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IOT FOR SMART FARMING: FOR GROWING OYSTER MUSHROOM

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Abstract— **In this 4.0 era, technological advancement is accelerating. Nowadays, IOT (iot) is the system that connects the components, and the internet is utilized in a variety of industries, including industry, agriculture, services, education, and so on. IoT may be of great assistance in agriculture, such as inoculant growth. Conventional methods, using climate variability and a human read rheometer, for example, is still regularly utilized by mushroom farmers. This project's objective is to construct an Internet of things that manages and monitors several aspects in order to enable smart oyster mushroom cultivation. A nodeMCU esp8266 controller is used in the design to operate [6] the platform's components. This same DHT11 sensor is used to check the humid and temps in the environment.**

Keywords— **NodeMCUesp8266, DHT11, temp, humus, soil sen0193, Blynk app.**

I. INTRODUCTION

These herbs, known as oyster fungi, are a kind of woody spore and has more nutrients than other types of fungi. This mushroom has max. lvl's fungus in terms of energy, fat, calcium, iron, vitamin b12, and ascorbic [1]. Rhizopus respondents in total is mostly planted in Indonesian. Because many Indonesian fungus farmers still practice ancient traditions, such as upland cultivation, which is temp and humd. dependant [1]. Climate ranging from 22 - 34 degrees Celsius, with humd. levels ranging from 82% – 94%, are perfect growing oyster mushrooms.

The most challenging factors of cultivating oyster mushrooms are temp and humd. [1]. According to Istiyanti and colleagues, the oyster fungus may grow at lowlands [1]. Shihombing and colleagues conducted research on oyster mushrooms utilising Arduino and Bluetooth [1] in 2018. In 2021, Setiawati constructed an edible mushroom contraption that measures temp and humd. using (esp8266 and DHT11). The objective of this research is to develop a Cellular, thick jungles smart oyster fungus. Using the serial communication chip, detectors, valves, and motors can operated. Information has been sent and received from the Wi-Fi module to the Push notification using the esp8266 [2] interface. Its same data procedures are accessible by Wi-Fi apps and integrated systems. An incubator's humd. and temp are regulated using DHT 11 temp and humd. sensor.

This 3v fan is powered on [1] It may be flicked on or off depending on the specific the temp. The compressor in Bluetooth module is activated via a fake button. Every 10 seconds, the SEN0193 soil detector [3] sends information to option to register to record the moisture content in the soil baglog. A Bluetooth module digital number of specified the 3v fan, that also serves as an auxiliary fan to keep the temperature consistent [4]. With this project we can make a system which provide Fungii a proper environment for growing them.

II.EQUIPMENT'S USED

A. Equips used

This study uses the Arduino microcontroller esp8266 as a microprocessor to deliver information to the Internet. DHT 11, and soil sensor [2] are among the sensors utilized in this project. The data obtained by the esp8266 will be transferred and shown on the Blynk widget because of the sensor reads. If the chipset and [2] Microcontroller are both plugged into the facts will be transmitted and displayed instantaneously on Blynk over the internet. Blynk also used virtual buttons to control some relays. [2]. Table 1 shows the specifics of the tools and supplies. Table 1 shows the project's components. There is currently no name again for component. The whole first item seems to be a NodeMCU esp8266 [2]. 3rd Send data to Push notification and take packets from that too.

TABLE 1. Components & software used for making this project

Sr. No.	Comps used	units	Intent
i.	NodeMCU esp8266	01	Send information to and read packets through Bluetooth module.
ii.	DHT11	01	Oversee temp as well as humid
iii.	2-ch relay	01	Used to control fan and pump
iv.	Gnd (SEN0193)	01	Oversee humus in soil
v.	LCD I2C 16x2	01	Oversee data from esp8266
vi.	Fan Dc	01	Maintain temp
vii.	Pump Dc	01	Watering content
viii.	Lithium-ion batteries	02	To give 9v to the ckt.
ix.	LED (white)	01	To oversee(temp>=30 deg c)
x	Buzzer	01	To oversee (humdlvl<=50%)

Sr. No.	Software utilized	Intent
i.	Coding Ide	Coding portion
ii.	App blynk	Data from esp8266 is visualized and manipulated.

