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Koi Fish (*Cyprinus carpio*) Nursery Techniques at the Batu Kumbung Lingsar Fish Seed Center, West Lombok

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ABSTRACT

Koi fish is one type of freshwater fish that is classified as an ornamental freshwater fish that has economic value in the national and international markets. Efforts to develop koi fish cultivation cannot be separated from the breeding stage such as enlargement and nursery activities. One of the koi fish cultivation places in West Lombok Regency is at the Batu Kumbung Lingsar Fish Seed Center, so it is necessary to know what nursery techniques are applied there considering its good production. The activity was carried out for approximately 30 days at the Batu Kumbung Lingsar using a descriptive method. The results of the activities obtained were that in the koi fish nursery technique at the Batu Kumbung Lingsar Fish Seed Center, it started from pond preparation (drying, fertilization, liming, filling with water), parent selection, spawning, nursery and feeding. The pond drying is done for 2 days, liming, fertilization, and filling with water are done for 1 day, the weight of the parent that is ready to spawn is 1.5 kg for the male parent while for the female parent 4 kg, the ratio of the parent used is 2:1 where 6 male and 3 female broodstocks, the nursery is done at the age of 2 days with the results of the offspring spread in the nursery as many as 5000 larvae, and the feeding technique uses the ad satiation method.

INTRODUCTION

Indonesia's natural resources are so abundant. Starting from land and water natural resources. One of them is the diversity of freshwater fish species, especially ornamental fish species. Kusrini *et al*. (2015) stated that freshwater ornamental fish are estimated to be around 400 species out of 1,100 ornamental fish species in the world. One of the introduced freshwater ornamental fish commodities that is still a favorite in the international market and is an expensive ornamental fish group, and the fluctuations in the market are relatively stable is koi fish (*Cyprinus carpio*).

Koi fish is a type of freshwater fish that is classified as an ornamental freshwater fish that has economic value in the national and international markets. This fish has an attractive body color and an ideal body shape, so its sales prospects are good. In addition, Andriani et al. (2019) stated that indicators of beauty in ornamental fish can be seen in their bright colors, physical shape and completeness, behavior, and health conditions or stamina. So, this makes koi fish a superior commodity for ornamental freshwater fish.

Lombok Island has great potential in the development of the koi fish farming sector in NTB. The cultivation locations are spread across several districts, including East Lombok,

Central Lombok, and West Lombok. It is known that in West Lombok Regency, koi fish (*Cyprinus carpio*) are among the superior commodities. The prospects for developing this type of freshwater ornamental fish are very good because the existence of koi fish farming activities certainly has a positive impact on the economic sector of the surrounding community. One of the koi fish farming places in West Lombok Regency is at the Batu Kumbung Lingsar Fish Seed Center. The koi fish farming process carried out here until the koi fish reach a certain size is then marketed for sale so that it can generate profits and have a positive impact on the economic sector.

Efforts to develop cultivation cannot be separated from the breeding stage such as rearing activities, nursery and so on. The availability of adequate seeds and offspring in terms of quantity, quality and continuity must be guaranteed so that efforts to develop organism cultivation can run well. One of the obstacles in koi fish cultivation efforts is the low survival rate and relatively slow fish growth. According to Joko (2013), nursery is a follow-up activity after spawning where fish larvae will be separated from the parent. Nursery needs to be done to get good quality seeds before being spread in the rearing pond with the aim of reducing the mortality rate and getting seeds with uniform sizes. Therefore, efforts to properly nurse koi fish as carried out at the Batu Kumbung Lingsar Fish Seed Center are very necessary to know in order to get quality seeds.

METHODS

The activity was carried out for 30 days starting from June 24 to July 24, 2023 at the Batu Kumbung Fish Seed Center, Lingsar District, West Lombok. The data obtained during the activity included primary and secondary data. Primary and secondary data were obtained through observation, active participation, interviews and literature studies. Furthermore, the data was analyzed and described descriptively. The tools and materials used in the activity can be seen in table 1.

