TRANSPORTATION OF MORE THAN ONE BETTA FISH (*Betta* Sp.) IN THE SAME CONTAINER WITH DIFFERENT TRANSPORTATION DURATION

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ABSTRACT

Betta fish is one type of ornamental fish that has high economic value. One of the obstacles faced is the transportation of betta fish. Betta fish cannot be brought together in the same transportation container because of their penchant for fighting. Stunning is needed to avoid fights between betta fish. This study aims to analyze the most optimal density and duration of transportation. This research was conducted during July 2021 – August 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. transportation duration factor (treatment 2, 4 and 6 hours) and density factor (treatment 1, 3, 6 and 9 fish). Parameters observed were survival rate and water quality. ANOVA test results show that the treatment that has the best survival rate is to use a transportation duration of 4 hours and a density of 3 fish.

Keyword: *Betta fish, Transportation, Survival rate, and Water parameter*

1. INTRODUCTION

Betta fish is one ornamental fish that has high economic value and is widely available in the market. Betta fish have a variety of unique patterns and colors, one of which attracts betta is the tail [1]. Based on information from betta fish farmers, one of the obstacles faced is the transportation of betta fish. Betta fish cannot be brought together in the same transportation container because of their penchant for fighting. Its aggressiveness is very high so it is not recommended to place or keep this fish in one container [2]. This is intended to avoid fights between individuals. Stunning is needed to avoid fights that can spoil the beauty of the betta fish.

2. METHODOLOGY

This research was conducted from July 2021 – August 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 an aquarium or container is used as a container for raising betta fish. A thermometer is used to measure temperature. DO meter is used to measure dissolved oxygen. HDPE plastic measuring 12 x 25 cm is used as a transportation container. The strainer is used to pick up fish in the aquarium. 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 Betta fish measuring S or 2.8 – 3 cm with an age range of 2 months and dried ketapang (*Terminalia catappa*) leaves for the maintenance of betta 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; Density factor with the assumption that fish will not pile up on each other in the transportation container; consisting of 1, 3, 6, and 9, and the Transportation Duration factor; consists of 2 hours, 4 hours, and 6 hours.

2.3 Research Procedure

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

Fish Transport Simulation is carried out in the following way: Plastic filled with betta fish is inserted into the styrofoam. The styrofoam is tightly closed. Styrofoam-containing betta 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 betta fish in plastic transportation was calculated. Betta fish were transferred to the aquarium and then given dry ketapang leaves. And then kept for 7 days by feeding 2 times a day in the form of mosquito larvae and water fleas.

2.4 Observed Parameters

Parameters observed were post-transport survival rate, post-maintenance survival rate and water quality.

The level of life according to [3] is:

$$SR = \frac{Nt}{No} \times 100\%$$

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 Data Analysis

Survival data obtained from observations were analyzed using analysis of variance (ANOVA Test F) with a 95% confidence level.

3. RESULT AND DISCUSSION

3.1 Survival Rate

The results of the ANOVA observations on the survival rate of betta fish after transportation are seen in table 1 below:

Table 1: ANOVA Test Results Post-Transportation Survival Rate

		Df	SS	Ms	F	F tab 5%	F tab 1%	Notation
Groups		1	73.73	73.73	1.42	4.49	8.53	nd
Treatment	Transport duration	2	1627.23	813.61	15.65	3.63	6.23	**
	Density	3	3055.56	1018.52	19.60	3.24	5.29	**

Interaction	Transport duration with Density	6	1712.96	285.49	5.49	2.74	4.20	**
Error		16	831.62	51.98				
Total		23	7301.10	317.44				

Note: ** significantly different at p>0.05, ** significantly different at p>0.01, nd is not significantly different

Based on the results of the ANOVA test, it was found that the treatment duration and density had a significant effect on the survival rate of fish separately. The interaction between duration and density treatment has a significant effect on the survival rate of betta fish during transportation.