B. Systematic ckt designing

This depicts the system design for this project. The project's work system is illustrated using a block diagram. There is esp8266 and Blynk [3] linked to the internet; the esp8266 coupled to DHT 11 is referred to as the DHT11 component. The esp8266 sends data to the Blynk and the LCD 16x2 in this section, and Bluetooth module about the status of the humid and temp. The esp8266 receives data from Blynk in order to regulate the pump if the value of temp %age is <=50, it automatically starts pump and turn off when the humidity level increase by 50%. In addition, to run the relay, esp8266 transfers data from the ground [3] to Invented and receives information from Mobile application.

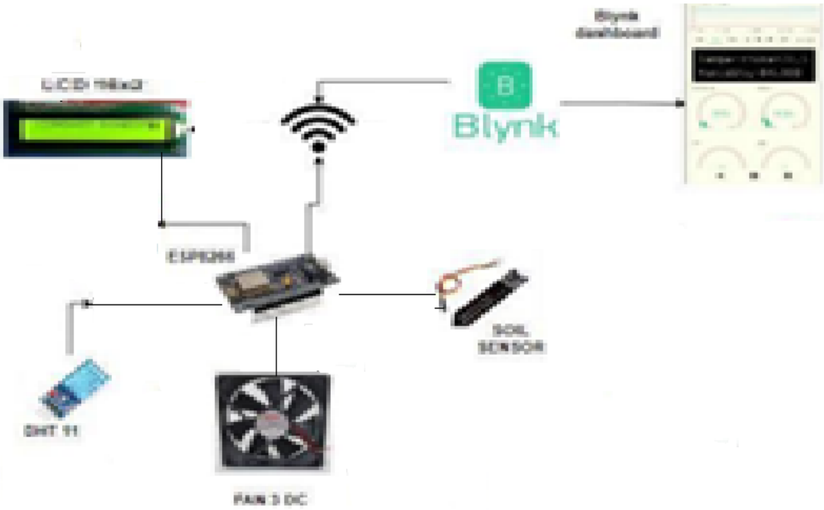


Fig. 1.Flowchart diagraming of system [1].

C. PCB PLATE CKT

In this depicts the connection of the DHT 11 component. The micro-controller has five dig pins, Sensor(DHT11) linked to D6, LCD16x2 output Scl(pin) and Sda((pin) is [4]attached the D2 and D1. Port COM is linked to a 12 volt adapter as an electrical supply for fans [4]. Pin VV is utilised for the LCD's VCC pins and channel.

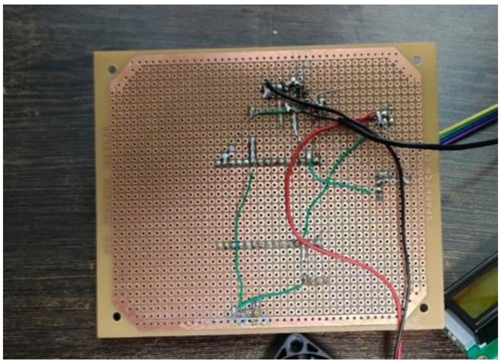


Fig. 2. Pcb connections

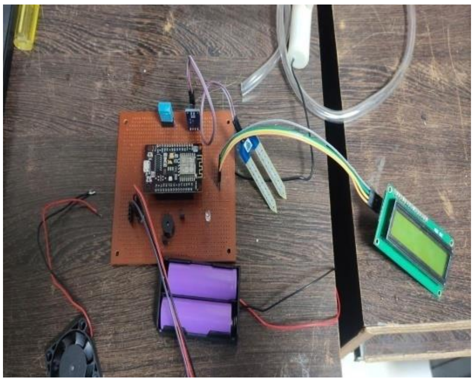


Fig. 3. DHT 11 circuit diagrams [1].

