

## UTILIZATION OF TOFU DREGS WASTE AS AN ALTERNATIVE MEDIUM BACTERIAL GROWTH *Pseudomonas aeruginosa* ATCC 27853

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### ABSTRACT

The high price of media and the lack of awareness related to the potential economic value of tofu dregswaste encouraged researchers to find innovations in the use of tofu dregs waste into alternative media products for bacterial growth. This study aims to determine the ability of tofu dregs alternative media in growing *Pseudomonas aeruginosa* ATCC 27853 bacteria and analyze the number of colonies and characteristics of *Pseudomonas aeruginosa* ATCC 27853 in tofu dregs alternative media. The research was conducted using the *laboratory experiment* method using the concentration level of tofu dregs media of 2%,3%,4%, and 5%. The results of the calculation of the number of colonies obtained the number of colonies of *Pseudomonas aeruginosa* ATCC 27853 on tofu dregs media concentrations of 2%,3%,4%, and 5% was (68; 94; 142; 156). The characteristics of *pseudomonas aeruginosa* colonies ATCC 27853 on tofu dregs alternative media are round, green, notched, 2 mm, convex, and wet. The observational characteristics of Gram staining obtained Gram-negative, bacillus, monobasil, red. Based on the Anova test, the results of 0.002 ( $P<0.005$ )  $H_a$  received showed a growth of the bacterium *Pseudomonas aeruginosa* ATCC 27853 on alternative media of 2%,3%,4%, and 5% tofu dregs. Following up with the Duncan test, the minimum tofu dreg concentration that can grow the bacteria *Pseudomonas aeruginosa* ATCC 27853 is a concentration of 2%. However, the optimum concentration of tofu dregs media that is good for the growth of *Pseudomonas aeruginosa* bacteria in this research was a concentration of 5%.

**Keywords:** *Tofu Dregs Media, Pseudomonas aeruginosa, Agar Cetrimide.*

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### INTRODUCTION

Soybeans (*Glycine max L. Merr*) are the basic ingredients for processing tofu, tempeh, soy sauce, and other processed products. One of the popular among Indonesians is tofu. The production process cost from soybean juice (*Glycine max L. Merr*) which is processed by heating and filtering to take advantage of the properties of proteins that will coagulate when reacts with acids accompanied by the absence of pressure in the manufacturing process (Marlien, R. A., et al, 2020). Processed products from soybeans (*Glycine max L. Merr*) are very diverse and have high nutritional value, namely as a source of vegetable protein, fat, vitamins A, E, and K as well as several types of B vitamins and minerals K, Fe, and Zn (Danela et al, 2019). The nutritional content in tofu pulp is quite complete and can be processed into something more useful. Often the tofu dregs derived from tofu production are used as animal feed that is of economic value amid nutrition for livestock.

Tofu production activities make the availability of tofu dregs waste abundant if it is not used optimally. In tofu pulp, there is a high fiber content, namely 28.4 grams, potassium 21.5 milligrams (Brilliant 218), and protein 10.80% (Yustina, I., et al 2020). Based on this information, it can be related to the use of tofu pulp as an alternative medium for the growth of bacteria (microorganisms). The high price of media, the use of waste that is not optimal,

the nutritional content that is still in the tofu dregs, and the potential for profitable waste utilization. Encouraging researchers to find innovations from materials that are easily available and do not require expensive costs. The ingredients used must contain nutrients needed for the growth of bacteria such as carbohydrates and proteins. Various other protein sources are also successfully used as an alternative medium for the growth of microorganisms (Juariah, S., et al, 2018). Various alternative media for bacterial growth have been studied quite a lot, but in this study researchers used a type of test bacterial bacteria, namely *Pseudomonas aeruginosa* ATCC 27853.

In the previous research conducted by (Siti Danela, et al 2019), the soybean material used as soybean flour can be used as an alternative source of protein in making *Nutrient Agar Plate* (NAP) media. This can be proven by the growth of colonies of *Pseudomonas aeruginosa* on alternative soybean media with variations in concentrations of 2%, 3%, 4%, and 5% and incubation time within 24 hours and 48 hours. Although there are differences in the characteristics of the observation of colony growth in the media that should be the *Medium of Sodium Agar* (NA). The results of a study conducted by Ibrahim Daffa Samudera in 2020 stated that bacterial growth using alternative media tofu pulp in *Klebsiella pneumoniae* and *Staphylococcus aureus* bacteria can be grown in such media. A similar study conducted by Rindi Antika Putri in 2021 stated that the growth of *Escherichia coli* and *Bacillus subtilis* bacteria occurred in alternative media of tofu dregs. Based on this information, researchers are interested in researching the use of tofu dregs waste as an alternative medium for the growth of *pseudomonas aeruginosa* bacteria ATCC 27853.

## RESEARCH METHODS

This study used the spread plate method. That is, the media is first poured into the Petri dish until it hardens. then the sample solution is pipetted by 0.1 ml aseptically placed on the media and flattened on the surface of the agar media using a *Spreader*. The reason why researchers use this method is that the bacterium *Pseudomonas aeruginosa* is obligate aerobic. The location of this research was carried out at the Microbiology Laboratory, Faculty of Health, University of MH Thamrin, from April to August 2022. Variation of sample concentration consists of 4 levels 2%, 3%, 4%, and 5%. Repetition of samples using Federer's Formula for (Randomize Block Design) using 5 repetitions.

