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THE EFFECT OF ADDITION OF CHROMIUM-YEAST TO THE FEED ON THE GROWTH RATE OF COMMON CARP (*CYPRINUS CARPIO*)

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KeyWords
Chromium-yeast, Common Carp seeds, insulin, carbohydrates.

ABSTRACT

The Seeds of Common Carp (*Cyprinuc carpio*) was given additional chromium-yeast. Chromium-yeast affects the performance of the insulin hormone which plays a role in carbohydrate metabolism so as to maximize fish growth. This research was conducted to determine the effect of adding chromium-yeast to feed on the growth rate of carp (seeds of *Cyprinus carpio*). The chromium-yeast addition treatments were treatment A (control) 0.0 mg / kg; treatment B (1.5 ppm); treatment C (2.5 ppm); and treatment D (3.5 ppm). The results showed that treatment B (2.5 ppm) produced the best survival rate of 91.25%, the best daily growth rate of 4.8%, and the best utilization of feed 91.78%. The results of chromium checking on carp meat (*Cyprinus carpio*) are still below the maximum value limit set by the Director General of POM No. 03725 / B / SK / 89 so that the Common Carp from this study are safe for consumption.

INTRODUCTION

Common Carp (*Cyprinus carpio*) is a freshwater fish species that has great opportunities in developing cultivation to reach the increasing market potential. Based on statistical data from the Ministry of Fisheries and Marine Affairs, that the production of carp aquaculture in Indonesia from 2014-2018 reached 1 million tons each year. Besides, fish is a source of animal protein to fulfill the nutrition of Indonesian society [1].

Some of the obstacles in aquaculture that many farmers complain about are the high price of commercial feed and the growth of Common Carp which must be adjusted to market needs. Feed as a source of energy for growth is a component of production costs, the largest of which is 30-89% [2]. In addition, commercial feed has a protein content of around 26-30% and according to Achadri (2018) so far fish feed has been dominated by commercial feed at a relatively expensive price, while the need for feed reaches 60-70% of the total need for fish farming.

One that affects the growth of fish by nutrition. Growth in Common Carp can usually grow well if the needs for protein, carbohydrates, and various other nutrients are met, but as is generally known, fish are less capable of utilizing feed carbohydrates. Feed carbohydrates are an inexpensive source of energy that can act as a Protein Sparing Effect so that feed protein can be saved for growth [3].

The low ability to utilize feed carbohydrates is related to the low ability to digest feed carbohydrates and the ability of cells to utilize carbohydrate digestion products, namely glucose. The use of feed carbohydrates as a source of non-protein energy may still be increased through the provision of trivalent chromium (Cr3+) so that more feed protein can be converted to body protein [4].

. This study is expected to provide information to fish farmers. mas, regarding the optimum dose of Chromium-Yeast as a feed additive to increase the growth of Common Carp (*Cyprinus carpio*) by utilizing carbohydrates in feed.

MATERIALS AND METHODS

Place and Time of Research

Study was conducted for 42 days from November to October at the Department of Agriculture, Fisheries and Livestock, Samosir Fish Seed Center, North Sumatra. Analysis of fish meat will be carried out at the Central Laboratory of Padjajaran University, Jatinangor, West Java.

Materials

Aquariumas a medium for maintaining 16 test fish, pH meter, DO meter, thermometer, analytical scale, scraps, ruler, milimeterblock, refractometer, basin, documentation and stationery. Materials used: Test fish, chromium-organic, feed and progol (feed adhesive). The research method used a completely randomized design (CRD) with four different chromium dosage treatments and four replications for each treatment. The treatments used with the addition of chromium-yeast ratio, namely; treatment A (control) 0.0 ppm, treatment B (1.5 ppm), treatment C (2.5 ppm), and treatment D (3.5 ppm).

