

## THE ATTRACTIVE ABILITY OF TYPES OF ATTRACTANTS AGAINST *Aedes sp.* MOSQUITO EGGS USING OVITRAP

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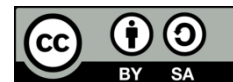
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### ABSTRACT

***The Attractive Ability of Types of Attractants Against Aedes sp. Mosquito Eggs Using Ovitrap.*** An attractant is a substance that attracts insects (mosquitoes) either chemically or visually. To prevent the spread of dengue, various methods have been employed, one of which is using ovitraps containing attractants. This study aimed to determine the number of *Aedes sp.* mosquito eggs based on different attractants. The research was experimental with a one-shot case study design, comparing various attractants and their effectiveness in attracting *Aedes sp.* mosquito eggs. The findings showed that the type of attractant significantly affected the presence of mosquito eggs, with a *p*-value of 0.000 (<0.05), allowing further analysis using a post hoc test. The post hoc test revealed significant differences between no attractant and shrimp paste water immersion, no attractant and shrimp head immersion, and no attractant and a brown sugar and yeast mixture. Significant differences were also found between shrimp paste soaked water and brown sugar and yeast mixtures and between shrimp head attractants and brown sugar and yeast mixtures. Shrimp head immersion attractant had a *p*-value of 0.199 (>0.05), indicating no significant difference compared to other attractants. Among the various attractants tested, shrimp paste soaking water and shrimp head soaking water were the most effective. It is recommended that communities use ovitraps with shrimp paste soaking solution to reduce the *Aedes sp.* mosquito population around homes, as these materials are relatively easy to obtain and ovitraps can be made using repurposed plastic cups.

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### INTRODUCTION

*Aedes sp.* is a mosquito that can act as a vector of various diseases, one of which is Dengue Hemorrhagic Fever (DHF) [1]. As for the characteristics of mosquitoes, *Aedes sp.* has a brownish-black body color, on the body as well as the limbs are covered with scales with silvery-white stripes [2]. Only female mosquitoes suck blood, while male mosquitoes eat honey and other plant fluids. The sex of the mosquito can be seen easily from the shape of the antennae. The antennae of male mosquitoes are very plumose, while in some female mosquitoes only have short antennae [3]. Mosquito *Aedes sp.* has a habit of sucking blood repeatedly (several bites) in one gonotrophic cycle to fill his stomach with blood growth and egg development [4].

Dengue Hemorrhagic Fever (DHF) is one of the infectious diseases that until now is still a public health problem in the world, including Indonesia, often appears as an extraordinary

event and causes unrest in the community because it spreads quickly and often can cause death. DHF (Dengue Hemorrhagic Fever) or more familiarly known as dengue fever is an acute disease caused by the dengue virus that enters the human blood circulation through mosquito bites of the genus *Aedes* for example *Aedes aegypti* and *Aedes albopictus* [5].

According to the Directorate of Infectious Disease Prevention and Control, dengue zoonotic vectors in Indonesia until July reached 71,633 with 459 deaths [6]. The dengue morbidity rate in South Kalimantan in 2020 was 43 per 100,000 with a total of 1,753 cases. The total deaths caused by DHF were 23 cases (CFR/death rate of 1.3%) with the most dengue cases in Tanah Bumbu Regency at 519 cases. Behavioral factors and difficult community participation in Mosquito Nest Eradication (PSN) activities, as well as factors of population increase, and increased population mobility accompanied by improved transportation facilities have caused the spread of dengue virus to become more widespread. The purpose of DHF Disease Control is to realize awareness, willingness and ability to live healthy for every community to avoid DHF. Dengue treatment requires continuous support and commitment from the community [7]. Dengue outbreaks will usually begin to increase in the middle of the rainy season, this is caused by the increasing number of mosquito breeding sites due to increased rainfall. No wonder that almost every year, dengue outbreaks are classified as extraordinary events (KLB) [8]. Various efforts were made to prevent the outbreak of dengue fever. One way is to do (PSN) 3M plus. 3M is draining, closing, and reusing waste that has economic value (recycling). While the pluses are raising larva-eating fish, mutual aid cleaning the environment, installing wire gauze on the windows of the house, using mosquito repellent, and planting mosquito repellent plants. The community is expected to play a role in this matter [9]. Eradication of infectious mosquitoes *Aedes* sp. The main way to eradicate dengue disease chemistry can be done by spraying insecticides on mosquito nests, such as sewers, bushes and rooms of the house [10].

The ovitrap is a useful tool for mosquitoes *Aedes* sp. Modifications include the use of attractants with varying degrees of concentration and differences in the color of ovitrap containers. Colorless ovitrap with black ovitrap and green ovitrap in trapping mosquito eggs *Aedes* sp. Based on the results of trials, ovitraps can be an alternative in vector control, especially for mosquito control *Aedes* sp. which is safe for the environment [11].

