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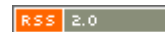
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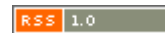
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Effect of Natural Feed Provision on the Growth of Koi Fish Seed

Mohamad Harun, Hasim Hasim, Rully Tuiyo

Abstract

This study aims to determine the effect of natural feeding of Tubifex sp, Moina sp, mosquito larvae on the growth of seeds of koi fish (*Cyprinus carpio*). This study uses a

Completely Randomized Design (CRD) using Analysis of Variance (ANOVA) with 3 treatments and 4 replications. The results showed that the best absolute length and weight growth was shown in A Tubifex sp treatment, namely absolute length 0.8 cm and absolute weight 0.51 gram. The results of analysis of various growth length and weight of koi fish have a very significant effect on growth, followed by the Least Significant Difference Test (LSD) for weight and length growth obtained at each significantly different treatment.

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Effect of Natural Feed Provision on the Growth of Koi Fish Seed

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Abstract

This study aims to determine the effect of natural feeding of *Tubifex* sp, *Moina* sp, mosquito larvae on the growth of seeds of koi fish (*Cyprinus carpio*). This study uses a Completely Randomized Design (CRD) using Analysis of Variance (ANOVA) with 3 treatments and 4 replications. The results showed that the best absolute length and weight growth was shown in A *Tubifex* sp treatment, namely absolute length 0.8 cm and absolute weight 0.51 gram. The results of analysis of various growth length and weight of koi fish have a very significant effect on growth, followed by the Least Significant Difference Test (LSD) for weight and length growth obtained at each significantly different treatment.

Keywords: koi; *Cyprinus carpio*; *Tubifex* sp; *Moina* sp; mosquito larvae; growth.

Introduction

The main problem in koi fish culture is that koi fish farming is still not optimal. Seedling stage is the most important stage because at this stage koi fish really need a very good and quality feed to support success in aquaculture. The growth of koi seeds is still relatively slow, this is likely influenced by feed factors which contain low protein content in it so that the growth of seeds is not optimal. One effort to overcome the low growth of koi fish seed is by providing the right feed in terms of size, amount, and giji content of the feed (Lingga and Susanto, 1989).

Koi fish seeds with an average length of 1-2 cm have an imperfect digestive apparatus for eating artificial feed. Therefore, the most suitable feed used as seed feed is natural food because it is easily digested, has a size that can be adjusted to the size of the mouth opening of fish seeds, and contains proteins that support growth (Djarajah, 1995).

Natural feed used in this study was *Tubifex* sp. (silk worms) *Moina* sp. (water fleas), and mosquito larvae. The feed is a feed commonly used by seed breeders. Djarajah, (1995). The use of natural food in koi seeds used in this study is distinguished in the behavior of feed in water media, such as *Moina* sp, which hovers in the middle of Rottman water media, (2003). Mosquito larvae, which are on the surface of the Daelami water media, (2001). and *Tubifex* sp, which is based on Kotpal (1980) water media. When

in Koi fish are bottom feeders and omnivores Susanto (2002).

Research Methodology

This research was conducted from February to March 2016. It was located at the Gorontalo City Fish Seed Center (BBI). Gorontalo Province.

The container used is an aquarium measuring 20 x 20 x 25 cm. Koi fish seeds used in as many as 240 individuals, stocked into 12 containers. The volume of water used is 8 liters of water. Each container is stocked up to 20 heads per container. With an average weight of ± 0.177 gm per head. with an average length of ± 2 cm per head. Test animals were obtained from fish seed centers (BBI) Gorontalo City, Gorontalo Province. *Moina* sp's natural feed is obtained from culture. The source of culture comes from the cultivation of feed culture in the Fish Seed Center (BBI). While mosquito larvae are obtained from gutters around the fish seed halls, and for *Tubifex* sp was the frozen red worms in packets purchased from ornamental fish shops.

The seeds of koi fish are fed twice a day, in the morning at 07:00 and 17:00, WITA. Feeds given at a dose of 7% in each treatment were natural feed *Tubifex* sp, *Moina* sp, and Mosquito larvae.

