

## Utilization of Different Substrates on Goldfish (*Carrasius auratus*) Seeds Productivity

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### ABSTRACT

The success of goldfish (*Carrasius auratus*) spawning is influenced by several factors, including the substrate media for fish spawning. This study aims to analyze the utilization of different substrates on the productivity of goldfish which includes the number of eggs attached to the substrate, the number of fertilized eggs, the number of eggs that hatch, and the survival of goldfish. The research method used a completely randomized design (CRD) with 4 treatments and 3 replications, including P1 coconut coir substrate, P2 knitting yarn substrate, P3 *Hydrilla* sp substrate, and P4 *Pistia stratiotes* L substrate. The results showed that a lot of goldfish eggs attached to the apu-apu substrate (treatment P4) of 1,959 eggs, the highest number of fertilized eggs was obtained on the substrate *Hydrilla* sp (treatment P3) of 65.65%, the highest number of eggs hatched on the substrate *Hydrilla* sp. (P3 treatment) was 78.54%, the highest survival rate was on *Pistia stratiotes* L substrate (P4) was 85.97 and the results of water quality analysis during the study supported the productivity of goldfish seeds.

**Keywords:** Egg Hatching Power, Goldfish, Substrates, Survival, Water Quality, Productivity

### INTRODUCTION

Goldfish (*Carrasius auratus*) is an ornamental fish that has beauty and attractiveness in terms of shape, body size, and beauty in color variations and is classified as a fish that easily adapts to its environment (Amalia *et al*, 2023; Mahyuddin *et al*, 2020). These advantages are factors that make goldfish have high aesthetic value and high economic value for development.

Along with the increase in the economic value of goldfish among hobbyists, good-quality goldfish are needed. Good quality fish is obtained from quality broodstock and proper spawning techniques. According to Oktavianti *et al* (2023), good spawning is

determined by the treatment techniques for the broodstock, spawning techniques for the broodstock, hatching of eggs, handling of larvae, and use of the substrate. Furthermore, Safri *et al* (2020) stated that using the right substrate can stimulate goldfish parents to attach their eggs.

The substrate treatments used in this research were coconut fiber substrate, *Hydrilla* sp substrate, knitting yarn substrate, and *Pistia stratiotes* L substrate. For this reason, it is necessary to carry out research that aims to analyze the use of different substrates on the productivity of goldfish which includes the number of eggs attached to the substrate, the number of fertilized eggs,

the number of eggs that hatch, and the survival of goldfish to see different substrates on goldfish seeds productivity.

## MATERIALS AND METHODS

### Research subject

The goldfish broodstock used were 12 females and 24 males, with a male-to-female ratio of 2:1. The research was conducted from April to June 2018 at the Gandus Fish Cultivation Center of the Palembang City Fisheries Service and the Fish Hatchery Workshop, Faculty of Fisheries and Marine Affairs, PGRI University of Palembang.

### Tools and materials

The equipment used in this research included an aquarium measuring 60x20x20 cm, an aerator, thermometer, pH meter, dropper pipette, seser, and stationery,



Coconut  
Fiber



Knitted  
Thread



*Hydrilla* sp



*Pistia*  
*stratiotes* L

**Figure 1.** Research Substrate

The procedure carried out in this research begins with preparing the substrate media in the form of coconut fiber, knitting thread, *Hydrilla* sp, and *Pistia stratiotes* L substrate, and then each substrate is inserted into the aquarium. The selection of goldfish broodstock with mature gonads is carried out, and then the broodstock is put into an aquarium with a ratio between males and females of 2: 1. Spawning of goldfish is done naturally. After spawning, data is collected which includes the number of eggs attached to the substrate (Yufika *et al*, 2019), egg hatchability (Oktavianti *et al*, 2021); (Amalia *et al*, 2023), larval survival (Rosid *et al*, 2019); (Exstrada *et*

while the materials used were goldfish broodstock, coconut fiber, knitting thread, *Hydrilla* sp, *Pistia stratiotes* L, silkworms and commercial feed.

### Research procedure

This study used a completely randomized design (CRD) with 4 treatments and 3 repetitions.

Treatment includes:

P1: Spawning goldfish using coconut fiber substrate.

P2: Spawning goldfish using knitted thread substrate.

P3: Spawning goldfish using *Hydrilla* sp substrate.

