Journal of Engineering and Technology for Industrial Applications

ITEGAM-JETIA

Manaus, v.11 n.52, p. 34-37. March. / April., 2025.
DOI: https://doi.org/10.5935/jetia. v11i52.1489.

ISSN ONLINE: 2447-0228

RESEARCH ARTICLE OPEN ACCESS

USE OF TARO BOGOR *(Colocasia esculenta (l.) Schott)* AS A GROWTH MEDIUM FOR *Aspergillus flavus*

Visensius Krisdianilo*[1]

[1] Lubuk Pakam Medical Healt Institute – North Sumatra,Indonesia.

[1]http://orcid.org/ 0000-0001-9888-9933

Email: chrizdianilo@gmail.com

ARTICLE INFO

Article History
Received: December 19, 2024
Revised: January 30, 2025
Accepted: February 15, 2025
Published: March 31, 2025

Keywords:
Aspergillus flavus,
Fungi,
Taro Bogor,

ABSTRACT

Fungi are one type of microbe that plays an important role in human life, there are many groups of fungi that can be found in everyday life, one type of fungus that is pathogenic and produces aflatoxins, namely fungi with Aspergillus flavus species. Bogor taro has the potential to be used as a raw material because it has a carbohydrate content of 23.7% as an energy source, while potatoes have a total carbohydrate of 19.10%. So it can be known that the amount of carbohydrates in taro bogor is more than potatoes. Based on this background, researchers are interested in conducting research related to the use of taro bogor (Colocasia esculenta (L.) Schott) as a growth medium for the fungus Aspergillus flavus. This type of research is experimental with Posttest Only Control Group Design research design, in this study the control group in the form of Aspergillus flavus planted on PDA medium while in the experimental group in the form of Aspergillus flavus planted on taro medium at a concentration of 2%. 4% and 6%. Conclusion based on the results of the paired T-test test, the p-value of taro medium is 2% and 4% less than 0.05 which means there is a significant difference with PDA medium, while in taro medium 6% the p-value of > 0.05 which can be concluded that there is no significant difference between taro medium 6% and PDA medium.

I. INTRODUCTION

Fungi are one type of microbe that plays an important role in human life, there are many groups of fungi that can be found in everyday life, both saprophytic (beneficial) and pathogenic (harmful) fungi. One type of fungus that is pathogenic and produces aflatoxin is the fungus species Aspergillus flavus. The result of the fungal toxin Aspergillus flavus is in the form of mycotoxins which are compounds from the metabolic products of fungi. Aflatoxin can cause health problems, one of which can attack the nervous system, is carcinogenic, causes cancer in the liver, kidneys, and stomach [1].

Cases of poisoning due to aflatoxin are quite common as happened in Kenya in 2014 causing the death of 125 people [2]. Based on the report of the Food and Drug Monitoring Agency (BPOM) in 2014 throughout Indonesia, there have been 153 cases of food poisoning in the province. The highest number of food poisoning in West Java Province was 32 incidents (21%), Central Java 17 incidents (11%), Jakarta Special Capital Region, East Java, and West Nusa Tenggara each 11 incidents (7.2%), Bali 10 incidents (6.5%), until the lowest in Riau, Bangka Belitung, and South Kalimantan each 1 incident (0.7%) [3]. It is suspected that the presence of microbial activity, one of which is fungi [4].

Studying the properties possessed by microorganisms such as fungi, research can be done by breeding through growth medium. Medium is a material consisting of a mixture of food substances (nutrients) that function as a place to grow microbes such as carbohydrates which are the main source for carbon metabolism in fungi, besides that it is also osmosis pressure, does not contain inhibitors and is sterile. One of the medium commonly used for fungal growth is Potato dextrose agar (PDA) [5].

PDA is a medium that is often used to grow fungi in the laboratory because of its low pH, which is pH 4.5 to 5.6 so that bacterial growth can be inhibited. Bacteria require a neutral environment with a pH of 7.0 and an optimum temperature between 25-30°C for growth [6]. The composition of PDA medium consists of 200 grams of potato extract (carbohydrate), 20 grams of dextose, and 15 grams of agar and 1000 ml of distilled water [7].

Based on its composition, PDA is included in the semi-synthetic medium because it is composed of natural ingredients

(potatoes) and synthetic ingredients (dextrose and agar). Potatoes are a source of carbon (carbohydrates), vitamins and energy, besides the agar component serves to solidify the PDA medium. Each of the three components is indispensable for the growth and proliferation of microorganisms, especially fungi [8].