Test Feed Preparation and Container Preparation

Procedure The research begins with the preparation of the test feed with the addition of progol to the feed so that the chromium-yeast can combine in the feed. Feeding is done twice a day, morning and evening. Maintenance of water quality is carried out in two ways, namely by piping and replacing the maintenance media water as much as ¼ of the water in the aquarium. First, clean the aquarium container with water. The test fish used were 320 fish (stocking density of 20 fish / aquarium). The tested fish came from the Department of Agriculture, Fisheries and Livestock, Samosir Fish Seed Center, North Sumatra. The observed parameters were calculated such as Survival Rate (SR), Daily Growth Rate, Feed Efficiency, Chromium in Fish Meat, Water Quality, and Data Analysis.

RESULTS AND DISCUSSION

Survival Rate

Survival Rate (SR) is an indicator to determine the tolerance and the ability of fish to survive. According to Kenneth [5], survival is one of the fundamental factors that regulate population persistence and can be influenced by the size or age of the fish and various other factors.

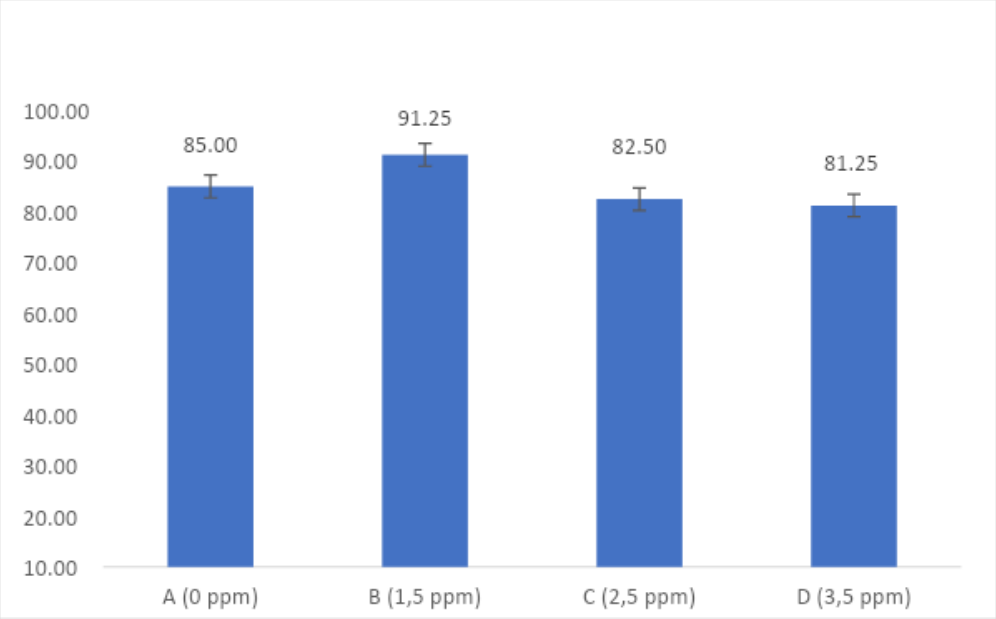

Fig. 1. Graph of Survival Rate (SR) of Common Carp Seeds

Based on the results of the analysis of variance, it was found that the feeding treatment with the addition of organic chromium was not significantly different from the survival value in the control treatment experiment. As previously mentioned, treatment B with the addition of 1.5 ppm organic chromium produced the best survival rate of 91.25%

followed by treatment A (control) with 85% still fish, treatment C (2.5 ppm) with still fish 82.50 %, and finally in treatment D (3.5 ppm) with fish still 81.25%.

The results of the survival chart of carp fry (Fig. 1) show that fish fed with additional 1.5 ppm chromium produced the highest survival compared to fish given the addition of 2.5 ppm and 3.5 ppm organic chromium. This shows that in its administration, organic chromium must be at an optimum level in order to work properly for fish survival. As Khaeriyah [6] argues, chromium at an optimum concentration can increase the entry of glucose in the blood, so that carbohydrates can act as a protein sparing effect in tissue formation so that fish can grow better.