An attractant is something that has an attraction to insects (mosquitoes) either chemically or visually (physically). Attractants from chemicals can be compounds of ammonia, CO<sub>2</sub>, lactic acid, octenol and fatty acids. These substances or compounds come from organic matter or are the result of metabolic processes of living things, including humans. There is a resemblance of the smell of the attractant to the smell of the human body.

Attractants of shrimp paste water baths have a stronger attraction than ordinary water. This is because shrimp paste soaking water contains residual proteins and chemical compounds derived from shrimp wide both in gas and liquid form that mosquitoes like *Aedes* sp. Shrimp paste contains ammonia produced from fermentation so that the shrimp paste smells stimulating. This compound is a good attractant for mosquitoes *Aedes* sp. [12].

The formula of 50gr brown sugar + 1gr tempeh yeast is better than other formulas, which is as many as 15 grains with a percentage of 50%, this is because 50gr brown sugar + 1gr tempeh yeast has a high CO<sub>2</sub> content of 53.1ml. The more sugar used; the fermentation process can run well so that CO<sub>2</sub> levels the resulting will be high [13]. The more sugar used; the fermentation process can run well so that the CO<sub>2</sub> levels produced will be high [14].

Windu shrimp head soaking water has a different effect on the number of mosquito perches *Aedes* sp. Almost no mosquitoes perch on negative control. In the 10% windu shrimp head soaking water, there are still few mosquito perches, while in the windu shrimp head soaking water, 20% and 30% more mosquitoes perch [15]. The shrimp head bath will attract mosquitoes that are around through the mosquito ORNS so that mosquitoes will approach the ovitrap and attach to the ovitrap gauze [16].

Based on the above, the author is interested in conducting research on the difference in attractant attraction ability (shrimp paste soaking water, shrimp head wading water, brown sugar + tempeh yeast) on the ovitrap against the presence of *Aedes* sp. mosquito eggs.

**MATERIALS AND RESEARCH METHODS**

The type of research used is experimental. This study observed the number of *Aedes sp. mosquito eggs* using different types of attractants, namely shrimp paste bath water attractant, windu shrimp head soaking water, brown sugar + yeast soaking water, using ovitraps. The study design was *pre-experimental* with a single treatment design (*One-Shot Case Study*) without control, namely treatment using different types of attractants. The number of treatments was 4 with 6 repeats so that there were 24 total samples in total for checking the number of *Aedes sp. mosquito eggs* in the ovitrap. Measuring water temperature, water pH, and room temperature then breeding mosquitoes from larvae to egg production was carried out at the Ministry of Health Banjarmasin Health Polytechnic workshop. The calculation of *Aedes sp. mosquito eggs* was carried out at the Banjarmasin Health Polytechnic Environmental Health Laboratory using a microscope. The results of the data obtained are recorded on the observation sheet and calculated the number from one repetition to the sixth repetition.

**RESULTS OF RESEARCH AND DISCUSSION**

Mosquito eggs are obtained from adult *female Aedes sp. mosquitoes* bred in raring, ranging from instar IV larvae to pupae. The pupa becomes an adult mosquito. The process of adult female mosquitoes maturing eggs ranging from sucking blood to finding a place to lay their eggs ranges from 1-2 days with environmental conditions water temperature 26.8°C - 27.7°C, water pH 7.1 - 7.4 and room temperature 28.4°C - 29.9°C for adult female mosquitoes laying their eggs. The number of eggs obtained in each attractant is shown in Table 1.

Table 1. Number of *Aedes sp. Mosquito Eggs at Each Attractant*

No.	Material Code	Repetition					YOU	Sum	Average
		I	II	III	IV	V			
1	No attractants	30	0	33	0	17	15	95	16
2	Attractant shrimp paste water bath	65	70	79	51	57	87	409	68
3	Shrimp head marinade attractant	63	54	73	53	55	60	358	60
4	Attractant water bath brown sugar + yeast	53	44	40	50	47	33	267	45

Based on table 1 of the results of the examination of the number of *Aedes sp. mosquito eggs* after treatment using variations in the type of attractant from 4 treatments with 6 repetitions with the average number of *Aedes sp. mosquito eggs* in treatment without using attractants which is 16 eggs, attractant treatment of shrimp paste water bath which is 68 eggs, attractant treatment of windu shrimp head marinade which is 60 eggs, attractant bath of brown sugar water + yeast which is 45 grains.

