Jurnal Pertanian Terapan of JURNAL ROCE (AGROSCIENCE)
https://jurnal.rocewisdomaceh.com/index.php/roce *e-ISSN : 3032-4505*
Vol. 1 No.2 Thn. 2024

THE EFFECT OF DIFFERENT DOSES OF PROBIOTICS IN COMMERCIAL FEEDINGS ON THE SURVIVAL AND LENGTH OF KOI FISH (*Cyprinus rubrofuscus*) SEEDS

PENGARUH PERBEDAAN DOSIS PROBIOTIK PADA PAKAN KOMERSIL TERHADAP KELANGSUNGAN HIDUP DAN PANJANG BENIH IKAN KOI (*Cyprinus rubrofuscus*)

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Article Info

Article history :
Received
14 – 07 – 2024
Received in revised
15 – 07 – 2024
Accepted
21 – 07 – 2024
Available online
23 – 07 – 2024

Abstract

This study aims to determine the growth of Koi (*Cyprinus rubrofuscus*) with the addition of probiotics. This research was carried out in the wet laboratory of the study program for Teknologi Produksi Benih dan Pakan Ikan Politeknik Indonesia Venezuela, from March to April 2024. The method used was a laboratory experimental method and a nonfactorial completely randomized design (CRD) consisting of 4 treatments and of 4 replications viz. based, namely A (control), B (3 ml addition of probiotics), C (6 ml addition of probiotics), and D (9 ml addition of probiotics). Based on the results of observations in the field for an average survival value of 100%. The results showed that the use of probiotics for Koi fish hatchery media had no significant effect on the survival of Koi fish, so further tests were carried out to determine the best treatment for producing Koi fish length and weight growth, it was known that probiotics were the best treatment in this study.

Keywords **:** *Cyprinus rubrofuscus, probiotics, growth, fish high.*

Abstract

Penelitian ini bertujuan untuk mengetahui pertumbuhan pada ikan Koi (*Cyprinus rubrofuscus*) dengan penambahan probiotik. Penelitian ini dilaksanakan di Laboratorim Basah Program Studi Teknologi Produksi Benih dan Pakan Ikan Politeknik Indonesia Venezuela pada bulan Maret-April 2024. Metode yang digunakan adalah metode eksperimental laboratorium dan Rancangan Acak Lengkap (RAL) non faktorial yang terdiri dari 4 perlakuan dan 4 ulangan yaitu A (Kontrol), B (3% penambahan probioti), C (6% penambahan probiotik), D (9% penambahan probiotik). Berdasarkan hasil pengamatan di lapangan untuk nilai kelangsungan hidup rata-rata 100%. Pertumbuhan panjang mutlak memiliki nilai tertinggi yaitu sebesar 1,98 cm dan nilai terendah yaitu 1,70 cm, sedangkan Laju Pertumbuhan Spesifik memiliki nilai tertinggi yaitu 0,33 cm dan nilai terendah yaitu 0,024, Rasio Konversi Pakan memiliki nilai tertinggi yaitu 12,88 sedangkan nilai Rasio Konversi Pakan terendah yaitu 5,53. Hasil penelitian menunjukkan penggunaan probotik untuk media pembenihan ikan Koi tidak berpengaruh nyata terhadap kelangsungan hidup ikan Koi, sehingga dilakukan uji lanjut untuk mengetahui perlakuan terbaik dalam menghasilkan pertumbuhan panjang dan berat ikan Koi, diketahui bahwa probiotik merupakan perlakuan terbaik dalam penelitian ini.

Kata Kunci : *Cyprinus rubrofuscus*, probiotik, pertumbuhan dan panjang ikan.

INTRODUCTION

Ornamental fish cultivation in Indonesia currently one of the priorities which is expected to be a source of growth for the fisheries sector, seen from the available natural resources to be able to encourage the development of the fisheries sector. Koi fish (*Cyprinus rubrofuscus*) is one of the leading freshwater fish commodities which is very popular and has high economic value. Koi fish (*Cyprinus rubrofuscus*) is one of the leading commodities of freshwater fish. So Koi fish (*Cyprinus rubrofuscus*) have quite a large market, both domestically and abroad, with quite high selling values (Bastian, 2018).

