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Comparative Analysis of Effect Iodine, Ozone and Peracetic Acid as Material Disinfectant of Eggs Cantang Grouper

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Abstract: Problems in the fish hatchery sector often occur such as high egg mortality or low quality of fish eggs. Optimizing biosecurity is one of the efforts to improve the quality of fish eggs, for example by adding disinfectants such as iodine, ozone and peracetic acid. The use of chemical disinfectants will produce good results if the right dose, time and commodity are used. In this study. This research aims (1) to determine whether the use of chemicals including iodine, ozone and peracetic acid had an effect as a disinfectant to increase the hatching rate of grouper fish, (2) to determine the level of effectiveness and efficiency of the use of chemicals as a disinfectant. This research is an experimental research type. The research subjects included in the study were cantang grouper fish eggs at PT. Pakarti Daksa Segara who used the exploratory sampling method. Conclusion of this study indicate that there is an influence on the growth rate of the use of iodine, ozone and, peracetic acid chemicals as disinfectants of cantang grouper eggs and there is a comparison of the effectiveness and efficiency of the use of the three chemicals which includes the percentage of the hatching rate, the cost of the disinfectant material and the time, which is needed in the use of the disinfectant. Iodine has the best level of effectiveness from the comparison of hatching eggs of cantang grouper and peracetic acid is the most efficient type of chemical.

***Keywords*:** Disinfectant, iodine, ozone, peracetic acid

I. INTRODUCTION

In aquaculture there is intervention in the maintenance process for increased production such as stocking, feeding, and the eradication of parasites and diseases. Currently, there are many problems in fish hatcheries, such as fish seed production that needs to be improved, especially the poor hatching rate. So far, cultivators do not fully understand the causes of fish egg mortality. Mass mortality due to infectious and non-infectious diseases often occurs in larvae reared in hatcheries. There are many choices of fish that can be cultivated, but currently the commodity that has great potential to be developed is from family groupers. One of them is the cantang grouper which is a hybrid grouper which has faster growth, is more resistant to disease and is more tolerant of unfavorable environments and limited space [1]. Hybridization of Brown-marbled grouper (*Ephinephelus fuscoguttatus*) with Giant grouper (*E. lanceolatus*) produces hybrid cantang grouper, which is one of the technological innovations of the Technical Implementation Unit and the Directorate General of Aquaculture.

Besides being able to increase species diversification, hybrid seeds also have cultivation prospects that have the opportunity to increase fishery production in the future. Cantang grouper hybrid seeds increase species diversification and have cultivation prospects that have the opportunity to increase fishery production. Focus on the production of Cantang grouper hybrid seeds is needed to produce seeds that have good quantity and quality and in the end it is hoped that it can help the needs of seeds in cultivation activities [2].

There are many solutions that can answer problems in hatchery activities, one of which is by increasing the biosecurity of cantang grouper eggs which must be done because hatchery activities are a measure of the long life span of cantang groupers. The biosecurity improvement activity referred to here is the disinfection process using chemical-based disinfectants. Regular disinfection of fish eggs with approved chemical disinfectants is available in common culture at most commercial hatcheries. The use of chemicals or drugs to disinfect eggs in farm facilities is regulated by various federal and state agencies. All biological, environmental, and physical factors play a role in the effectiveness of chemical treatments and should be considered when developing strategies for managing egg disease. All hatchery hatcheries are unique in the design, source and quality of water, production capacity and management of the cultivation company itself. Many chemical disinfectants are now available in aquaculture, such as formalin, hydrogen peroxide, copper sulfate, providone iodine, ozone and peracetic acid [3].