Tabel 1. Tools and Materials

Tools	Materials
Aerator	Freshwater
Stationery	Koi Fish Seeds
Tub	Ijuk
Hoe	Plastic Bags
Camera	PSP Feed
Sack	Pellet
Sickle	Manure
Strainer	
Seser	

RESULTS AND DISCUSSION

Pond Preparation

Pond preparation activities at the Batu Kumbung Lingsar Fish Seed Center West Lombok are carried out in spawning ponds and also nursery ponds. Pond preparation includes pond drying, liming, fertilization, and filling with water. This is in accordance with the statement of Nurhalisa (2018) which states that several activities in pond preparation include drying,

repairing embankments, making kemalir, liming, fertilization, eradicating pests and diseases and filling with water. In this Field Work Practice activity, it can be seen that the pond used is a soil pond with a soil embankment or commonly known as a traditional pond for spawning ponds, namely with a pond size of 7 x 8 m2. While for the nursery pond, a semi-intensive pond is used, namely a pond based on soil with a concrete embankment measuring 3 x 7 m². This is in accordance with Prayuginingsih's statement (2018) which states that traditional ponds are ponds made entirely of soil and the embankments are also made of piles of soil, good soil to use is clay and non-porous soil, because this type of soil can hold large amounts of water and is able to provide nutrients for fish nutritional needs. The advantage of this traditional pond is that there is a lot of taro growing around the pond so it is not difficult to get green feed for fish. This is also in accordance with Nurhalisa's statement (2018) which states that earthen ponds with wall embankments are also called semi-intensive ponds. This pond is more durable and long-lasting.

Pool Draining

The pond drying activity at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center is carried out on the spawning pond and nursery pond, namely by removing all the water in the pond through the outlet pipe. Drying the pond takes 2 days. The bottom of the pond that is dry is marked by cracked soil. How quickly the pond dries depend on the hot sunlight. The purpose of drying the bottom of the pond is to kill bacterial material that can cause fish to get sick and toxins remaining during previous cultivation activities. This is in accordance with Hasibuan's statement (2021) which states that drying activities assisted by sunlight help kill most pathogenic organisms, besides drying can also release toxic gases in the pond. This is also in accordance with Mustajib's statement (2018) which states that pond drying aims to improve the pond, eliminate toxic compounds and decompose organic matter.

Liming

Liming activities at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center were carried out 1 time by spreading it at the beginning of pond preparation. Liming was given throughout the bottom of the pond. Liming was carried out for only 1 day, the liming process was carried out in the spawning pond and also in the nursery pond. The lime used in this field work practice activity was dolomite lime with a dose of 25 grams/m^2 for the spawning pond with a pond area of 7 x 8 m^2, while for the nursery pond a dose of 15 grams/m2 was used with a pond area of 3 x 7 m². It can be seen that dolomite lime is very good for increasing soil pH and neutralizing acidity levels. The liming process is in the morning at 09.00 WITA in this dolomite lime reaction, water (H_2O) and CO_2 concentration are needed. In the morning the CO_2 level is quite high so that the reaction is very easy. This reacted lime will bind to the soil packaging source and carry it into the soil to be deposited. This is in accordance with Hasibuan's statement (2021) which states that liming fish farming ponds aims to increase soil pH. And this is also in accordance with Dwiyanto's statement (2014) which states that liming aims to kill pests, parasites, and fish diseases. The type of lime used for liming is agricultural lime ($CaCO_3$) or dolomite lime. The lime is spread evenly over the surface of the pond bottom soil. After liming is complete, the pond bottom soil is turned over using a hoe.

Fertilization

Fertilization activities at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center at the bottom of the pond are intended to increase pond fertility. Fertilization is also carried out to grow phytoplankton and zooplankton as natural food. This is in accordance with the statement of Dwiyanto (2014) who stated that fertilization is useful for providing a medium for growing natural food and nutrients for plankton which are natural food for fish. Organic fertilizer is an

