodities that are easily damaged due to their high water content, thus requiring proper post-harvest handling and further processing to extend shelf life and maintain product quality. One form of processing that is widely developed is ginger kencur sugar, including the stages of extraction, heating, stirring, crystallization, and packaging. This study aims to evaluate the co-crystallization kinetics of ginger kencur sugar using several mathematical models, analyze exergy efficiency, and determine the most optimal solution concentration. Evaluation of the kinetic model was carried out using statistical indicators in the form of coefficient of determination ( $R^2$ ), Root Mean Square Error (RMSE), Mean Absolute Error (MAE), Mean Bias Error (MBE), Sum of Squared Error (SSE), and Akaika Information Criterion (AIC) and Schwarz Information Criterion (SIC). The results showed that a solution with a concentration of 1.170 M reached crystallization in 44 minutes, faster than 1.754 M which took 56 minutes. The Gompertz model is most suitable at concentrations of 1.170 M and 1.754 M with  $R^2$  values of 0.9978 and 0.9957, while for a concentration of 1.462 M the Avrami model is most suitable with an  $R^2$  value of 0.9959. Exergy analysis shows a decrease in energy efficiency from 14.66% to 7.35% as the concentration increases. This research provides a positive*

*contribution in controlling the crystallization process, selecting the appropriate kinetic model, and increasing energy efficiency, thus supporting product quality improvement, energy consumption savings, and decision making in the industrial scale ginger and kencur sugar production process.*

**Keywords:** *Crystallization Kinetics, Exergy, Ginger Kencur Sugar*