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THE USE OF MIXED REBON SHRIMP FLOUR (ACETES SP.) IN COMMERCIAL FEED ON THE COLOUR BRIGHTNESS OF GOLD FISH (CARASSIUS AURATUS)

Penggunaan Campuran Tepung Udang Rebon (*Acetes Sp.*) Dalam Pakan Komersil Terhadap Kecerahan Warna Ikan Komet (*Carassius Auratus*)

Viona Liuprilita Budiman*, Ibnu Dwi Buwono, Kiki Haetami, Roffi Grandiosa

Fisheries Study Program, Faculty of Fisheries and Marine Affairs, Padjadjaran University

Bandung Sumedang Main Street KM.2, Jatinangor, West Java 45363

*Coresponding author: liuviona2003@gmail.com

ABSTRACT

This study aims to investigate the effect of adding shrimp head flour (Acetes sp.) to commercial feed on the color brightness of comet goldfish, as well as to determine the optimal usage level that can achieve the highest brightness level. The research method employed was a complete randomized design (CRD) with four treatments: (A) control 0%, (B) 10%, (C) 20%, and (D) 30% shrimp head flour. The study was conducted over 40 days, with observations made every 10 days using the Toca Color Finder to assess fish color. The results indicate that adding shrimp head flour to commercial feed significantly enhances the brightness of comet goldfish compared to the control, although there was no significant difference observed among treatments with varying levels of shrimp head flour. The highest increase in color brightness

Key words: Acetes sp., Carassius auratus, Color Brightness

ABSTRAK

Penelitian ini bertujuan untuk mengetahui pengaruh penambahan tepung udang rebon (*Acetes sp)* dalam pakan komersil yang berpengaruh terhadap kecerahan warna ikan komet serta menentukan tingkat optimum yang dapat menghasilkan kecerahan tertinggi. Metode penelitian yang digunakan adalah lengkap percobaan dengan rancangan acak (RAL) dengan 4 perlakuan yang meliputi (A) kontrol 0%, (B) 10%, (C) 20%, dan (D) 30%. Penelitian dilakukan selama 40 hari dan Pengamatan dilakukan setiap 10 hari sekali terhadap warna ikan disimpan dengan *Toca Color Finder*. Hasil penelitian menunjukkan bahwa penambahan tepung udang rebon pada pakan komersil dapat meningkatkan kecerahan warna ikan komet dengan signifikan hasil yang berbeda dari perlakuan kontrol tetapi tidak berbeda nyata antara perlakuan dengan penambahan tepung udang rebon. Peningkatan warna tertinggi adalah diperoleh pada perlakuan D dengan penambahan tepung udang rebon sebesar 30%.

Kata Kunci: Udang Rebon (*Acetes sp.)* Ikan Komet (*Carassius auratus*), Kecerahan warna.

INTRODUCTION

Ornamental fish are one of the potential fisheries commodities at home and abroad. Ornamental fish can be used as a source of foreign exchange income for the country.

Ornamental fish have their own charm and now many consumer fish entrepreneurs are switching to the ornamental fish business. The advantage of ornamental fish is that it can be cultivated on a large or small scale or household scale, besides that capital turnover in this business is relatively fast. Not all of the ornamental fish in Indonesia are native to Indonesia, most of them are fish that are imported and then developed and the results can satisfy ornamental fish fans abroad. Ornamental fish are fish for viewing the beauty of the different colors and patterns of each type and have their own charm, as well as fish for display/decoration (Sihombing et al. 2013).

Comet fish (Carassius auratus) is one of the freshwater ornamental fish commodities which is popular among ornamental fish hobbyists because of its attractive color patterns and body shape, and can be kept in ponds or aquariums. The selling value of comet fish is influenced by the brightness of its body color, the brighter it is, the more expensive the selling price of the comet fish is. The level of color brightness in fish depends on the number and location of chromatophore movements (Nyquist & Toner, 1997). Beautiful and varied body colors are the attraction of comets as ornamental fish. The beautiful color of fish is caused by chromatophores (pigment cells) located in the epidermis layer, which have the ability to adapt to the environment and sexual activity, while the number and location of chromatophore movements influence the level of color brightness in fish (Indarti et al., 2012). The addition of pigment-bearing feed ingredients in feed can increase the concentration and distribution of chromatophores in skin tissue which will ultimately increase color brightness (Dahlia, 2014).