P4: Spawning goldfish using *Pistia stratiotes* L substrate

*al*, 2020); (Yusanti *et al*, 2022) and water quality during the research (Susilo *et al*, 2022)

### Data analysis

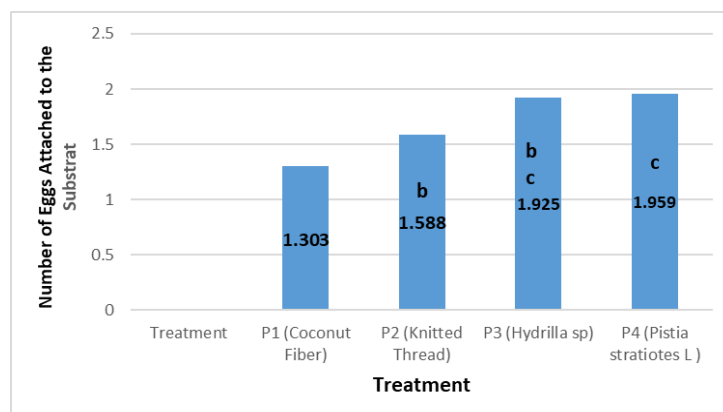
The data obtained were analyzed using analysis of variance at a 95% confidence interval. Then a further test was carried out to see the effect between treatments based on the Diversity Coefficient value obtained.

## RESULTS AND DISCUSSION

### Number of Eggs Attached to the Substrate

The results of observations on the number of goldfish (*Carrasius auratus*)

eggs attached to different substrates are presented in Figure 2 below.



**Figure 2.** Average Number of Goldfish (*Carrasius auratus*) Eggs Attached to Different Substrates During the Study. (The same superscript letter in the diagram indicates results that are not significantly different with  $P < 0.05$ )

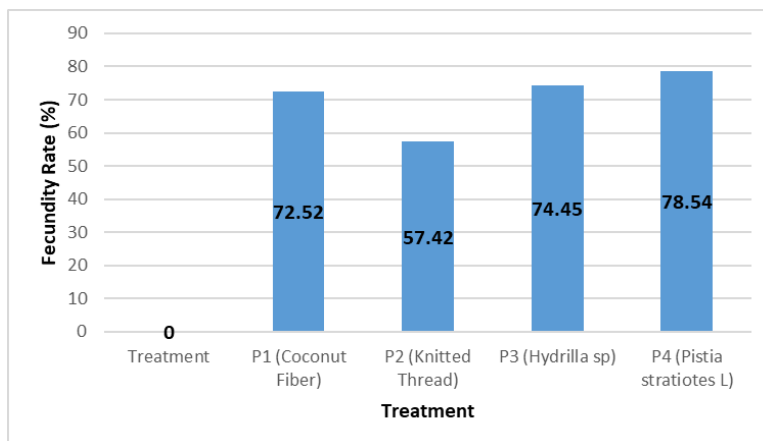
From Figure 2 above, the highest average value of eggs attached to the substrate was found in treatment P4 of *Pistia stratiotes* L with an average of 1,959 eggs, followed by treatment P3 (*Hydrilla* sp substrate) with an average of 1,925 eggs, treatment P2 (knitting yarn substrate) with an average of 1,588 eggs and the lowest in treatment P1 (coconut fiber substrate) with an average of 1,303 eggs. The high number of eggs attached to *Pistia stratiotes* L substrate and *Hydrilla* sp substrate is thought to be because these plants have many long downward roots, have soft roots, and have a branched root system making it easier for the female to attach her eggs. This is to Fajrin's (2012) statement; (Yufika *et al*, 2019); which states that the high or low number of eggs attached to the substrate is influenced by the cleanliness and number of fiber sheets to

which the eggs are attached, where the more substrate the higher the number of eggs attached. Meanwhile, the hatchability of eggs on knitted yarn and coconut fiber substrates is relatively low, because the media to which the eggs are attached has the characteristics of a stiff and hard substrate, so the eggs do not succeed in sticking well to the substrate.

Based on the results of the analysis of variance (ANSIRA), it was found that the value of  $F_{count} > F_{table}$  at the 0.05 level, and further tests indicated that the different types of substrate in this study had a very significant effect on the number of goldfish (*Carrasius auratus*) eggs attached to the substrate.

#### Hatchability of Goldfish Eggs

The hatchability of goldfish fry eggs during the research is presented in Figure 3.



**Figure 3.** Hatchability of Eggs with Different Substrates in Goldfish (*Carrasius auratus*). (The same superscript letter in the diagram indicates results that are not significantly different with  $P < 0.05$ ).