In the egg hatching process, the disinfectant process is very important to do with the aim of suppressing the

development of microorganisms [4]. There are many chemical disinfectants that can now be used in the field of aquaculture, but in this study, three types of chemical disinfectants were used with varying doses and immersion times, namely iodine, ozone and peracetic acid. According to Battaglene and Morehead [3], states that ozone can be used to oxidize organic matter and kill bacteria and other pathogens in water. Liao [5] said that the treatment of disinfecting with ozone material is also recommended for grouper fish eggs. Meanwhile, there are other disinfectant choices, one of which is iodine, iodine is a low priority aquaculture drug. Iodine is a disinfectant that has a relatively small toxicity to the eggs of some fish but is highly toxic to pathogens such as bacteria and viruses [6]. There are also chemicals used, namely peracetic acid or paracetic acid (PAA). PAA is known as bactericidal, virucidal and fungcidal, even according to Kitis (2004) that peracetic acid will break down into harmless and non-toxic compounds when used as a chemical disinfectant [7].

Increased biosecurity by using chemical disinfectants, it is hoped that it can increase the hatching rate of Cantang grouper fish eggs and researchers want to find out which of several chemicals are recommended as egg disinfectants, compared to the three materials which are more efficient in terms of time, cost, and use techniques that result in improved hatching rate for cantang grouper eggs. Based on the explanation above, the researcher considers it necessary to know more deeply about the effect of using chemical disinfectants in the form of iodine, ozone and peracetic acid as well as the effectiveness and efficiency of the hatching rate of white grouper fish. This research was conducted at PT. Pakarti Daksa Segara.

II. METHODS

Types of research used in this research is experimental research. In this study, using a research design in the form of a randomized posttest only control group. This research was conducted at PT.Pakarti Daksa Segara, located in Penyabangan Village, Gerokgak District, Buleleng Regency, Bali. The spread of disinfected eggs was carried out on March 13, 2021.

This research was conducted with 4 repetitions in 3 treatments. The eggs of grouper fish that will be stocked beforehand are disinfected using chemical disinfectants. In this study, using a sample method in the form of exploration with the subjects in this study were commodity grouper fish eggs that were scattered in the cultivation container of PT. Pakarti Daksa Segara is rectangular, while the object in this study is the effect of iodine, ozone and peracetic acid on hatchability of grouper eggs.

Cantang grouper fish eggs use a disinfectant made from iodine using a dose of 5 ppm with a soaking time of 10 minutes, while for ozone using a dose of 400 ORP with a soaking time for 60 seconds and in the treatment given peracetic acid at a dose of 0.1 ppm with a soaking time for 10 minute. An aerator was given to each research container in the form of a plastic jar as oxygen supply. The tub used in the distribution of cantang grouper eggs is rectangular with a volume of 2200 Liters.

The data was collected by recording the results of field notes in the form of hatchability of grouper eggs in each distribution container. The eggs of grouper fish that are spread in one container are approximately 41000 eggs / tank. In this study, using several hypothesis tests to get the results of the study. The assumption test used is normality test, homogeneity test and analysis test used is the one-way ANOVA test and follow-up test post hoc in the form of IDD with a significant level of 5%.

III. RESULT AND DISCUSSION

Results

The observation results show that cantang grouper eggs using iodine, ozone and peracetic acid disinfectants with the dose and immersion time that have been determined in this study have an effect on the hatching rate of cantang grouper eggs.

Cantang grouper eggs with iodine treatment get a percentage hatching rate of 88% as well as cantang grouper eggs with ozone immersion in 400 ORP getting a percentage of 85%, but the treatment using peracetic acid has a different percentage value, namely 74%. The percentage value of HR for each treatment is in Table 6. The results of the mean comparison of the percentage of hatching rate for cantang grouper eggs can be seen in the graph Figure 1.

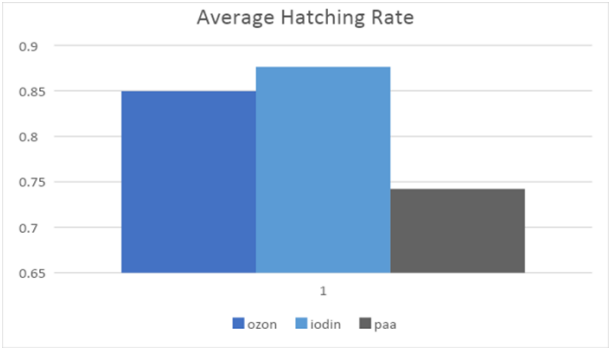

Figure 1. The Average hatching rate (%)