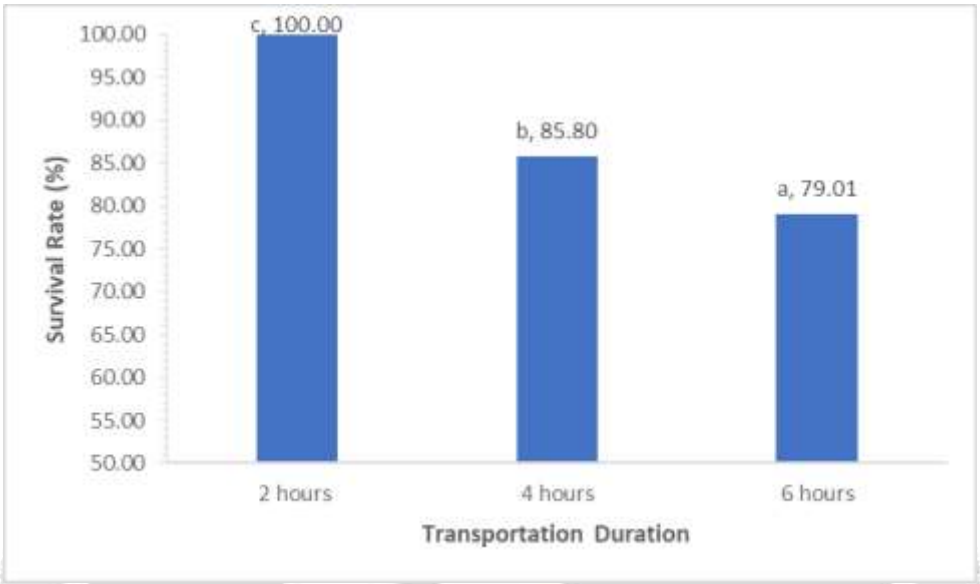

Chart 1: Survival Rate for Transport Duration Treatment

Treatment duration of transportation has different values for the survival rate of betta fish during transportation. The duration of transportation for 2 hours had the highest survival rate of 100%. While the duration of transportation for 6 hours has the lowest survival rate of 79.01%.

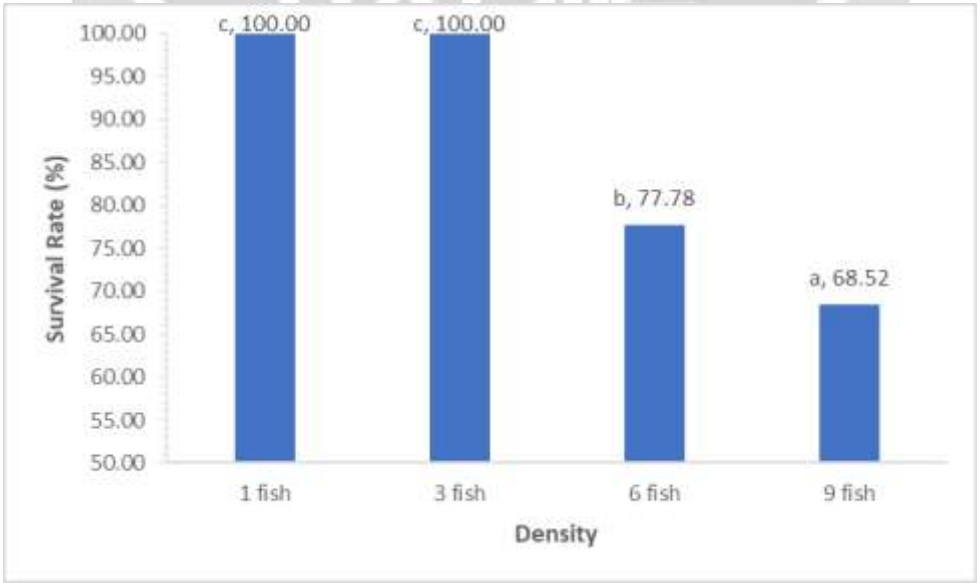

Chart 2: Survival Rate for Density Treatment

Treatment of fish density has different values for the survival rate of betta fish during transportation. The density of fish visited by 1 and 3 individuals had the highest survival rate of 100%. While fish that have 9 tails have the lowest survival rate of 68.52%.

