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GOLDFISH HATCHERY TECHNIQUES (Carassius auratus) AT THE KEPANJEN MALANG AQUACULTURE INSTALLATION

Teknik Pembenihan Ikan Koki (Carassius auratus) di Instalasi Perikanan Budidaya Kepanjen Malang

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ABSTRACT

Kepanjen Aquaculture Installation (IPB) is one of the fish growers located in Kepanjan, Malang district. This research focuses on the management of cook fish filling techniques with the aim of ensuring that the filling technique carried out by the community can be done well and get quality seed yields. This study took samples from the Plant for Cultivated Fisheries (IPB) that were carried out for 40 days using samples of 5 different types of cooked fish. This method of research uses an explorative descriptive approach, namely by describing a result in research, but the result of research is not used as a general conclusion. There are several measurement indicators performed in the filling technique: 80% Hatching rate (HR), Survival Rate (SR) 89,01%, Daily Growth Rate Calculation (SGR) with a value of 0.012133 grams/day, Fekundity of 785 grains, Absolute Weight and Absolute Length measurements, Food Supply Management and Water Quality Management. It is driven by the level of water quality, temperature as well as excellent pool management installation. As well as the pesticide and disease treatment techniques that are performed are very helpful at the time of the rejuvenation process.

Keywords: Goldfish, Hatchery, Cultivation

ABSTRAK

Instalasi Perikanan Budidaya (IPB) Kepanjen adalah salah satu tempat budidaya ikan koki yang berlokasi di Kepanjen, Kabupaten Malang. Penelitian ini terfokus kepada teknik pengelolaan pembenihan ikan koki dengan tujuan agar teknik pembenihan yang dilakukan oleh masyarakat dapat dilakukan dengan baik dan mendapatkan hasil benih yang berkualitas. Lokasi Penelitian ini mengambil sampel di Instalasi Perikanan Budidaya (IPB) Kepanjen yang dilakukan selama 40 Hari dengan menggunakan sampel ikan koki sebanyak 5 dengan jenis yang berbeda-beda. Metode penelitian ini menggunakan pendekatan deskriptif eksploratif, yakni dengan menggambarkan suatu hasil dalam penelitian, namun hasil dari penelitian tidak digunakan sebagai sebuah kesimpulan yang umum. Terdapat beberapa indikator pengukuran yang dilakukan dalam teknik pembenihan yang dilakukan yakni pengukuran *Hatching rate* (HR) sebesar 80%, pengukuran *Survival Rate* (SR) 89,01%, perhitungan Laju Pertumbuhan Harian

(SGR) dengan nilai 0,012133 gr/hari, Fekunditas sebanyak 785 butir, pengukuran Bobot Mutlak dan Panjang Mutlak, Manajemen Pemberian Pakan dan Manajemen Kualitas Air. Hasil yang didapatkan dalam penelitian ini yakni teknik pembenihan yang dilakukan masih menggunakan teknik pembenihan alami dan hasilnya sangat memuaskan dengan tingkat penetasan berkisar 80% pada saat masa pembenihan. Hal ini didorong dengan tingkat kualitas air, suhu serta pengelolaan kolam instalasi yang sangat baik. Serta teknik pengobatan hama dan penyakit yang dilakukan sangat membantu pada saat proses pembenihan berlangsung.

Kata Kunci: Ikan Koki, Pembenihan, Budidaya

INTRODUCTION

Koki fish (*Carrasius auratus*) is one of the many types of ornamental fish cultivated by Indonesian people (Apriani *et al.,* 2023). The unique shape and color make it a special attraction which is the reason why ornamental fish are in great demand among ornamental fish lovers ranging from children to adults, ordinary hobbyists to ornamental fish collectors (Manurung *et al.,* 2017).

During the Covid-19 pandemic, sales of goldfish in Indonesia experienced a significant increase, both from cheffish farmers, middlemen, and retail traders who gained a large turnover from selling goldfish which had high economic value during the pandemic (Septiara *et al.,* 2021). During the pandemic, more sales were bought and sold on a large scale ranging from 200-500 fish so that the prices obtained were cheaper, consumers also came from businesses cultivating and marketing ornamental fish. The fish sold by middlemen have uniform sizes and types, because they will be remarketed by ornamental fish marketers (Ummung & Roswiyanti, 2022).

