The Effect of Temperature on the Length of Anesthesia for Prospective Male Tilapia Mothers

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Abstract

This research was conducted at the Jember State Polytechnic on 05 November - 12 November 2012. The aim of this research was to observe the time to faint and the time to recover consciousness by administering different temperatures to obtain the optimal temperature or ideal temperature for prospective male tilapia broodstock. Stunning fish using direct drop is a natural anesthetic technique used in fish transportation. In this study, the temperatures used were 3°C, 5°C, 7°C and 9°C per 10 liters of water. The tilapia fish used were 32 prospective male tilapia parents weighing 250 grams which had been aged for a day before being used as test animals. The results of the study showed that the best treatment was shown by P4 (9°C) with a fainting time of 226.25 seconds and a recovery time of 382.00 (seconds).

Keywords: anesthesia, temperature, male tilapia parent

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INTRODUCTION

Background

In general, aquaculture activities are divided into *on-farm production activities* and *off-farm activities* . *On-farm* production activities consist of hatching and enlargement, while *off-farm activities* include, among other things, procurement of facilities and infrastructure, production, handling of harvests, distribution of results (including transportation of live fish), and marketing.

Demand for live fish commodities, especially for fish that have high economic value, is increasing rapidly both in the domestic and international markets. Fish in live form is believed to be healthier and protected from preservatives, such as the use of formaldehyde which is currently widespread in fishery products. This promising market opportunity needs support in the form of technology for handling live fish transportation that is economical, effective and efficient.

Transportation as a means of marketing is currently still a quite complicated problem, the high demand for transportation out of the region, both out of town and for export, requires superior packaging, the death of fish in transit is generally caused by a lack of oxygen supply due to the oxygen being used up for the fish respiration process. . One effort to reduce *the metabolic rate* during the transportation process is to *anesthetize* the fish before packing. The development of *anesthesia* in fish continues to be explored, it is now known that Lowering the temperature can be done to reduce the body's *metabolic rate* .

Fish anesthesia is required in transportation. Competition in the fish trade is felt to be getting tighter and tougher, and this competition is predicted to continue to increase in the coming years. To help increase the competitiveness of

this trade, various actions have been taken, one of which is changing the transportation and trade of fish from fresh, dead form to live form.

Based on the thoughts and desire to respond to the current situation and conditions, this research will try to apply low temperatures for the anesthesia process of parent tilapia fish. Anesthetizing fish using low temperatures is a simple anesthetic technique with the aim of extending transportation time, by suppressing the metabolic rate and activity of the fish and reducing the risk of the fish experiencing stress which results in death of the fish during transportation.

Based on the description above, the author took the title "The Effect of Giving Different Temperatures on the Length of Anesthesia for Prospective Male Nile Tilapia Parent ″ .

METHODOLOGY

Research Location and Time

This research activity was carried out in the Jember State Polytechnic Reeling Room which is located on Jl. Mastrip KP.164. This research was carried out on November 5 - November 12 2012.

Research tools and materials

The tools and materials used in this research are:

Table 1. tools

Tools and materials	Specification	Function
1.Sterofoarm	Volume 10 L	For stunning media
2. Scales	Digital	To weigh test animals
3.pH meter	-	To measure the pH of water
4.Thermometer	-	To measure water temperature
5.Aerator	Digital	To increase and decrease DO
6.Stopwatch	Cell Phone Stopwatch	To measure the time of unconsciousness and consciousness
7. Stationery	-	For stationery
8.Camera	Digital	For documentation

Table 2 ingredients

Material	Specification	Function
1. Ice cubes	-	Test material
2. Prospective parent tilapia fish	Male fish weighing 250 grams each	Test animals

Data Collection Method

The data collection procedure used a primary collection method, which was carried out through direct observation in research on the effect of providing different temperatures on the length of time it took to faint and the time it took to recover consciousness from prospective male tilapia broodstock.

