ABSTRAK

Cabai merupakan komoditas hortikultura yang memiliki kadar air tinggi sehingga mudah mengalami penurunan mutu apabila tidak segera dikeringkan. Pengeringan secara konvensional dengan penjemuran langsung masih memiliki kelemahan, seperti ketergantungan terhadap cuaca, waktu pengeringan yang sulit dikendalikan, serta risiko kontaminasi dari lingkungan. Penelitian ini bertujuan untuk merancang alat pengering cabai berbasis energi surya tipe tidak langsung menggunakan sistem blower untuk kapasitas 5 kg cabai segar. Metode yang digunakan adalah metode perancangan teknik (*engineering design*) dengan analisis teoritis dan pemodelan tiga dimensi menggunakan SolidWorks. Tahapan penelitian meliputi penetapan parameter perancangan, perhitungan neraca massa, kebutuhan energi pengeringan, kebutuhan aliran udara, luas kolektor surya, penentuan dimensi utama alat, serta pemodelan komponen. Parameter rancangan meliputi kadar air awal 80% basis basah, kadar air akhir 11% basis basah, temperatur pengeringan 55°C, dan waktu pengeringan 8 jam. Hasil perancangan menunjukkan bahwa ruang pengering berdimensi 730 mm × 530 mm × 713,60 mm memiliki volume 0,2761 m^3 dengan tiga tingkat rak dan kapasitas 1,67 kg/rak. Total kebutuhan energi teoritis sebesar 9670,69 kJ dengan kebutuhan daya panas rata-rata 335,79 W. Debit udara minimum yang diperlukan sebesar 41,48 m^3/jam, sehingga direkomendasikan *centrifugal blower* berkapasitas 45–50 m^3/jam. Kolektor surya tipe flat plate solar air collector berdimensi 1527,36 mm × 766 mm memiliki luas 1,17 m^2 dan mampu menghasilkan daya panas teoritis sebesar 409,49 W. Secara teoritis, rancangan alat pengering cabai ini mampu memenuhi kebutuhan panas minimum dan dapat dijadikan acuan awal untuk pengembangan prototipe serta pengujian kinerja.

Kata kunci: *alat pengering cabai, energi surya, blower sentrifugal, kolektor surya plat datar, SolidWorks*.

ABSTRACT

Chili is a horticultural commodity with high moisture content, making it susceptible to quality deterioration if not dried immediately. Conventional drying through direct sun drying still has several limitations, such as dependence on weather conditions, difficult-to-control drying time, and the risk of environmental contamination. This study aims to design an indirect solar energy-based chili dryer using a blower system with a capacity of 5 kg of fresh chili. The method used in this study is an engineering design method with theoretical analysis and three-dimensional modeling using SolidWorks. The research stages include determining design parameters, calculating mass balance, drying energy requirements, airflow requirements, solar collector area, determining the main dimensions of the dryer, and modeling the components. The design parameters include an initial moisture content of 80% wet basis, a final moisture content of 11% wet basis, a drying temperature of 55°C, and a drying time of 8 hours. The design results show that the drying chamber with dimensions of 730 mm × 530 mm × 713,60 mm has a volume of 0.2761 m^3, equipped with three drying racks with a capacity of 1.67 kg per rack. The total theoretical energy requirement is 9670.69 kJ, with an average heat power requirement of 335.79 W. The minimum required airflow rate is 41.48 m^3/h, so a *centrifugal blower* with a capacity of 45–50 m^3/h is recommended. The flat plate solar air collector with dimensions of 1527,36 mm × 766 mm has an area of 1,17 m^2 and is theoretically capable of producing 409,49 W of heat power. Theoretically, the designed chili dryer is able to meet the minimum heat requirement and can be used as an initial reference for prototype development and performance testing.

Keywords: *chili dryer, solar energy, centrifugal blower, flat-plate solar air collector, SolidWorks.*