environmentally friendly fertilizer in providing nutrients to support the growth of phytoplankton and zooplankton. The fertilizer used during the PKL activity is manure in the form of chicken manure, with a dose of 500 grams/m2 for the spawning pond, and 250 grams/m2 for the nursery pond. Fertilization activities are carried out by spreading chicken manure evenly on the bottom of the nursery pond assisted by filling it with water and is carried out only 1 day at the beginning of pond preparation, fertilization is carried out in the morning at 09.00 WITA. The use of chicken manure is more effective and more efficient compared to other organic fertilizers because it has been provided by the Batu Kumbung Lingsar Lombok Barat Fish Seed Center. Chicken manure contains nutrients in the form of phosphorus, nitrogen and potassium which are useful for growing phytoplankton, but the only weakness of chicken manure is that chicken manure is considered susceptible to carrying disease germs. This is in accordance with the statement of Kurniawan (2020) which states that chicken manure has nutrients that are very useful for fish farming activities. Chicken manure that has dissolved in water can grow quite useful microorganisms such as protozoa, bacteria, paramecium and so on.

Pool Water Filling

The activity of filling the pond water at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center is carried out after the liming and fertilization activities are completed. Filling the pond water is done by opening the inlet channel to enter water. The flowing water is taken from a small ditch channel. Water is put into the spawning pond and nursery pond up to a height of 40 cm so that the fish get a good oxygen supply and can continue their lives. If the water quality decreases or increases, it will cause the accumulation of leftover feed, organic materials, organic compounds and other hazardous substances. This is in accordance with Dwiyanto's statement (2014) which states that filling the pond water is carried out when the liming and fertilization activities have been completed. Usually, the pond water is filled with a water height reaching 40-50 cm from the bottom of the pond.

Broodstock Selection

Selection of broodstock at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center is carried out to select broodstock that will spawn and to find out which broodstock are ready to spawn. Broodstock selection is carried out by netting fish, after being selected by observing several parts of the koi's body and gonad maturity as an indication of being ready to spawn. The characteristics that must be considered in broodstock selection are that the broodstock is not disabled, in good physical condition, agile body movements, complete body parts and has sharp colors and clear patterns, age and weight are also included in the requirements for broodstock selection. The weight of the male broodstock used is 1.5 kg while for the female broodstock it is 4 kg, where to find out the maturity of the gonads, stripping is carried out on the broodstock. In this field work practice activity, the types of koi broodstock used are tancho, showa, and sanke, while for the age of the broodstock, the male is 2 years old and the female is 2.5 years old. This is in accordance with the statement of Nurhayati et al. (2022) which states that parent selection is carried out by selecting parents that have mature gonads, which are characterized by agile movements, rough operculum, slender body, and if stripping is carried out, it will release a white liquid (sperm) in the male parent. While in the female parent it is characterized by a large or bloated stomach, smooth operculum and if stripping is carried out, it will release a yellow liquid. In addition, age and weight are also requirements for parent selection, at least 2 years for males with a body weight of 1-2 kg and 3 years for females with a weight of 4-5 kg. It can be seen that the individuals or populations selected are not based on

their ability to adapt to the environment but based on the superiority of their characteristics, for example fast growth, high resistance to disease, and others.

Spawning and Hatching of Eggs

Spawning carried out at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center is natural spawning. Natural spawning is spawning that is carried out without human intervention. This is in accordance with Lukman's statement (2021) which states that natural spawning is spawning that is carried out without the help of stimulation or hormone induction. Natural spawning is fairly easy to do, namely by uniting the male and female parents in one place. The distribution of koi fish parents is carried out in a 7 x 8 m2 earthen pond and uses a 1x1.5 m kakaban as a place for the eggs to stick. The time for spreading the parents is carried out in the morning at 09.00 WITA, because the temperature conditions in the pond water are considered stable. Spawning was carried out during field work practices 1 time. The ratio between male and female parents that were spawned was 2:1, where 6 male parents and 3 female parents. As usual, time for koi fish to spawn is from 22.00 to dawn. This is in accordance with the statement of Nurhayati *et al*. (2022) which states that the koi fish spawning process is carried out in a natural spawning pond. And this is also reinforced by the statement of Rizqi (2018) which states that koi fish spawn at 22.00 to dawn marked by the activity of the male parent chasing the female parent. The female parent will release eggs towards midnight in the kakaban and is followed by the male parent releasing white sperm fluid.

