

ABSTRAK

ANALISIS KINERJA MESIN PENGERING HASIL PERTANIAN BERBASIS TUNGKU BIOMASSA

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Pengeringan biji kakao merupakan tahapan penting dalam proses pascapanen untuk menurunkan kadar air hingga batas aman penyimpanan. Penelitian ini bertujuan untuk menganalisis kinerja mesin pengering hasil pertanian berbasis tungku biomassa ditinjau dari distribusi temperatur, penurunan massa bahan, kadar air, serta efisiensi pengeringan dan efisiensi tungku. Pengujian dilakukan menggunakan mesin pengering rak bertingkat berbasis tungku biomassa dengan bahan bakar kayu jati, menggunakan sampel biji kakao sebanyak ± 5 kg. Pengambilan data dilakukan sebanyak tiga kali pengujian dengan parameter meliputi temperatur ruang pengering, temperatur lingkungan, kelembaban udara, waktu pengeringan, serta massa bahan sebelum dan sesudah pengeringan. Hasil penelitian menunjukkan bahwa temperatur ruang pengering berada pada kisaran 37,5 °C hingga 89,4 °C. Massa biji kakao mengalami penurunan dari rata-rata 5,28 kg menjadi 2,31 kg dengan rata-rata massa air yang diuapkan sebesar 2,97 kg. Kadar air akhir biji kakao mencapai nilai rata-rata 7,29% dalam waktu pengeringan 7,2–8 jam sehingga memenuhi standar kadar air aman penyimpanan. Efisiensi termal pengeringan yang diperoleh berturut-turut sebesar 3,5%, 3,9%, dan 2,7%, sedangkan efisiensi tungku biomassa meningkat dari 42% menjadi 46%. Rendahnya efisiensi pengeringan disebabkan oleh jumlah sampel yang jauh di bawah kapasitas mesin serta adanya kehilangan panas melalui dinding ruang pengering. Secara keseluruhan, mesin pengering berbasis tungku biomassa efektif digunakan untuk pengeringan biji kakao, namun masih memerlukan optimasi untuk meningkatkan efisiensi energi.

Kata kunci: biji kakao; tungku biomassa; mesin pengering; efisiensi pengeringan.

ABSTRACT

PERFORMANCE ANALYSIS OF A BIOMASS FURNACE-BASED AGRICULTURAL PRODUCT DRYING MACHINE

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Drying of cocoa beans is an essential post-harvest process to reduce moisture content to a safe level for storage. This study aims to analyze the performance of an agricultural dryer based on a biomass furnace in terms of temperature distribution, mass reduction, moisture content, drying efficiency, and furnace efficiency. The experiment was conducted using a multi-rack drying machine powered by a biomass furnace fueled with teak wood, with approximately 5 kg of cocoa beans as the drying sample. The experiment was carried out in three test runs by measuring drying chamber temperature, ambient temperature, air humidity, drying time, and material mass before and after drying. The results show that the drying chamber temperature ranged from 37.5 °C to 89.4 °C. The average mass of cocoa beans decreased from 5.28 kg to 2.31 kg, with an average evaporated water mass of 2.97 kg. The final moisture content reached an average value of 7.29% within a drying time of 7.2–8 hours, which meets the safe moisture standard for cocoa storage. The thermal drying efficiency obtained was 3.5%, 3.9%, and 2.7% for the first, second, and third tests, respectively. Meanwhile, the biomass furnace efficiency increased from 42% to 46%. The low drying efficiency was influenced by the small sample mass compared to the machine capacity and significant heat losses through the dryer walls. Overall, the biomass furnace-based dryer is effective for drying cocoa beans, although further optimization is required to improve energy efficiency.

Keywords: cocoa beans; biomass furnace; drying machine; drying efficiency.