Rebon shrimp is one of the marine products of the crustacean type but is very small in size compared to other types of crustaceans. For coloring ornamental fish, natural astaxanthin is also found in rebon shrimp and freshwater microalgae, so it is good to use in an effort to increase coloring in fish. The color and pigmentation of ornamental fish are influenced by the absorption and accumulation of carotenoids in the body (Sukarman & Hirnawati, 2014). One feed that is a rich source of carotenoids is rebon shrimp. Rebon shrimp flour plays a good role in fish coloring because it contains the carotenoid type astaxanthin (Gouveia et al., 2002). Empirically, the natural carotenoid astaxanthin can increase the brightness of fish color. However, the use of rebon shrimp flour containing astaxanthin as additional feed to increase the brightness of fish color needs to be biologically tested on comet fish.

Based on the potential of rebon shrimp, research is needed regarding the use of a mixture of rebon flour (Acetes sp.) in commercial feed on the brightness of the color of comet fish (Carassius auratus).

METHODS

The research was carried out from March 2024 to April 2024, in the Aquaculture Laboratory, Building 4, Faculty of Fisheries and Marine Sciences, Padajajaran University. The materials used are comet fish (Carassius auratus) measuring 5 ± 6 cm long with a weight of around 6 ± 7 g, rebon shrimp flour (Acetes sp.), Breeder Pro commercial feed, CMC, and silica gel. The tools used are digital scales with an accuracy of 0.01, blender, oven, blender, 12 aquariums measuring 40x25x25 cm3, fiber tub, aeration, heater, mercury thermometer with an accuracy of 0.1°C, DO, pH meter, millimeter block , and a ruler with an accuracy of 0.1 cm.

Rebon shrimp flour is made in the Aquaculture Laboratory Building 2, Faculty of Fisheries and Marine Sciences, Padajajaran University. The rebon shrimp (Acetes sp.) obtained are first blended until smooth, then mixed with commercial feed according to the treatment. Then it is molded until it is shaped like a pellet. After that, the feed is dried using an oven for ± 2-3 hours. Once dry, put it in a container (jar) and add silica gel to prevent moisture from forming.

The test fish were first acclimatized for 7 days in a fiber bath to adapt to the new environment and rearing media. During this process, the fish were given food (without the

addition of rebon shrimp flour (Acetes sp.) 2 times a day. After acclimatization, brightness measurements were carried out using TFC (Tocca Color Finder). Next, the test fish were stocked into 12 aquariums equipped with aeration and heating devices.

Fish rearing lasts for 40 days. Once every 10 days, sampling is carried out including measuring water quality, measuring length and observing the brightness of the color of the fish using the Toca Color Finder (TFC) to observe the color on the fish's body. During maintenance, the feed given is test feed in the form of commercial feed which is added with rebon shrimp flour. Previously mixed with CMC as an adhesive then stored and closed tightly in a ziplock bag, silica gel was added to keep the feed from getting damp or moldy. Feed is given twice a day, namely at 10.00 WIB and 14.00 WIB. The amount of feed given is 5% of the fish biomass. The treatment given is as follows:

Treatment A : 100% commercial feed (Without the addition of Rebon Shrimp Flour).
Treatment B : Commercial feed + 10% Rebon Shrimp Flour.
Treatment C : Commercial feed + 20% Rebon Shrimp Flour.
Treatment D : Commercial feed + 30% Rebon Shrimp Flour.

Research Parameters

Changes in Fish Color Brightness Levels

Observations on changes in the brightness level of fish colors were carried out every 10 days for 40 days. Observations were carried out by 3 panelists who were not color blind to avoid bias. The parameter observed was the color brightness value on the comet fish's body, using a scale based on Toca Color Finder (TCF) which gives a score from one to six. The result of observing the level of color change is data about the increase in color brightness, which is then analyzed descriptively.

Water Quality

Observations of water quality parameters are carried out every 10 days, used as supporting data in determining the optimum conditions for raising test fish, including water temperature, dissolved oxygen (DO), and pH.