Discussion

The main purpose of using disinfectants with chemicals ingredients. The basic chemistry which includes iodine, ozone and peracetic acid in this study is to trigger the hatching rate of grouper eggs, one of which is to increase the hatching rate of the commodity used, namely white grouper. Figure 1 shows that there is an effect of the use of chemical disinfectants in the form of the addition of iodine,

ozone and peracetic acid. There is a difference in the ratio of the mean percentage hatching rate between iodine and ozone by 3% while iodine with peracetic acid or PAA is 14%. Basically, there are still very few studies that discuss the use of chemical-based disinfectants, especially on grouper fish eggs. The choice of disinfectant use must have been thought of in advance for the commodity to be tested.

The difference in the percentage value of egg hatchability in the provision of the three ingredients is different because there are several possibilities, such as the inaccurate use of the commodity grouper eggs for disinfection or the inaccurate use of the dose and time of immersion in the disinfectant material, or the presence of other factors such as environmental factors or the quality factor of the egg itself.

Research by Kuo et al. [8] suggests that the use of chemicals in the form of ozone can be applied to process fish eggs, break down virus particles on the surface of the eggs and produce eggs free of viruses. Meanwhile, research conducted by Buchan et al. [9] concluded that using ozone was successful in disinfecting haddock fish eggs and fighting stain virus. He said that the haddock eggs that had been given disinfectant in the form of ozone at a dose of 3.0 mg / I TRO for 3.3-6.7 minutes (10-20 CT units) and exposure to ozone could deactivate the stain virus but did not reduce the hatchability of the eggs.

Research conducted by Tendencia [6], states that using I2 or iodine as a disinfectant for eggs Epinephelus coioidesdropping in the cleavage phase is correlated with the iodine concentration used but not with the decrease in bacteria present in the eggs, but in the phase eyed stage, the drop rate and decrease in bacteria did not correlate with the iodine concentration used. In further research conducted by Tendencia [10], concluded that the use of iodine as a disinfectant was effective. Both effective at reducing bacteria and safe at the hatching rate of eggs E.coioides. The concentration used by the researchers was 7.5 ppm for 10 minutes.

In a study conducted obtained results on the application of peracetic acid-based disinfectant aquastrate bath or PAA at a dose of 8.9 ppm with immersion for 30 minutes, this treatment did not show a negative effect on growth and hematological fish in rainbow trout fish. maintained for 60 days. No abnormal changes were detected in the gills, liver and kidney tissue in this type of fish [12]. In this study using a dose of 5 ppm of iodine solution with a duration of soaking time for 10 minutes resulted in an average percentage of egg hatchability in the same 4 treatments with 3 repetitions of 88%. In this study also found that the application of iodine-based disinfectants had an effect the highest average percentage compared to the other 2 disinfectant materials. The effect of iodine disinfectant on hatching percentage varies widely depending on what is being studied, for instance the presence of large variations in species, tested concentrations, or duration of use. Consequently, it cannot come to a definite conclusion and with good reason. As stated by Battaglene and Morehead [3], ozone can oxidize organic matter and kill bacteria and other pathogens in the water which also affects the hatching rate of grouper eggs in this study [12].

Previous studies that discussed the use of disinfectants based on iodine, ozone, and peracetic acid have mostly discussed the eradication of fungi, bacteria, parasites, and viruses in one of the fisheries commodities that will be tested, whereas this study focused on the effect of using the addition of disinfectants made from chemicals, namely iodine, ozone, and peracetic acid. In conclusion, this study found that the use of these three chemicals has an effect on the hatchability of eggs in grouper eggs [13-14]. In this study, using a disinfectant made from ozone (O3) had an effect on the hatchability of grouper eggs with a dose of 400 ORP at the immersion time for 60 seconds resulting in an average percentage hatching rate of 85%.