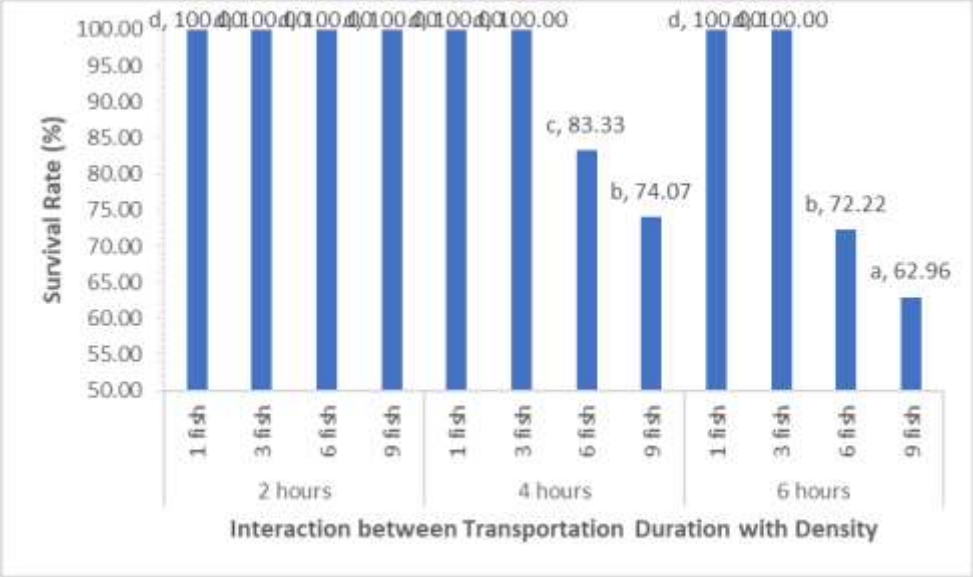

Chart 3: Survival Rate for Interaction of Transport Duration with Density

The interaction between treatment duration and fish density had different values for the level of life of betta fish during transportation. Interaction with a transport duration of 2 hours has a 100% survival rate worldwide for fish. Interaction with densities of 1 and 3 fish had a 100% survival rate for all transportation durations. The interaction between transport and fish density had the lowest survival rate starting at 6 hours and a density of 9 fish was 62.96%.

The longer the duration of transportation will result in the accumulation of fish metabolism in the form of ammonia. Ammonia is a substance that is naturally formed in waters from the breakdown of organic matter and the excretion of metabolic products released by fish. Ammonia can be toxic because this substance can affect the central nervous system and cause acute ammonia poisoning, which can cause convulsions and lead to death [4].

Betta fish are fish that have a fairly high power of aggression towards their species and even other fish [2]. The density of more than one fish in the same transportation container will result in fish attacking each other in the transportation container. This will make the fish lose their fins or fish scales and cause stress even in extreme cases can lead to death.

The survival rate of fish after rearing for all treatments and interactions was 100%. Betta's adaptability is very high, including being able to adapt to narrow places and not allowing other types of fish to breed [5]. Due to the very high adaptability, betta fish can survive after rearing.

3.2 Water Quality

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

Table 2: Water quality before and after transportation

Transportation Duration	Density	Temperature		DO		pH		Ammonia	
		Before	After	Before	After	Before	After	Before	After
2 jam	1 fish	19.50	20.95	6.15	6.05	5.87	5.94	0.0012	0.0020
	3 fish	19.40	21.18	6.22	6.08	5.81	6.00	0.0018	0.0028

4 jam	6 fish	19.48	21.30	6.18	6.01	5.84	6.05	0.0017	0.0028
	9 fish	19.48	21.33	6.17	5.96	5.81	6.08	0.0018	0.0040
	1 fish	19.50	21.38	6.20	6.09	5.85	6.00	0.0015	0.0022
	3 fish	19.47	21.37	6.18	6.02	5.83	6.02	0.0014	0.0024
	6 fish	19.47	21.48	6.22	6.04	5.91	6.14	0.0014	0.0024
	9 fish	19.47	21.58	6.22	5.98	5.85	6.15	0.0018	0.0040
6 jam	1 fish	19.50	21.68	6.20	6.06	5.92	6.08	0.0014	0.0024
	3 fish	19.47	21.90	6.20	6.03	5.86	6.06	0.0014	0.0024
	6 fish	19.40	22.08	6.20	6.00	5.89	6.13	0.0012	0.0022
	9 fish	19.53	22.30	6.17	5.93	5.85	6.19	0.0015	0.0026
[6]		24 - 30		>3		6.2 - 7.5		-	

[6] states that the standard temperature for the maintenance of betta fish is 24-30 ^{o}C. The results of observations before and after transportation have values below the standard proposed by [6]. However, at this temperature, betta fish can still live well and maintain a high survival rate after transportation in certain treatments. The low pH value is caused by the water used is water that has been mixed with dry ketapang leaves. The results of research conducted by [7] showed that ketapang leaf extract could lower the pH by up to 16.5%. The pH level during the transportation is still within the tolerance range of betta fish so that with a slightly lower pH value, betta fish can still maintain their survival.

4. CONCLUSIONS

Betta fish can be transported with more than one density in different transportation durations in one transportation container. The treatment that has the best survival rate is to use 4 hours with a density of 3 fish in the same transportation container.

5. REFERENCES

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