

Design of an automatic temperature and humidity measuring device in the oyster mushroom cultivation room

Riski Surya Permata¹, Dirja Nur Ilham^{2*}, Muharratul Mina Risky³, Muhammad Khoiruddin Harahap⁴, Sepri Kurniadi⁵

^{1,2,3,5}Politeknik Aceh Selatan, Indonesia, ⁴Politeknik Ganesha Medan, Indonesia

¹riskisuriya11@gmail.com, ²dirja.poltas@gmail.com, ³kikyamiruddin@gmail.com, ⁴choir.harahap@yahoo.com,

⁵seprikurniadi@gmail.com



*Corresponding Author

Article History:

Submitted: 06-05-2024

Accepted: 18-05-2024

Published: 20-05-2024

Keywords:

Arduino Uno; DHT22 sensor; temperature; Oyster Mushroom Cultivation.

PERFECT: Journal of Smart Algorithms is licensed under a Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0).

ABSTRACT

Advances in science and technology have become the idea of a tool for the development of oyster mushroom cultivation which has increased following the large market demand. Cultivating oyster mushrooms in areas with high temperatures requires special care techniques. Current technological developments make it easier to maintain oyster mushroom cultivation, namely by automatically regulating the temperature and humidity in the cultivation room. With automatic temperature control, it can make maintenance easier and reduce failure in oyster mushroom production. To realize the simulation of automatic temperature and humidity control, several pieces of hardware are needed, namely temperature and humidity sensors, DC fan, LCD, power supply, and Arduino Uno as the processor. which are then combined into a system. The growth of oyster mushrooms is greatly influenced by the surrounding environmental conditions. Therefore, we must know the conditions that are suitable for growth before we cultivate oyster mushrooms. Usually, the growth of oyster mushrooms will be optimal throughout the year if the cultivation location is by its natural habitat, namely in a mountainous area with an altitude of between 400 - 800 meters above sea level and an air temperature of around 21 - 29 °C with a humidity level of around 60 - 80%. In general, farmers cultivate natural mushrooms in a room to obtain environmental conditions suitable for growth. Because mushrooms are very sensitive to temperature and humidity, it is necessary to monitor the temperature and humidity in the growing room.

INTRODUCTION

Indonesia is a developing agricultural country with the agricultural sector as the main source of livelihood for the majority of the population. The existence of agriculture functions socially as a provider of quite extensive employment opportunities, especially in production center areas. One of the agricultural products that is currently popular in society is the cultivation of white oyster mushrooms, whereas their growth is very dependent on the surrounding environmental conditions (Rosmiah et al., 2020). Therefore, we must know the conditions that are suitable for growth before we cultivate oyster mushrooms. Usually, the growth of oyster mushrooms will be optimal throughout the year if the cultivation location is by its natural habitat, namely in a mountainous area with an altitude of between 400 - 800 meters above sea level and an air temperature of around 21 - 29°C with a humidity level of around 60 - 80% (Evy Hanifah, n.d.)(Sasria et al., 2021).

In general, farmers cultivate mushrooms indoors to obtain environmental conditions suitable for growth. Because the fungus is very sensitive to temperature and humidity, it is necessary to monitor the temperature and humidity in the kampung room. There have been several previous studies such as the Development of an Automated Mushroom House to Optimize the Growth and Production of White Oyster Mushrooms (*Pleurotus ostreatus*) (Nur Intan Baharsyah, Jamaluddin, 2023). Implementation Of Monitoring and Control Temperature and Humidity Based on IoT in The Oyster Mushroom Cultivation Room (Wibowo et al., 2023). Based on the background that has been referred to, the researcher will conduct research with the title "Design of an automatic temperature and humidity measuring device in the oyster mushroom cultivation room".

LITERATURE REVIEW

Research conducted by previous researchers used the same technology or cases in different ways, including the Design and Manufacture of an Automatic Mushroom Sprinkler-based Internet of Things to Increase Oyster Mushroom Productivity (Setiawan et al., 2021). Study of Growth and Production of White Oyster Mushrooms (*Pleurotus ostreatus*)



in the Growth Media Formulation of Sugarcane Bagasse and Tea Dregs (Anggaraini, 2017). Design of temperature and humidity control system on oyster mushroom plant house based on Internet of Things (IoT) (Setiawati et al., 2021). Design of IoT-Based Oyster Mushroom Monitoring and Automation System Prototype (Hakim et al., 2022). Prototype System of Temperature and Humadity Automatic in Oyster Mushroom Cultivation using Arduino Uno (Akbar et al., 2020). Design and Build a Multilevel Mace Nutmeg Dryer to Improve the People's Economy (Ihsan et al., 2021).

