TIK-6_RESPONSE OF DIFFERENT TYPES OF FEED ON SURVIVAL RATE AND GROWTH OF KOI FISH LARVAE (CYPRINUS CARPIO)

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RESPONSE OF DIFFERENT TYPES OF FEED ON SURVIVAL RATE AND GROWTH OF KOI FISH LARVAE (CYPRINUS CARPIO)

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ABSTRACT
Koi fish is one of the most sought-after and cultivated ornamental fish because it is an expensive group of ornamental fish that is excellent in the international market. The larval period is the most critical phase in fish farming because in this phase the body's resistance is still not good and it is still vulnerable to changes in environmental conditions. The purpose of this study was to determine the effect of the response of different types of feed on the survival rate and growth of koi fish larvae. This research was conducted using the experimental method and completely randomized design (CRD) with 3 treatments and 3 replications. The feed used is Daphnia sp., Tubifex sp. and commercial feed. The research parameters included survival rate, relative weight growth, relative length growth, mouth opening size and water quality. The results showed that the response of different types of feed had a significant effect on survival, relative weight growth and relative length growth. The best results were obtained for treatment A (feed daphnia sp., tubifex sp. and commercial feed) with a survival rate of 79.333%, relative weight growth with a value of 1.413.725% and relative length growth with a value of 412.282%. The water quality parameters during the study were optimal and still within reasonable limits for the maintenance of koi fish larvae.

KEY WORDS
Feed, Cyprinus carpio; daphnia sp., tubifex sp., survival rate, growth.

Indonesia has good natural resources to support the development of fish farming, including ornamental fish. Koi fish is one of the ornamental fish that is much sought after and cultivated in Indonesia (Hendriana et al., 2021). Koi belongs to the family *Cyprinidae* and the order *Cypriniformes*, which is a mutation of the ornamental carp (*Cyprinus carpio*), which is native to Asia, especially China and Japan. Koi fish is one of the expensive groups of ornamental fish which is a prima donna in international market (Kusrini et al., 2015).

Constraints in the Koi Fish farming business are the low survival rate and the relatively slow growth of fish. The growth of koi fish is very dependent on several factors, namely the type of fish, genetic traits, ability to utilize food, disease resistance and is supported by environmental factors such as water quality, feed and space for movement or stocking density (Emaliana et al., 2016).

The larval period is the most critical phase in fish farming because in this phase the body's resistance is still not good and it is still vulnerable to changes in environmental conditions. According to Pramono & Marnani (2009), the development of larvae from the endogenous feeding phase (energy source from egg yolk reserves) to the exogenous feeding phase (external energy sources) is a very vulnerable phase in the death of fish larvae. Therefore, the success of larval rearing is very dependent on the availability of suitable feed, which can be digested easily and meets the nutritional needs of the larvae (Pangkey et al., 2019).

According to Muslim et al., (2019), in the larval phase, fish are not able to adapt properly to the environment, causing a high mortality rate, because in this phase, fish have difficulty getting food that fits their mouth openings. Larvae, especially at the start of the feeding period, are highly dependent on natural food. According to Pangkey et al., (2019), the survival rate of larvae is higher when given natural feed compared to artificial feed. Daphnia sp. is a type of natural feed that is easy to cultivate and inexpensive so it can

reduce feed production costs to meet the needs of koi fish seeds. Another type of natural feed that can be used besides Daphnia sp. is the silkworm (Tubifex sp.). Silkworms have strong ability and resistance in low oxygen environments and have high nutrient content, so they can be used as an alternative feed to commercial feed which is much more expensive (Syahputra et al., 2019).

The results of Buwono et al., (2019) research stated that daphnia sp. to koi fish larvae as many as 20-35 individuals/head, are able to produce a percentage survival rate of 50.67% compared to other natural feeds Chlorella sp. (33.33%) and artemia (42.67%). Pratama (2021) in his research stated that giving Tubifex sp. to fish larvae, was able to produce an increase in growth of 13.78% compared to larvae that were only given pellets of 12.31%.

Based on the description above, it is necessary to conduct research on the response of different types of feed, so it is hoped that by giving natural food in the form of Daphnia sp. and Tubifex sp. in the larval stage, it is able to support the survival rate and growth of koi fish so that the best treatment method is known after absorption of egg yolk in koi fish larvae.