Currently, there are still few Indonesian people who are interested in cultivating goldfish, both on a small and large scale, this is in contrast to the very high demand for goldfish from abroad (Risdawati, 2021). One factor in the lack of interest among Indonesian people in cultivating goldfish is that the facilities and infrastructure they have are still inadequate (Kordi, 2009).

When cultivating goldfish, Indonesian people can look to farmers in Thailand. Thailand is famous for its quality goldfish seeds which will allow Indonesians to breed Thai goldfish with local parents. This is done so that the goldfish chicks produced are of high quality and have a high market selling price. As is known, the selling price of goldfish varies depending on the type and types, such as market, fancy, and HQ goldfish which are usually used as contest events (Daelami, 2001).

Based on data from the East Java Maritime and Fisheries Service, goldfish production in Malang Regency in 2021 is 5.38 tons, while data according to pond cultivation and types of fish in city districts is 145,225,000 fish and data according to quarterly data is 92,008,980 fish. Farmers themselves in the city of Malang have as many as 50 ornamental fish cultivators (Dinas Kelautan dan Perikanan Provinsi Jawa Timur, 2021).

Until now, goldfish spawning is still done naturally, so the success of spawning is still low compared to artificial spawning. This failure can be influenced by several factors, including lack of care in selecting broodstock whose gonads are truly mature and ready to be spawned and failure to stimulate broodstock ovulation, resulting in less than optimal spawning. There are several factors that influence the success of fish cultivation, namely in terms of feed, use of biotics and integrated cultivation methods (Syamsunarno & Sunarno, 2016). Behind the decline in production levels, in fact there are still many people in Malang district who seek goldfish directly from farmers. Due to the decreasing level of goldfish production in Malang Regency and the increasing public demand for goldfish, one solution that can be taken is to maximize goldfish cultivation techniques. It is hoped that the correct technique can restore goldfish

production levels in Malang Regency.

METHODS

This research activity was carried out at the Kepanjen Cultivation Fisheries Installation, Malang Regency, East Java for 40 days, from 1 February to 12 March 2023. The samples used in this research were Koki fish and water hyacinth as objects in the research. There are several observation parameters carried out in this research, namely: 1) Hatching rate (HR), 2) Survival Rate (SR), 3) Daily Growth Rate (SGR), 4) Fecundity, 5) Absolute Weight, 6) Absolute Length, 7) Feed Management. 8) Water Quality Management. Carrying out these parameters requires several tools and materials such as a pool measuring 50×30×40 cm3, water hose and mirror hose measuring 1/2 inch, Seser, pH meter with specifications 0.01, DO meter type 550A and digital scales.

The method used in this research is an exploratory descriptive method. This technique is used to describe a result in research, but the results of the research are not used as a general conclusion (Arikunto, 2010). In this research, the author is always directly involved in all activities carried out at the Kepanjen Aquaculture Installation (IPB) with several techniques used to collect research data, namely using observation, interviews and active participation methods.

RESULT

The Kepanjen Aquaculture Installation (IPB) is a cultivation site under the East Java Province Maritime and Fisheries Service which is located on Jalan Trunojoyo No.12 Kepanjen, Malang Regency. IPB Kepanjen has an area of 40 ha which includes 20.53 ha of swimming area including reservoirs and water inlets, 2.5 ha of office area and 16.5 ha as a hatchery and housing for IPB employees. In cultivating goldfish, IPB Kepanjen does not only cultivate 1 type of goldfish, but there are several types such as Oranda goldfish, Ryukin goldfish and Rancu goldfish.

Research Procedure

Goldfish Hatchery Techniques

In hatching goldfish, the Kepanjen Aquaculture Installation (IPB) uses several hatching techniques so that the results from hatching goldfish can be of high quality. The following are the stages in the fish hatchery technique at the Kepanjen Aquaculture Installation (IPB).

