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LEVEL OF USE OF LEMNA PERPUSILLA IN FEEDING ON SEED GROWTH CARP (CYPRINUS CARPIO)

Tingkat Penggunaan *Lemna Perpusilla* Pada Pakan Terhadap Pertumbuhan Benih Ikan Mas (*Cyprinus Carpio)*

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ABSTRACT

Feed production costs are the largest costs incurred by fish farmers. Carp (Cyprinus carpio) is quite popular among the public because of the delicious taste of its meat and its fairly affordable price. Caring for carp fry requires a lot of money if the feed used is 100% factory-made feed. It is necessary to look for additional feed whose protein content can reduce the use of commercial feed. The artificial feed needed is feed that has a high nutrient content, is easy to find in nature, and is widely available in nature. One of the feed raw materials derived from aquatic plants that can be used as additional feed is Lemna perpusilla. This type of aquatic plant can be used and has potential as an alternative source of protein for carp, namely the Lemna perpusilla aquatic plant. This research aims to determine the level of use of Lemna perpusilla in feed on the growth of carp fry. This research was carried out from June to July 2023 at UPR Amphibi Batang Toru. Completely randomized design method: 5 (five) treatments and 3 (three) replications with a dose of 0% Lemna perpusilla as a control, followed by administration of 10%, 20%, 30% and 40% Lemna perpusilla. The final results of the research can be concluded that the addition of Lemna perpusilla is the most optimal and efficient in feed at 40%, showing a significant effect on the growth of carp.

Key words: Lemna perpusilla, feed, carp

ABSTRAK

Biaya produksi pakan merupakan biaya terbesar yang dikeluarkan pembudidaya ikan. Ikan mas (*Cyprinus carpio*) cukup digemari di masyarakat karna rasa dagingnya yang enak dan hargany yang cukup terjangkau. Pemeliharaan benih ikan mas memerlukan biaya yang tergolong banyak jika pakan yang digunakan 100 % menggunakan pakan buatan pabrik. Perlu dicari pakan tambahan yang kandungan proteinnya dapat mengurangi penggunaan pakan komersil. Pakan buatan yang dibutuhkan yaitu pakan yang memiliki kandungan nutrien yang tinggi,

mudah ditemukan di alam, dan ketersediaanya banyak terdapat di alam. Salah satu bahan baku pakan yang berasal dari tanaman air dapat digunakan sebagai pakan tambahan yaitu *Lemna perpusilla*. Jenis tanaman air ini bisa digunakan dan memiliki potensi sebagai sumber protein pakan alternatif pada ikan mas yaitu Tanaman air jenis *Lemna perpusilla.* Penelitian ini bertujuan untuk mengetahui tingkat penggunaan *Lemna perpusilla* pada pakan terhadap pertumbuhan benih ikan mas. Penelitian ini dilaksanakan mulai bulan Juni sampai Juli 2023 di UPR Amphibi Batang Toru. Metode Rancangan Acak Lengkap (RAL) 5 (lima) perlakuan dan 3 (tiga) ulangan dengan dosis pemberian *Lemna perpusilla* 0% sebagai kontrol, dilanjutkan dengan pemberian *Lemna perpusilla* 10%, 20%,30% dan 40%. Hasil akhir penelitian dapat disimpulkan bahwa penambahan *Lemna perpusilla* paling optimal dan efesien pada pakan sebesar 40% menunjukkan pengaruh secara signifikan terhadap pertumbuhan ikan mas.

Kata kunci: *Lemna perpusilla*, pakan, ikan mas

INTODUCTION

Ikan mas merupakan salah satu jenis ikan air tawar yang memiliki daging yang enak untuk dikonsumsi, digemari masyarakat dan memiliki nilai ekonomis tinggi, sehingga permintaan konsumen untuk ikan ini tergolong tinggi, khususnya Masyarakat yang ada di Sumatera Utara. Ikan ini tergolong banyak dibudidayakan karena ikan ini memiliki daya adaptasi tinggi terhadap kondisi lingkungan. Ikan ini juga memiliki pertumbuhan yang cepat dan mudah dipijahkan (Mustofa *et al.,* 2018).