Koi fish (*Cyprinus rubrofuscus*) have several beneficial properties for aquaculture such as cheap Koi fish seeds, large size of each individual, relatively easy to cultivate, beautiful color and body pattern of the fish and a high selling price when large (Leny, 2017). Not many Koi fish (*Cyprinus rubrofuscus*) as a fishery commodity with high economic value are cultivated properly so there is a lot that must be observed with cultivation techniques so that the cultivation activities carried out can be successful.

Ornamental fish cultivators always harvest in stages, this is because the size of the ornamental fish when stocked is the same even though the growth varies. Engineering and efforts have been made to accelerate the growth of Koi fish (*Cyprinus rubrofuscus*) to be very good. Ornamental fish cultivators use high-protein food and provide natural food such as worms, snails, and so on. Several fish farms such as tilapia, catfish, and others, providing probiotics have had benefits in accelerating fish growth.

Probiotics are living microorganisms that have many benefits for other living creatures. Tarigan and Meiyasa (2019) stated that the microorganisms contained in probiotics can help digest food in the animal's body so that food containing probiotics will be able to be digested and absorbed by the body. In addition, this probiotic can increase the body's immunity from disease attacks. According to Yisa et al., (2015) adding probiotics to artificial feed can increase the protein content of the feed and achieve microbial balance in the digestive tract.

Probiotics can also be used for fish farmers, where probiotics are mixed with fish feed. This mixture can be made with artificial feed from factories or natural feed found in nature. So adding probiotics to fish feed will produce more protein than feed that is not given prebiotics. This can be seen in previous research, where probiotics given to fish cultivated for consumption will produce significant results (Sumianto and Chilmawati, 2015). This probiotic is an additional food (supplement) in the form of live microorganisms that have a beneficial effect on the host who consumes it by balancing the flora of intestinal microorganisms in the digestive tract. Therefore, this study aims to provide different doses of probiotics with commercial feed mixtures to obtain survival and growth rates (length) of Koi fish (*Cyprinus rubrofuscus*) seeds.

RESEARCH METHODS

This research was conducted in March to April 2024 at the Laboratory of Program Studi Teknologi Produksi Benih dan Pakan Ikan Politeknik Indonesia Venezuela, Aceh Besar. The

tools used in this research are an aquarium that functions as a research vessel, a cellphone camera that functions as research documentation, an aerator that functions to increase oxygen, a ruler that functions to measure the length of Koi fish seeds and an activity stationery functions to record research results. Meanwhile, the materials used in this research were purchased Koi fish (*Cyprinus rubrofuscus*) as a research sample of 160 fish, probiotics functioned as additional feed, and factory fish feed (commercial feed) functioned as fish food.

This research uses experimental methods, according to Setyanto (2020), there is an experimental method, namely to test the influence of one variable on other variables or test the relationship between one variable and another variable. The variables in this study were Koi fish (*Cyprinus rubrofuscus*) seeds that were given commercial feed with a mixture of different doses of probiotics. The analytical method for this research used a Completely Randomized Design (CRD) with 4 trials and 4 trials, resulting in 16 units. The treatments carried out in this research were:

A = Without use of probiotics (control)
B = Use of probiotics as much as 3 mg/l
C = Use of probiotics as much as 6 mg/l
D = Use of probiotics as much as 9 mg/l

The results of the research will be further tested using *Duncan* with a confidence interval of 95%. The parameters of this research looked at survival rate (SR), absolute length growth, specific growth rate, and feed conversion ratio. This parameter is calculated using the following formulation:

1. Survival Rate (Survival Rate/SR)

Survival is the percentage of the number of live fish at the end of rearing compared to the number of fish at the beginning of stocking, the formulation can be seen as follows (Effendie, 1979):

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

Information :