Analysis Method

Research design

The design of this research is experimental research using a Completely *Randomized Design* with 4 treatments and 4 replications. The plan is as follows:

Table 3. Giving different temperatures to the treatments

Treatment	Temperature
P1	3°C
P2	5°C
P3	7°C
P4	9°C

Experimental design

Experimental Design

Based on the main problems described, the variables analyzed can be grouped as follows:

1. 16 experimental units with 4 treatments and 4 repetitions
2. The method used is RAL

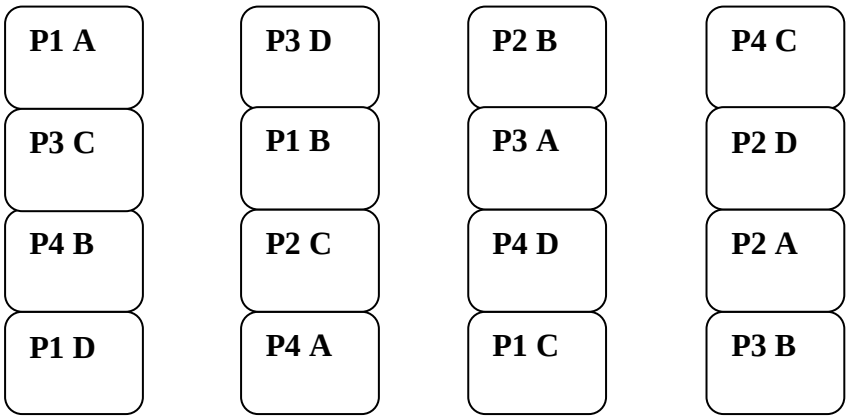

Figure 1. Plan of experimental unit placement

Information :

P1 = Treatment 1, namely using an anesthesia temperature of 3°C. Using 2 prospective tilapia broodstock.

P2 = Treatment 2, namely using an anesthesia temperature of 5°C. Using 2 prospective tilapia broodstock.

P3 = Treatment 3, namely using an anesthesia temperature of 7°C. Using 2 prospective tilapia broodstock.

P4 = Treatment 4, namely using an anesthesia temperature of 9°C. Using 2 prospective tilapia broodstock.

A, B, C, and D = 1st, 2nd, 3rd, and 4th repetitions

Observation Parameters

1. Observed variables

The parameters that will be observed in this study are anesthesia time and recovery time (consciousness). The time for fainting or anesthesia is calculated when the mother tilapia fish is treated until it shows symptoms of loss of balance or a fainting condition. The recovery or conscious time is calculated when the fish experiences normal symptoms again after the fish is transferred to normal water.

2. Main parameters

In this research, the main parameter is the provision of different temperatures that will be given to each treatment, namely:

P1 = water temperature 3°C with a density of 2 fish
P2 = water temperature 5°C with a fish density of 2 fish
P3 = water temperature 7°C with a density of 2 fish
P4 = water temperature 9°C with a density of 2 fish

3. Supporting parameters

The supporting parameter in this research is water quality. Observations of water quality parameters for temperature and pH were carried out at the beginning and end of the research.

Table 4. Water quality parameters

Water quality factors	Unit	Tool
Temperature	°C	Thermometer
pH	Ppm	PH meter

Operational Definition of Variables

Based on the main problem posed, the variables analyzed can be defined as follows:

1. Temperature
   The temperatures used are 3°C, 5°C, 7°C and 9°C.
2. Fainting time or anesthesia time.
   The time to faint was calculated when the mother was given treatment until she showed symptoms of fainting.
3. Awareness time or recovery time
   Awareness or recovery time is the time needed for the fish to reach a normal state of recovery.
4. Prospective Tilapia Parent
   Selected male tilapia fish weighing 250 gr each.

Research procedure

1. Preliminary Test

Preliminary tests are carried out to find out how much the temperature decreases in the test media before the research is carried out so that factors that may hinder the research can be overcome. The stages are as follows:

1. Prepare the tools and materials that will be used in the preliminary test, namely aquarium/bucket, aerator/blower, aeration hose, aeration stone, thermometer, ice cubes and clean water.