Fish that are given the optimum addition of organic chromium can produce energy that can be used for growth as well as adjustments to the new rearing environment. This is related to the effect provided by organic chromium which triggers insulin performance through GTF to maximize blood glucose into target cells as a source of energy in line with the research of Mutiara [7]. Chromium as a micronutrient which acts as a cofactor in increasing the work of insulin in transferring glucose into cells and regulating blood sugar reduction [8].

The results of research conducted by Nur [9] show that the survival rate (SR) of tilapia (seeds *Oreochromis niloticus*) with the addition of organic chromium has varied values. The addition of organic chromium to tilapia seeds, respectively, of 1.5 ppm, 2.5 ppm, 3.5 ppm showed a survival rate (SR) of 87.5%, 97.5% and 80%. The optimum addition of organic chromium in this study was at 2.5 ppm with a survival rate (SR) of 97.5%. The optimal amount of organic chromium in feed in addition to growth energy can make fish survival increase and healthier, presumably because the success of chromium in suppressing the hormone cortisol is due to stress on fish in facing their environment as stated by Hastuti [10]. Chromium-yeast is expected to be able to make fish body respond better to stress so that its survival is good. In this treatment, it was found that 1.5 ppm was the most optimal for the survivalrateof carp fry.

Daily Growth Rate

Observations of the weight growth of carp fry for 42 days showed that the treatment of feed with organic chromium added at different concentrations resulted in different growth of carp fry.

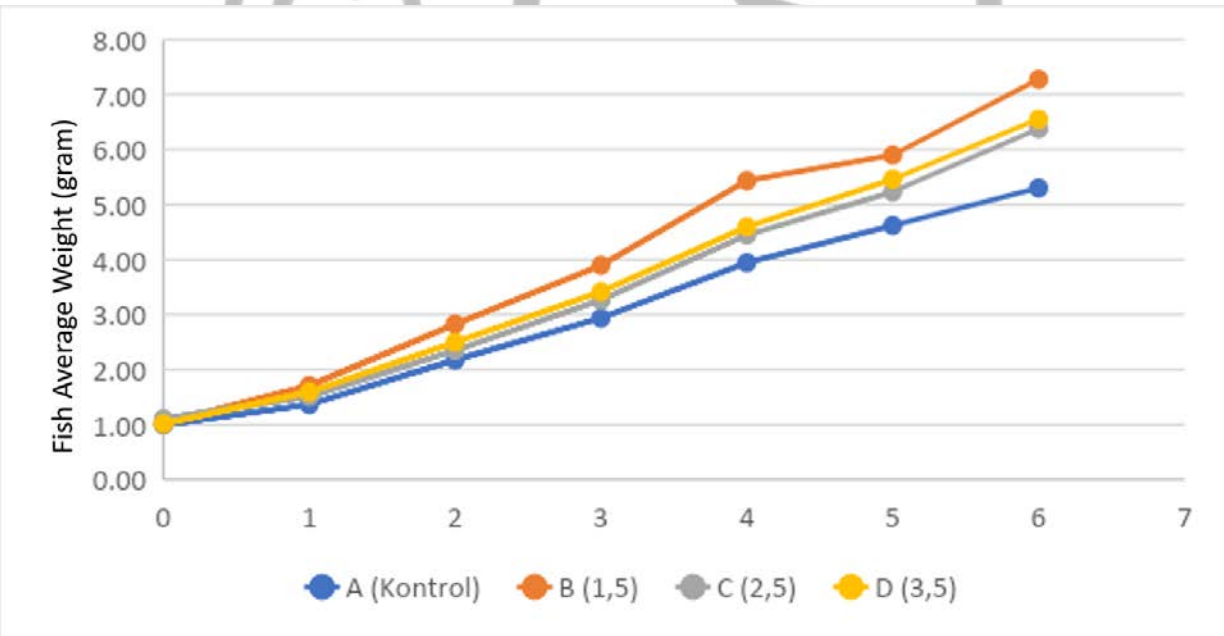

Fig. 2. Graph of the average weight gain of Common Carp fry.