SR : Survival (%)
Nt : Number of koi fish at the start of rearing (tails)
No : Number of fish at the end of rearing (tails)

2. Absolute Length Growth

Absolute length growth is calculated by the development of fish length every day during research. This is very important to know to determine the growth rate of fish during cultivation. The formula for knowing the length of a fish is (Effendie, 1979):

$$L = LT - Lo$$

Information :

L : Absolute length growth (cm)
Lt : Final maintenance length (cm)

Lo : Initial maintenance length (cm)

3. Specific Growth Rate

Specific growth rate (LPS) is carried out by weighing seed samples to determine the weight growth of fish seeds about the feed given. Weighing seed samples is done using a digital scale. According to Effendie, (1979), it is calculated using the following formula:

$$LPS = \frac{LnWt - LnWo}{T}$$

Information :

LPS : Specific growth rate
Wo : Initial research fish biomass weight (grams)
Wt : Fish biomass weight at the end of the study (grams)
T : Duration of research (days)

4. Feed Conversion Rate

Feed Conversion Ratio (FCR) is the ratio of the amount of feed consumed to the increase in body weight. According to Effendie, (1979), feed conversion uses the following formula:

$$RKP = F : (Bt - Bo)$$

Information :

RKP : Feed Conversion Ratio
F : Amount of fish feed given during the study
Bt : Biomass of fish seeds at the end of the study
Bt : Biomass of fish seeds at the start of the study

RESULTS AND DISCUSSION

The results and discussion of this research are seen from the survival rate, absolute length growth, specific growth rate, and FCR in the treatment of probiotics in commercial feed, namely as follows:

1. Survival Rate (Survival Rate/SR)

The survival rate is a comparison between the initial number of organisms at the time of stocking until the end of the study. The survival rate results will produce a percent value. Looking at a good survival rate, that is, there are still a lot of fish alive compared to the dead. Suminto and Chilmawati, (2015) also stated that if the fish survival rate is 50% it is in the good group and if the survival rate is only 30 - 50% it is in the medium group and if the survival rate is less than 30% then it is declared not good. Therefore, the results of the survival rate of Koi fish (*Cyprinus rubrofuscus*) can be seen in Figure 1 below:

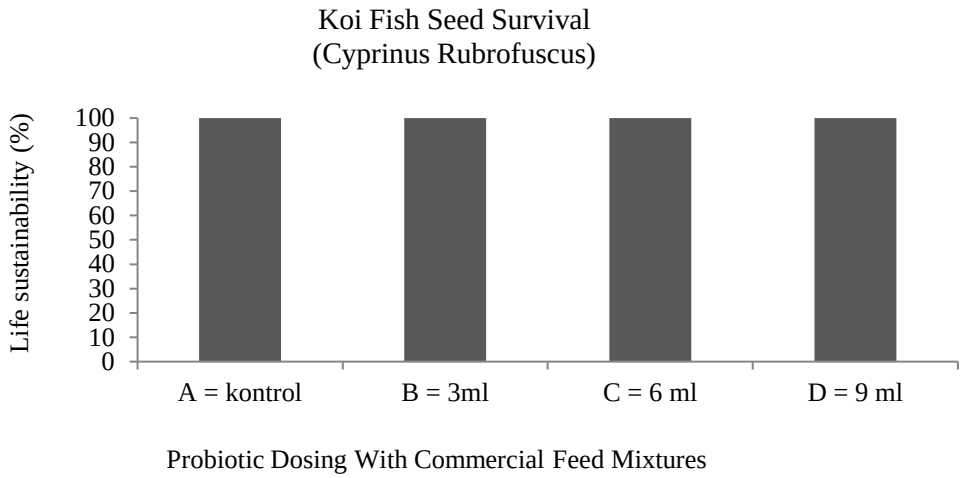

Figure 1. Survival of Koi Fish Seeds (*Cyprinus rubrofuscus)*

Figure 1 shows that the AD treatment has a figure of 100%, meaning that the survival rate of Koi fish (*Cyprinus rubrofuscus*) seeds when adding probiotics with a mixture of commercial feed is declared good. The survival of Koi fish seeds (*Cyprinus rubrofuscus*) is suspected to be successful because the initial steps of the experiment were carried out well, namely first being quarantined before the trial was carried out. It is possible that this results in the Koi fish (*Cyprinus rubrofuscus)* not experiencing stress so that the survival of the Koi fish (*Cyprinus rubrofuscus)* has a perfect value.