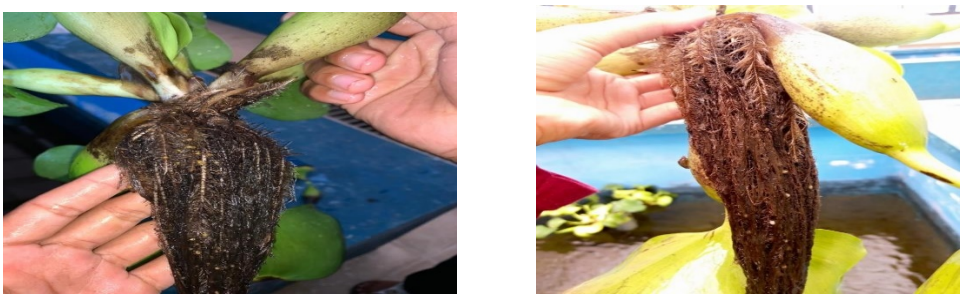
1) Preparation of Goldfish Spawning Ponds
   In spawning goldfish, the basic thing that must be done is to prepare a concrete pond that is equipped with a hatchery. The pool provided has a height of 1 meter with a surface area of 2 x 3 meters and a water capacity of around 25-30 cm.
2) Selection of Goldfish Broodstock
   The process of selecting goldfish is a very important thing to do before spawning parent goldfish. The broodstock that is spawned is 8 months old and has characteristics such as the appearance of white spots on the chest, and if it is rough then it can be confirmed that it is male, whereas if it feels smooth to the touch it indicates it is female. After separating the male and female, the spawning step for the male is to massage his urogenital organs until they produce white fluid, while for the female, this is by feeling the abdomen, if it

feels soft and bloated then the female is ready to be spawned by moving the female to the spawning pool.

(1) **(2)**

Figure 1. Difference Between Male Cheffish (1) dnd Female Cheffish (2)

3) Care of Parent Goldfish
This broodstock maintenance can be done by cleaning the pool by changing the installation water regularly at least once every two weeks. Furthermore, feeding is carried out routinely in the morning and evening. The feed given to the broodstock is pf25 pellets and silk worms.
4) Goldfish spawning process
The spawning process carried out at the Kepanjen Cultivation Fisheries Installation is carried out naturally, namely by bringing the male and female broodstock together into a pond that has been prepared for spawning, such as placing the water hyacinth plant as a place for the eggs to attach. This spawning process is carried out by placing a male Ryukin type goldfish with 2 female goldfish of the same type. This spawning system is carried out with a fish number ratio of 2:1 with an estimated time required of approximately 24 hours.
5) Embryo Fertilization
After the spawning process is carried out, the next step is embryo fertilization. This is done by separating the goldfish broodstock from the eggs and moving the broodstock to a rearing tank while the eggs remain in the pond. The maintenance of these eggs lasts for 3 days before they hatch into larvae and they are given running water every day so that the water in the pond remains stable. Fertilized eggs are characterized by their bright yellow color, while unfertilized eggs are milky white (Darmawan, 2001).



(1) **(2)**

Figure 2. Difference Between Fertilized Eggs (1) and Unfertilized Eggs (2)

6) Care of Goldfish Larvae
Treatment of goldfish larvae is done by feeding Artemia sp. every morning and evening. This feeding is carried out using a non-decapsulation method, namely by using a salinity of 20 ppt with several additional ingredients such as 4 liters of water, 80 grams of salt and

Artemia sp. A total of 4 grams. The dosage of this material is only carried out in 1 artemia culture and one culture can be used for up to 3 days during the larval feeding period. The artemia culture process is carried out for 24 hours until the artemia hatch and is given aeration for 24 hours.

7) Nursery
The nursery or fish rearing process is after the larvae are 21 days old which are then moved into a pond in the form of a concrete tank measuring 140x140x45 cm3. The newly hatched larvae will be left in the egg hatching container until they are 1 week old, then after the larvae are one week old the larvae will be stocked into the larval rearing pool for 21 days or three weeks into the cleaned rearing pool.

Figure 3. Cheffish Nursery Pond

Hatching Rate (HR)

Hatching rate is the hatchability of eggs or the number of eggs that hatch (Putri *et al.,* 2022).

$$HR = \frac{Number\ of\ eggs\ hatched}{Number\ of\ fertilized\ eggs} \times 100$$

$$= \frac{628}{785} \times 100\%$$

$$= \mathbf{80\%}$$

So the hatchability of eggs is estimated to be around 80% in one fertilization period.