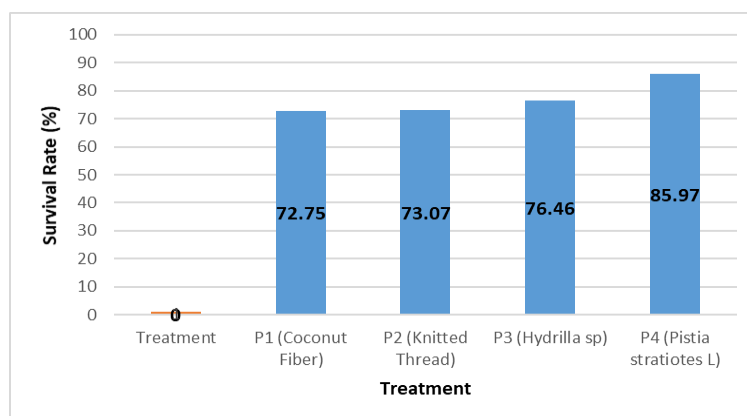
Based on Figure 3, the highest egg hatchability was in treatment P4, namely *Pistia stratiotes* L substrate at 78.54%, followed by P3 substrate *Hydrilla* sp at 74.45%, P1 coconut fiber substrate at 72.52%, and the lowest was in treatment P2, namely knitting yarn substrate of 57.42%. The high hatchability of eggs in treatments P4, P3, and P1 is thought to be due to the large number of eggs being fertilized by sperm. Apart from that, the condition of the goldfish broodstock with mature gonads and good water quality also plays an important role in this research. This is in line with the opinion of Aidil *et al* (2016) who stated that the hatchability of fish

eggs will determine the quality of the larvae produced, where good egg quality is greatly influenced by internal factors of the parent and external environmental factors.

The results of analysis of variance (ANSIRA) showed that  $F_{count} < F_{table}$  at the 0.05 level, indicating that the different types of substrate in this study had no significant effect on the hatchability of goldfish (*Carrasius auratus*) eggs.

#### Goldfish Survival

The survival of goldfish during the study is presented in Figure 4 below.



**Gambar 4.** Average Survival of Goldfish (*Carrasius auratus*). (The same superscript letter in the diagram shows no significant difference in results with  $P < 0.05$ )

The survival value of goldfish (*Carrasius auratus*) in each treatment during the study showed that the average survival rate in treatment P4, namely *Pistia stratiotes* L substrate, was 85.97%, then in treatment P3, the *Hydrilla* sp substrate was 76.46%, P2 knitting yarn substrate was 73.07%, in the P2 treatment coconut fiber substrate was 72.75%. Based on the results of the analysis of variance, it was found that the substrate treatments had no significant effect on the survival of goldfish.

The survival value of the four treatments was relatively high, this is thought to be because the larvae that hatched were able to adapt well to the existing environmental conditions. According to Oktavianti (2021), factors that influence larval resistance are food factors and environmental factors.

#### Water quality

The results of water quality measurements are presented in Table 1.

**Table 1.** Water Quality Data During Research

TREATMENT	Water quality			
	Temperature (oC)	pH	DO	Ammonia
P1 Coconut fiber	23,85	6,28	6,17	0,38
P2 Knitting Yarn	26,95	6,92	6,67	0,42
P3 <i>Hydrilla</i> sp	23,95	6,25	6,03	0,34
P4 <i>Pistia stratiotes</i> L	25,79	6,68	6,05	0,39

From Table 1 above, the temperature values obtained for each treatment range from 23 to 26.95°C. This value is considered optimal to support goldfish productivity. This is the opinion of Wihardi, *et al* (2014); Haris, *et al* (2018); Haris, *et al* (2019) stated that a good temperature for cultivating fish from the Cyprinidae family ranges from 25°C to 30°C. For pH, the values obtained ranged from 6.25 to 6.92. Allegedly able to support the productivity of goldfish. This is in line with the research results of Yufika, *et al* (2019); Safri *et al* (2020) obtained a pH value in the range of 6.28 to 7.2, where this value is still within the optimum pH limit for goldfish. The DO value is in the range of 6.03 to 6.67. This value is able to support the productivity of goldfish. This is the opinion of Siagian (2009) in Ramadhan, *et al* (2020) which states that dissolved oxygen content plays a very important

role for organisms in waters for the process of nutrient oxidation in the body. The ammonia value obtained in this study was 0.34 to 0.42. According to Ramadhan, *et al* (2020), based on PP RI No. 82 of 2001 concerning Water Quality Management and Water Pollution Control, it is explained that the ammonia content for fisheries activities is <0.02 mg/L. The high value of ammonia in each treatment is thought to be caused by the metabolic remains of the fish undergoing the decomposition process.

The water quality values during the research were still considered good to support the productivity of goldfish as indicated by the success of goldfish broodstock in spawning, laying eggs, and the presence of live larvae. This statement is reinforced by Laila *et al* (2020) who say that water quality factors play an important role in the hatching of goldfish eggs. The presence of goldfish

laying eggs indicates that the water quality during the spawning process is in the appropriate range and there are no problems.

## CONCLUSION

From the results of the research, it can be concluded that the highest use of substrate as a target for attaching goldfish eggs was on *Pistia stratiotes* L substrate with a total of 1,959 eggs, the highest number of fertilized eggs was obtained on the *Hydrilla* sp substrate (treatment P3) at 65.65%, the highest number of hatched eggs on the *Hydrilla* sp substrate (treatment P3) was 78.54%, the highest survival rate on *Pistia stratiotes* L substrate (treatment P4) was 85.97% and the results of water quality analysis during the research supported the productivity of goldfish seeds.

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