Good fish survival is influenced by good cultivation management such as stocking density, water quality, parasites, or disease (Arief *et al*, 2011). Fish feed that has good nutrition plays an important role in maintaining the survival and accelerating the growth of Koi fish (*Cyprinus rubrofuscus*) seeds during the research. As a medium for living Koi fish seeds (*Cyprinus rubrofuscus*), good water quality plays an important role in efforts to increase fish growth. Rimalia, (2016) also stated that one of the criteria for good water quality is that it suits the needs of each type of fish. Apart from that, the addition of probiotic bacteria in feed can improve the immune system of Koi fish seeds (*Cyprinus rubrofuscus*) because probiotic bacteria can produce anti-bacterial compounds such as bacteriocins found in *Bacillus cereus*. Bacteriocins are peptide compounds that function as antibacterial compounds (Inayah *et al*, 2017). With the presence of anti-bacterial compounds and good water quality, Koi fish will have a stronger immune system against pathogenic bacteria and their survival rate will increase or they will not die at all. Antibacterial is a compound that is used to inhibit bacteria. Antibacterials are usually present in an organism as secondary metabolites. The mechanism of antibacterial compounds is generally carried out by damaging cell walls, changing membrane permeability, disrupting protein synthesis, and inhibiting enzyme action (Umasugi *et al.*, 2018).

2. Absolute Length Growth

Absolute length growth is seen from the length of the biota observed in this study. This study will discuss the absolute length growth of Koi fish (*Cyprinus rubrofuscus*) seeds. By adding commercial feed with the addition of probiotics. The observation results can be seen in Figure 2:

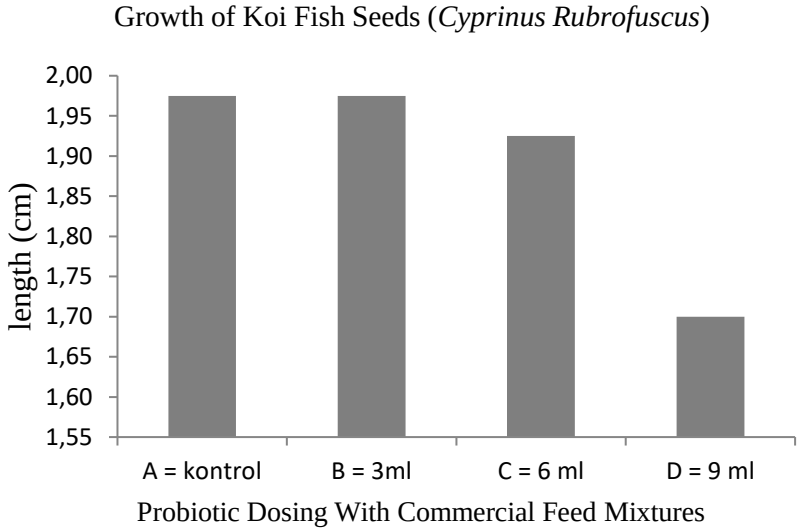

Figure 2. Absolute Length Growth of Koi Fish (*Cyprinus rubrofuscus)*

Figure 2 shows the absolute length growth of containers A (control) and B (3 ml dose) of 1.98 cm, which is the treatment with the highest absolute length, followed by treatment C (6 ml dose) which has an absolute length value of 1.93 cm and in container D (9 ml dose) had the lowest absolute length value, namely 1.70 cm.