Survival Rate (SR)

Survival rate is an index of the survival rate of a type of fish in a cultivation process.

$$SR = \frac{Number\ of\ live\ fish}{Initial\ stocking\ number\ of\ fish} \times 100\%$$

$$= \frac{559}{628} \times 100\%$$

$$= \mathbf{89.01\%}$$

It can be concluded that the fish survival index is 89.01%

Daily Growth Rate (SGR)

It can be interpreted as changes in fish weight, size and volume over time (Arifaldianzah *et al.,* 2022).

SGR (%/Day) = Wt – w0 : T x 100
= 0.396 – 0.032
= 0.0364: 30 days
= 0.012133 gr/day

Fecundity (F)

Fecundity is a calculation of the number of mature eggs in the ovaries that will be released during spawning (Harianti, 2013). In carrying out the calculations, data on the weight of the male and female parents is needed both before and after spawning. The following is the data obtained by the author during the research process:

Table 1. Measurement of Parent Weight

No	Weight of male parent before and after spawning	Weight of female parent before and after spawning
1.	42 gr ~ 40 gr	14 gr ~ 12 gr
2.	26 gr ~ 24 gr	18 gr ~ 15 gr
3.	20 gr ~ 19,3 gr	-
4.	28,6 gr ~ 28 gr	-

F = (Wg/Ws) x N
= (5 gr / 1gr) x 157 grains
= **785 eggs** (2 broodstock)

Absolute Length and Weight

In calculating the length and weight, data on the length and weight of the goldfish is absolutely necessary. The author has recorded the length and weight of 5 fish samples which were calculated during the research. The following is the goldfish measurement data that the author obtained during the research.

Table 2. Measurement of Length and Weight of Koki Fish

Fish Measurement Data (5 daily)	Fish 1		Fish 2		Fish 3		Fish 4		Fish 5	
Observation Date	**P (cm)**	**B (gr)**	**P (cm)**	**B (gr)**	**P (cm)**	**B (gr)**	**P (cm)**	**B (gr)**	**P (cm)**	**B (gr)**
February 6th 2023	0.9	0.03	0.9	0.03	0.9	0.03	0.9	0.03	0.9	0.04
February 11st 2023	1.5	0.19	1.6	0.32	1.1	0.11	1.1	0.11	1	0.05
February 16th 2023	2.3	0.31	1.5	0.38	1.9	0.15	1.5	0.11	1.5	0.09
February 21st 2023	2	0.26	1.5	0.21	2.4	0.39	1.5	0.14	2	0.17
February 26th 2023	2	0.22	1.5	0.23	1.7	0.41	2	0.17	1.5	0.17
March 3rd 2023	2.4	0.33	2	0.16	2.5	0.42	2	0.31	3	0.76
Average	**1.74**	**0.202**	**1.4**	**0.234**	**1.6**	**0.218**	**1.4**	**0.112**	**1.38**	**0.104**

Absolute length (PM) is measured using a measuring ruler. Absolute length growth can be calculated using the formula (Balqis, 2021) **PM = Lt - L0**, so the results for absolute length in 5 fish samples are obtained as follows.

Table 3. Results of Absolute Length of Goldfish

Absolute Length	The Final Result
Fish 1	1.5
Fish 2	1.1
Fish 3	2.47
Fish 4	1.1
Fish 5	2.1

Absolute Weight (BM) measurement is carried out using the formula **PM = Wt - W0**, so the results for absolute weight are obtained as follows.

Table 4. Absolute Weight Results for Koki Fish

Absolute Weight	The Final Result
Fish 1	0.3
Fish 2	0.13
Fish 3	0.39
Fish 4	0.28
Fish 5	0.72

Feeding Management

Feeding functions as a source of energy used for body maintenance for fish (Mulyadi & Usman, 2010). The food given to goldfish, especially larvae, varies depending on the age and mouth opening of the larvae. Generally, larvae that are 3 days old are fed Naupli Artemia for 3 weeks regularly. The frequency of feeding is determined by the species and size of the fish as well as several factors that influence the fish's appetite (Tahapari & Ningrum, 2009). When the larvae reach the age of 21 days, they will be fed silk worms for 1 week. Feed was given ad libitum with a feeding frequency of twice a day. Providing consumption of live food is beneficial for achieving growth and survival in goldfish (Gupta & Banerjee, 2009)..