Aquarium cleaning using a small hose is done every two days to remove the remaining food and dirt contained in the aquarium.

The design used in this study was a completely randomized design (CRD) consisting of three feed treatments and four replications from each treatment. The treatment is feeding in the form of natural feed Tubifex sp, (silk worms), Moina sp. (water lice), mosquito larvae.

The variables observed in this research were absolute length growth, absolute weight growth and the rate of koi fish seed survival calculated according to the formula used by Arifin and Rupawan (1997). Weight growth, length gain and survival data were analyzed with the Analysis of Variance (ANOVA) test.

Results and Discussion

Absolute length growth

The results of length measurements of koi carp seeds conducted during 28 days of maintenance showed a difference in each treatment. The differences in each of these treatments can be seen in Figure 1.

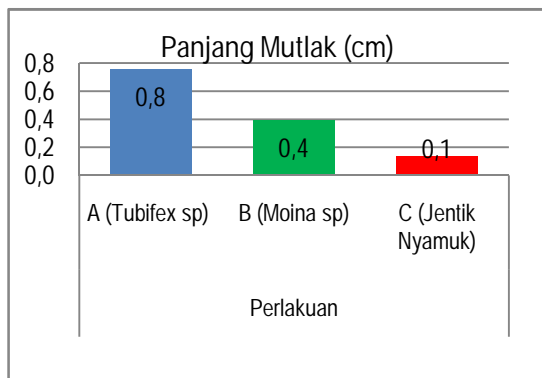


Figure 1 Average absolute length growth

Different feeding results in an average growth of a different absolute length in koi carp seeds, where the highest growth in the absolute length is obtained in treatment A (Tubifex sp), which results in an average growth of 0.8 cm, average growth the second best average absolute length was obtained in treatment B (Moina sp) which produced an absolute length growth of 0.4 cm while the smallest average absolute length growth was obtained in treatment C (Mosquito larvae) which produced an average absolute length growth of 0.1 cm.

The highest length growth in the treatment of A is due to Tubifex sp, which is a food that is on the bottom of the water (demmersal) so that the seeds are easier to consume, compared to Moina sp feeds that float in the middle of the water and feed on mosquito larvae that are on the surface of the water. Besides the movement of Tubifex sp feeds at the bottom of the waters and the distinctive odor of Tubifex sp feeds can trigger fish appetite. In addition, moina sp feed is always active and will stimulate fish seeds to eat it compared to mosquito larvae which are less active and its nature is above the surface of the water making the fish consume less. The nature of koi fish is always looking for food in the waters. According to Susanto, (2002) when in the nature of koi fish are bottom feeders (bottom eaters) and omnivores (eaters everything).

Mujiman (1984) in Tampubolon (2015) states that the movement of color and special odor of a type of feed can also affect the attractiveness and appetite of fish. High fat content can increase fish growth Subamia et al. (2003). Growth from feed Moina sp and mosquito larvae was lower than that of Tubifex sp. This is probably caused by insufficient fat from Moina sp and Mosquito larvae. If fat is insufficient then protein will be used as an energy source Subamia et al., (2003). In addition, mosquito larvae feed contains higher crude fiber 6.94%. The higher the crude fiber, the more difficult it is to digest Suhenda et al. (2003). Fish will consume feed to meet their energy needs, most of the feed is used for metabolic processes and the rest is used for other activities such as growth. Tubifex sp feed is favored by koi carp seeds because the characteristic odor of the feed can trigger the appetite of koi fish seeds, compared to Moina sp and Mosquito larvae so that it can support the absolute length growth of koi carp seeds.

Different feeds on koi carp seeds have an effect because the feed that is given is able to be consumed well by koi carp seeds which produce good growth too.

Tabel 1 Anova analysis of length of koi carp seeds

Sumber Keragaman	Db	JK	KT	F Hit	F _{tab} 1%	FK
Perlakuan	2	0.785	0.3925	94.2		
Galat	9	0.0375	0.004167		8.02	2.1675
Total	11	0.8225				

Signifikan pada taraf 0.01

Anova analysis results above show that Fcount (94.2) is greater than Ftab (8.02), then the treatment given affects the growth of koi carp seeds. Based on the results of the Least Significant Difference (BNT) test results are obtained in Table 2.