## RESULTS AND DISCUSSION

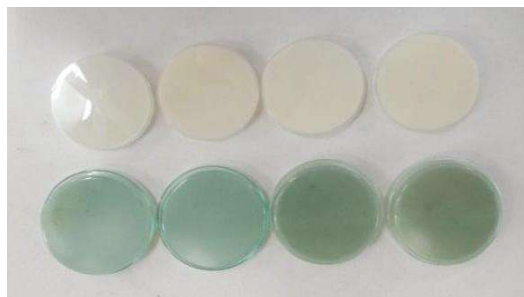
Based on the results of research, soybean flour (*Glycine max*) can be used as an alternative source of protein in the manufacture of *Cetrimide Agar* media, but it has a slight difference, namely in the size of the growing colony. This can be proven by the growth of colonies of *Pseudomonas aeruginosa* bacteria on alternative media of soybeans. Variations of soybean flour used were 2%, 3%, 4%, and 5%.

Table 1. Observations of bacteria colony

Cetrimide Agar					
Shape	Diameter	Color	Edge	Elevation	Consistency
Round	3 mm	Green	Rough	Convex	Wet

Alternative Media Dregs of Tofu					
Shape	Diameter	Color	Edge	Elevation	Consistency
Round	2 mm	Green	Rough	Convex	Wet

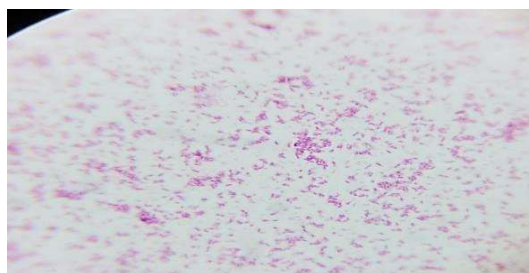


Picture 1. Bacteria *Pseudomonas aeruginosa* Growth of Tofu Dregs Media

Based on the table above, the characteristic experiments formed on tofu dregs media with Cetrimide Agar media for *Pseudomonas aeruginosa* bacteria found differences in terms of diameter, the tofu dregs media had a diameter of 2 mm while on Cetrimide agar media it was 3 mm. However, the ability of bacteria to produce special pigments can be seen in both

Table 2. Characteristic Gram Stain

Gram	Shape	Structure	Color
Negative	Basil	Monobasil	Red



Picture 2. Result of Gram Stain

Based on the table above, the observation of Gram preparations that have been carried out shows that Gram Negative bacteria, bacilli, and monobacilli, red.

Table 3. Result Of Count The Number Of Colonies

Number of Bacterial Colonies	<i>Pseudomonas aeruginosa</i>					Mean
	1	2	3	4	5	
Media						
Tofu Dregs 2%	80	70	90	50	50	68
Tofu Dregs 3%	80	60	120	100	110	94
Tofu Dregs 4%	150	80	150	190	140	142
Tofu Dregs 5%	140	90	210	180	160	156
Cetrimid Agar	200	260	290	190	220	232
Control Negative	0	0	0	0	0	0

Based on the concentration of tofu dregs media 2%, 3%, 4%, 5%, and Cetrimide to obtain a different number of colonies at each concentration. Colony growth of *Pseudomonas aeruginosa* occurred in tofu dregs media with concentrations of 2%, 3%, 4%, and 5%. The highest number of colonies of *Pseudomonas aeruginosa* bacteria that grew was found at a concentration of 5% tofu dregs 156. The results of the ANOVA test showed that  $P < 0.05$  Ha was accepted resulting in the growth of *Pseudomonas aeruginosa* bacteria in alternative tofu dregs media at concentrations of 2%, 3%, 4%, and 5%. Based on the Duncan test in Table 6, the minimum concentration of tofu dregs that can grow *Pseudomonas aeruginosa* bacteria is 2%. However, the optimum concentration of tofu pulp medium for the growth of *Pseudomonas aeruginosa* bacteria in this study was 5%.

### **CONCLUSION**

Tofu dregs media can grow *Pseudomonas aeruginosa* bacteria. In alternative media, the bacteria *Pseudomonas aeruginosa* ATCC 27853 with the highest number of colonies at 5%, and the characteristics of the tofu dregs media with Cetrimide Agar are differences in diameter

### **ACKNOWLEDGMENTS**

1. Imas Latifah., S.KM., M, K.K.K, as Chair of the Diploma III Health Analyst Study Program at MH Thamrin University Jakarta.
2. Dr. Dra. Syarifah Miftahul El J.T., M. Biomed as Advisor I who has provided ideas and ideas in considering good things related to the topic of preparing Scientific Papers and is willing to help provide solutions when I am faced with research problems.
3. Prima Nanda Fauziah., S.Sc., M.Sc as Supervisor II who has helped provide technical supervision and direction for the implementation of this research and pays attention to the systematics of preparing Scientific Papers.
4. Dra. Estu Lestari, MM lecturer examiner I of a scientific writing session
5. Zuraida., SKM., MKM lecturer examiner II of a scientific writing session
6. My parents always pray, and encourage me both morally and materially regarding my educational needs.

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