Field data collection is needed in this study as data on environmental conditions that can affect the results of the study. This study is about the number of eggs of *Aedes sp. mosquitoes* using attractants. The attractants used are without using attractants, shrimp paste water bath attractants, windu shrimp head water bath attractants, brown sugar + yeast water bath attractants. Supporting data measurements in this study include water temperature, water pH, and room temperature with shrimp paste bath solution, windu shrimp head solution, brown sugar + yeast solution.

Table 2. Water Temperature Without Attractant Solution, with Shrimp Paste Water Bath Solution, Windu Shrimp Head, Brown Sugar + Yeast

Antraktan	Repetition					
	I	II	III	IV	V	YOU
No attractants	26,9	27,5	27,0	27,6	27,3	27,3
Attractant shrimp paste bath	26,8	26,9	27,3	27,5	27,5	27,0
Shrimp head attractant	27,0	27,5	27,0	27,7	26,8	26,8
Brown sugar attractant + yeast	26,9	27,5	27,7	27,5	27,5	27,7

Based on table 2, the environmental conditions of water temperature at the time of the study ranged from 26.8 °C – 27.7 °C. The highest temperature measurement values were measured at the brown sugar + yeast water bath attractant at the 3rd and 6th repetitions and at the shrimp head bath attractant at the 4th repetition. As for the lowest temperature, it was measured in the shrimp paste water bath in the 1st repetition and in the shrimp head bath attractant in the 5th and 6th repetitions.

Table 3. pH Water with No Attractant Solution, with Shrimp Paste Bath Solution, Windu Shrimp Head, Brown Sugar + Yeast

Antraktan	Repetition					
	I	II	III	IV	V	YOU
No attractants	7,2	7,4	7,2	7,2	7,4	7,4
Attractant shrimp paste bath	7,1	7,2	7,2	7,1	7,2	7,2
Shrimp head attractant	7,1	7,1	7,2	7,2	7,1	7,1
Brown sugar attractant + yeast	7,1	7,2	7,1	7,2	7,4	7,4

Based on table 3, the pH of the water at the time of the study ranged from 7.1 – 7.4. The highest pH was measured in variations without the use of attractants that occurred in the 2nd repetition of the 5th and 6th repetitions, and in brown sugar + yeast water bath attractants that occurred in the 5th and 6th repetitions. The lowest pH was measured in the shrimp paste water bath in the 1st and 4th repetitions, in the shrimp head bath attractants in the 1st, 2nd, 5th and 6th repetitions, while in the brown sugar + yeast water bath attractants in the 1st and 3rd repetitions.

Table 4. Results of Air Temperature Measurement in the Workshop

Antraktan	Repetition					
	I	II	III	IV	V	YOU
No attractants	28,6	29,9	28,4	29,9	29,7	29,7
Attractant shrimp paste bath	28,6	28,6	28,4	28,9	28,5	29,2
Shrimp head attractant	28,6	28,8	28,5	28,8	28,7	28,6
Brown sugar attractant + yeast	28,8	29,0	29,4	29,0	29,2	29,5

Air temperature at the time of the study ranged from 28.4 – 29.9. The value of temperature measurement without using attractants obtained the highest results in the 2nd and 4th repeats. As for the lowest temperature measurement obtained at no attractant at the 3rd repetition and attractant soaking shrimp paste at the 3rd repetition.

The results of the analysis in the study of differences in the attractiveness of attractants without using attractants solution was inserted into the ovitrap as much as 200ml with 6 repetitions obtained the results of the number of mosquito eggs *Aedes sp.* 95 grains with each repetition obtained results of 30 grains, 0 grains, 33 grains, 0 grains, 17 grains, 15, grains. Based on the results of research that has been carried out that the highest number of eggs is

obtained on the 3rd repeat with the number of mosquito eggs *Aedes sp.* of 33 grains, the water temperature at the 3rd repetition is 27.0°C, the water pH at the 3rd repetition is 7.2, and the air temperature at the 3rd repetition is 28.4°C

The results of the analysis in the study of differences in the attractiveness of attractants of shrimp paste water baths inserted into the ovitrap as much as 200ml with 6 repetitions obtained the results of the number of mosquito eggs *Aedes sp.* 408 grains with each repetition obtained results of 65 grains, 70 grains, 79 grains, 51 grains, 57 grains, 87 grains. Based on the results of research that has been done that the highest number of eggs is obtained in the 6th repeat with the number of mosquito eggs *Aedes sp.* of 87 grains, the water temperature at the 6th repetition is 27.0°C, the water pH at the 6th repetition is 7.2, and the air temperature at the 6th repetition is 29.2°C.

