SIAMESE FIGHTING FISH (*Betta* Sp.) FAINTING TECHNIQUES IN ONE TRANSPORTATION CONTAINER USING COLD TEMPERATURE METHOD

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ABSTRACT

The production of ornamental fish is increasing every year. Siamese fighting fish is one type of ornamental fish that can exceed the national target for ornamental fish production. Anesthesia using low temperatures can minimize the metabolism of siamese fighting fish without leaving residues that can harm the fish. This study aims to analyze the most optimal fainting technique, duration of transportation, and density for transportation of siamese fighting fish in one container. This research was conducted during August 2021 – September 2021 in Rancaekek District, Bandung Regency and Ciparanje Wet Laboratory, Padjadjaran University, Sumedang Regency, West Java. This study used a 2-factor randomized block design method with 3 replications. The factors used are; fainting technique factors consisting of induction techniques and direct techniques and transportation duration factors; consists of 2 hours, 4 hours, and 6 hours. The density factor was analyzed descriptively with the assumption that fish would not pile up on each other in the transportation container; which consists of 1 tail, 3 tails, 6 tails, and 9 tails. Parameters observed were survival rate and water quality. The results of the ANOVA test showed that the results of all treatments were significantly different. The treatment that had the best survival rate was using the induction fainting technique with a transportation duration of 4 hours, up to a density of 6 fish in one transportation container with temperatures from 19.45 to 21.45 ^{o}C, DO from 6.02 to 6.20 O^{2} mg/l, pH from 5.89 to 6.11 and amonia from 0.0014 to 0.0025 mg/l..

Keyword: *Transportation, Siamese fighting fish, Survival rate, and Water parameter*

1. INTRODUCTION

Indonesia's ornamental fish production in 2016 reached 1.3 billion and increased to 1.7 billion in 2017, or around 84.21% of the target set at 2.1 billion fish. Although it has not met the national target, there are ornamental fish species that meet these criteria with a production achievement of 170% or capable of producing as many as 232,606,000 fish from the target of 137,000,000 fish, namely Siamese fighting fish (*Betta* sp.) [1]. Anesthesia is an activity of anaesthetizing fish to make the fish in an unconscious state. Anesthesia in transportation is divided into three, namely, the use of low temperatures, anesthetic agents and electric shock. According to [2] the use of using low temperatures is more profitable than using electric shocks and anesthetic agents because the use of low temperatures is cheaper and quite safe when used because there are no chemical residues that can harm fish.

2. METHODOLOGY

This research was conducted during August 2021 – September 2021 in Rancaekek, Bandung Regency and Ciparanje Wet Laboratory, Padjadjaran University, Sumedang Regency, West Java.

2.1 Tools and Materials

The tools used in this study are as follows: An aquarium or container is used as a container for raising siamese fighting fish. A thermometer is used to measure temperature. DO meter is used to measure dissolved oxygen. The basin is used for water containers with cold temperatures. HDPE plastic measuring 12 x 25 cm is used as a transportation container. The strainer is used to pick up fish in the aquarium. Plastic cups are used as containers for the induction of cold water. Rubber bands are used to bind plastic transport containers. Styrofoam is used to store plastic-containing fish. Smartphones are used for documentation. The materials used in the study were plaque-type Siamese fighting fish measuring -M or 3.0 – 3.3 cm with an age range of 3 months and dried Ketapang leaves for the maintenance of siamese fighting fish.

2.2 Research Method

The research method used is an experimental method using a 2-factor randomized block design with 3 replications. The factors used are; fainting technique factors consisting of induction techniques and direct techniques and transportation duration factors; consists of 2 hours, 4 hours, and 6 hours. The density factor was analyzed descriptively with the assumption that fish would not pile up on each other in the transportation container; which consists of 1 tail, 3 tails, 6 tails, and 9 tails.

2.3 Research Procedure

Fish preparation is carried out in the following way: 3-month-old Siamese fighting fish are prepared and put into the aquarium and given dry Ketapang leaves. Siamese fighting fish are fed 2 times a day using mosquito larvae and water fleas. Siamese fighting fish are kept for 7 days or until fish conditions are normal. Siamese fighting fish are fasted 1 day before being transported.