2. Prepare the media by placing ice cubes in an aquarium/bucket filled with clean water until the media temperature is 3°C, 5°C, 7°C and 9°C. To measure water temperature, a thermometer is used.
3. Calculate how much the temperature of the water has dropped after leaving it for a few minutes.

2. Research Implementation

The steps in carrying out research are:

1. Preparation of tools that will be used during research such as tubs, blowers, aeration hoses, aeration stones, thermometers, ice cubes and clean water, pH meters, DO meters, ATK, stopwatches, cameras.
2. Preparation of materials that will be used during research, such as potential parent tilapia fish as test material, ice cubes and clean water.
3. Selecting potential broodstock to be used. The criteria for a good prospective breeder is that it is healthy and has no defects. Then acclimatization can be carried out for ± 15 minutes with the aim that the fish do not experience high levels of stress when research activities are carried out.
4. During the acclimatization process, the test media was prepared, namely filling the styrofoarm with a water volume of ± 10 liters. Then put the ice cubes in the tub/bucket until the media temperature drops to the desired temperature, namely 3°C, 5°C, 7°C, 9°C. 16 experimental units were carried out with 4 treatments and 4 replications.
5. When the desired temperature is reached, add 2 units of prospective parent tilapia. Then record the anesthesia time from the time the fish is first introduced until it shows signs of fainting.
6. Fish that have been anesthetized are placed in water at normal temperature.
7. Record the length of time the fish recovers consciousness, starting when the anesthetized fish is placed in water with a normal temperature of 28°C until the fish regains consciousness.

Analysis Techniques

The aim of calculating variance is to determine the KK (Diversity Coefficient) value. Based on the KK value and the experimental conditions, the appropriate use of a different test (advanced test) can be determined, namely if the KK value is small it is best to continue with the BNJ (Honest Significant Difference) test, if the KK value is medium it is best to continue with the BNT test (Smallest Real Difference), and if the KK is large it is best to continue with the DMRT test (Duncan Multi Range Test). The general form of RAL in the mathematical model of experimental data Y can be written as follows:

$$\mathbf{Yij = \mu + T + \sum ij}$$

Where:

Yij = Observation value of the ith treatment level in the jth replication

μ = General average / constant

T = Effect of treatment level

∑ij = Random observation value for the ith treatment level for the jth replication

The results of observations using the RAL pattern are presented in Anova form as follows:

Table 5. Observation results using the RAL pattern are presented in Anova form

SK	db	JK	KT	F_{hit}	F_{tab}
Treatment	p- 1	$JKP = \frac{\Sigma(p^2)-FK}{n}$	JKP/db	$\frac{KTP}{KTG}$	
Error	p(n-1)	JKG = JKT - JKP	JKG/db		
Total	p- 1				

Where:

SK = Source of diversity

db = Degrees of freedom

n = Repetition

Jk = Sum of squares

Y pn = Variable in the pth treatment and nth replication

FK (JKNT) = Correction factor (sum of squares of mean values) ie $\frac{\Sigma Y\ p.n^2}{p\ .\ n}$

JKP = Sum of squares of treatments

JKG = Sum of squared errors

KTP = Treatment mean square

KTG = Mean square error

Fhit = F test calculation result

Ftab = F test value in the table

RESULTS AND DISCUSSION

Research result

Tilapia Fainting Time

The length of time for prospective tilapia broodstock to swoon using different temperatures, namely 3 ° C, 5 ° C, 7 ° C and 9 ° C, can be seen in Figure 4.1 below:

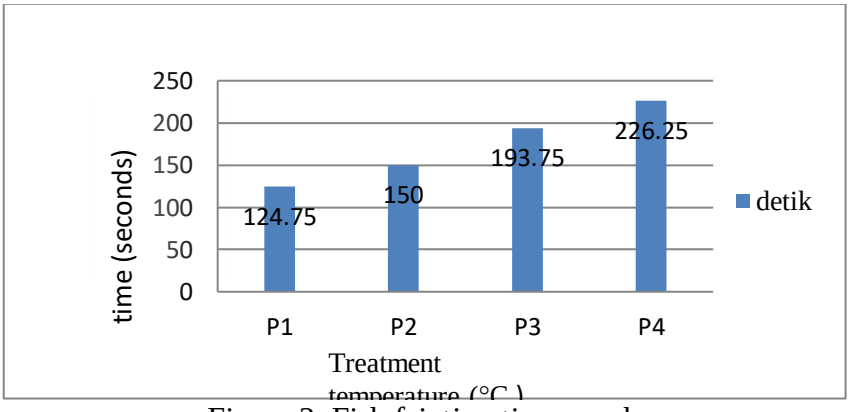

Figure 2. Fish fainting time graph

Figure 2 shows that treatment P1 showed the fastest fainting time, namely 124.75 seconds using an anesthesia temperature of 3 ° C and the longest fainting time was shown in treatment P4, namely 226.25 seconds using an anesthesia

temperature of 9 ° C. This was caused by more ice. If given to fish, the faster the fish will experience anesthesia.

The results of the variance test showed that different levels of temperature reduction for potential parent tilapia fish using temperatures of 3°C, 5°C, 7°C and 9°C had a very significant effect (Fcount > Ftable 1%) on the fish's stun time .

Table 6. Test results of variations in fish fainting times

Treatment	Average	P4	P3	P2	P1	Notation
		226.25	193.75	150.00	124.75	
P4	226.25	0				a
P3	193.75	32.5	0			a
P2	150.00	76.25	43.75	0	0	ab
P1	124.75	101.5	69	25.25	0	b

Note: The same notation indicates that different treatments are not significant

Tilapia Fish Recovery Time

The length of recovery time is the time required for the test fish to return to normal condition when transferred to normal water media. Recovery time at different temperatures can be seen in Figure 4.2.

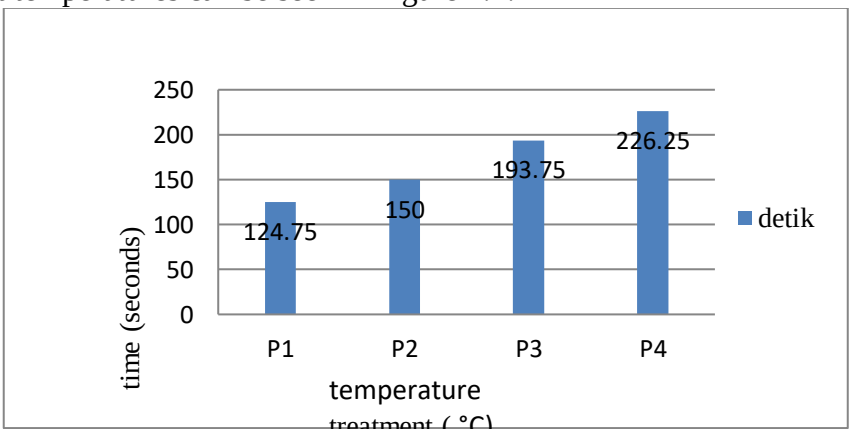

Figure 3. Graph of fish awareness time

Figure 3 shows that the fastest recovery time was shown by treatment P1 with a recovery time of 195.25 seconds and the longest treatment was shown by treatment P4 using an anesthesia temperature of 9 ° C with a recovery time of 382.00 seconds. This is because the longer the anesthesia takes for the fish, the longer it takes for the fish to return to its normal state.

The results of the variance test showed that different levels of temperature reduction for potential parent tilapia fish using anesthesia temperatures of 3°C, 5°C, 7°C and 9°C had a very significant effect (Fcount > Ftable 1%) on the fish's conscious time.