Pakan ikan harus memiliki nilai gizi tinggi yang sesuai dengan kebutuhan ikan, bahan baku untuk pembuatan pakan ikan tidak susah diperoleh, tidak susah untuk diolah, bahan baku paka juga tidak sulit untuk dicerna ikan, selain itu bahan baku juga memiliki harga yang tidak tergolong mahal dan tidak ada kandungan racunnya.

Tanaman air jenis *Lemna perpusilla* merupakan gulma diperairan. Keberadaan tanaman air ini juga tergantung dengan adanya keberadaan ikan herbivora di sekitar lingkungan perairan tersebut (Nugroho, 2015). *Lemna perpusilla* merupakan jenis tanaman yang tumbuh di air yang dapat digunakan sebagai salah satu jenis pakan alami (Ilyas *et al.,* 2014). Jenis tanaman air ini juga mampu diproduksi dengan jumlah berat segar sebesar 176,38 g/m^2 dan jumlah bahan kering sebesar 6,24 g/m^2 (Nopriani *et al.,* 2015). *Lemna perpusilla* merupakan tanaman air yang bersifat fitoremediasi atau memperbaiki kualitas air yang tercemar limbah dengan cara menyerap bahan organik sehingga terjadi proses metabolisme yang dapat meningkatkan PO_4,NO_2,NO_3,NH3 (Amalia, 2014). Menurut penelitian Puspitasari *et al.,* (2018) menyatakan bahwa kandungan nutrien yang ada di *Lemna perpusilla* meliputi protein kasar 23,47 %, lemak kasar 3,99 %, serat kasar 29,92 % dan karbohidrat 19,02 %. Tanaman air ini juga mengandung mineral dan vitamin yang tergolong cukup tinggi (Andriani *et al.,* 2018). Oleh sebab itu, penelitian ini bertujuan untuk mengetahui tingkat penggunaan *Lemna perpusilla* pada pakan terhadap pertumbuhan benih ikan mas

METHODS

Place and Time

Penelitian telah terlaksana pada bulan Juni hingga Juli 2023 di lokasi UPR Amphibi Batang Toru Padang Lancat Desa Sisoma, Kecamatan Batang Toru.

Tools and Materials

Ada berbagai jenis alat yang digunakan selama penelitian, alat tersebut meliputi Akuarium, timbangan digital, DO meter, penggaris, alat tulis, selang sifon, thermometer, pH

meter, blender. Sedangkan bahan yang digunakan benih ikan mas, pelet komersil dan *Lemna perpusilla*.

Research design

The method used during the research was experimental with a completely randomized design (CRD) with 5 (five) treatments and 3 (three) replications using a combination of giving pellets and *Lemna perpusilla*. Treatment consisted of LP0 (control), LP1 (Addition of *Lemna perpusilla* 10%), LP2 (Addition of *Lemna perpusilla* 20%), LP3 (Addition of *Lemna perpusilla* 30%), LP4 (Addition of *Lemna perpusilla* 40%). Giving Lemna perpusilla refers to previous research (Selfiana, 2020).

Table 1. Dosage of *Lemna perpusilla* in goldfish feed

Treatment	Infomation
LP0	100 % Pellet Feed
LP1	90 % Pellet ± 10 % *Lemna perpusilla*
LP2	80 % Pellet ± 20 % *Lemna perpusilla*
LP3	70 % Pellet ± 30 % *Lemna perpusilla*
LP4	60 % Pellet ± 40 % *Lemna perpusilla*

Procedurs

The test fish were sourced from the Amphibian Center. The test fish were maintained using 15 units of aquarium containers measuring 100 x 50 x 50 cm. The container for the test fish, in the form of an aquarium, is cleaned using a sponge and then doused with water until clean. The clean aquarium is then filled with clean water to a height of 40 cm, then an aerator and aeration device are installed to increase oxygen and then a treatment code is given for each aquarium.