Based on the analysis of variance (ANOVA) on the treatments given probiotics in commercial feed, it can be concluded that the AD treatment had a significant difference in the absolute length growth of koi fish (*Cyprinus rubrofuscus*) seeds. Observation results, Koi fish seeds (*Cyprinus rubrofuscus*) in treatment D (9 ml) the body length was not visible when weighed in treatment containers A (control), B (3 ml), and C (6 ml). Mudeng *et al.,* 2020 state that increasing the number of bacteria in too much feed can cause the bacteria to sporulate more quickly so that the function and activity of the *Lactobacillus sp bacteria.* Becomes not optimal and the absorption process also becomes not optimal. So the results of the follow-up test showed that Treatment D (9 ml) was significantly different from treatments A (control), B (3 ml), and C (6 ml).

3. Specific Growth Rate.

The pecific growth rate of Koi fish seeds (*Cyprinus rubrofuscus*) by adding probiotics to commercial feed, namely looking at the specific growth rate. Results of the growth rate of Koi fish seeds (*Cyprinus rubrofuscus*) with the addition of probiotics can be seen in Figure 3, namely:

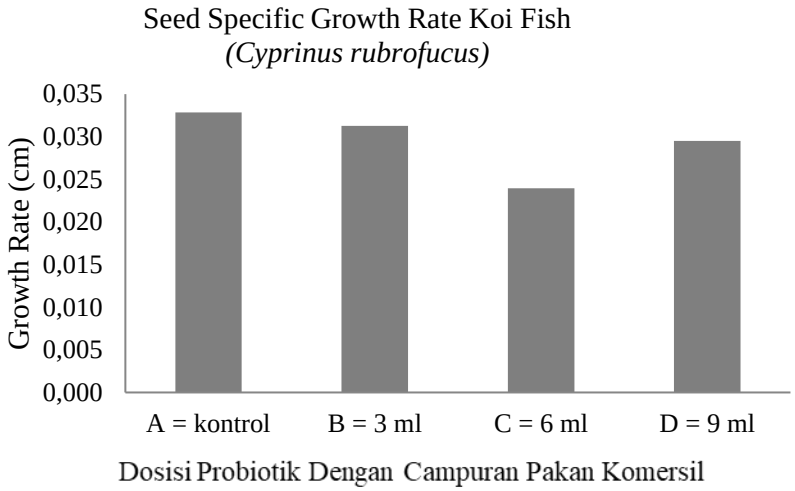

Figure 3. Specific Growth Rate of Koi Fish (*Cyprinus rubrofuscus*) Seeds

Figure 3 shows that the specific growth rate in treatment A (control) has a value of 0.033 and container C (6 ml) is 0.024. This is thought to be due to excess protein which can reduce the appetite of Koi fish (*Cyprinus rubrofuscus*) seeds. Efendi *et al.*, (2004) also stated that excess protein and fat can cause fat accumulation, reducing appetite for fish. The nutritional value of feed is generally seen from the composition of nutrients and how many nutritional components are important and must be available in the feed, including protein, fat, carbohydrates, and vitamins. The results of the analysis of variance (ANOVA) on the treatments given probiotics in commercial feed can be concluded that treatments A (Control), B (3 ml), C (6 ml), and D (9 ml) did not have a significant effect on the specific growth rate of Koi fish (*Cyprinus rubrofuscus) seeds*.

Priaditia (2009), stated that growth is influenced by several factors, namely internal factors and external factors, while internal factors include hereditary characteristics, resistance to disease, and the ability to utilize food, while external factors include the physical, chemical, and biological properties of waters. Food factors and water temperature are the main factors that can influence fish growth. Suminto and Chilmawati (2015) also stated that fish growth can occur if the amount of food exceeds the need for body maintenance.

4. FCR *(Feed Conversion Ratio)*

Factors that influence a high feed conversion ratio are poor feed quality, for example, feed that is easily crushed or the smell of feed that is not stimulating will cause the feed not to be eaten by the fish. Koi fish feed conversion data during the research can be seen in Figure 4.