Water Quality Management

To maintain water quality in the Kepanjen Aquaculture Installation (IPB) pond, this is done by measuring temperature, DO, pH and TDS which is carried out every five days for one month of maintenance. Measuring these parameters will influence the goldfish's metabolic processes, such as the activity of finding food, the digestive process and growth of the goldfish.

1) TDS Measurement

   TDS measurements are carried out in maintenance pools routinely every five days, namely in the morning, afternoon and evening. Temperature measurements can be done using a TDS meter. The TDS measurement results can be seen in the following graph.

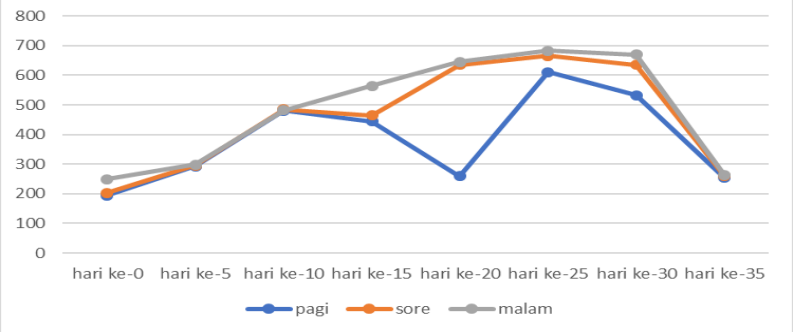


Figure 4. Graph of TDS Measurement Results

From the graph above, it can be concluded that the water concentration level is higher at night and the highest occurs on the 25th night. This proves that the level of compounds in the water will exceed its maximum on the 25th day.

2) Temperature Measurement

Temperature observations in the pool are carried out every five days, namely in the morning, afternoon and evening. Temperature measurements can be made using a DO meter. The results of the dissolved temperature measurement can be seen in the following graph.

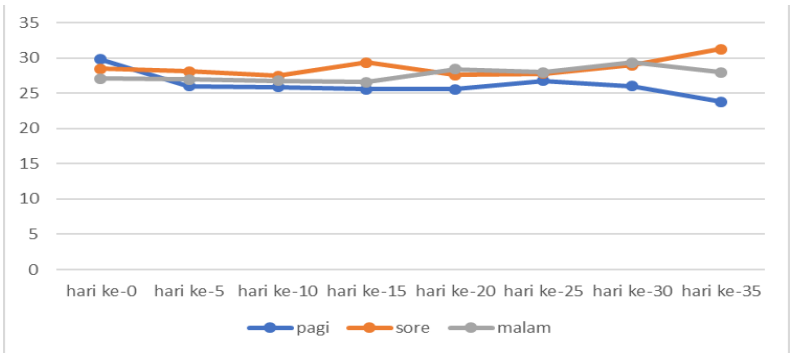


Figure 5. Graph of Temperature Measurement Results

From the measurement data above, it can be seen that the temperature in the installation pool will increase in the afternoon, the highest temperature is in the afternoon, precisely on the 35th day with a temperature above 30 degrees. Meanwhile, the majority of low temperatures occur in the morning with the lowest temperature occurring on the 35th day with a temperature level below 25 degrees.

3) DO Measurement

Dissolved oxygen (DO) measurements are carried out once every five days, namely in the morning, afternoon and evening using a DO meter. The following is a graph of dissolved oxygen measurements in the installation pool.

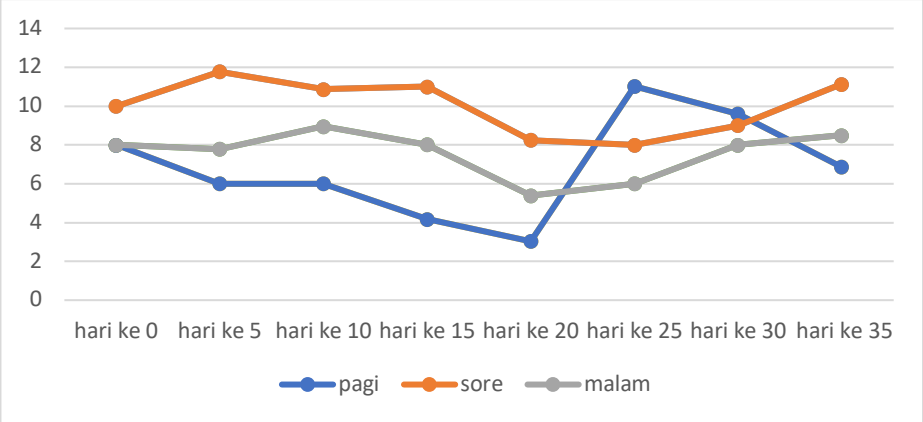


Figure 6. Graph of DO Measurement Results

It can be seen that low oxygen levels occur more often in the afternoon and low oxygen levels occur more often in the morning. The peak occurred on day 20, namely the dissolved oxygen level was below 4 mg/liter and the highest level occurred on day 2, namely 12 mg/liter.