Fish Transportation Simulation is carried out in the following way; the Induction technique is carried out in the following way: a basin is prepared and filled with ice water. The plastic cup is filled with water and the siamese fighting fish is put into a plastic cup. A plastic cup containing a siamese fighting fish is put into a basin filled with water without any ice water entering the glass. Siamese fighting fish are left for a while until they are immobilized or unconscious. Siamese fighting fish that have fainted are put into plastic according to the density treatment. DO in plastic is calculated. The plastic is covered with a water to air ratio of 30:70 and tied using a rubber band. The direct technique is done by preparing a basin and filling it with ice water. Siamese fighting fish is immediately put into ice water. Siamese fighting fish that have fainted are immediately transferred to plastic according to the density treatment. DO in plastic is calculated. The plastic is covered with a water to air ratio of 30:70 and tied using a rubber band.

Plastic containing siamese fighting fish is inserted into the styrofoam. The styrofoam is tightly closed. Styrofoam-containing siamese fighting fish is inserted into the car. Transport simulations were carried out according to the duration (2, 4, and 6 hours). DO in plastic transportation is calculated before and after the transportation simulation process. The survival rate of siamese fighting fish in plastic transportation was calculated. Siamese fighting fish were transferred to the aquarium and then given dry Ketapang leaves. And then reared for 7 days by feeding 2 times a day in the form of mosquito larvae and water fleas.

2.4 Parameter yang Diamati

The parameters observed were the survival rate of transportation, post-maintenance survival rate, and water quality.

The level of life according to [3] is:

$$SR = \frac{Nt}{No} \; x \; 100\%$$

where:
SR = Survival Rate (%)
Nt = Number of fish at the end
No = Number of fish at start

Observation of water quality consisted of temperature, dissolved oxygen (DO), pH, and ammonia. Measurement of water quality in this research was carried out at the beginning and end of transportation.

2.5 Analisis Data

Survival data obtained from observations were analyzed using analysis of variance (ANOVA F test) with a 95% confidence level. While the density factor was analyzed descriptively.

3. RESULT AND DISCUSSION

3.1 Post-Transportation Survival Rate

The results of ANOVA observations on the survival rate of post-transport siamese fighting fish can be seen in Table 1 below:

Table 1: ANOVA Test Results Post-Transportation Survival Rate

		DF	SS	Ms	F hit	F tab 5%	expl
Group		2	40.01	20.01	1.00	4.10	nd
Treatment	Fainting Technique	1	3694.98	3694.98	184.69	4.96	**
	Transportation Duration	2	1960.60	980.30	49.00	4.10	**
Interaction	Technique*Duration	2	926.44	463.22	23.15	4.10	**
Error		10	200.06	20.01			
Total		17	6822.10	401.30			

Note: ** significantly different at p>0.05, nd not different

Based on the results of the ANOVA test calculation, it was obtained that the treatment of fainting technique and transportation duration in the same transportation container separately had significantly different results. The interaction between the duration of transportation and the fainting technique was significantly different at the 95% confidence level.

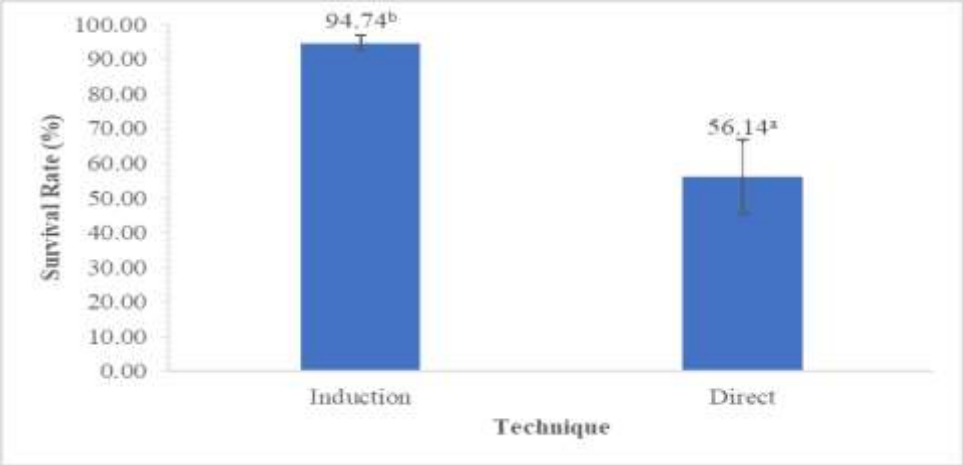

Chart 1: Fainting Technique Survival Rate

The survival rate of post-transport siamese fighting fish based on the best fainting technique is the induction method with a survival rate of 94.74% while the direct fainting method is 56.14%.