The results of the analysis in the study of differences in the attractant attractant ability of shrimp head water baths inserted into the ovitrap as much as 200ml with 6 repetitions obtained the results of the number of mosquito eggs *Aedes sp.* 358 grains with each repetition obtained results of 63 grains, 54 grains, 73 grains, 53 grains, 55 grains, 60 grains. Based on the results of research that has been done that the highest number of eggs is obtained on the 3rd repeat with the number of mosquito eggs *Aedes sp.* by 73 grains, the water temperature at the 3rd repetition is 27.0°C, the water pH at the 3rd repetition is 7.2, and the air temperature at the 3rd repetition is 28.5°C.

The results of the analysis in the study of differences in the attractant attraction ability of brown sugar + yeast water baths inserted into the ovitrap as much as 200ml with 6 repetitions obtained the results of the number of mosquito eggs *Aedes sp.* 267 grains with each repetition obtained results of 53 grains, 44 grains, 40 grains, 50 grains, 47 grains, 33 grains. Based on the results of research that has been done that the highest number of eggs is obtained on the 1st repeat with the number of mosquito eggs *Aedes sp.* by 63 grains, the water temperature at the 1st repetition is 26.9°C, the water pH at the 1st repetition is 7.1, and the air temperature at the 1st repetition is 28.8°C.

The average temperature at the study site was quite hot, this was influenced by dry season conditions so that the air temperature was getting higher<sup>[17]</sup>. In general, mosquitoes *Aedes sp.* will lay the eggs at a temperature of about 20°C to 30°C<sup>[18]</sup>. In this study, the water temperature in ovitraps with different attractants ranged from 26.8 °C – 27.7 °C with a pH of 7.1-7.4 and room temperature 28.4°C – 29.9°C so that it was included in the optimum temperature range of laying eggs.

CO<sub>2</sub>, lactic acid, and octenol are excellent attractants for mosquitoes. The aroma of fatty acids produced from the normal flora of the skin is effective at a distance of 7 – 30 meters, in some typhus reaching 60 meters for some species.

The results of previous studies have been conducted to prove the use of attractant paste as an attractant substance<sup>[15]</sup>.

The results of research conducted by<sup>[20]</sup> regarding the influence of temperature and humidity on mosquito reproduction and survival *Aedes sp.*, determined that at 35°C and relative humidity of 60 percent it can reduce mosquito oviposition (average 54.53±4.81 eggs), while at 25°C and relative humidity of 80 percent will increase mosquito oviposition (average 99.08±3.56 eggs).

*Aedes sp.* Attractants from chemicals in the form of ammonia, CO<sub>2</sub>, lactic acid, octenol, and fatty acids<sup>[21]</sup> are excellent attractants for mosquitoes. The aroma of fatty acids produced from the normal flora of the skin is effective at a distance of 7 – 30 meters, it can even reach 60 meters for some species<sup>[22]</sup> The results of this study are reinforced by the results of previous studies on the impact of temperature and humidity variations on reproductive activities and survival of *Aedes aegypti* mosquitoes<sup>[23]</sup>.

The higher (alkaline) or lower (acidic) the pH of the brood water, the fewer the number of adult mosquitoes that lay eggs. This can affect the growth and development of *Aedes sp.* Adults usually lay eggs at a neutral pH between 6-7<sup>[24]</sup>. At 30°C, the eggs hatch after 1 to 3 days and

at 16°C hatch within 7 days.<sup>[25]</sup>

From the normality test the data on the normal distribution of the number of mosquito eggs *Aedes sp.* with a Sig value of  $> \alpha$  (0.05). Then continued with the one-way anova test with a sig value of  $< \alpha$  ( $0.000 < 0.05$ ) meaning that there is a significant difference in the number of eggs in each type of attractant, shrimp paste bath water, shrimp head bath water, brown sugar + yeast bath water. Furthermore, further tests were carried out, namely LSD, the results of post hoc tests in this treatment were found attractant variety. In the variation of the shrimp paste bath attractant against the variation of the shrimp head bath attractant, the value of sig ( $0.199 < \alpha$  (0.05) which means  $H_0$  is rejected which means there is no significant difference.

## CONCLUSIONS AND RECOMMENDATIONS

Based on the results of research that has been conducted, it was concluded that the number of *Aedes sp. mosquito eggs* from observations using shrimp paste water bath attractants was 409 eggs, shrimp head bath water attractants were 358 eggs, brown sugar + yeast water bath attractants were 267 eggs. The results of measuring water temperature in each ovitrap without attractants, shrimp paste water bath attractants, shrimp head water bath attractants, brown sugar + yeast bath attractants obtained water temperatures of 26.8 – 27.7 °C. The pH of the water obtained was 7.1 – 7.4, room temperature obtained results of 28.4 – 29.9 °C. Further researchers can add water variations such as well water, rainwater, river water, and domestic wastewater (used laundry water) by using shrimp paste bath water attractants

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