Table 7. Test of variance in fish recovery time

Treatment	Average	P4	P3	P2	P1	Notation
		382.00	275.00	230.75	195.25	
P4	382.00	0				a
P3	275.00	107	0			ab
P2	230.75	151.25	44.25	0	0	b
P1	195.25	186.75	79.75	35.5	0	BC

Note: The same notation indicates that different treatments are not significant.

Results of Supporting Parameter Measurements

The results of measuring supporting parameters in research on the temperature reduction levels of different media can be seen in the following table:

Table 8. Supporting Parameters (Water Quality)

Treatment	Normal Water Temperature (° C)	pH
P1	28 ° C	7 ppm
P2	28 ° C	7 ppm
P3	28 ° C	7 ppm
P4	28 ° C	7 ppm

Supporting data in this research is the quality of media water. Measurement of water quality parameters (temperature and pH) which shows stable conditions. The temperature during the study was 28°C. The pH measurement during the research was 7 ppm. For the survival of tilapia, the suitable pH is 6-7 ppm. If the water pH is below 6 and exceeds 7 the fish can still survive but their growth is abnormal and can even cause death.

Discussion

Fish are said to be truly anesthetized if they have the characteristics of a tilted fish body, passive or silent movements. In this study, the fish that experienced the fastest anesthesia were shown in treatment P1, namely 3°C with a time of 124.75 seconds and the longest anesthesia was shown in treatment P4 using a temperature of 9 ° C with a time of 226.25 seconds. This is because the more ice given to the fish, the faster it will stun and if little ice is given then the stun process will take a long time.

The time for fish anesthesia is calculated when the parent is placed in a container that has been treated with different temperatures until the fish shows symptoms of the fainting phase.

The fastest fainting time treatment was shown in treatment P4 (temperature 9°C) with a fainting time of 226.25 seconds. This is because the longer the stunning time, the longer the time to faint. The results of stunning prospective male tilapia parents using low temperatures can cause the metabolism in the fish's body to be disturbed because the use of low temperatures will affect the fish's

nerves which function as receptors for stimuli so that external stimuli are not transmitted by *the neurites* or *axons* .

Fish recovery time is the time required for the test fish to return to normal consciousness when transferred to normal water. Recovery time is calculated from when the fish is anesthetized until it shows signs of returning to normal balance. The longest recovery time was shown in treatment P4 (9°) with a mass recovery time of 382.00 (seconds). This is because in the P4 treatment the fish experience the longest anesthesia time compared to other treatments so that the fish's ability to take in oxygen to reach the brain is also slow and takes a long time to return to normal.

Supporting data in this research is the quality of the water media. Measurement of water quality parameters (temperature and pH) shows relatively stable conditions. The water temperature during the study was 28°C, this temperature range is considered ideal for the survival of tilapia fry. Temperature directly affects the metabolic process of fish, high temperatures or above 30 ° C can cause oxygen consumption to increase because the fish's metabolic rate increases, whereas at low temperatures or below 25 ° C fish metabolism becomes slow and oxygen consumption also decreases.

The pH measured during the research was 7 ppm, this pH range is ideal for the survival of tilapia because the pH suitable for the survival of tilapia is 6-7. If the water pH is below 6 and more than 7, the fish can still survive but their growth will not be normal.

CONCLUSIONS AND SUGGESTIONS

Conclusion

From the results of the research, giving different temperatures to the anesthesia time of prospective male tilapia broodstock had a very real effect (Fcount > Ftable 1%) with a fainting time of 226.25 seconds and a conscious recovery time of 382.00 seconds so that the optimum temperature used for Anesthesia for prospective tilapia broodstock is in the P4 treatment using an anesthesia temperature of 9 ° C.

Suggestion

Suggestions that can be given in research regarding the effect of different levels of temperature on anesthesia are:

1. For those who are interested in exploring fish anesthesia using low temperatures, it is necessary to test it using various commodities so that the results can be compared.
2. It is best to carry out anesthesia using low temperatures on prospective male tilapia broodstock, namely the transportation test.

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