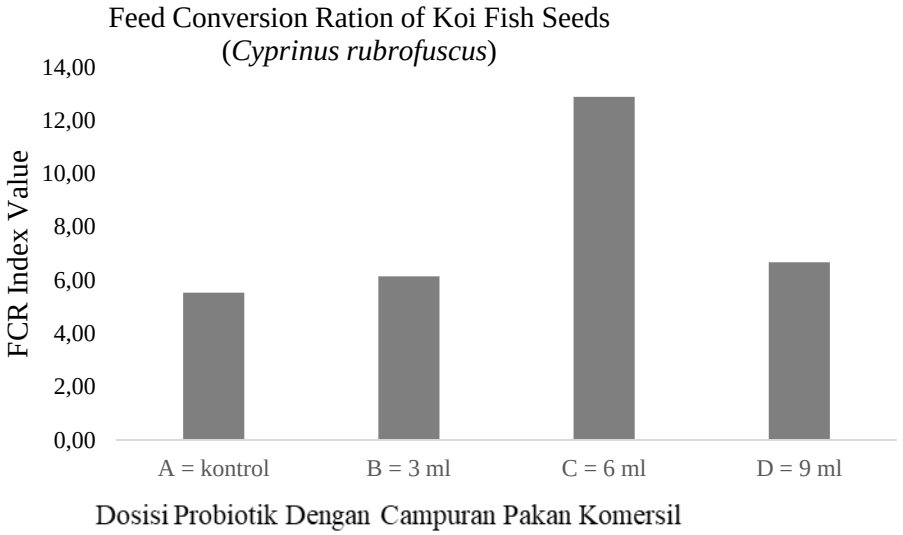

Figure 4. Feed Conversion Value (FCR) of Koi fish (*Cyprinus rubrofuscus)*

Figure 4 states that the largest Koi fish feed conversion came from Treatment C (6 ml), namely 12.88. Meanwhile, the smallest feed conversion came from treatment A (control), namely 5.53. According to Mudeng *et al.*, (2020), the feed conversion ratio value is influenced by several factors such as density, weight of each individual, age of the animal group, water temperature, and method of feeding (quality, quantity, and frequency of feeding). The large or small value of the feed conversion ratio is thought to be due to different nutrient absorption in each species, age, size, and number of test fish.

Based on analysis of variance (ANOVA), the addition of probiotics to commercial feed for treatments A (control), B (3 ml), C (6 ml), and D (9 ml) had no significant effect on koi fish feed conversion. This is thought to be caused by feed using high doses of probiotics causing bacterial density so that the function and activity of the bacteria are not optimal and the absorption process is also not optimal, in line with Mulyadi's statement, (2011) in Arief *et al*., (2015) said that adding too many bacteria to feed can cause the bacteria to sporulate more quickly so that the function and activity of the *Lactobacillus sp bacteria.* Is not optimal and the absorption process is also not optimal. Susanti (2004) said that a low feed conversion value means the quality of the feed provided is good. Meanwhile, if the feed conversion value is high, it means that the quality of the feed provided is not good. The lower the feed ratio value, the better the quality of the feed provided.

CONCLUSION

The study concluded was that there were four treatments, namely: treatment A = control, treatment B = 3 mills, treatment C = 6 mills, and treatment D = 9 mills. The results of the research showed that the survival rate of Koi fish seeds *(Cyprinus rubrofuscus)* from the four

treatments was 100%. This means that from the first time they were reared until the research was completed, no koi (*Cyprinus rubrofuscus) fish seeds died.* The results of the growth in length of koi fish seeds (*Cyprinus rubrofuscus)* in treatment D had a significant effect on the AC treatment. The values for treatments A and B reached 1.98 cm, treatment C reached 1.93cm and treatment D reached 1.70 cm. Furthermore, the specific growth rate of Koi fish seeds (*Cyprinus rubrofuscus)* was greatest in treatment A, reaching an average of 0.033 and treatment C, an average of 0.024 cm. And the largest feed conversion for koi fish seeds (*Cyprinus rubrofuscus)* was 12.88 and the smallest feed conversion was 5.53.

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