The perpusilla lemna used was taken from the pool in the Amphibian hall. The *perpusilla lemna* is cleaned using running water to remove dirt, then drained and dried. The dried *perpusilla lemna* is then crushed by blending, after blending the flour is sifted to separate the coarse and fine particles. The finely ground flour is then mixed with the adhesive and then stirred until evenly mixed. 1 gram of adhesive is given for each mixture then spread evenly and left for 10 minutes, then the feed is poured into the *Lemna perpusilla* flour mixture and stirred evenly until the *Lemna perpusilla* flour sticks evenly to the pellets. The feed that has been mixed with *Lemna perpusilla* flour according to the dosage is then air-dried until dry for approximately 4-5 hours, until the mixed feed according to the dosage is ready to be used in the test feed. Fish feed without the addition of *Lemna perpusilla* as a control treatment is fish feed that is not mixed with Lemna perpusilla. Control fish feed using commercial pellets or factory-made feed.

The test fish were fed 3 (three) times in one day, namely in the morning at 08.00 WIB, in the afternoon at 12.00 WIB and in the afternoon at 17.00 WIB, the maintenance period was 4 weeks, the test fish were given as much food as they wanted after the fish did not want to eat. again, the feeding is stopped or what is known as the Ad satiation method. Growth measurements were carried out once a week to determine the growth that occurred in the test fish.

Measurement of growth in weight and absolute length of goldfish, and water quality measurements in the rearing media were carried out every 7 days. The water quality parameters that were the object of observation during the research were temperature, pH and dissolved

oxygen (DO). The water in the rearing tank was replaced by 50% so that the test fish did not experience stress.

Research Paremeters

In this study, the parameters measured consisted of growth in absolute weight and length and fish survival (SR) using the formula (Effendie, 1997), while calculating the feed conversion ratio using the formula from (Kordi & Ghufran, 2010) and measuring water quality.

Data Analysis

The data is stored neatly and correctly using Microsoft Excel 2019 software. Analysis of data that has been collected using SPSS version 25 software is then used for the next stage of analysis of variance (ANOVA). In processing the data, if significant differences are found between treatments, further testing is continued with Duncan's test. Data that has been processed is presented in tables, pictures and graphs.

RESULT

The results of the research obtained regarding the use of different doses of Lemna perpusilla with parameters of absolute weight and length growth, feed conversion ratio and survival of fish kept for 40 days are shown below..

Table 2. Growth in absolute weight and length, feed conversion ratio and survival (%)

Treatment	Absolute Weight (gr)	Absolute Length (cm)	FCR	Survival Rate (%)
LP0 (Without administration of *Lemna perpusilla*)	0,88±0,06^{e}	0,5±0,15^{e}	1,37±0,03^{e}	0,86±67^{e}
LP1 (feeding with *Lemna perpusilla* 10%)	2,38±0,59^{d}	1,05±0,10^{d}	1,33±0,05^{d}	0,93±33^{d}
LP2 (feeding with *Lemna perpusilla* 20%)	4,64±0,58^{c}	1,74±0,05^{c}	1,18±0,05^{c}	0,93±33^{c}
LP3 (feeding with *Lemna perpusilla* 30%)	5,32±0,27^{b}	2,63±0,14^{b}	1,12±0,01^{b}	0,96±67^{b}
LP4 (administration with *Lemna perpusilla* 40%)	7,79±0,77^{a}	3,91±0,16^{a}	1,04±0,3^{a}	100±0,00^{a}

Notes : Apabila Hasil uji statistik tidak berbeda nyata (P>0,05) terlihat dari huruf superscript yang sama dan berada pada kolom yang sama. Hasil uji statistik berbeda nyata (P<0,05) terlihat dari huruf superscript yang berbeda dan berada pada kolom yang sama

Absolute Weight Growth

The statistical test results obtained for absolute weight growth results when using *Lemna perpusilla* at different doses show significant differences between treatments and other treatments. Data on the absolute weight growth of fish is presented below.