The survival rate of post-transport siamese fighting fish based on the best fainting technique is the induction method with a survival rate of 94.74% while the direct fainting method is 56.14%. [4] stated that a rapid drop in water temperature can result in a number of physiological, behavioral, and fitness consequences for fish called cold-shock. Cold-shock stress occurs when fish have acclimatized to a certain water temperature or temperature range and are then exposed to a rapid drop in temperature, resulting in a series of physiological and behavioral responses and, in some cases, death.

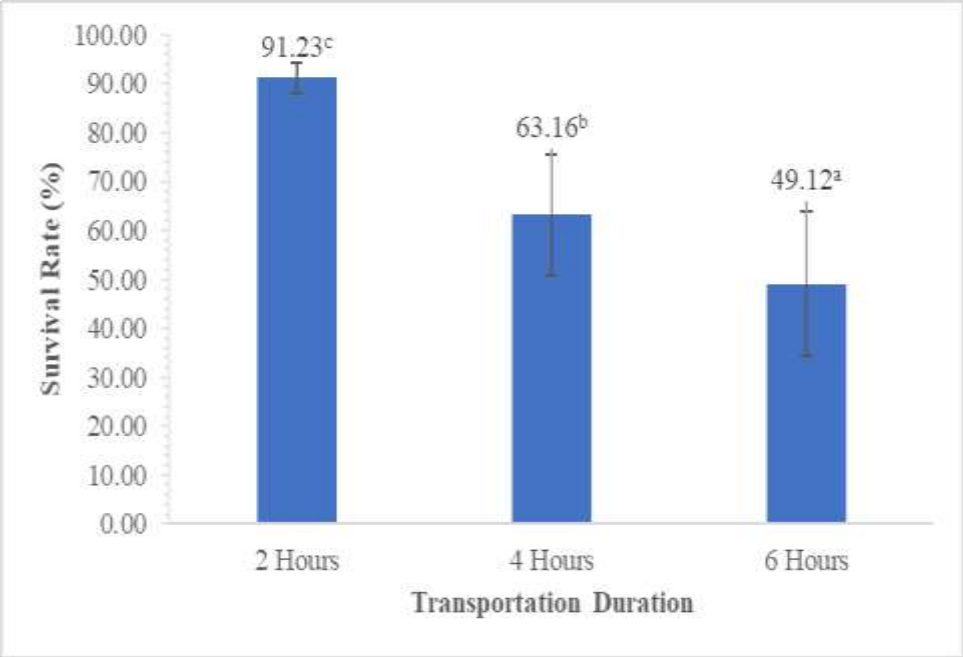

Chart 2: Transportation Duration Survival Rate

The survival rate of post-transport siamese fighting fish based on the best transportation duration is 2 hours with an average survival rate of 91.23%. The lowest survival rate with 6 hours of transportation duration is 49.12%.

The longer the duration of transportation, the survival rate will decrease. This is caused by the increase in temperature in the transportation container because the ice cubes used to maintain the temperature have melted. With the increase in temperature, the metabolic activity of fish increases, there is decay so that the water becomes smelly, the pH drops, and the ammonia (NH3) content is higher [5].