PDA medium is often ready-made or instant so that this medium is ready to use. However, this medium only exists in certain places. Abundant natural resources can be used for fungal growth medium, this makes the impetus for researchers to conduct research on PDA replacement medium derived from natural ingredients with good enough content as a substitute for PDA medium. The material used as a substitute for PDA nutrients must be fulfilled, one of which contains high carbohydrates and protein [6].

The main base material for making PDA medium is potatoes which are a source of carbohydrates, so other substitutes can be made which contain almost the same as potatoes, namely by using Bogor taro (Colocasia esculenta (L.) Schott). Taro is one of the tubers that usually grows on the banks of rivers, swamps and barren land. Bogor taro has the potential to be used as a raw material because it has a carbohydrate content of 23.7% as an energy source, while potatoes have a carbohydrate amount of 19.10%. So it can be seen that the amount of carbohydrates in taro bogor is more than potatoes. Taro bogor also has sufficient nutrients that allow it to be used as a medium for the growth of Aspergillus flavus fungus [9].

Based on this background, researchers are interested in conducting research related to the use of bogor taro (Colocasia esculenta (L.) Schott) as a medium for the growth of Aspergillus flavus fungi.

II. MATERIALS AND METHODS

Type of Research.

This type of research is experimental, namely knowing a symptom or influence that arises due to certain treatments with a research design using Posttest Only Control Group Design with this design allows researchers to measure the difference or effect of treatment on the experimental group by comparing the group with the control group [10]. in this study the control group was Aspergillus flavus grown on PDA medium while the experimental group was Aspergillus flavus grown on taro medium at a concentration of 2%. 4% and 6%.

Time and Location of Research.

The research was conducted in June 2024. The sampling was carried out in Labuhan Batu and then made into flour and then brought to the Laboratory of the Institute of Health Medistra Lubuk Pakam, Jalan Sudirman No.38, Petapahan, Kec. Lubuk Pakam, Deli Serdang Regency, North Sumatra to be studied.

Tools and Materials.

Measuring cup, object glass, deck glass, analytical balance, hot plate, stirring rod, dropper, ose, bunsen, lighter, petri dish, autoclave, erlenmeyer, flour sieve, ruler, oven, microscope, mask, handscoon, wooden mortar, pestle. PDA medium, taro flour medium concentration 2%. 4% and 6%. Aspergillus flavus culture, distilled water, plain agar, sugar, cotton, lactophenol cotton blue (LPCB) reagent, label paper, and plastic wrap.

Cultivation of Aspergillus flavus fungus on PDA medium and taro medium at concentrations of 2%. 4% and 6%.

Prepare tools and materials, take a Petri dish containing Aspergillus flavus culture. Then the tip of the ose is sterilized first over a bunsen flame until it is red and wait until it cools. After that, take the fungal culture on the bikan. Then, Aspergillus flavus fungal colonies were taken and planted on PDA medium and on taro medium using the single dot method. Then incubated at room temperature (25-30°C) for 3 days.

Identification.

a. Macroscopic

Take the medium that has been incubated to make observations to see the surface of the medium by observing the colonies, and the surface and matching the observation results with the characteristics of the Aspergillus flavus fungus. Then record the observations and document them.

b. Microscopy:

Tools and materials are prepared, then LPCB reagent is dripped 1-2 drops on the glass object. The tip of the ose is sterilized first over a bunsen flame until red and wait until it cools. After that, take the fungal culture in the culture and then place the fungus on the glass object that has been dripped with LPCB solution then flattened and then cover with deckglass and observed under a microscope.

c. Measuring the Diameter of Fungal Colonies

Measured using a ruler, then recorded the results in millimeters (mm).

Data analysis.

Data analysis was carried out by processing the collected data using the SPSS program using the Parametric test, namely the Paired T-Test Test.

III. RESULTS

Macroscopic.

The results of macroscopic identification of Aspergillus flavus fungal colony growth are cotton-like, there is a dark yellow area on the surface of the fungus that is clearly visible on PDA medium, while on taro medium at concentrations of 2%. 4% and 6% did not look so clear. In addition, the green area that grows on taro medium at concentrations of 2%. 4% and 6% are not as thick as the green area that grows on PDA medium.

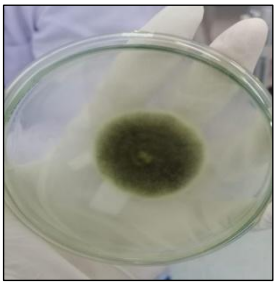

Figure 1. Macroscopic on PDA medium.