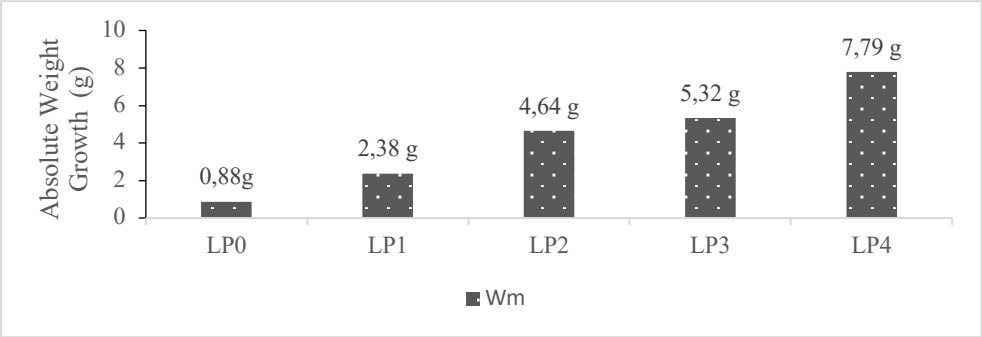

Figure 1. Absolute Weight Growth

Absolute Length Growth

The statistical test results obtained for data on absolute length growth of fish when rearing fish using a combination of pellets and Lemna perpusilla feed showed significant differences between treatments. Absolute length growth is presented in the figure below.

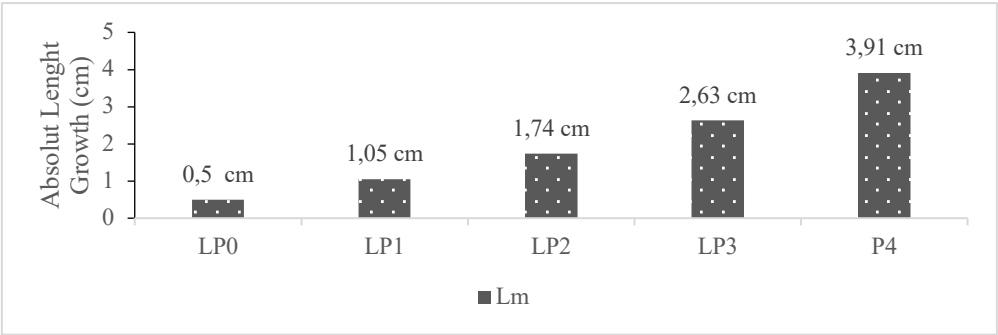

Figure 2. Absolute Length Growth

Feed Conversion Ratio

The results of statistical tests on the fish feed conversion ratio showed that the addition of *Lemna perpusilla* had a significant effect on the feed conversion ratio. From the results of further tests, it was shown that the treatment at a dose of 40g/kg feed was significantly different from the treatment at a dose of 0g/kg feed, 10g/kg feed, 20g /kg feed, and 30g/kg feed. Feed conversion given Lemna perpusilla was lower than feed conversion without *Lemna perpusilla.*

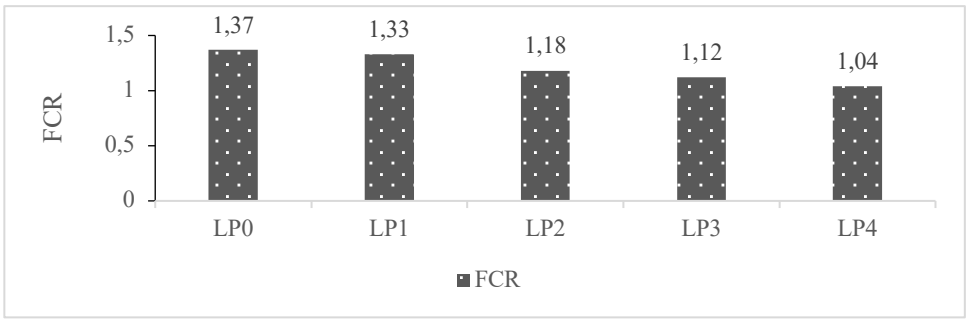

Figure 3**.** Fish feed conversion ratio

Survival Rate

In the results of statistical tests on fish survival using different doses of Lemna perpusilla, there were significant results between treatments. Further test results showed that there were significant differences between one treatment and another. Goldfish survival data is presented in Figure 4 below.

