Pengaruh Temperatur Pengeringan Dan Kelembaban Spesifik Terhadap Konstanta Laju Pengeringan Dan Energi Aktivasi Kopi Robusta Menggunakan Pengeringan Pompa Kalor = Effect of Drying Temperature and Specific Humidity on Drying Rate Constant and Activation Energy of Robusta Coffee Using Heat Pump Drying

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Abstrak

Karakteristik pengeringan sangat ditentukan oleh nilai konstanta laju pengeringan dan energi aktivasi bahan. Pemahaman terkait proses pada pengering pompa kalor penting diketahui untuk optimalisasi proses pengeringan kopi. Biji kopi robusta berkulit tanduk dikeringkan pada laju aliran udara, temperatur, dan kelembaban spesifik yang berbeda. Pengeringan dilakukan pada variasi temperatur heater 60, 65, 70, 75, dan 80 °C selama 5 jam, dengan laju aliran udara sebesar 400, 550, dan 700 lpm. Kelembaban spesifik divariasikan berdasarkan temperatur keluaran evaporator sebesar 10, 15, dan 20 °C. Pengeringan juga dilakukan tanpa sistem refrigerasi. Sehingga terdapat 4 variasi kelembaban spesifik. Variasi nilai kelembaban spesifik diperoleh dari hasil perhitungan rata-rata temperatur keluaran evaporator dan kelembaban relatif selama periode pengeringan. Nilai paling besar diperoleh pada variasi temperatur 80 °C dengan kelembaban spesifik 6,16 g H2O/kg dry air pada laju aliran udara 700 lpm dengan nilai 10,69x10-3 s-1. Nilai energi aktivasi paling besar adalah 45,93 kJ/mol yang diperoleh pada variasi kelembaban spesifik 17,24 g H2O/kg dry air dan laju aliran udara 400 lpm. Penurunan kadar air akan semakin cepat dengan meningkatnya laju aliran udara, meningkatnya temperatur pengeringan, dan kelembaban spesifik yang semakin kecil.

.....The drying characteristics are largely determined by the value of the drying rate constant and the activation energy of the material. It is important to understand the process related to heat pump dryers to optimize the coffee drying process. The wet parchment robusta coffee beans are dried at different air flow rates, temperatures, and specific humidity. Drying was carried out at heater temperature variations of 60, 65, 70, 75 and 80 °C for 5 hours, with air flow rates of 400, 550 and 700 lpm. Specific humidity is varied based on the evaporator output temperature of 10, 15, and 20 °C. Drying is also carried out without a refrigeration system. So, there are 4 variations of specific humidity. Variations in specific humidity values are obtained from the results of calculating the average evaporator outlet temperature and relative humidity during the drying period. The highest value was obtained at a temperature variation of 80 °C with a specific humidity of 6.16 g H2O/kg dry air at an air flow rate of 700 lpm with a value of 10.69x10-3 s-1. The highest activation energy value is 45.93 kJ/mol obtained at a specific humidity variation of 17.24 g H2O/kg dry air and an air flow rate of 400 lpm. The decrease in water content will be faster with increasing air flow rate, increasing drying temperature, and decreasing specific humidity.