METHODS OF RESEARCH

This research was conducted from June to August 2022 at the Wet Laboratory of the Faculty of Fisheries and Marine Affairs, Lambung Mangkurat University, Banjarbaru, South Kalimantan Province. The tools used in this study were aquariums, blowers, digital rulers, digital scales, pH meters, DO meters, thermometers and ammonia test kits while the materials used were Koi fish larvae, Daphnia sp., Tubifex sp. and pellets.

This research was conducted using the experimental method and completely randomized design (CRD) with 3 treatments and 4 replications resulting in 12 experimental units. The treatment given can be seen in Table 1.

Table 1 – The treatment used

Treatments	Feeding (Days)				
	5-12	13-15	16-23	24-26	27-34
A	D	D+T	T	T+P	P
B	D	D+T	T	P	P
C	D	P	P	P	P

Description: D = Daphnia sp., T = Tubifex sp., P = pellet.

The maintenance media in this study used 12 aquariums which had a size of 30x25x35 cm with a water level of 15 cm and were given aeration. Stocking begins when the larvae are 5 days old. The number of fish larvae tested was 50 fish/aquarium of 12 aquariums with a volume of 10 liters of water.

Daphnia sp. culture was carried out in a cement pool with a size of 2x1 m and a water depth of 20 cm. Culturing using manure and additional dry coconut leaves with an initial starter density of 100 ind/L for 7 days. Tubifex sp. obtained by buying at the cultivator.

Daphnia sp. was given as many as 100 individuals/larvae, Tubifex sp. given as much as 10% of the weight of the larvae and for commercial feed in the form of MS Prima Feed 500 given in satiation. Feeding is done 2 times a day in the morning and evening. Sampling is done every 7 days. In this study, sampling was carried out 5 times. Sampling was carried out to measure the length and weight as well as the number of larvae at the end of the study. The test parameters applied in this study include:

Survival rate calculations use the formula (Effendi, 2002), which is as follows:

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

Where: SR = survival rate; Nt = Number of fish larvae at the end of rearing; No = Number of initial fish larvae rearing.

The relative length growth rate is the percentage increase in length growth over a time interval, formulated as follows (Effendi, 2002):

$$Lr = \frac{Lt - Lo}{Lo} \times 100\%$$

Where: L = Total length; Lt = The length of the larvae at the end of the study (cm); Lo = The length of the initial larvae of the study (cm).

Relative weight growth rate is the percentage increase in weight growth in each time interval, formulated as follows (Effendi, 2002):

$$Wr = \frac{Wt - Wo}{Wo} \times 100\%$$

Description: Wr = Relative weight (%); Wt = Larval weight at the end of the study (g); Wo = The weight of the initial larvae of the study (g).

The mouth opening calculation method according to Shirota 1970 in (Fahmi et al., 2021), is as follows:

$$D = \sqrt{2AB}$$

Where: D = Mouth opening size (mm); AB = Upper jaw length (mm).

The data obtained regarding the parameters above were analyzed statistically using the ANOVA test at the 95% confidence level.

Water quality analysis was carried out as supporting parameters which included water quality parameters such as temperature, DO, pH and ammonia. For water quality measurements carried out at the beginning and end of the study.

The normality test was performed using the Liliefors method; this test is useful to test the normality of the data from the research results. In addition, the uniformity test used the Barlett method. If the data are declared as anomalous and homogeneous, the data should be transformed before further analysis is performed. Once the above conditions are met, the variance analysis can be performed. According to Hanafiah (2005), if the data need further testing, further testing depends on the diversity coefficient (DC) and a simple regression test.

RESULTS AND DISCUSSION

Based on the results of the study, data on survival rate, relative length growth, relative weight growth and mouth opening size were obtained in Table 1. The ANOVA results showed that the response to different types of feed was significantly different from the dependent variable, which means that the response to different types of feed had a significant effect on the research parameters.

Table 1 – Results of Observation of Survival Rate (SR), Growth in Length and Relative Weight and Mouth Opening Size of Koi Fish Larvae

Treatments	Survival Rate (%)	Relative Weight Growth (%)	Relative Length Growth (%)
A	79.333±8.083^{a}	1,413.725±233.123^{a}	412.282±2.295^{a}
B	65.333±12.858^{ab}	1,120.392±103.110^{ab}	342.333±21.572^{b}
C	53.333±3.055^{b}	877.255±31.067^{b}	229.164±11.403^{c}

The results showed that the survival rate was significantly different between treatments A and C, while between A and B and between B and C were not significantly different. Relative weight growth showed a significant difference between treatments A and C, while between A and B and between B and C were not significantly different. The relative length growth shows a very significant difference between treatments. For more details, the research results can also be seen in Figure 1.