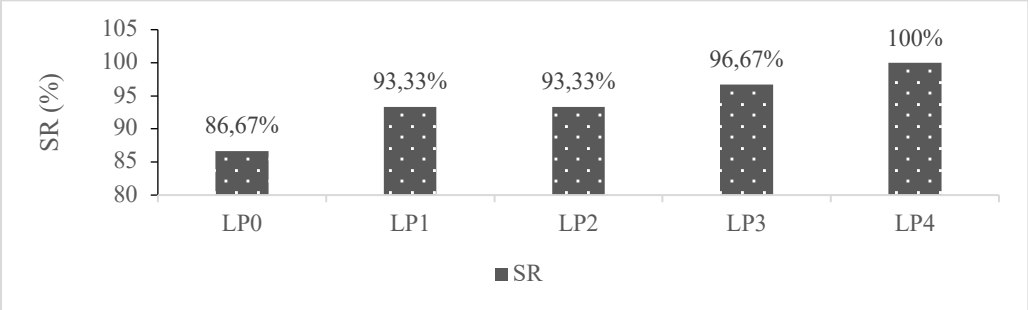

Figure 4. Survival rate of goldfish

Water Quality

Water quality factors in fish rearing containers is one of the important factors that must be monitored during research. The following is a table of observations of temperature, pH and dissolved oxygen measurements obtained during the research.

Table 3. Water quality during the study

Treatment Code	Temperature (^{0}C)	pH	DO (mg/l)
LP0	27,33-27,66	6,60-7,46	3,06-6,56
LP1	27,00-28,00	6,75-7,57	4,10-6,10
LP2	26,65-28,00	6,40-7,63	3,82-7,05
LP3	27,00 -28,00	6,51-7,50	3,76-6,70
LP4.	28,00-29,00	6,53-7,49	3,77-6,80

DISCUSSION

The results of statistical tests that were carried out on absolute weight growth in goldfish treated with Lemna perpusilla showed significant differences between treatments and other treatments. Based on Figure 1, the higher the feed given when keeping goldfish can increase the absolute weight growth of the fish, as found in the LP4 treatment, namely with an absolute weight growth of 7.79 gr. The weight growth of goldfish has an upward trend, from these results it is known that the combination of pellets and Lemna perpusilla which are used as fish food can be consumed and utilized optimally by fish in increasing the weight growth of goldfish.

The highest absolute weight growth obtained during feeding can be seen in treatment LP4 7.79 gr, then LP3 5.32 gr, treatment LP2 4.64 gr, and treatment LP1 2.38 gr, then the lowest is in treatment LP0 0.88 gr. The difference in absolute weight growth for each treatment in this case looks significant between treatments, this is because the fish that are kept can adapt to the new environment and the feed provided. The growth that occurs in fish is due to the composition of feed which is classified as balanced, the efficiency of feed which is relatively high and in accordance with needs, especially in terms of nutrition, this is supported by the

statement of Zulkifli (2023) which states that feed with high efficiency can be utilized properly by fish so that the feed is changed for fish growth.

The highest absolute length growth was obtained in the LP4 treatment, namely 3.91 cm, followed by LP3 2.63 cm, then LP2 1.74 cm, and the LP1 treatment 1.05 cm, the lowest was in the LP0 treatment at 05.cm. The balance of protein and energy in feed can affect growth so their availability must be optimal in fish feed. The addition of Lemna perpusilla in feed can increase the energy source for growth. Maximum growth can be achieved if the protein content contained in the fish food is in accordance with the fish's needs, besides that the protein content in the aquatic plant Lemna perpusilla is relatively high and has high quality (Nopriani *et al.,* 2015).