Tabel 2 Hasil Uji BNT Pertumbuhan Panjang

Perlakuan	Rata-rata Perlakuan ()	Beda Selisih		BNT (1%)
		- B	- C	
A	0.75	0.35**	0.62**	0.064
B	0.40		0.27**	
C	0.13			

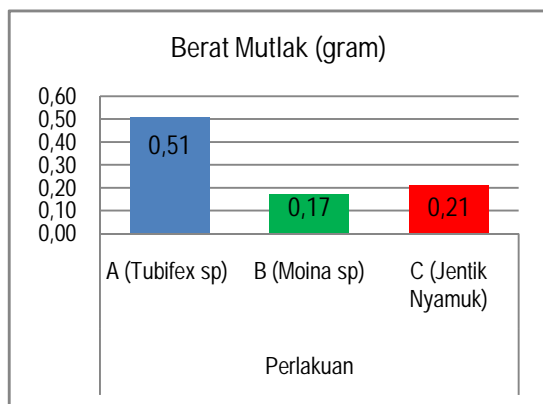


Figure 2 Average growth in absolute weight

Figure 2 shows that the highest growth weight of the highest koi carp seed mulch was obtained in treatment A (Tubifex sp), which produced an average growth of absolute weight of 0.51 grams, the second average weight growth was obtained in treatment C (Mosquito larvae) that is equal to 0.21 grams and the lowest average absolute weight growth was obtained in treatment B (Moina sp) where the average absolute weight growth was 0.17 grams.

The highest average weight growth was obtained by treatment A (Tubifex sp by 0.51%), which

produced the best growth because the feed consumed contained high protein, Tubifex sp had a higher protein content of 57.50%, while an average weight the second highest was treated C (Mosquito larvae by 0.21%), because Moina sp had a protein content of 48.72%, and the third highest average weight was obtained by treatment B (Moina sp by 0.17%), because the protein content of moina sp is only 37.38%. Feeds that contain higher protein will produce better growth compared to feed that has a low protein content, this is in accordance with the results of research Agus, et al., (2010) in Rabiati, et al., (2013) where treatments using worms silk produces the highest growth in ornamental betta fish compared to other treatments. That is because the nutrient content found in silk worms (Tubifex sp) is higher than the nutrient content found in mosquito larvae and Daphnia sp.

Besides the soft texture of meat (Tubifex sp) which is very easily digested by fish seeds also affects the level of consumption of koi carp seeds, where a high level of consumption can produce good growth as well. This is in accordance with the opinion of Soesono, (1984) in Tampubolon (2015) fish eating habits greatly affect the growth of fish, the type of feed given in accordance with fish eating habits, then the food provided can be eaten by the fish larvae, besides that it can choose food, then will choose foods that are easily digested (usually soft) rather than difficult to digest.

Tabel 3 Anova analysis of weight

Sumber Keragaman	Db	JK	KT	F Hit	F _{tab} 1%	FK
Perlakuan	2	0.2796916	0.1398458	173.		
Galat	9	0.007257	0.00080633		8.02	2.1675
Total	11	0.28694866				

Signifikan pada taraf 0.01

The above Anova analysis results show Fcount (173,434) is greater than Ftab (8.02), this shows that the different feeding provides an influence on the growth of koi carp seeds. The Least Significant Difference (BNT) test results are seen in Table 4.

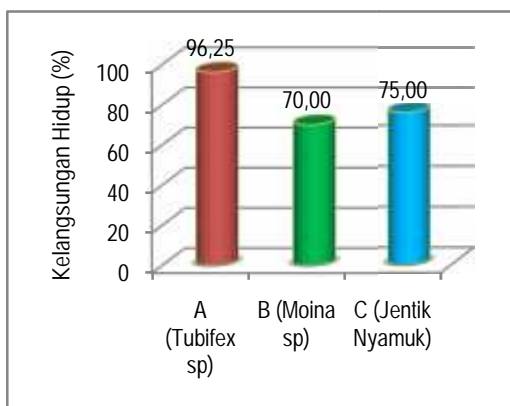
Tabel 4 Least Significant Difference for weight growth