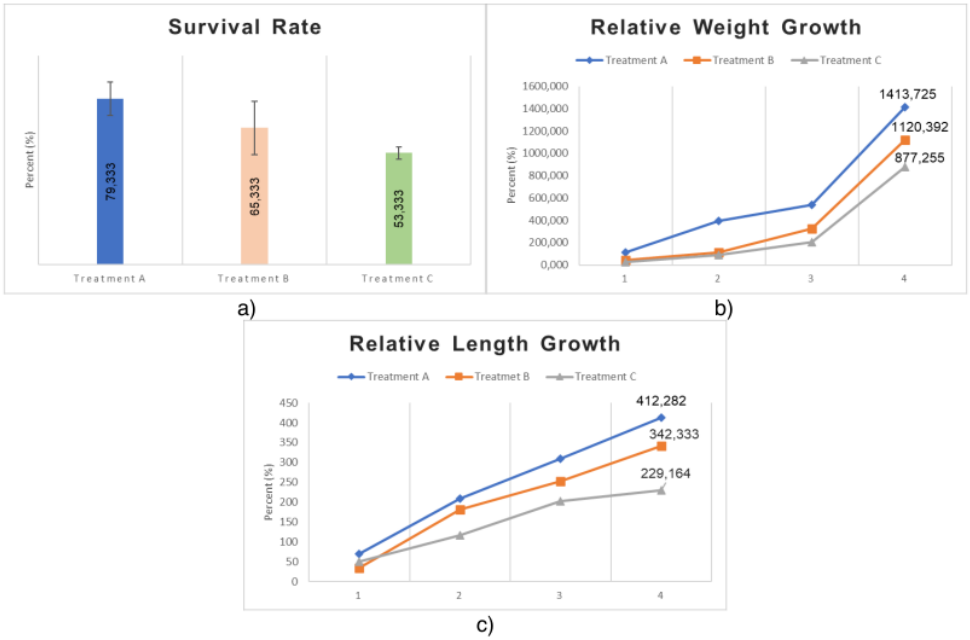

Figure 1 – Research Results, a) Survival rate, b) Relative weight growth and c) Relative length growth

The highest survival rate was in treatment A which was 79.333%, followed by treatment B which was 65.333% and treatment C with a value of 53.333%. The results of the ANOVA test using the 5% level showed that the calculated F value > F table was 5% (6,350 > 5.14), which means that the response to different types of feed had a significant effect on the survival rate of koi fish larvae.

Treatment A resulted in the highest survival among the other treatments. This shows that changes in the type of feed in this treatment are more in line with the development of the digestive system of the larvae and the size of the mouth opening in the koi fish larvae. Treatment A uses a transition of feed from Daphnia sp to Tubifex sp on days 13-15, on days 24-26 giving Tubifex sp to pellets thought to be more in line with the development of the digestive system & the size of the larval mouth opening. According to Buwono et al., (2019) daphnia-type natural food has a size that matches the mouth opening of the larvae. Saputra (2021) stated that Tubifex sp worms are the raw food most preferred by freshwater fish and are very good for the growth of freshwater fish because of their high protein content.

The lowest survival rate was obtained in treatment C with a value of 53.333%. This is presumably because the change in the type of feed in this treatment is not in accordance with the development of the digestive system of fish larvae, because in this treatment they are only given natural food in the form of Daphnia sp until the 12th day, then given artificial feed until the end of rearing. In this treatment, the natural feeding time was thought to be too short so there were many deaths due to the larvae not being able to adapt well to their new feed (artificial feed).

The food attractiveness factor is thought to play a crucial role in the survival rate of fish. Alem et al., (2016) stated that the success rate of survival is determined by stimuli when food has nutritional requirements and also has physical aspects. Muchlisin (1997) stated that natural food that is actively moving has a better appeal in stimulating fish larvae to prey on it.

The highest relative weight growth value was in treatment A which was 1,413.725%, followed by treatment B which was 1.120.392% and treatment C with a value of 877.255%. The results of the ANOVA test with a level of 5% showed that the calculated F value > F table was 5% (9,849 > 5.14), which means that the response to different types of feed had a significant effect on the growth of the relative weight of koi fish larvae.