During the research which lasted for 42 days, it was shown that the weight growth of carp fry increased. The average individual weight of Common Carp seeds at the beginning of the maintenance ranged from 0.75 to 1.20 grams, while at the end of the study the average individual weights ranged from 5.0 to 7.3 grams. The results of growth observations showed that the results of treatment B using a chromium concentration of 1.5 ppm resulted in the highest average growth rate seen. The results of the average weight of Common Carp during the study were continued by calculating the daily growth rate.

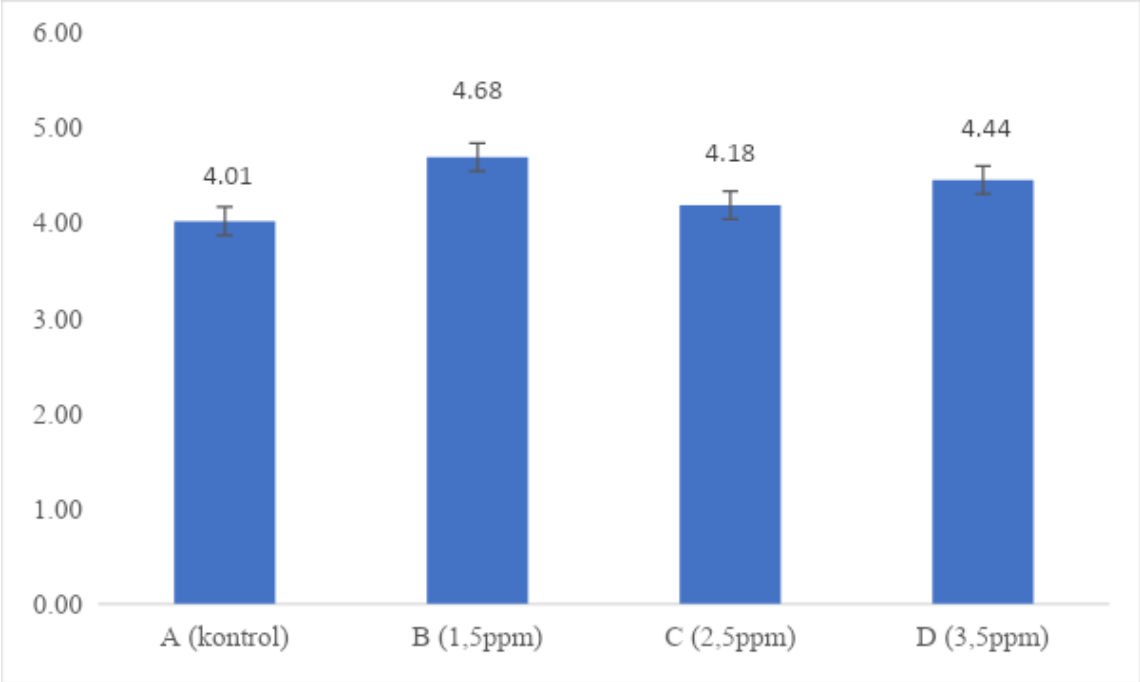

Fig. 3. Graph of daily growth rate of Common Carp seeds The

Value of daily growth rate for each treatment, namely, A (Control) 4.01%, treatment B (Cr-yeast 1.5ppm) 4.68%, Treatment C (Cr-yeast). 2.5ppm), 4.18%, and Treatment D (Cr-yeast 3.5ppm) 4.44%. The results of the calculation of the daily growth rate were analyzed using variance analysis showing that the level of use of commercial feed given organic chromium showed significantly different results, and continued with the Duncan multiple distance test.

The difference in the results of giving organic chromium in this study as stated by Akbar [11] was due to optimization in each trial treatment with chromium, he stated that the difference in growth due to the addition of different chromium content in the feed given was related to the role of chromium in optimizing the use of carbohydrates by okan as a source of energy. This is in line with what was stated by Yanto [12] that the highest daily growth rate is closely related to optimal chromium levels in the feed, thereby increasing insulin performance through the glucose tolerance factor to maximize blood glucose into target cells as a source. energy.