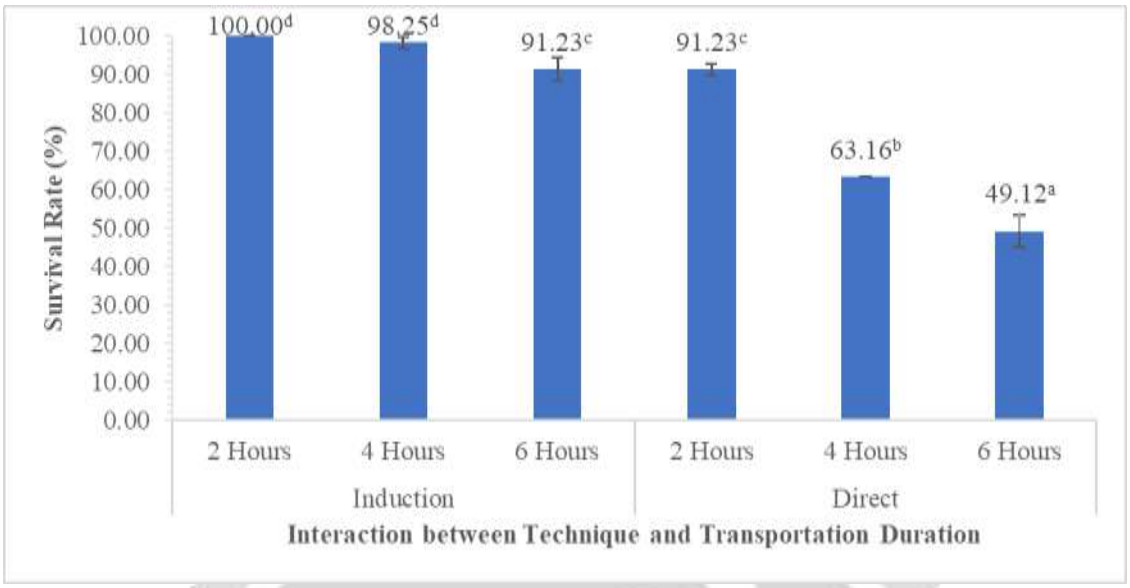

Chart 3: Interaction between Technique and Transportation Duration Survival Rate

The survival rate of post-transport siamese fighting fish based on treatment interactions between fainting technique and the best transportation duration was induction*2 hours at 100% and the lowest survival rate was direct interaction*6 hours at 49.12%.

It can be seen in the results of the study that the longer the duration of transportation, the lower the survival rate of fish, both in the induced fainting technique and the direct technique. The interaction with the direct fainting technique has a lower value than the induction technique because in the direct fainting technique the fish experience stress caused by cold shock [2].

The cold shock experienced by fish at a transportation duration of 2 hours can still be tolerated by fish and results in a survival rate of above 90%. In low-temperature fish immobilization, the temperature is lowered in such a way that the condition of fish with minimal fish activity is obtained but can still live healthily after undergoing restoration [6]. Meanwhile, for a duration of 4 and 6 hours, the stress caused by cold shock or the start of melting of ice in the transportation container resulted in stress and eventually, the fish died.

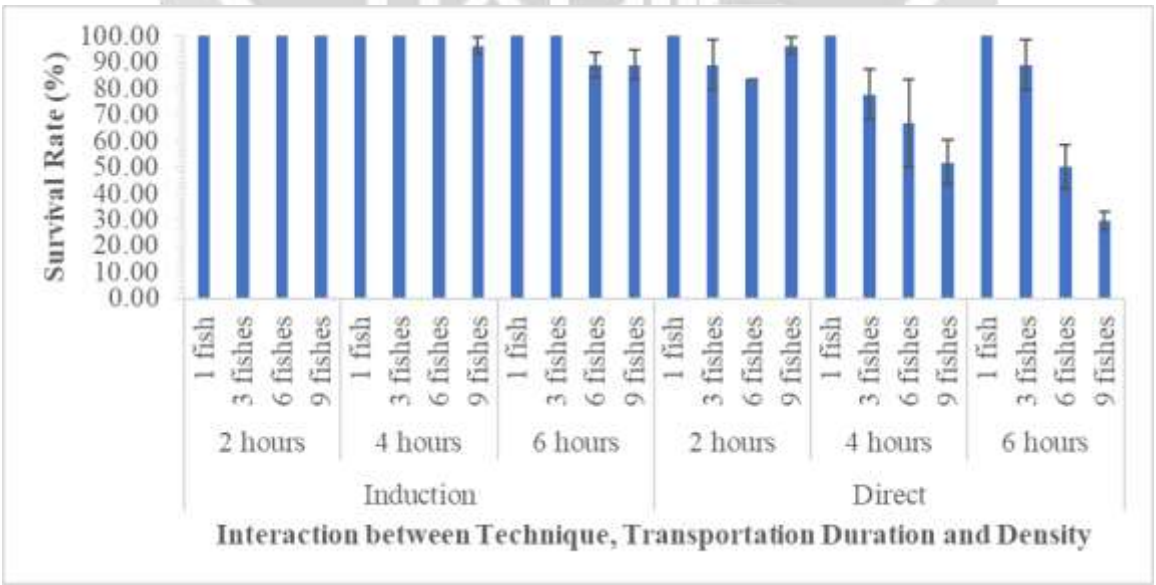

Chart 4: Interaction between Fainting Technique and Transportation Duration Survival Rate