The highest relative weight growth value was found in Treatment A, where this was thought to occur because the nutrition of the feed given and the transition time for the koi fish larvae were right. This is reinforced by the statement of Batu (1982) which states that the growth in weight of fish is not the same between natural feed and artificial feed, due to the unequal nutritional content, where natural feed has better nutritional content.

The natural feeds given to treatment A were Daphnia sp and Tubifex sp. Jangkaru (1999) states that silkworms and water fleas are easily digested by fish because they do not have a skeleton. The texture of the food affects the ease with which the fish digest the food given. Therefore, this is crucial because fish are animals that do not chew food (Mudjiman, 2004).

The lowest relative weight growth value was found in treatment C which was only given Daphnia sp feed and commercial pellets. This is presumably due to the lack of nutrient content of the feed given and the incompatibility of the feed given with the physiological development of the larvae. This was reinforced by the statement of Suci et al., (2018) which stated that the low growth of the fish fry obtained was allegedly due to the nutritional content in the fish feed given which was unable to meet the energy requirements for the fish to grow.

The highest relative length growth value was in treatment A which was 412.282%, followed by treatment B which was 342.333% and treatment C which was 229.164%. The results of the ANOVA test with levels of 5% and 1% show the F count > F table 5% (127,938 > 5.14) and F table 1% (127,938 > 10.92). These results indicate that the response to different types of feed has a very significant effect on the relative length growth of koi fish larvae.

The highest relative length growth value was found in treatment A, where this is presumably because the larvae in their growth phase require the type of feed that is appropriate to their age, mouth opening and transition time for feeding. This is reinforced by the opinion of Tampubolon et al., (2016) which states that in the larval phase, fish larvae need easily digestible and highly nutritious food because the digestive tract and body organs are still not well developed. Age also affects the growth and development of fish larvae. The larval phase can be said to be a critical phase where in this phase the digestive system is still not fully formed so the feed given must be adjusted. According to Heltonika (2012), for each type of fish the level of ability to digest food increases according to the increase in age and size of the fish and the opening of the fish's mouth.

The lowest relative length growth value was found in treatment C. This low value is thought to have occurred because the larvae were still unable to adapt well to artificial feed, as a result, the larvae were less responsive to the feed given. This is supported by the statement of Halver & Tiews (1979), changing feed and feeding time that is not appropriate can cause slow growth of larvae, because the larvae need time to adapt to the new feed.

The size of the mouth opening of koi fish larvae can be measured when they enter the age of five days using a microscope, where the mouth of the larva is formed and can be opened to measure its length. Measurement of the mouth opening at the age of 5 days of larvae obtained a value of 0.8 mm so that the size of the mouth opening before the age of 5 days was considered <1 mm.

The natural feeding of koi fish larvae in this study was initiated using Daphnia sp at the age of 5 days for all treatments. According to Meilisa & Yulisman (2015), daphnia sp is a zooplankton that has a relatively small body size ranging from 0.3-1 mm, thus this feeding is in accordance with the size of the larva's mouth opening. In the initial phase, the larvae do not have perfect organs, as a result, at the beginning of life there is more development than growth.

The results of measuring the mouth opening of koi fish larvae on the first day obtained a value of 0.2 mm. The mouth opening of the larvae on the 7th day was 0.96 mm, on the 14th day was 1.18 mm, on the 21st day was 1.56 mm, on the 28th day was 1.73 mm and on the 34th day the value was 1.98 mm. The results of measuring the mouth opening of koi fish larvae based on the method Shirota (1970) during the study can be seen in Figure 2 below.

Water quality is one of the supporting factors in the survival rate and growth of fish kept. Water quality measurements carried out during the study included temperature, pH,

DO, and NH3. The results of observations of water quality during the study period can be seen in Table 2.

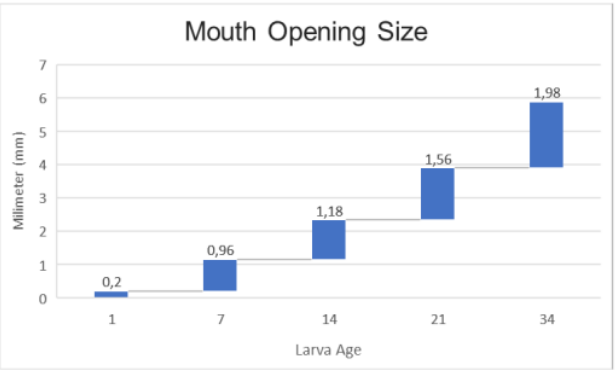

Figure 2 – Mouth Openings of Koi Fish Larvae

Table 2 – Results of Water Quality Measurements

Treatments	Parameters							
	Temperature (°C)		DO (mg/L)		pH		NH_3 (mg/L)	
	Beginning	End	Beginning	End	Beginning	End	Beginning	End
A	29.6	25.3	4.34	5.3	7.66	6.32	0.02	0.1
B	29.6	25.3	4.34	5.03	7.66	6.09	0.02	0.1
C	29.6	25.4	4.34	6.24	7.66	6.35	0.02	0.1

