

## ABSTRAK

### RANCANG BANGUN SISTEM KENDALI SUHU *GREENHOUSE* OTOMATIS PADA BUDIDAYA TANAMAN BAWANG MERAH, CABAI RAWIT, DAN TOMAT

Oleh

**RISKI PRATAMA**

Masalah utama yang dihadapi budidaya tanaman hortikultura di daerah tropis adalah intensitas cahaya yang tinggi oleh karena itu diperlukan naungan salah satunya yaitu *greenhouse*. Dari hasil pengamatan yang telah dilaksanakan didapat suhu di dalam *greenhouse* di daerah tropis mampu mencapai 34 - 36°C. Untuk itu, diperlukan sebuah alat yang dapat mengukur dan mengendalikan suhu udara yang ada di dalam *greenhouse*, agar pertumbuhan tanaman dapat maksimal. Tujuan penelitian ini adalah melakukan kalibrasi dan validasi sensor suhu untuk suhu tanaman dan melakukan perancangan dan pengujian alat untuk mendapatkan nilai kinerja aktuator yang meliputi keakurasian, rerata waktu pengendalian, stabilitas, respon sistem, dan pemberian aksi.

Penelitian ini dilaksanakan pada bulan Juni - September 2019 di *Greenhouse* dan di Laboratorium daya dan alat mesin pertanian Jurusan Teknik Pertanian, Fakultas Pertanian, Universitas Lampung. Perancangan sistem kendali ini dilakukan dengan membuat skematik rangkaian, dilanjutkan dengan pembuatan rangkaian sistem kendali suhu dan perakitan komponen sistem ke *greenhouse*. Pengambilan data dilakukan dengan pengujian kinerja alat berdasarkan akurasi, rerata waktu pengendalian, stabilitas, respon sistem, pemberian aksi, dan pertumbuhan tanaman.

Hasil penelitian menunjukkan sensor DHT22 pada rancang bangun sistem kendali otomatis suhu *greenhouse* pada budidaya tanaman cabai rawit, bawang merah, dan tomat ini telah sesuai dengan rancangan yang diinginkan dengan nilai kalibrasi R<sup>2</sup> berturut-turut sebesar 97,78%, 98,54%, 98,60%, dan 99,27%. Sedangkan untuk nilai validasi R<sup>2</sup> berturut-turut 99,68%, 99,29%, 99,00%, dan 98,83%. Nilai keakurasian yang didapat yaitu sebesar 98,40%, 97,82% dan 97,53%. Sedangkan untuk rerata waktu pengendalian pada suhu 32 °C sebesar 12,8 menit, suhu 33 °C.

Kata Kunci : Suhu, Mikrokontroler, dan *Greenhouse*

## ABSTRACT

The main problem faced by the cultivation of horticultural crops in the tropics is the high light intensity. Therefore, shade is needed, one of which is the *greenhouse*. From the results of observations that have been carried out, it is found that the temperature in the *greenhouse* in the tropics can reach 34 - 36°C. For that, we need a tool that can measure and control the air temperature in the *greenhouse*, so that plant growth can be maximized. The purpose of this research is to calibrate and validate temperature sensors for plant temperatures and to design and test tools to obtain actuator performance values which include accuracy, average control time, stability, system response, and action.

This research was carried out in June - September 2019 at the *Greenhouse* and at the Laboratory of Power and Agricultural Machine Tools, Department of Agricultural Engineering, Faculty of Agriculture, University of Lampung. The design of this control system is done by making a schematic of the circuit, followed by making a series of temperature control systems and assembling system components to the *greenhouse*. Data retrieval is done by testing the performance of the tool based on accuracy, average control time, stability, system response, action, and plant growth.

The results showed that the DHT22 sensor in the design of the *greenhouse* temperature automatic control system for the cultivation of cayenne pepper, shallots, and tomatoes was in accordance with the desired design with R2 calibration values of 97.78%, 98.54%, 98 respectively. ,60%, and 99.27%. Meanwhile, the R2 validation values were 99.68%, 99.29%, 99.00%, and 98.83%, respectively. The accuracy values obtained are 98.40%, 97.82% and 97.53%. Meanwhile, the average control time at 32°C temperature is 12.8 minutes, 33°C temperature is 10.5 minutes, and 34°C temperature is 9.4 minutes with an average of 10.9 minutes at the three temperatures. When the air temperature value passes the *setting point*, the device will turn on the pump which sprays water with an amount of water as much as 6.45 liters/hour from a total of 4 pipe holes to lower the air temperature at 1 - 10 HST from 32.7°C until it reaches 32° C with system response for 6 hours, 11 - 20 hst air temperature from 34.67°C - 33°C with system response for 5 hours, and 21 – 30 hst air temperature from 35.17°C - 34°C with response system for 3 hours.

Keyword : *greenhouse*, temperature, microcontroller