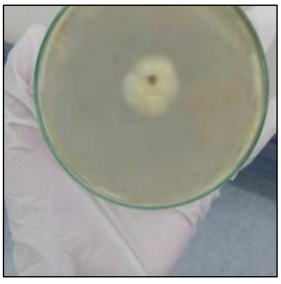

Figure 2. Macroscopic on 2% taro médium.

Source: Authors, (2025)

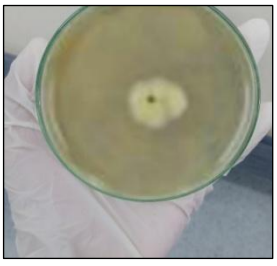

Figure 3. Macroscopic on 4% taro médium.

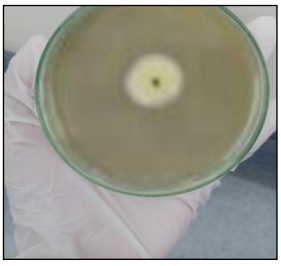

Figure 4. Macroscopic on 6% taro médium.

Source: Authors, (2025).

Microscopic.

The results of microscopic identification of Aspergillus flavus fungal colony growth on PDA media and taro media at concentrations of 2%. 4% and 6%, obtained the results of round conidia heads, long conidia and hyphae are concentrated in taro media and PDA media.

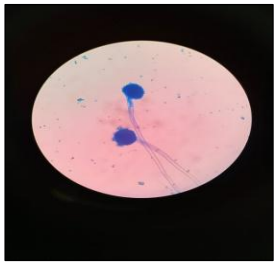

Figure 5. Microscopic on taro médium.

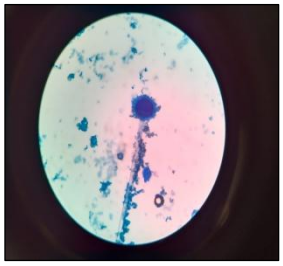

Figure 6. Microscopic on PDA medium.

Source: Authors, (2025).

Fungal Colony Diameter.

The results of measuring the diameter of fungal colonies obtained the highest average in taro media with a concentration of 6%, namely 26 mm.

Table. 1 Diamater of colony growth of Aspergillus flavus fungus.

Sample Repetition	Colony Diameter (in milli meters) At Taro Media Concentration			Control
	2%	4%	6%	PDA
1	16	23	24	29
2	17	20	30	32
3	20	21	25	34

Source: Authors, (2025).

Comparison Test Results.

From the results of the paired t-test (Paired T- Test) with the analysis of the SPSS program between 3 variables, it can be seen that the *p-value* of 2% taro media compared to PDA media results *p = 0.002*, 4% taro media compared to PDA media results *p = 0.042* and in 6% taro media compared to PDA media results *p = 0.119*. From the p-value, it shows that the taro media compared with PDA media has a significant difference at a concentration of 2% and 4% while the taro media 6% compared with PDA media obtained a *p-value = 0.119* these results are greater than 0.05 which means there is no significant difference between taro media concentration 6% with PDA media.

Table. 2 Comparison test results.

Sample	Mean	N	SD	Sig
2% taro medium -PDA	17,62	3	2,082	0,002
4% taro medium -PDA	21,33	3	1,528	0,042
6% taro medium -PDA	26,33	3	3,215	0,119

Source: Authors, (2025).

IV. DISCUSSIONS

The results obtained from the study show that the bogor taro media can grow Aspergillus flavus fungi. The results of the diameter of Aspergillus flavus colonies in table.1 show that the diameter of colonies at concentrations of 2% to 6% has increased compared to the control media (PDA), this is because at the highest concentration of 6% the carbohydrate and protein content in the media is higher than the concentrations of 2% and 4%.

The results of this study are in line with research conducted by Amir, et al. (2018) with the largest diameter found at the highest concentration of 8%, because Aspergillus flavus utilizes the nutritional content in taro media, especially carbohydrates and proteins to grow and develop so that growth is faster at high concentrations [11].

In the comparison test using the paired T-test test, the p value = 0.002 in the 2% concentration of taro media and p = 0.042 in the 4% concentration of taro media, which means that the p-value data <0.05, these results show that there is a significant difference in the diameter growth of Aspergillus flavus fungi in 2% and 4% taro media against PDA media.