Egg observations were carried out at 07.00 WITA at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center in the spawning pond, koi fish eggs were seen attached to the kakaban, then the koi fish parents were moved from the spawning pond. The purpose of separating the parents after spawning is so that the newly attached eggs are not eaten by the koi fish parents. After spawning, the fertilized eggs will stick to the prepared kakaban, then the male and female parents are moved back to the parent pond. After that, the eggs that have stuck to the kakaban will be moved to the hatchery, namely the egg hatching place. Fertilized eggs are considered good if they are bright yellow because bright yellow fish eggs have embryos, while pale white eggs are damaged eggs or cannot hatch. The time required for hatching koi fish eggs is 2 days. This is in accordance with Iskandar's statement (2021) which states that the characteristics of fertilized eggs are yellow and clear while unfertilized eggs are milky white, the eggs will hatch in 48 hours. This is also in accordance with the statement of Hendriana et al. (2021) it can be seen that the number of larvae produced from a spawning is influenced by the hatching rate. Hatching rate is the number of eggs that hatch from the total eggs that are successfully fertilized. The number of eggs produced from koi fish spawning is an average of 116,452 eggs, while the percentage of koi fish hatching normally ranges from 50-80%. Observations on hatched eggs are carried out after fertilization until no more eggs hatch. Eggs that hatch are marked by their rotating movement on the surface of the water, while eggs that do not hatch are cloudy yellow and sink to the bottom of the substrate. Egg hatchability is influenced by internal factors, namely the quality of eggs and sperm, as well as external factors, namely the environment including temperature, dissolved oxygen, pH, and ammonia. The high and low values of egg hatchability (HR) can affect cultivation production, if the HR value obtained is high, it will be able to produce high fish larvae so that it can maximize cultivation production.

Nursery

Nursery activities at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center are carried out after the eggs hatch in the spawning pond ward then the kakaban is lifted and moved to the koi fish nursery pond, then after the eggs hatch in the spawning ward the fish larvae are

taken using a seser and placed in a tub that has been given water then moved to the prepared pond by pouring it slowly because the larvae are very weak so that the larvae do not die quickly, the size of the larvae is 0.5 cm and is 2 days old. Spreading is done in the morning so that the seeds that are spread do not die because if it is done during the day then at that time the pool temperature is quite high and is more susceptible to temperature shock. The pond used is a pond with a soil base and concrete embankments (semi-intensive pond) with a pond size of 3 x 7 m2 with a spread of 5,000 thousand seeds. After one week of sampling, the size of the koi larvae obtained was 2.2 cm at the age of 7 days, in the second week the size of the koi larvae obtained was 4 cm at the age of 14 days and in the third week the size of koi fish was 5.5 cm at the age of 21 days which indicates good koi fish growth (Figure 6). Koi fish growth graph is shown in the figure. It can be seen that the length measurement activity on koi fish seeds is taken every week for sample growth. This is in accordance with Erwin's statement (2019) which states that 21 days the seeds are 5-7 cm in size and the nursery process is carried out in a pond based on the ground. This is in accordance with Joko's statement (2013) which states that nursery requires determining the stocking density so that the survival rate and change of the larvae that are stocked remain optimal. In addition, stocking density is a limiting factor that can affect the survival rate, larval quality, production costs and time units.