The average percentage results obtained with the use of ozone in grouper eggs in fact have a good percentage in the hatching rate of eggs, but in this study the percentage of HR with the use of ozone was smaller than the use of iodine. This can happen due to many factors that influence where the difference in disinfectant material will result in a different percentage of egg hatchability. As previously explained, in this study the use of peracetic acid (PAA) obtained the smallest and far too far average percentage of egg hatchability compared to the average yield of egg hatchability in iodine and ozone, which was 74%. This could be due to the inaccuracy of the dose and time of immersion and the commodities used.

Previous studies that related to the use of disinfectants based on iodine, ozone, and peracetic acid have mostly discussed the eradication of fungi, bacteria, parasites, and viruses in one of the fisheries commodities, whereas this study just focuses on the effect of using the addition of disinfectants made from chemicals, namely iodine, ozone, and peracetic acid. In conclusion, this study found that the use of these three chemicals has an effect on the hatchability of eggs in grouper eggs [15-16].

The effectiveness of the 3 disinfectants has different effectiveness. Effectiveness can be compared by measuring the percentage results of hatchability of eggs in the 3 treatments given in the phase of grouper eggs. In achieving effectiveness, many factors influence it. Seen in the graph in Figure 1, that the eggs of cantang grouper with the use of iodine and ozone disinfectants have a high level of effectiveness, it can be seen that the addition of iodine and 85%, while the addition of disinfectants uses acid. Peracetic is considered less effective because the percentage of egg hatchability in grouper eggs is only 74%.

TABLE.1
PERCENTAGE OF HATCHING RATE

No.	Tank	Treatment	Average Number of Egg / L	Volume of container	Estimated Number of larvae	Number of eggs (L)	Stocked %HR
1	LR 2.1 A	OZONE	15:33	2 200	33 733	41 000	82%
2	LR 2.1 B	OZONE	16.67	2200	36 667	41 000	89%
3	LR 2.1 C	OZONE	16:00	2200	35 200	41000	86%
4	LR 2.1 D	OZONE	33733	2200	15.33	41000	82%
5	LR 2.2 A	iodine	17.33	2200	38133	41000	93%
6	LR 2.2 B	iodine	32267	2200	14.67	41000	79%
7	LR 2.2 C	iodine	36667	2200	16.67	41000	89%
8	LR 2.2 D	iodine	36667	2200	16.67	41000	89%
9	LR 2.3 A	PAA	33733	2200	15.33	41000	82%
10	LR 2.3 B	PAA	27867	2200	12.67	41000	68%
11	LR 2.3 C	PAA	29333	2200	13.33	41000	72%
12	LR 2.3 D	PAA	14.00	2200	30800	41000	75 %

Efficiency is an important factor for researchers and cultivators in choosing chemicals that are on the market because aquaculture actually has the goal of producing optimal fishery products but with efficient cost, time and human resources in order to get the highest profit. There is a comparison of the price and time of use of each disinfectant in Table 2. There is a price comparison between iodine, ozone and peracetic acid and the time required to use it. Indeed, the application of disinfectants using iodine and peracetic acid has a range of costs and the time required is not much different. If you look at the results of the percentage rate of hatching rate produced with the addition of chemicals as disinfectants of grouper eggs, it is seen that the most effective use of iodine-type chemicals is seen because it [17-19].

TABLE II
PRICE AND TIME OF USE OF THE DISINFECTANT

No	Material	Price of	Usage Time
1	Iodine	IDR 58,000 per liter	Can be adjusted according to user wishes and can be used immediately
2	Ozone	IDR 6,000. 000 - IDR 21,500,000 per 20gram	Adjusted to the user's wishes but cannot be used immediately, must wait until the desired ORP level
3	PAA	IDR 50,000 per liter	Can be adjusted according to user wishes and can be used immediately

IV. COCLUSION

Based on the above description, it can be concluded that in this study the use of chemicals such as iodine, ozone and peracetic acid as a disinfectant for cantang grouper eggs has a positive effect on the proportion of hatching rate on cantang grouper eggs and iodine has the best level of effectiveness from the proportion of hatching rate eggs of cantang grouper and peracetic acid is the most efficient type of chemical.

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