The highest fish feed conversion ratio can be seen at a dose of 0g/kg feed at 1.37, while the lowest feed conversion at a dose of 40g/kg feed is 1.04. Based on research results from Gusman and Muhammad (2014), a good goldfish feed conversion ratio is in the maximum range of 1.6. According to research by Selfiana *et al.,* (2021), a low feed conversion value will indicate the feed digestion process which affects the feed conversion rate. This is in accordance with research by Sulawesty (2014) that if the value obtained is lower, the feed can be utilized better in the body and the quality of the feed is also better, thus providing higher body weight growth.

The fish feed conversion ratio is an illustration of the level of feed efficiency in utilizing the feed consumed. Feed conversion shows how much feed is used to produce the growth of one kilogram of fish weight. According to Sinaga *et al.,* (2021), an important factor that influences the fish feed conversion ratio is the type and composition of feed that suits the nutritional needs of the fish.

The treatment with the highest survival was LP4 100%, followed by LP3 treatment 96.67%, then LP2 93.33%, and then LP1 93.33%, the lowest was LP0 treatment 86.67%. The survival values for each treatment are presented in Figure 4. From the results of the statistical tests that have been carried out, it can be seen that administration of Lemna perpusilla at different doses in fish feed has a significant impact on the survival values of goldfish in aquarium containers. Carp seed rearing with the highest survival value was found in the LP4 treatment with a value of 100%. If fish are in a rearing container, if they do not experience stress, it will not affect the survival rate of the fish. This is also supported by the statement of Ramadhani *et al.,* (2023) in the results of the research he obtained that the level of stress in fish is one of the factors that can affect fish survival.

Water quality parameters measured in test fish rearing containers such as temperature, pH and dissolved oxygen are in optimal conditions for the survival, growth and development of goldfish. Manunggal *et al.,* (2018) stated that to support the life and growth of fish, one of the factors that must be monitored regularly is the water quality factor as a fish cultivation medium. The same thing was also expressed by Ayuniar & Hidayat (2018) who stated that water quality Good practices are very important in cultivating goldfish because these fish need a clean and healthy environment to breed and grow well.

The water temperature parameter factor in fish rearing media is an important factor for fish life, besides that it must be available in optimal conditions. The results obtained from water temperature measurements during the research showed that the water temperature was in the range of 26.65-29 0C. The results of water quality measurements are supported by the statement of Akbarurrasyid *et al.,* (2020) that the optimal temperature range for keeping goldfish is in the temperature range of 26-30 0C. Growth performance, namely the length and body weight of fish, is determined by physiological responses consisting of appetite, metabolic processes and health which are influenced by environmental temperature (Laila, 2018).

The pH conditions of the water measured during the research ranged from 6.40 to 7.63, from the results of water quality measurements in fish rearing containers, this pH level is the optimal range for keeping fish. In accordance with Ramadhan & Yusanti, (2020) who stated that pH 6.5-8.5 is the optimal pH for rearing goldfish, this is also supported by Fajarwati & Andriani, (2022) who stated that the pH value for cultivating freshwater fish is 6-9 and this value corresponds to class 2 water quality standards.

The dissolved oxygen levels that were measured during the research in fish rearing containers ranged from 3.06 to 7.05 mg/l, the dissolved oxygen conditions in the rearing media were at optimal conditions, which is also supported by research by Yufika *et al.,* (2019) that the optimal level of dissolved oxygen for rearing goldfish is above 3 mg/l. Aquatic biota needs dissolved oxygen to be used as fuel for burning, such as food, to produce activities, one of which is growth. (Syahrul *et al.,* 2021).

CONCLUSION

The research results obtained regarding the level of use of Lemna perpusilla in fish feed concluded that the addition of Lemna perpusilla to fish pellets as additional feed can increase fish growth. The addition of Lemna perpusilla to goldfish feed has a real impact on growth in absolute weight and length. The best treatment is LP4 40%, namely the addition of Lemna perpusilla as much as 40% with absolute weight results of 7.79 g, length 3.91cm and feed conversion ratio of 1.04%, fish survival is 100% with temperature conditions of 28-29°C and oxygen levels dissolved (DO) in the range of 3.77-6.80 mg/l and the pH levels obtained were in the range of pH 6.53-7.49.

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