Perlakuan	Rata-rata Perlakuan ()	Beda Selisih		BNT (1%)
		- B	- C	
A	0.51	0.34**	0.3**	0.03
C	0.21	0.04*		
B	0.17			

Then the results obtained from the koi carp seed length analysis as follows: treatment A (Tubifex sp) was very significantly different from treatment B (Moina sp) and C (Mosquito larvae), treatment C (mosquito larvae) were significantly different from treatment B (Moina sp), whereas treatment B (Moina sp) was not significantly different from all treatments.

Rate of Survival

Figure 3 shows that the highest survival rate is in treatment A (Tubifex sp) which is 96.25%, then the second survival rate is in treatment C (Mosquito larvae) that is 75%, while the smallest survival rate is obtained in treatment B (Moina sp), i.e. by 70%.



Gambar 3 Laju Sintasan Benih Ikan Mas Koi

The highest survival rate was obtained in treatment A because the feeding response of the fish to the feed is very large so that the feed given is consumed properly which can support the growth of koi carp seeds.

Water quality

In this study, several measurements of water quality, namely dissolve oxygen (DO), temperature and pH. Water quality measurements are carried out once a week, while the average calculation results per week for each treatment can be seen in Table 5.

Table 5 Results of water quality measurements during the study

Treatment	Parameters	Measurement in week					Avg.
		0	I	II	III	IV	
A	DO (mg/l)	5.1	5.1	4.9	5.4	5.0	5.1
	Temp. (°C)	28	27	27	28	28	27
	pH	7	7	7	7	7	7
B	DO (mg/l)	5.3	5.1	5.1	5.2	5.2	5.2
	Temp (°C)	27.8	28.0	26.8	26.8	27.8	27
	pH	7.0	7.0	7.0	7.0	6.8	7
C	DO (mg/l)	5.4	5.3	5.2	5.3	5.5	5.3
	Temp (°C)	28.0	27.8	27.8	28.8	27.5	28
	pH	6.5	7.0	6.8	6.8	6.5	7

Based on the results of measurements of the average water quality at each treatment for every week is still fairly good, because during the maintenance of koi carp seeds there has never been a significant change (fluctuating). So that the influence of water quality on the growth and survival of seeds is not so influential.

The oxygen content (DO) of waters in the maintenance container ranges from 5.1 to 5.3 mg / l. This is still in line with the tolerant limits for growing koi carp. According to Alex, (2013) oxygen content that is good for the life of koi carp ranges from 3-5 mg / l. Mujidman, (2001) in Tampubolon, (2015) explains that oxygen influences the feeding. Oxygen levels of less than 5 mg / l fish appetite can be lost, oxygen supply comes from aeration stones and the recirculation system is effective in water utilization and more environmentally friendly, because the water conditions used are well controlled.

The temperature of the waters in aquaculture containers ranges from 27-28 ° C. These temperatures are still included in the optimal category for the maintenance of koi carp seeds. According to Utami, et al., (2013) the temperature or water temperature is very influential on the metabolism and growth of koi fish and affects the amount of food consumed by fish. Temperature also affects dissolved oxygen in the waters. Optimal temperature for koi fish in the range of 25-30 ° C. while Rabiati, et al., (2013)

stated that for fish seed growth temperatures between 26-30 ° C are needed.

The average water pH content for each treatment in the maintenance container is around 7. Utami, et al., (2013) states that pH is the free hydrogen ion constant in a system. The pH range is set from 1 to 14, but the pH suitable for the growth of living creatures is between 5 to 8, especially for koi fish, a pH of between 7-8 is the ideal pH.

Conclusion

Anova analysis results show that Fcount is greater than Ftable, 1%, so the treatment given has a very significant effect on the growth of koi carp seeds. Tubifex sp feed produces the best growth which produces an absolute length growth of 0.8 cm and absolute weight growth of 0.51 grams. The effect of feeding Tubifex sp with different doses on the growth of koi fish seeds (*Ciprinus Carpio*).

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