3 dig pins and 1 Analog pin are utilised in the final esp8266 (fig 2), D6 and Transistors are linked to the relay fan's IN ports, and the relay fan's COM port is joined to a 12v adaptor [13]. VCC fans use the relay fan's NO port. D5 is linked to the IN [4]port the relay buzzer, and the Rx port of valve led is joined to the 5 volt adapter. The NO outlet of switch lamp 2 is linked to lamp 2's VCC. The esp8266's A0 is linked to the SEN0193 soil sensor [16]. The circuit fan and soil sensor's VCC are linked with pin 3V esp8266, while the relay lamp is attached to pin VV esp8266 [18].

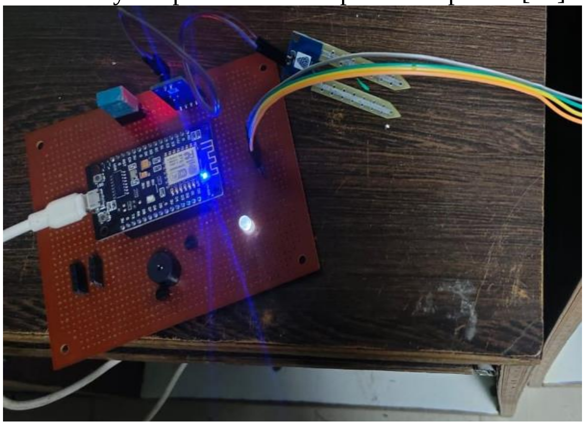
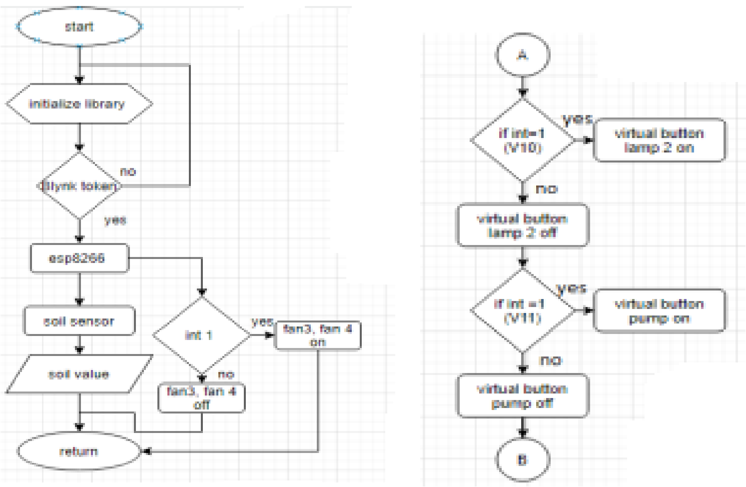


Fig. 4. Soil sensor part

D. Application based ckt

It depicts the algorithm programme. The Micro-controller (a) sends temp and humid data on Mobile App. When temp rises are 25 degC [18], automatically fan is turn on to lower the temp. Sensor (DHT11) and 3v fan performance results shown on blynk and LCD 16x2. Then temp is lower 23 degC, 3v fan turned off [19].



(a) (b)

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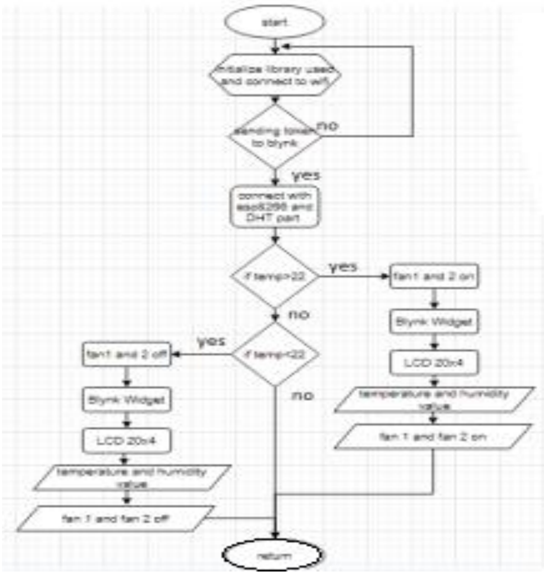

(c)

Fig. 5. Flowchart diagram of (a) DHT 11 (b) Pump (c) soil sensor [1].