The results showed that treatment B (1.5 ppm) produced the highest growth rate compared to treatment C (2.5 ppm) and D (3.5 ppm). These results show results that are almost similar to Mokoginta's [13] research, the addition of chromium to Common Carp immunity, which in conclusion states, based on the evaluation of various parameters used in this study that the Crlevels3+ of 1.6-2.2 ppm are optimum levels that can be given in Common Carp feed. So this shows that the optimum levels of chromium can have an effect on increasing the growth of carp fry.

Feed Efficiency

The Feed efficiency value is obtained from the comparison between fish body weight gain and the amount of feed consumed by fish during the rearing period. The greater the feed efficiency value, the more efficient the fish use the feed consumed for growth [14]. The value of feed efficiency produced in this study was quite high and varied (Figure 4).

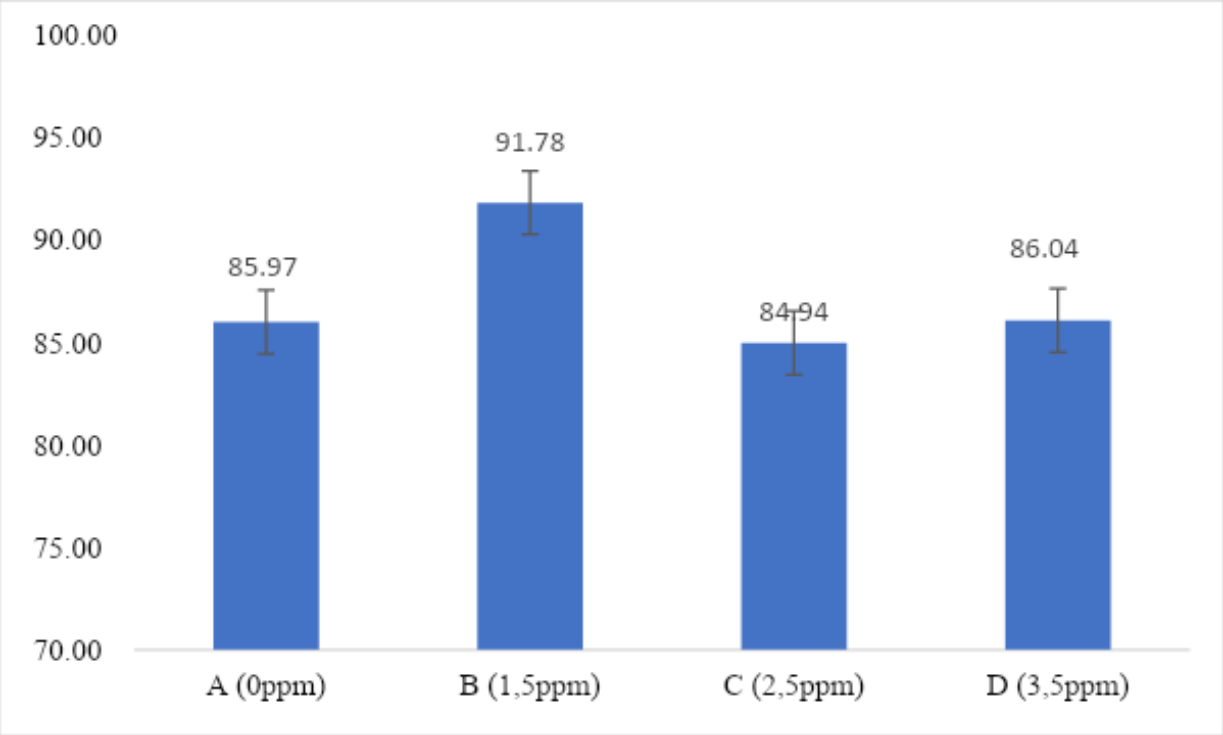

Fig. 4. Graph of feed efficiency of carp fry.