Water quality measurements carried out were temperature, DO, pH and NH3. Measurement of water quality was carried out twice during the study, namely at the beginning and end of the study. Measurements at the beginning of the study were carried out to determine the water conditions used so that it could be decided whether the water conditions were good or not. Measurements at the end of the study were carried out to determine the state of the waters after being given treatment with the aim of knowing the effect of giving treatment on water and fish quality.

The water temperature in this study ranged from 25.4-29.6°C in all treatments. The range of temperature values above explains that the water temperature during the study was still in optimal conditions for the life of koi fish larvae. Based on SNI 77334 the temperature range can be stated as good for supporting the growth of koi fish which are kept in the range of 20-28℃. DO measurements during the rearing period indicated that it was still in the optimum range for koi fish, namely 4.34-6.24 mg/L. Based on SNI 77334, the dissolved oxygen content for keeping koi fish is at least 5.

The pH of the water during the study was at a value of 6.09-7.66 in all treatments. The measurement results show that the degree of acidity in the study site is still in the good range for optimal koi fish growth. Based on SNI 77334 the optimal pH range for keeping koi fish is between 6.5-8. Ammonia (NH_3) levels in koi larvae maintenance were at a value of 0.02-0.1 mg/L in each study treatment. Gunawan (2016) stated that the NH3 level that is considered safe enough for keeping koi larvae is below 0.1 mg/L.

CONCLUSION

The results showed that the response to different types of feed had an effect on the survival rate and growth of koi fish larvae. Treatment A gave the best value among the other treatments with a survival rate of 79.333%, relative weight growth of 1.414.725% and relative length growth of 412.282%. Water quality parameters during the study were still at optimal limits for the maintenance of koi fish larvae so that they could support their survival rate and growth.