The results of this study are in line with research conducted by Amir, et al. (2018) with the results there is a significant difference [11]. However, at a taro concentration of 6%, the results obtained did not have a significant difference with PDA media because the p-value of 0.119 was greater than 0.05, this result was supported by research by Octavia, et al. (2017) whose results showed that 6% taro media did not have a significant difference with PDA media [8].

The growth of Aspergillus flavus is indicated by the development of diameter, spore fertility, and mycelium color. PDA control media has the best Aspergillus flavus growth. Taro media has more complex nutrients (difficult to digest) so that the mycelial growth of fungal colonies is not as optimal as PDA media. This is emphasized by Gandjar (2006), which states that the complex content in the media causes the test fungus to take longer to break down into simple components that can be absorbed by cells used for synthesis and energy [12,13].

In addition to nutritional needs to grow, there are also several factors that can also affect the growth of fungi, namely the humidity factor, in this factor the Aspergillus flavus fungus can grow with 70% environmental humidity. Then the temperature factor, in this factor the Aspergillus flavus fungus will grow with an optimum temperature of 30 ° C and the pH factor, the Aspergillus flavus fungus can grow with a pH between 5-7. Of the three factors that can also affect the growth process of fungi in a medium [13].

Based on the results of the research, the best mushroom growth media is in taro media with a concentration of 6% because the media has a simple formulation and is the best media because of its ability to support mushroom growth [14]..

V. CONCLUSIONS

Based on the results of the paired T-test, the p-value of 2% and 4% taro media is less than 0.05, which means there is a significant difference with PDA media, while in 6% taro media the p-value> 0.05, which can be concluded that there is no significant difference between 6% taro media and PDA media.

VI. AUTHOR'S CONTRIBUTION

Conceptualization: Visensius Krisdianilo.
Methodology: Visensius Krisdianilo.
Investigation: Visensius Krisdianilo .
Discussion of results: Visensius Krisdianilo.
Writing – Original Draft: Visensius Krisdianilo.
Writing – Review and Editing: Visensius Krisdianilo.
Supervision: Visensius Krisdianilo.
Approval of the final text: Visensius Krisdianilo

VII. REFERENCES

[1] Edyansyah, E. The presence of mycotoxin-producing contaminants in peanut butter sold in traditional markets in Palembang city. Palembang. Palembang Poltekkes. 2015.

[2] Taufik, M. Identification of pathogenic microbiology in soy sauce of meatball sellers in Sumbermulyo village. Jombang: STIKes ICMe Jombang.2018.

[3] Food and Drug Monitoring Center. Poisoning Cases Throughout Indonesia, Food and Drug Monitoring Center, Indonesia.2004.

[4] Syaifudin, A.N. Identification of Aspergillus sp Fungi in Fresh Bread Based on Before and After Expiration. Jombang: STIKes ICMe Jombang .2017.

[5] Cahyani, V.R. Practicum Manual for Agricultural Microbiology. Surakarta: Sebelas Maret University Surakartaa.2014.

[6] Cappucino, J. G., and Sherman, N. Microbiology Laboratory Manual.Jakarta: ECG.2014.

[7] Aryal, Sagar. 2019. Potato Dextrose Agar (PDA)- Principles, Uses, Composition, Procedure, and Colony Characteristic.

[8] Octavia, A. and Wantini, S,. Comparison of Aspergillus flavus Fungus Growth on PDA (Potato Dextrose Agar) Media and Alternative Media from Cassava (Manihot esculenta Crants). Tanjungkarang: Journal of Health Analysis.2017.

[9] Nurcahya, H. Cultivation & How to Process Taro for Food and Medicine. First Printing, Pustaka Baru Press. Yogyakarta .2015.

[10] Notoatmodjo, S,. Health Research Methodology, Jakarta: PT Rineka Cipta. 2012.

[11] Amir, et al,. Taro Flour as an Alternative Media for the Growth of Candida albicans and Aspergillsu sp. University of Muhammadiyah Semarang. 2018.

[12] Jiwintarum, Y. Natural Media for the Growth of Candida albicans Causing Candidiasis from Kluwih Seed Flour (Artocarpus communis). Prima Health Journal. 2017.

[13] Gandjar, I., Sjamsuridzal, W., and Oetari, A. Basic and Applied Mycology. Yayasan Obor Indonesia. Jakarta. 2006.

[14] Rohmi, R., Fikri, Z., & Pujasari, N.K.R White Sweet Potato (Ipomoea Batatas L.) Alternative Media for Aspergillus Niger Growth. Prima Health Journal.2019.