The results of the feed efficiency value in this study were quite high even in the control treatment, but it can be seen that the value between treatments was quite significant, especially in treatment B (Cr 1.5 ppm). Treatment A (control) got a value of 85.97%, treatment B (Cr 1.5 ppm) with a value of 91.78%, treatment C (Cr 2.5 ppm) with a value of 84.94%, and treatment D (Cr 3.5 ppm) with a value of 86.04%. Commercial feed given organic chromium additives is proven to be edible and utilized by Common Carp seeds.

If you look at the results of the feed efficiency in the graph above, it states that feed treatment with chromium added results in higher feed efficiency values compared to control treatment (without adding chromium-yeast). Treatment B has the highest feed efficiency value so that it is the best compared to other treatments.

Table 1. Feed Efficiency of Common Carp seeds

Treatment	Average EPP (%)
A (control)	85.97 ± 3.72[a]
B (organic Cr 1.5 ppm)	91.78 ± 4.93[a]
C (organic Cr 2 , 5 ppm)	84.94 ± 3.71[a]
D (organic Cr 3.5 ppm)	86.04 ± 6.67[a]

Note: The value followed by the same lowercase letter shows no significant difference (P <0.05) based on Duncan's multiple distance test at the 95% confidence level.

If you look at the results of the analysis of variance above, there is no real difference in the efficiency of feed utilization between treatments. In Figure 6, Common Carp seeds fed organic chromium infused had a higher feed efficiency value than fish not given chromium even though the results of analysis of variance showed no significant effect (P <0.05) (Table 1). Treatment B (Cr 1.5 ppm) is the highest among other treatments so that it is the most optimal given to Common Carp seeds. This is also in line with the results of the average daily growth rate of Common Carp fry in treatment B which is higher than other treatments (Figure 3). The relationship between feed utilization efficiency and growth is also supported by the statement of Simatupang and Nugroho [15] that feed is said to be good if the feed efficiency value is more than 50% or even close to 100%. Akbar *et. al.,* [16] stated that high feed efficiency values can optimize and in-

crease growth. So it can be said that organic chromium at an optimum level can increase fish feed efficiency thus increasing the growth rate of fish.

Mokoginta [13] also obtained a similar result in which he stated that the results, feeding with chromium combined, could make the use of carbohydrates as an energy source more effective so that protein could be stored in the body. In a study using gouramy conducted by Subandiyono [17] reported an increase in protein and fat deposition, protein and energy retention and increased feed efficiency in gouramy which was fed with chromium supplementation of 1.5 ppm. Meanwhile, Shiau and Liang [18] observed an increase in weight gain, feed efficiency, comparison of protein efficiency, protein deposition, and phosphofructokinase activity in hybrid Common Carp with supplementation of 0.5% - 2.0% chromium on rations containing pure glucose as one. the only source of glucose.

Several results from previous studies prove that organic chromium can play a role in the utilization of carbohydrates as an energy source. So that growth can be maximized at an optimum level, as non-protein energy sources are sufficient, so the function of protein for growth can be carried out [19]. Then it was found in this study that the feed with chromium-yeast additive of 1.5 ppm (Treatment B) could increase the level of feed efficiency and increase the growth rate of carp fry. The increase in the amount of energy produced by organic chromium causes energy allocation for growth to increase and growth to increase.

Chromium in Fish Meat

The chromium content in the feed consumed by carp has an impact on the accumulation of chromium in carp meat. Accumulation of metals in the body of the fish from the largest to the smallest starting from the gills, liver, and meat. In line with this, according to Darmono [20], metal accumulation in fish body tissue from the largest to the smallest is in the gills, liver and meat, respectively. The body parts of Common Carp that were tested for chromium levels in this study were the parts of fish meat

Based on Table 1, it can be seen that the chromium content in Common Carp meat increases with the increase in the percentage of chromium application in the research treatment. This result is similar to Rostika [4] study, which states that the final body chromium content of the fish group that consumed cecium feed was higher than that of the fish group that consumed non-chromium feed. The higher the chromium in the feed will increase the chromium content of the fish body.