The survival rate of post-transport siamese fighting fish based on treatment interactions between fainting technique, transportation duration, and fish density was best in interactions that used fainting induction techniques with survival rates above 90%. While the lowest survival rate of fish lies in the direct treatment interaction*4 hours*9 tails of 29.63%

It can be seen in Figure 9 that the induced fainting technique has a relatively high survival rate on the interaction of both transport duration and density. Meanwhile, the direct fainting technique has varied values. The longer the duration of transportation, the lower the survival rate of siamese fighting fish after transportation. The higher the density of fish, the lower the survival rate.

3.2 Post-Maintenance Survival Rate

The results of ANOVA observations on the survival rate of post-maintenance siamese fighting fish can be seen in Table 2 below:

Table 2: ANOVA Test Results Post-Maintenance Survival Rate

		DF	SS	Ms	F hit	F tab 5%	expl
Group		Group	26.41	13.20	1.38	4.10	nd
Treatment	Treatment	2	29.34	29.34	3.07	4.96	nd
	Durasi	2	1.15	0.58	0.06	4.10	nd
Interaction	Interaction	2	1.15	0.58	0.06	4.10	nd
Error		Error	95.56	9.56			
Total		Total	153.62	9.04			

Note: nd not different

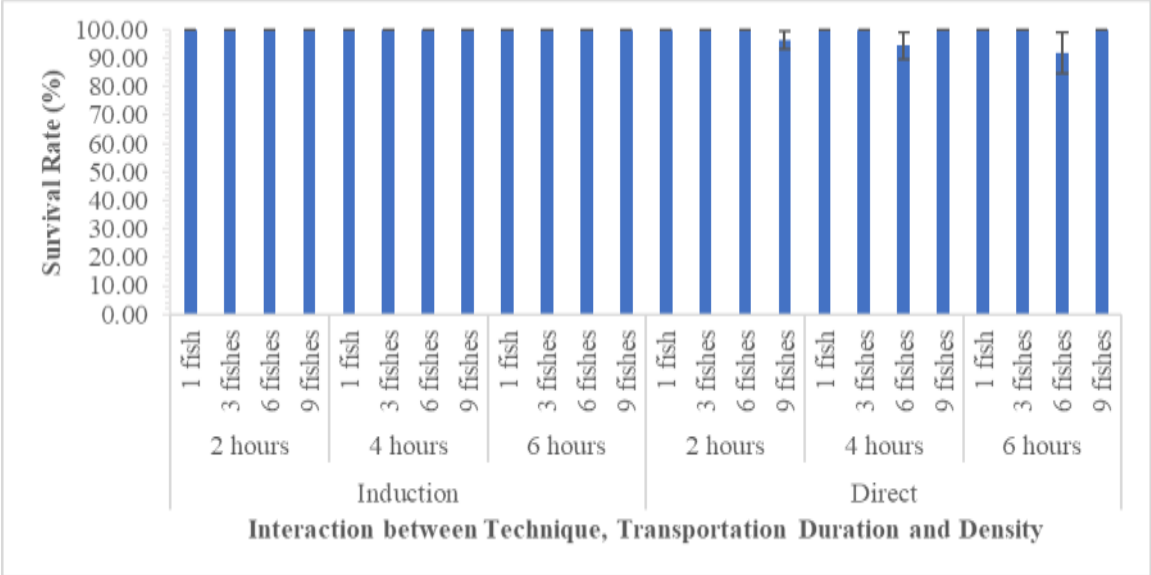

Chart 4: Interaction between Fainting Technique and Transportation Duration Survival Rate Post-Maintenance

Based on the results of the ANOVA test calculation, the results obtained that all treatments and treatment interactions showed results that were not significantly different. The high survival rate of siamese fighting fish in all treatments is because siamese fighting fish is one type of fish that easily adapts to the environment and has a strong immune system. wide and not good water.