Then, Micro-controller is used for the, Water(pump), and led(white). The blank button operates the pump (c). Integers are transmitted from bylnk to the second esp8266 [6]. In this, 1 indicates Switch (on), and 0 indicates Switch (off). The soil sensorlike (SEN0193) detector transmits information to Mobile App (blynk) [20].

E. Mechs ckt board

In this depicts an oyster mushroom incubator. It is constructed from two plastic crates. The incubator is made up of plastic box 20x6(cm). DHT 11 is situated on top of the Pcb plate [25], with fan on the top front. Also, the led and buzzer is used for the indicator for notifying the system alarm. In the field (SEN0193) named soil sensor is put on the edge of Pcb. By going through the entire was fashioned from a card box that was 20 cm long, 6 cm wide, and 5 cm tall [22].

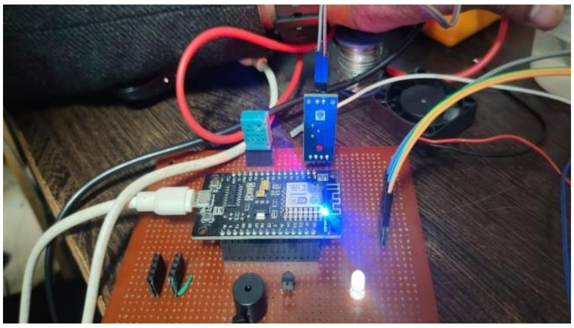

Fig 6. Mechanical ckt Diagram.

A. OUTCOMES of PROJECT

1) CKT Hardware Used

a). DHT equipping

This shows the moisture and temp readings from DHT 11 after irrigation twice a day. The avg temp and reltv. humd. Was on the first irrigation i.e., 26.27 degC and 85% ReHD. At eveng, the usual temp's and humd. were 25.07 degC and 875% ReHd, respectively. Then, outcome of precondition Humd. Sensor (DHT11) 3v(fan). It can be shown on LCD 16x2 with mobile App (Blynk widget) [23].

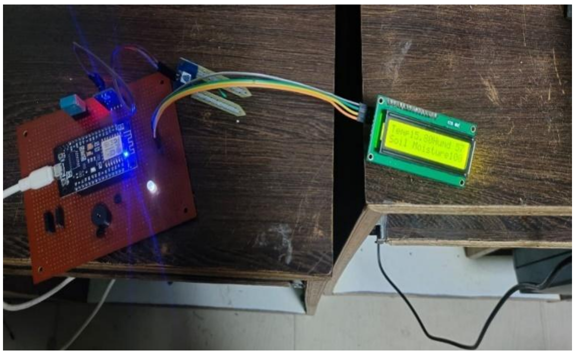

Fig. 7. DHT 11 testing.

TABLE 2. Comparison At different levels

Duration	Temp (deg C)	Hmd (%ReHd)	Wtg	Duration	Temp	Hmd (%RH)	Wtg
10.00	29.5	100	Yes	19.00	28.9	100	Yes
11.00	30.5	46	After	20.00	28.9	45	After
12.00	32.5	45	After	21.00	28.9	40	After
13.00	31.9	42	After	22.00	28.9	41	After
14.00	27.9	43	After	23.00	28.9	42	After
Avg	30.66	43		Avg	28.9	43	

b). Pump operation

The pump is operated by a virtual button on the internet mobile app Blynk. The motor was examined in the 2-5 cm. When it was switched on, the average reaction time was 0.9 secs. When turned off, the average reaction time was 0.9 seconds. The outcomes of water ejector can be seen in below given tables [1].