METHOD

Analysis of system requirements

Designing an automatic temperature and humidity measuring device for oyster mushroom cultivation requires hardware components used including:

Table 1. Hardware components

No	Hardware	Function
1	Arduino Uno	As controller of all components
2	Fan	Cooling
3	DHT22 sensor	resistive type humidity meter and temperature measurement
4	Relays	perform switches on AC or DC devices
6	Heater plate 220v	to create a heating flow
7	LCD	serves to display the output of the tool's performance
8	RTC	as a digital timer to remind the harvesting period once a week on the tool
9	Power Supply 12V	serves as a source for the tool as a whole
9	Aluminum foil	Heat insulation, oxygen, and light barrier

System planning

The oyster mushroom room temperature measuring hardware is divided into 7 parts, namely a 12-volt power supply, DHT22 temperature sensor, serial monitor sensor, RTC time clock, relay, soil moisture sensor and 16x2 LCD, hardware scheme for the temperature and humidity measuring device for mushroom cultivation rooms oysters can automatically be seen in Figure 1.

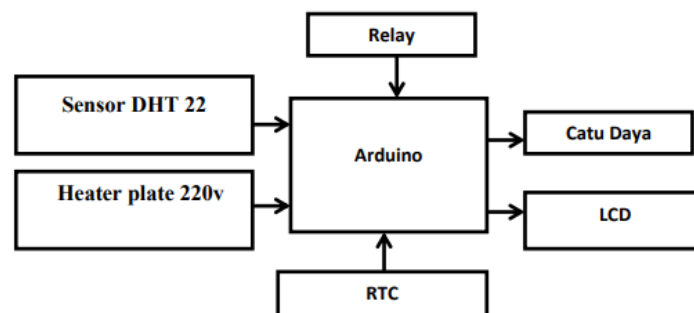


Figure 1. System design diagram

It can be seen in Figure 1, namely the performance process carried out on the temperature and humidity measuring device in the oyster mushroom cultivation room automatically, namely:

1. RTC as a digital timer to remind the harvesting period once a week on the device.
2. DHT 22 to detect the temperature of the tool.
3. 220v heater plate functions as a warmer or heater.
4. Arduino Uno as a data processing center and system controller.
5. The relay functions as a breaker and current connector for the pump
6. The 12v power supply functions as the main source of the tool.
7. The LCD functions to display the performance of devices that have been processed by the Arduino Uno microcontroller.

Flowchart for measuring temperature and humidity in the oyster mushroom cultivation room

Starting by turning on the tool, the HT22 sensor initialization, fan & 220v heater plate will turn on. Next, set the DHT22 sensor and 220v heater plate. If the temperature is below 23 then the heater will be on, if the temperature is above 27 then the heater will be off and the fan will be on above 27, then the LCD displays the resulting temperature and humidity. As in Figure 2 below:

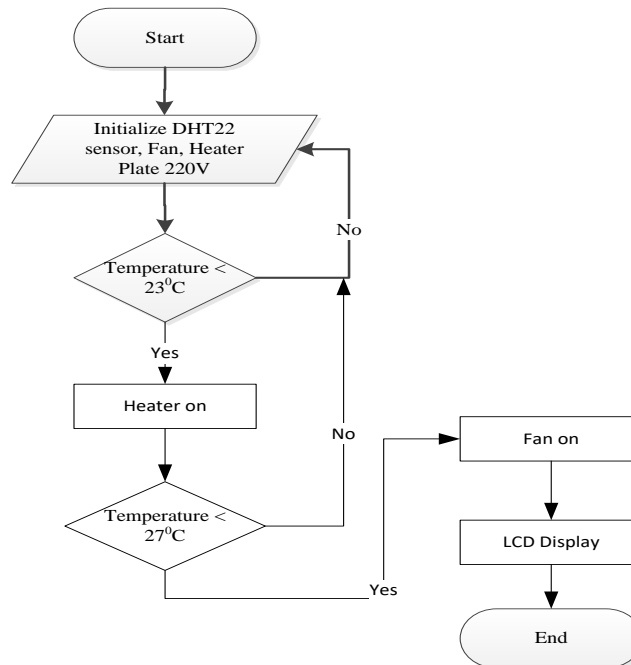


Figure 2. Flowchart for measuring temperature and humidity in the oyster mushroom cultivation room

RESULT

The results of the tool series

The Overall Series of Tools for Designing a Series of Automatic Oyster Mushroom Cultivation Temperature Measuring Tools to control or control all devices.



Figure 3. Overall tool set

To produce a tool design that works as expected, based on the program that has been created, tool testing is carried out. Testing of the tool was carried out to measure the temperature, humidity, and heat of the oyster mushroom cultivation room to provide notification to the LCD. Here the author carried out the test for two days.

Tool testing results

Time		Condition		Tool			
Date	Hours	Temperature °C	Humidity %	Fan 1	Fan 2	Fan 3	Heating
08-04-2023	13:06	29.70°C	78.10%	ON	ON	ON	OFF
08-04-2023	14:51	27.90°C	84.70%	ON	ON	ON	OFF
08-04-2023	20:12	29.10°C	76.10%	ON	ON	ON	OFF
08-04-2023	20:29	27.00°C	80.00%	OFF	OFF	OFF	ON
26-04-2023	12:50	29.40°C	74.10%	ON	ON	ON	OFF
26-04-2023	12:52	27.10°C	66.00%	ON	ON	ON	OFF
26-04-2023	12:54	27.00°C	69.60%	OFF	OFF	OFF	ON

DISCUSSION

The results of testing the temperature, humidity, heater, and fan measuring equipment for two days can be explained below: the test was carried out at temperature conditions, namely, 27 °C - 23 °C with the same humidity, namely 89%. The average results from testing for two days at a temperature of 27.2 °C detected and an average humidity of 89% detected.

