

Kajian Kinetika dan Analisis Eksergi pada Pengeringan Biji Kakao berbagai Variasi Suhu

(A Study of Kinetics and Exergy Analysis in the Drying of Cocoa Beans at Various Temperatures)

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ABSTRACT

Cocoa bean drying is a crucial stage in post-harvest handling because it significantly determines the final product quality, particularly moisture content, flavor, aroma, color, and shelf life. Traditional drying processes that rely on sunlight often lead to quality inconsistencies due to weather changes and poor temperature control. The use of a food dehydrator is a more effective alternative because it can provide more stable and controlled drying conditions. Variations in drying temperature at 50°C, 60°C, and 70°C significantly affected the drying rate and energy efficiency. Drying time at 50°C reached 315 minutes, at 60°C for 175 minutes, and at 70°C for 160 minutes. Based on the evaluation of the mathematical model of drying kinetics using the R^2 , SSE, RMSE, AIC, and BIC criteria, the Lewis Model provided the best performance. The highest R^2 value of 0.9950, the lowest SSE of 0.1020, the smallest RMSE of 0.3487, AIC of -455.1637, and BIC of -452.9158 were obtained at Tray 2 at 50°C. Overall, the drying temperature of 60°C was determined as the most optimal condition because it provided the best balance between adequate drying rate, high effective moisture diffusivity value, better exergy efficiency, and the ability to maintain the physical quality and bioactive compounds of cocoa beans.

Keywords: *Cocoa beans, food dehydrator, drying kinetics, exergy*