4) Measurement of the Degree of Acidity (pH)
pH measurements were carried out twice a day in the morning and evening. The way to measure pH is by taking water from the cultivation pond using a long dipper then dipping the pH meter as an electrode into the pond water, waiting a few seconds and showing a constant number to get the calculation number.

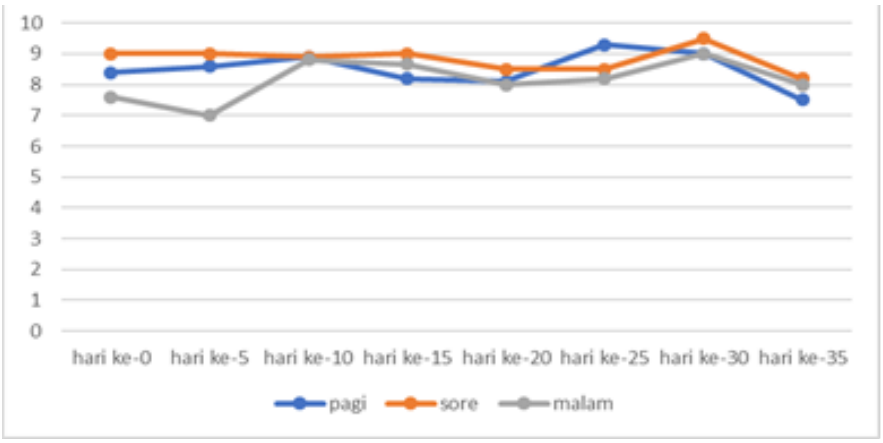


Figure 7. Graph of pH Measurement Results

From the graph above, it can be concluded that the pH in goldfish ponds tends to be good because the pH ranges from 7-8.5, which is still in the category suitable for cultivation because no goldfish died during the maintenance process.

Cookfish Pests and Diseases

Obstacles in the fish farming process include the presence of pests and diseases. Pests found at the Kepanjen Malang Aquaculture Fisheries Installation, East Java were snail eggs attached to the edge of the pond, wild fish, moss bacteria Aeromonas sp. fungi, anchor lice, and turtle lice. These pests are detrimental and can disrupt the survival of chefs. Goldfish that are infected with the disease are usually treated with killer lice using a dose for ornamental fish, namely 1-5 ppm dissolved in water, namely at a ratio of 1 mg/liter of water or 0.001 grams/liter.

DISCUSSION

The goldfish hatchery at the Kepanjen Aquaculture Installation (IPB) uses several hatchery techniques so that the results from the goldfish hatchery can be of high quality. Several stages are carried out for hatching goldfish consisting of 6 stages, namely 1) Preparing the spawning pond, 2) selecting broodstock, 3) spawning and caring for goldfish, 4) Fertilizing embryos, 5) caring for fish larvae and finally 6) nursery.

From several stages of breeding goldfish, there are several parameters that must be carried out so that the results obtained are in line with expectations. Regarding the Hatching Rate (HR) calculation carried out, it can be said that the hatching capacity of the eggs will reach 80% of the hatching rate during 1 fertilization period, this means that the hatching rate of goldfish eggs is quite high. In the Survival rate (SR) parameter, the survival rate of goldfish after hatching is 89.01%, which means that the survival rate of goldfish in the installation is good with many fish surviving after hatching. In terms of Daily Growth Rate (SGR), it can be seen that the volume and weight rate of goldfish is 0.012133 gr/day. This indicates that the fish will increase every day even though the growth is not much. Based on table 2 which was carried out using 5 goldfish samples, it can be seen that the length and weight of each fish are not the same. In the first observation (6 February 2023) all goldfish had almost the same length and weight, namely 0.9 cm long and 0.3 gr. In the second observation (11 February 2023), fish growth was starting to be seen, namely fish 2 was quite significant with a length of 1.6 cm and a weight of 0.32 grams. This can be influenced by several factors, both in terms of water temperature and the feed provided. At the last measurement (3 March 2023) the growth of the fish was quite clear and could be compared with the 5 fish sampled in terms of these parameters. The most significant growth was seen in fish 5 with a length of 3cm and a weight of 0.76g, while the fish experiencing slow growth was fish 2, namely with a length of 2cm and a weight of 0.16g.