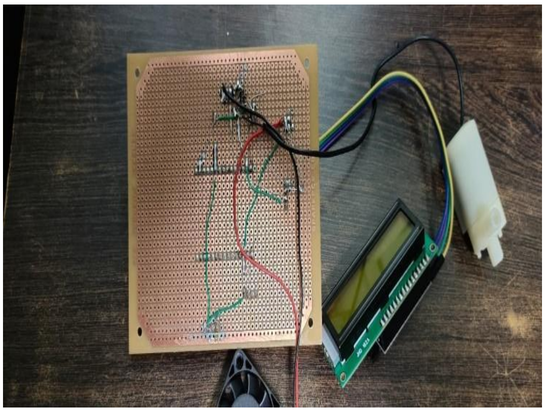

Fig 8. Water ejector testing.

high		Low	
span (m)	period (sec)	span (m)	period (sec)
0.1	0.94	0.1	1.01
0.2	0.82	0.2	1.87
0.3	2.16	0.3	2.12
Avg	1.43	Avg	1.23

c). Capacitive Soil Moisture Sen0193 operating's

Capacitive sensing measures soil moisture levels. Planting the ground detector on the baglog exterior was utilized to examine it. Before watering, the water content per each baglog was somewhat better than 49% (dried), and then after rinsing, the saturation was mostly larger above 77% [1] (wet).

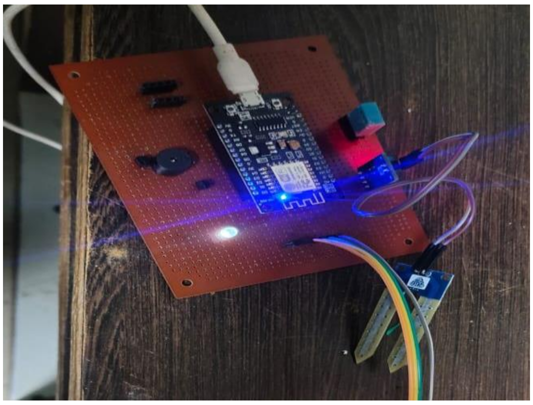

Fig. 8. Field moisture sensor

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The capacitance of the role of information systems as plant water increases. Furthermore, the obtained data spread among moist and humid is projected among 100% and 0%. Then, displays the humidity baglog results [15]. The absorption intensity before spraying was 49.75% ReHd, while after watering, the resulting combination was 77.27% ReHd. [1].

BagloG	Soil humd. (Before wtg)	Constrain	Soil humd. (After wtg)	Constrain
i	100%	Dehydrate	46%	hydrate
ii	100%	Dehydrate	48%	hydrate
iii	100%	Dehydrate	39%	hydrate
iv	100%	Dehydrate	45%	hydrate
Avg	100%	Dehydrate	46.37%	hydrate

III. CALIBRATING OPERATIONS

This shows the outcomes of tests contrasting temp (sensor DHT11) (Td) & min. Hgmtr. (Th deg C), humd. (Hmd) and min-Hgrmtr. (Hmh) [16]. According to the graph below, the temperature difference between the DHT11 and the tiny hygrometer is comparable. However, the humidity differential between the DHT11 and the tiny hygrometer is significant [13]. The temperature on DHT 11 at 19.40 was 29.57 deg C and 32.23 deg C on µ hgrmtr., resulting in a 0.0027% inaccuracy. In this humd. on DHT 11 is between 93% and 74%, resulting in a 0.37% inaccuracy. The avg temp a discrepancy between DHT11 & min. hgmtr 0.00597% [1], while the avg humd. discrepancy 0.93%. The disparities among sensor experimental testing and commercial measurement are generated by this testing. The remarkable differences are as follows:

= −*h*/ xh × 100% [1]

Duration	Td (deg C)	Th (deg C)	Hmd(% ReHd)	Hmh(%Rehd)	Ee d (%)age	Ee h (%age)
07:40	31.10	31.00	93	50	0.0026	0.21
07:50	31.20	30.80	94	49	0.0058	0.23
08.:00	31.60	30.40	89	47	0.0047	0.29
08:10	31.60	31.50	88	48	0.0065	0.26
08:20	31.00	31.50	87	46	0.0076	0.22
Avg	31.00	31.00	90	48.7	0.0117	0.223

Fig. 9. Calibration test results [1].