The mortality in fish was identified as caused by infection with *Ichthyophthirius multifiliis* which was thought to have originated from natural larvae feed. The effect of transportation that occurs can directly affect the physiological

processes of fish. This in turn can reduce health conditions and body resistance, thus causing stress in the fish kept. When there is external stress, fish begin to expend their energy to survive the stress. During this survival process, growth can decline and then death occurs [8].

3.2 Water Quality

The results of water quality observations can be seen in table 2 below:

Table 3: Water quality before and after transportation

Fainting Technique	Transportation Duration	Density	Temperature		DO		pH		Ammonia	
			Before	After	Before	After	Before	After	Before	After
Induction	2 hours	1 fish	19.50	20.73	6.20	6.10	5.89	5.94	0.0012	0.0018
		3 fishes	19.40	21.20	6.20	6.06	5.76	5.95	0.0018	0.0026
		6 fishes	19.50	21.30	6.10	5.93	5.89	6.09	0.0018	0.0030
		9 fishes	19.47	21.33	6.13	5.92	5.87	6.15	0.0018	0.0050
	4 hours	1 fish	19.50	21.37	6.23	6.13	5.81	5.97	0.0018	0.0022
		3 fishes	19.53	21.43	6.20	6.04	5.79	5.98	0.0012	0.0022
		6 fishes	19.47	21.40	6.20	6.02	5.90	6.13	0.0015	0.0026
		9 fishes	19.50	21.63	6.20	5.96	5.83	6.11	0.0018	0.0050
	6 hours	1 fish	19.50	21.67	6.23	6.09	5.88	6.04	0.0012	0.0022
		3 fishes	19.40	21.77	6.20	6.03	5.80	6.00	0.0015	0.0026
		6 fishes	19.37	22.03	6.17	5.97	5.90	6.13	0.0012	0.0022
		9 fishes	19.50	22.20	6.17	5.93	5.81	6.16	0.0018	0.0030
Direct	2 hours	1 fish	19.50	21.17	6.10	6.01	5.84	5.94	0.0012	0.0022
		3 fishes	19.40	21.17	6.23	6.09	5.85	6.04	0.0018	0.0030
		6 fishes	19.47	21.30	6.27	6.09	5.79	6.00	0.0015	0.0026
		9 fishes	19.50	21.33	6.20	6.00	5.75	6.01	0.0018	0.0030
	4 hours	1 fish	19.50	21.40	6.17	6.06	5.89	6.04	0.0012	0.0022
		3 fishes	19.40	21.30	6.17	6.00	5.86	6.06	0.0015	0.0026
		6 fishes	19.47	21.57	6.23	6.05	5.91	6.15	0.0012	0.0022
		9 fishes	19.43	21.53	6.23	6.00	5.88	6.19	0.0018	0.0030
	6 hours	1 fish	19.50	21.70	6.17	6.03	5.95	6.11	0.0015	0.0026
		3 fishes	19.53	22.03	6.20	6.03	5.92	6.12	0.0012	0.0022
		6 fishes	19.43	22.13	6.23	6.04	5.89	6.13	0.0012	0.0022
		9 fishes	19.57	22.40	6.17	5.92	5.90	6.23	0.0012	0.0022
	[9]		24 - 30		>3		6.2 - 7.5		-	

The temperature at the time of transportation was below the optimal temperature for siamese fighting fish according to [9]. At the time of improving the quality of fish, they are stunned to suppress the metabolism of fish so they are not easily stressed and leave little metabolic waste. One method of fainting fish that is easy and effective is to lower the temperature below the temperature of the fish's living environment to a certain temperature [2].

4. CONCLUSIONS

Siamese fighting fish can be transported with a density of more than one fish using the cold temperature method and in different transportation durations in one transportation container. The treatment that has the best levels of life is to use a fainting technique with a transportation duration of 4 hours to a density of 6 fishes in one transportation

container. container with temperatures from 19.45 to 21.45 ^{o}C, DO from 6.02 to 6.20 O^2 mg/l, pH from 5.89 to 6.11 and amonia from 0.0014 to 0.0025 mg/l.

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