Table 1. Chromium content in carp meat after research

Treatment	Chromiumon meat (mg / kg)
A (control)	-
B (1.5 ppm)	0.1176
C (2.5 ppm)	0.1463
D (3.5 ppm)	0 , 1741
Maximum limit *	2.5

* Description: Dirjen POM No. 03725 / B / SK / 89

The highest chromium content was in treatment D (Cr 3.5 ppm) 0.1741 mg / kg, then followed by treatment C (Cr 2.5 ppm) 0.1463 mg / kg, treatment B (Cr 1.5 ppm) had the lowest content with a yield of 0.1176 mg / kg, the Cr content in treatment A (control) was not tested because the feed given did not contain chromium. The results above are in line with Yanto's research [12] which examined nettle fish, the results obtained were that the increased Cr content would also have an effect on the increase in Cr in the stinging fish meat.

The limit of metal contamination according to Dirjen POM No. 03725 / B / SK / 89 concerning the limit of metal contamination in food, which is 2.5 mg / kg. If referring to the limit of metal contamination according to the BPOM, the Common Carp in this study is below the threshold and safe for consumption. The chromium content in Common Carp in this study is organic chromium with three valences (Cr3+) so that it is safe to use by fish and for human consumption. This also makes organic chromium a lot of use for both animals and humans.

Chromium in the blood causes glucose to be immediately used as an energy source to meet metabolic energy needs so that certain proteins can be used more efficiently for growth without having to convert it into energy through catabolic pathways. This means that chromium is able to increase the efficiency of feed protein utilization or increase body protein deposition for growth.

Water Quality

Water quality is an important factor in fish farming, namely as a medium for fish maintenance. The results of measuring water quality parameters can be seen in Table 2.

Table 2. Water Quality Parameters during the study

AverageValue			
Treatment	Temperature	DO(mg / l)	pH
A (Control)	25 - 25.7	5.9 - 7.3	6 , 51 - 7.1
B (1.5 ppm)	25 - 25.6	5.5 - 6.9	6.62 - 6.9
C (2.5 ppm)	25 - 25.4	6.3 - 7, 0	6.5 - 7.2
D (3.5 ppm)	24.9 - 25.5	5.8 - 6.7	6.7 - 8.5
Optimal Range *	25 - 32	> 3	6.5 - 8, 5

Information: * SNI 7550 (2009)

Water quality is something that needs attention during cultivation activities. Good and optimal fish maintenance media will have a good effect on fish survival. As a similar opinion, the management of water quality for cultivation purposes is very important, because water is a living medium for aquaculture organisms [21]. If you look at the table above, the water quality parameters in this study are still included in the normal category according to SNI 7550 [22] for Common Carp cultivation.

The water temperature during the study was within the normal Common Carp cultivation range. Indeed, temperature fluctuations ranged from 24.9 - 25.6^{o}C, but the water temperature in each treatment was not much different, ranging from around 25^{o}C. The water temperature in the study was relatively not too high because the place used in this study was a warehouse room. tilapia feed, so that sunlight does not enter the room too often. Normal temperature in culture is important because it can affect fish activity during maintenance. This is as Effendi [23] states, temperature can affect the life activities of organisms such as fish appetite. If the temperature increases, it will increase the intake of food by the fish and the decrease in temperature causes the digestive and metabolic processes to run slowly.

Conclusion

In this study, commercial feed supplemented with organic chromium was proven to increase the growth rate of carp fry. Based on the evaluation of the various studies used in this study, it can be concluded that the organic chromium content of 1.5 ppm is the optimum level for the addition of Common Carp seed feed because it produces the highest daily growth rate value of 4.68% and the highest feed efficiency of 91.78%. The results of checking the chromium content in Common Carp meat are still far below the maximum fish limit set by the Director General of POM No. 03725 / B / SK / 89 so that the Common Carp is safe for consumption. It is recommended to provide organic chromium as much as 1.5 ppm in commercial feed for the maintenance of carp seeds. It is also advisable to conduct further research to determine how the effect of organic chromium with different doses on Common Carp rearing stadia at a further level.

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