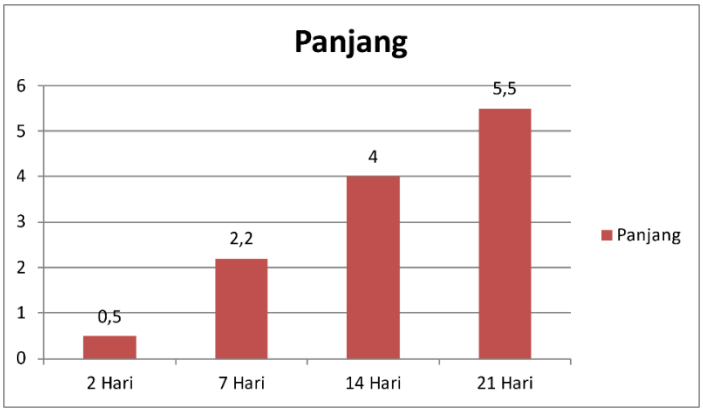

Figure 1. Length Growth Chart

According to Bayu & Fasya (2022), survival rate is the percentage of the number of live fish at the end of the observation compared to the number of fish at the beginning of hatching. Factors that affect the survival of koi larvae include the availability of food, water quality, environmental temperature, the most important thing in the survival of fish seeds is determined by food reserves (egg yolk) and environmental factors, this is because the egg yolk is a source of energy during embryogenesis and after larvae hatch. The fairly fluctuating temperature conditions are also thought to be another factor in the survival of koi larvae. The survival rate (SR) value of larvae is 50-60%, because larval phase is a critical phase in cultivation.

Feeding

Feeding in the nursery pond at the Batu Kumbung Lingsar Lombok Barat Fish Seed Center is one of the important factors in supporting fish maintenance. The availability of feed is one of the supporting factors in the success of fish farming efforts. The feed given must be digestible, in accordance with the mouth opening of the fish and have high efficiency. Feeding during this PKL activity is carried out twice a day where the feeding is carried out using the ad satiation method (feeding until full). This is in accordance with Ahda's statement (2014) which

states that the use of the ad satiation method aims to ensure that all feed given is eaten up by the fish, this causes the feed to be consumed optimally and prevents the remaining feed that is not eaten by the fish so that it is expected to produce optimal growth. If the fish do not respond to the feeding, the feed distribution is automatically stopped because it is assumed that the fish are full. The feed given in koi fish nursery activities is the PSP type with a protein composition of 37%. The type of feed given for this nursery is in accordance with the mouth opening of the fish because the feed can affect the growth of the fish and has a very good protein content. This is in accordance with Riska's statement (2019) which states that the factor that affects fish growth is the protein content in the feed because protein functions to form new tissue for growth and replace damaged tissue.

Water Quality

Water quality parameters are one of the most important parameters in koi fish cultivation management. Water as a cultivation medium plays an important role in the growth and health of koi fish. Poor water quality can cause cultivation failure, conversely, if the water quality is optimum, it can support growth and prevent disease. This is in accordance with the statement of Bayu & Fasya (2022) which states that koi fish maintenance has several requirements that must be met. One of them is water quality as a medium for maximum koi fish growth. There are environmental and water requirements that are benchmarks for water quality, namely temperature. Optimal temperature for cultivation to support the life and development of aquatic organisms is around 25-30℃. The temperature that can cause fish to die and is dangerous is not extreme temperatures, but sudden changes in temperature from natural temperatures, causing death. The next most important water quality parameter is pH. It can be seen that the pH of koi fish waters ranges from 7.0 - 7.9, indicating a tendency for neutral pH and is good for supporting fish growth. The existence of pH can function as a buffer system for the balance of chemical compounds in water, the next parameter is DO or dissolved oxygen where the optimal DO is between 5.85 - 7.68 mg / L, this value is still normal for the maintenance of koi fish broodstock and seeds. The availability of DO in waters can affect the fish activity cycle, feed conversion, and growth rate. While the next water quality parameter is ammonia where the maximum value of ammonia levels is 0.02 mg / l, ammonia levels that are too saturated can reduce the quality of life of koi fish. This indicates that the waters are safe from ammonia and do not cause toxicity to fish.

CONCLUSION

Based on this activity, it can be concluded that the koi fish nursery technique at the Batu Kumbung Lingsar Fish Seed Center Lombok Barat starts from pond preparation (drying, fertilizing, liming, filling with water), parent selection, spawning, nursery and feeding. Pond drying is carried out for 2 days, liming, fertilizing, and filling with water are carried out for 1 day, the weight of the parent ready to spawn is 1.5 kg for the male parent while for the female parent 4 kg the ratio of the parent used is 2:1 where 6 male parents and 3 female parents, nursery is carried out at the age of 2 days with the results of the offspring spread in the nursery as many as 5000 larvae, and the feeding technique uses the *ad satiation* method.

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