CONCLUSION

Based on the test results on the Oyster Mushroom Cultivation Room Temperature Measuring device, conclusions can automatically be drawn, namely:

1. From testing the equipment for five days, it can be explained that the test was carried out at temperature conditions, namely 27 °C - 23 °C with the same humidity, namely 89%, the average results from testing for five days at a detected temperature of 27.2 °C and humidity an average of 89% was detected.
2. The Oyster Mushroom Cultivation Room Temperature Gauge which has been designed to be visible directly from the DHT 22 sensor will detect the temperature and humidity of the oyster mushroom cultivation room. Next, the LCD (liquid crystal display) will display the temperature and humidity figures for the oyster mushroom cultivation room.
3. Every test read by the DHT 22 sensor can be monitored via Arduino Uno.

REFERENCES

- Akbar, T., Gunawan, I., & Utama, S. (2020). Prototype System of Temperature and Humidity Automatic in Oyster Mushroom Cultivation using Arduino Uno. *Journal of Physics: Conference Series*, 1539(1). <https://doi.org/10.1088/1742-6596/1539/1/012036>
- Anggaraini, A. D. (2017). Studi Pertumbuhan dan Produksi Jamur Tiram Putih (*Pleurotus ostreatus*) pada Formulasi Media Tumbuh Serbuk Ampas Tebu dan Ampas Teh. *Skrpisi*, 1–60.
- Evy Hanifah, T. S. (n.d.). The Growth and Yield of White Oyster Mushroom (*Pleurotus Ostreatus*) on The Different Composition of Sawdust, Bagasse and Banana Flowers as The Planting Medium. *Seminar Nasional XI Pendidikan Biologi FKIP UNS*, 98–105.
- Hakim, L. S., Widodo, F. Z. R., Setiawan, A. E., Nuramin, H., Mardiaty, R., & Hamidi, E. A. Z. (2022). Design of IoT-Based Oyster Mushroom Monitoring and Automation System Prototype. *Proceeding of 2022 8th International Conference on Wireless and Telematics, ICWT 2022*. <https://doi.org/10.1109/ICWT55831.2022.9935460>
- Ihsan, Ilham, D. N., Putra, R. A., Candra, R. A., & Budiansyah, A. (2021). Design and Build a Multilevel Mace Nutmeg Dryer to Improve the People ' s Economy. *Jurnal Dan Penelitian Teknik Informatika*, 6(1), 107–112. <http://jurnal.polgan.ac.id/index.php/sinkron/article/view/11171%0Ahttp://jurnal.polgan.ac.id/index.php/sinkron/article/download/11171/621>
- Nur Intan Baharsyah, Jamaluddin, A. M. A. M. (2023). Development of an Automated Mushroom House to Optimize Growth and Production of White Oyster Mushrooms (*Pleurotus ostreatus*). *Journal of Agroscience Indonesia*, 1(1), 17–24. <http://creativecommons.org/licenses/by/4.0/>
- Rosmiah, R., Aminah, I. S., Hawalid, H., & Dasir, D. (2020). BUDIDAYA JAMUR TIRAM PUTIH (*Pluoretus ostreatus*) SEBAGAI UPAYA PERBAIKAN GIZI DAN MENINGKATKAN PENDAPATAN KELUARGA. *Altifani: International Journal of Community Engagement*, 1(1), 31–35. <https://doi.org/10.32502/altifani.v1i1.3008>
- Sasria, N., Hayati, R. N., & Amalia, L. (2021). Budidaya Jamur Tiram Putih (*Pluoretus ostreatus*) untuk Meningkatkan Kompetensi Jamur Tiram di Wilayah Karang Joang. *Seminar Nasional Pengabdian Kepada Masyarakat*, 2(1), 1–



5.

- Setiawan, R. J., Tarnadi, A., & Surfani, I. (2021). Design and Manufacture an Automatic Mushroom Sprinkler based Internet of Things to Increase Oyster Mushroom Productivity. *JMPM (Jurnal Material Dan Proses Manufaktur)*, 5(1), 1–9. <https://doi.org/10.18196/jmpm.v5i1.12043>
- Setiawati, D. A., Utomo, S. G., Murad, & Putra, G. M. D. (2021). Design of temperature and humidity control system on oyster mushroom plant house based on Internet of Things (IoT). *IOP Conference Series: Earth and Environmental Science*, 712(1). <https://doi.org/10.1088/1755-1315/712/1/012002>
- Wibowo, B. C., Rozaq, I. A., & Pratama, T. P. (2023). Implementation Of Monitoring and Control Temperature and Humidity Based on IoT in The Oyster Mushroom Cultivation Room. *PROtek : Jurnal Ilmiah Teknik Elektro*, 10(2), 85. <https://doi.org/10.33387/protk.v10i2.4863>