REFERENCES

1. Alem, A., Rachimi, R., & Raharjo, E. I. (2016). Pengaruh Pemberian Pakan Alami Yang Berbeda Terhadap Pertumbuhan Dan Kelangsungan Hidup Larva Ikan Biawan (Helostoma temmincki). Fakultas Perikanan.
2. Batu, D. (1982). Pengantar Ke Fisiologi Hewan Air: Edisi ke Tiga. Institut Pertanian Bogor, Fakultas Perikanan, Departemen Hidrobiologi, Bagian Biologi Laut.
3. Buwono, N. R., Mahmudi, M., Sabtaningsih, S. O., & Lusiana, E. (2019). Analisis Daya Cerna Pakan Alami pada Larva Ikan Koi. The Indonesian Green Technology Journal, 8(1).
4. Effendi, M. (2002). Biologi perikanan (p. 116). Jakarta: Yayasan Pustaka Nusantara.
5. Emaliana, E., Usman, S., & Lesmana, I. (2016). Pengaruh Perbedaan Suhu Terhadap Pertumbuhan Benih Ikan Mas Koi (Cyprinus carpio)(The influence of the temperature against the growth of the seed goldFish koi (Cyprinus carpio). Aquacoastmarine, 13(3), 16-25.
6. Fahmi, M. R., Musthofa, S. Z., & Permana, A. (2021). Tingkah Laku Pemijahan, Embriogenesis, Dan Perkembangan Larva Ikan Peacock Goby (Tateurndina ocellicauda). Jurnal Riset Akuakultur, 15(4), 205-214.
7. Gunawan, S. (2016). Panduan Komplet Budi Daya Lele di Lahan Sempit: AgroMedia.
8. Halver, J. E., & Tiews, K. (1979). Finfish nutrition and fishfeed technology; proceedings of a world symposium sponsored and supported by European Inland Fisheries Advisory Commission of FAO, ICES and IUNS, Hamburg, 20-23 Jun 1978-v. 1-2.
9. Hanafiah, K. A. (2005). Rancangan percobaan aplikatif.
10. Heltonika, B. (2012). Pengaruh Kombinasi Pakan Terhadap Pertumbuhan Dan Kelulusan Hidup Larva Ikan Selais (Ompok Hypophthalmus). Berkala Perikanan Terubuk, 38(2).
11. Hendriana, A., Ridwansyah, F., Iskandar, A., Munawar, A. S., & Lugina, D. (2021). Metode Pembenihan Ikan koi Cyprinus carpio dalam menghasilkan benih berkualitas di Mizumi Koi Farm, Kabupaten Sukabumi, Jawa Barat. Jurnal Perikanan Terapan, 2.
12. Jangkaru, Z. (1999). Memacu pertumbuhan gurami: Niaga Swadaya.
13. Kusrini, E., Cindelaras, S., & Prasetio, A. B. (2015). Pengembangan budidaya ikan hias koi (Cyprinus carpio) lokal di balai penelitian dan pengembangan budidaya ikan hias Depok. Media Akuakultur, 10(2), 71-78.
14. Meilisa, R., & Yulisman, T. F. (2015). Pertumbuhan populasi Daphnia sp. yang diberi larutan dedak terfermentasi menggunakan ragi tape. Jurnal Akuakultur Rawa Indonesia, 3(2), 48-54.
15. Muchlisin, Z. (1997). Pertumbuhan dan kelnagsungan hidup larva ikan jambal siam (pengasius tutchi) yang diberi pakan alami Artemia dan pakan buatan mengandung enzim aditif. Skripsi. Universitas Riau, Pekanbaru.
16. Mudjiman, A. (2004). Fish food. Penebar Swadaya, Jakarta.
17. Muslim, M., Sasanti, A. D., & Apriana, A. (2019). Pengaruh Lama Perendaman Hormon Tiroksin terhadap Pertumbuhan Larva Ikan Gabus (Channa striata) The Effect of Immersion Duration in Thyroxine Hormone on Growth of Snakehead Fish Larvae (Channa striata). Journal of Aquaculture, 4(1), 01-11.
18. Pangkey, H., Lantu, S., & Monijung, R. D. (2019). Growth study of coi fish larvae fed chydoridae. Jurnal Ilmiah PLATAX, 7(2), 432-436.
19. Pramono, T. B., & Marnani, S. (2009). Pola Penyerapan Kuning Telur dan Perkembangan Organogenesis Pada Stadia Awal Larva Ikan Senggaringan (Mystus nigriceps). Berkala Perikanan Terubuk, 37(1).
20. Pratama, A. R. (2021). Pertumbuhan dan Sintasan Benih Ikan Cupang. Jurnal Tropika Bahari (JTBH), 1(4).
21. SAPUTRA, A. (2021). Pengaruh Pemberian Pakan Alami Yang Berbeda (Artemia, Jentik Nyamuk, Kutu Air Dan Tubifex Sp) Terhadap Pertumbuhan Dan Kelangsungan Hidup Benih Ikan Molly (Poecilia sp). Universitas Muhammadiyah Pontianak,
22. Shirota, A. (1970). Studies on the mouth size of fish larvae. Bull. Jpn. Soc. Sci. Fish., 36, 353-369.

23. Standar Nasional Indonesia [SNI]. 2017. Syarat Mutu Kualitas Air Ikan Koi (Cyprinus carpio). Jakarta (ID): SNI 7734 - 2017.
24. Suci Ananda Sadri, T., Malik, A., & Gusmira, E. (2018). Perbandingan pemberian pakan buatan dengan pakan pabrik terhadap pertambahan bobot ikan patin (pangasius hypophthalmus). Uin sulthan thaha saifuddin jambi,
25. Syahputra, M. E., Rahmatia, F., & Gultom, V. D. N. (2019). Uji Pemberian Pakan Alami Berbeda (Tubifex sp., Artemia sp., Daphnia sp.) Terhadap Pertumbuhan dan Kelangsungan Hidup Benih Ikan Mas Koki Mutiara (Carassius auratus). Jurnal Ilmiah Satya Minabahari, 5(1), 28-39.
26. Tampubolon, T. P., Raharjo, E. I., & Farida, F. (2016). Pengaruh Beberapa Jenis Pakan Alami Terhadap Pertumbuhan Dan Kelangsungan Hidup Larva Ikan Koi (Cyprinus carpio). Fakultas Perikanan dan Ilmu Kelautan.

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