IV. BLYNK DASHBOARD

The esp8266 µ-controller, which connects to Bluetooth module. DHT 11 is a temp and humdmtr. If the temp rises over 25 degrees Celsius, the 3v fan will activate [1]. If the temp falls below 25 degrees Celsius, the 3v fan will switch off. The data sent or received by the µ -controller will be routed to Blynk's host computer for monitoring and maintenance. [23Information is streamed to blynk every 2 seconds and appears in android application modules such as altimeter, LCD virtual, and plot flow. And, the classification of 3v fan shown underneath a temp and humd signifier.

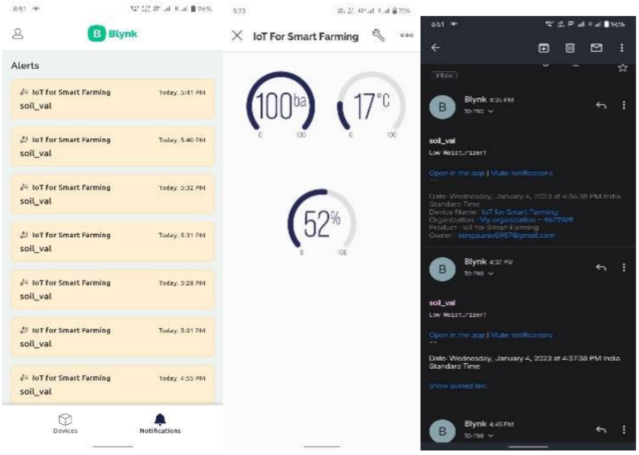

Fig 9. Blynk notification sent to Gmail.

V. CONCLUSION

In this we have made an Iot based smart farming system for farmer's who have been dependent on the natural or traditional method of farming so that they face problems during natural calamity. We made this project with the help of nodeMCU esp8266 (Bluetooth based micro-controller) and with different sensor which may provide an artificial environment which is best suitable for their growth [1]. Also, with this we can monitor some aspects like temp, humd. of soil, &humd. Of environment. From previous studies we have configure that for oyster mushroom the temp must be maintained within 20-35 deg C and for the humd. Should be maintained within 80-95%. With this project we can give this favourable condition to mushroom cultivation. Also, with this Bluetooth module we can remotely check and operate devices like water ejector, 3v fan which will maintain automatically these conditions.

VII. REFERENCES

[1]. Tolera, K. D., & Abera, S. (2017). Nutritional quality of Oyster Mushroom (Pleurotus Ostreatus) as affected by osmotic pretreatments and drying methods. Food Science & Nutrition, 5(5), 989–996. https://doi.org/10.1002/fsn3.484

[2]. Mohammed, M. F., Azmi, A., Zakaria, Z., Tajuddin, M. F. N., Isa, Z. M., & Azmi, S. A. (2018). IoT based monitoring and environment control system for indoor cultivation of oyster mushroom. Journal of Physics: Conference Series, 1019, 012053.

[3]. Sihombing, P., Astuti, T. P., Herriyance, &Sitompul, D. (2018). Microcontroller based automatic temperature control for oyster mushroom plants. Journal of Physics: Conference Series, 978, 012031. https://doi.org/10.1088/1742-6596/978/1/012031

[4]. Karimaa, A. (2011, June). Mobile and WireleDjarijah NM and Djarijah AS 2001 Budidaya Jamur TiramPembibitan, Pemeliharaan, dan Pengendalian Hama Penyakit (8th ed.). Kanisius.

[5]. Rochman A 2015 PerbedaanProporsiDedak Dalam Media Tanam TeRhadapPertumbuhan Jamur Tiram Putih (Pleurotus florida). Agribis 11(13) 56–67.

[6]. Putra GMD and Hunaepi H 2014 Pengaruhpenggunaan evaporative pad teRhadapiklimmikro pada rumahjamurtiram (Pleurotus ostreatus) berdindingjerami di musimkemarau. JurnalIlmiahBiologi "Bioscientist" 2(1) 88–99.