Based on the results of observations for 35 days, goldfish fry have different growth, and their growth is unstable between one fish and another fish. This can be caused by many factors, one of which is the quality of the pool water. Researchers have also made observations of water quality, namely by measuring TDS levels, temperature measurements, DO measurements and water acidity (pH).

TDS level observations were carried out 3 times a day, namely in the morning, afternoon and evening. This is done to determine the density of particles dissolved in water. It can be seen in Figure 4 that the TDS level graph carried out by researchers experienced a significant increase on the 35th day, both in the morning and afternoon. This level of particles will be the key to successful growth in goldfish. This can be seen in table 2 that the goldfish experienced an overall increase on the 24th night (21 February 2023). So it can be concluded that the high level of water concentration has an effect on the growth of the goldfish.

Apart from TDS measurements, researchers also measured temperature levels using a DO Meter which can be seen in Figure 5. From the temperature measurement data it can be interpreted that the more stable the temperature from morning to night will affect the growth of goldfish. Low temperatures will slow down the fish's metabolism, resulting in a decrease in the fish's appetite and slow fish growth. Therefore, normal temperatures from morning to night can accelerate the metabolic rate in fish, namely this happens on day 25. This is in accordance with table 2 that on day 25 the growth in length and weight of fish is stable from the 5 fish samples used.

When observing dissolved oxygen (DO), it was found that higher oxygen levels occurred in the afternoon. Generally, a good DO level for fish farming is 4-6mg/L (Mariam & Supriyono, 2018). From the observation results, the DO level occurred on days 10 to 15. According to the observation results, it can also be seen that a good time for fish metabolism is in the morning with oxygen levels ranging from 4-7mg/L.

From the results of pH measurements in the same fish pond carried out for 35 days, it shows that the pH level is still considered suitable for use in fish cultivation. The pH of water that is good for fish cultivation is around 6-7 pH (Marbun & Darma, 2013). High pH levels will cause damage to fish cell membranes, which usually ranges from 9-10 pH. From Figure 7 it can be seen that the pH level in the pond does not exceed the maximum pH limit, so it can be said that the pH of the water in the fish pond is suitable for use.

From several parameters measured to determine the factors that influence the growth rate of goldfish, researchers also observed obstacles in goldfish cultivation, one of which is pest and disease attacks in goldfish cultivation. The results of the observations found several pests, namely snail eggs attached to the edge of the pond, wild fish, moss bacteria Aeromonas sp. fungi, anchor bugs, and tortoise bugs are pests. This pest is very detrimental and can disrupt the survival of goldfish (Effendi, 1997). Steps that can be taken by farmers if they find goldfish infected with pests are using flea killer medication with a dose for ornamental fish, namely 1-5 ppm dissolved in water, namely in a ratio of 1 mg/liter of water or 0.001 grams/liter. This can be a medicine if the goldfish is attacked by pests during its growth period.

CONCLUSION

Based on the research results, it can be concluded that there are five types of goldfish cultivated at IPB Kepanjen, namely oranda panda, oranda tricolor, oranda red white, rancu, and ryukin. Regarding the hatching technique used, IPB Kepanjen still uses natural hatching techniques. Using this natural technique can produce good hatchability, namely 80%, while the survival rate for goldfish is 89.12%, which is included in the high category and is suitable for cultivation. This routine morning and evening feeding is very important to maintain the fish's nutritional needs. Regarding water quality during maintenance, it tends to be quite good, namely pH ranging from 7-8.5, TDS 200-600 ppm DO 6-8mg/L and temperature ranging from 25-28°C so that during maintenance, no fish die (Afandi *et al.,* 2023) for cleaning the pool, namely cleaning it once a week.

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