[7]. Universitas Al-Azhar Indonesia JurnalBiologi Al-Kauniyah, 7(2), 94–98.

[8]. Hariadi N, Setyobudi L, and Nihayati E 2013 Studi pertumbuhan dan hasilproduksijamurtiramputih (Pleorotus ostreatus) pada media tumbuhjeramipadi dan serbukgergaji. JurnalProduksiTanaman, 1(1) 47–53.

[9]. Suhaeni, Yunus,N M, Nurjannah S, and Sari A 2018 Pertumbuhan dan Produktivitas Jamur Tiram Putih (Pleurotus ostreatus) pada Media Tanam Sabut Kelapa Sawit (Elaeisguinensis) dan Kulit Durian (Durio zibethinus). Prosiding Seminar Nasional Megabiodiversitas Indonesia, April 26–30.

[10]. Yulianto S 2011 Budidaya Jamur Tiram (Pleurotus ostreatus) di Balai Pengembangan dan PromosiTanaman Pangan dan Hortikultura (BPPTPH) Ngipiksari Sleman, Yogyakarta. Skripsi. FakultasPertanian Universitas Sebelas Maret Surakarta.

[11]. Arjuna Marzuki and Soh Yan Ying, "Environmental monitoring and controlling system for mushroom farm with online interface" International Journal of Computer Science & Information Technology (IJCSIT) Vol 9, No 4, August 2017.

[12]. David Whiting, , CMG Garden Notes Plant growth Factors: Temperature, Colorado state University Extension.

[13]. Kalinin Y. S., Velikov "Design of Indoor Environment Monitoring System Using Arduino", Int. J. Innov. Sci. Mod. Eng., Vol. 3, No. 7, pp. 46–49, 20.

[14]. Chandra P. Pokhrel, "Cultivation Of Oyster Mushroom: A Sustainable Approach Of Rural Development In Nepal", Journal of Institute of Science and Technology, Volume 21, Issue 1, August 2016 ISSN: 2469- 9062.

[15]. Zerihun Tsegaye, "Growing of oyster mushrooms using agricultural residues at Ethiopian Biodiversity Institute Addis Ababa, Ethiopia",

Academia Journal of Microbiology Research 3(1): 014-021, October 2015.

[16]. Triyanto A and Nurwijayanti KN 2016 PengaturSuhu dan KelembapanOtomatis Pada Budidaya Jamur TiramMenggunakanMikrokontroler ATMega16 Jurnal Teknik Elektro 18(1). doi: 10.24912/tesla.v18i1.292.

[17]. Handi, Fitriyah H, and Setyawan, GE 2019 SistemPemantauanMenggunakan Blynk dan PengendalianPenyiramanTanaman Jamur Dengan Metode Logika Fuzzy. JurnalPengembanganTeknologiInformasi Dan IlmuKomputer, 3(4), 3258–3265.

[18]. Pakaja, F, Naba A, and Purwanto 2012 PeramalanPenjualan Mobil MenggunakanJaringanSyarafTiruan dan Certainty Factor. Eeccis 6(1), 23–28.

[19]. Martiani E, Murad, and Putra GMD 2017 Modifikasi dan Uji Performansi Alat Pengering Hybrid (suryaBiomassa) Tipe Rak. JurnalIlmiahRekayasaPertanian dan Biosistem 5 (1), 339–347.

[20]. Kenanga P, Pambudi A, and Puspitasari RL. PerbandinganPertumbuhan Jamur Tiram Putih di KumbungCiseeng dan.

[21]. Shruti Pathania1*, Nivedita Sharma1 and Dharmesh Gupta2, “A Study on Cultivation and Yield Performance of Oyster Mushroom (Pleurotus ostreatus) on Wheat Straw Mixed with Horticultural Waste (Apple Pomace) in Different Ratio and their Nutritional Evaluation”, International Journal of Current Microbiology and Applied Sciences, ISSN: 2319-7706 Volume 6 Number 8 (2017) pp. 2940-2