Data Analysis

Data regarding changes in color brightness were explored descriptively, while the increase values were analyzed using the Kruskal-Wallis test. If there is a significant difference between treatments, the Z test is carried out with a confidence level of 95%. The absolute growth in length and weight of fish were analyzed via ANOVA with the F test at the 95% confidence level. Meanwhile, data regarding water quality is assessed comparatively using a descriptive approach.

RESULT AND DISCUSSION

The results of research that lasted for 40 days showed that the addition of rebon shrimp flour to the feed significantly affected the color brightness of comet fish ($p < 0.05$) when compared to the control group. The increase in color brightness is especially visible on the back of the comet fish. Treatment D (30%) showed the highest increase in color brightness with an average score of 5.7, followed by treatments C (20%), B (10%), and A (Control). The graph below depicts the average increase in color brightness from the start to the end of the study based on Toca Color Finder (TCF) scores (Figure 1).

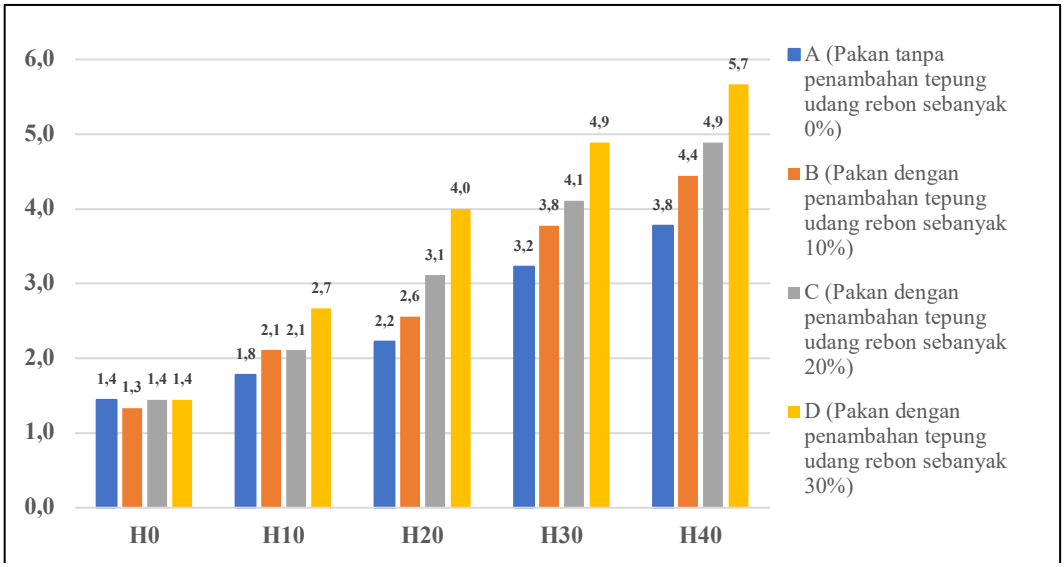


Figure 1. Average increase of color brightness

Based on the graph of changes in average color brightness, at the beginning of the rearing period (day 0), the color value of comet fish from all treatments ranged from 1.3 to 1.4. On the 10th day, there was a visible increase in color in all treatments, with average values ranging from 1.8 to 2.7. On the 20th day of the rearing period, there was a significant increase in the color value in treatment D (30%) with an average score of 3.4, treatment C (20%) with an average score of , and treatment B (20%) with a score average 3.2. Treatment A (Control) showed the lowest increase in color value, with an average value of 3.1 but showed a slight increase. This variation may be caused by factors such as age of the fish, color development in the fish, and water quality (Lagler 1997).

On day 30, a significant increase in color value was seen in treatments B (10%), C (20%), and D (30%), although the color increase in treatment B was lower than in treatments C and D without significant differences. significant. The increase in color value in treatment A (Control) was the lowest compared to other treatments because the fish in treatment A did not get a source of carotenoids from feed. On the 40th day, there was a significant difference in the average color value in treatments B (10%), C (20%), and D (30%) with the average score for each treatment being 3.9, 4.1 and 4.4 compared to the average score for treatment A (Control) which reached 3.8. It is assumed that high carotenoid content in feed can increase the color of fish so that the color of the fish becomes brighter (Fitriana et al., 2013).

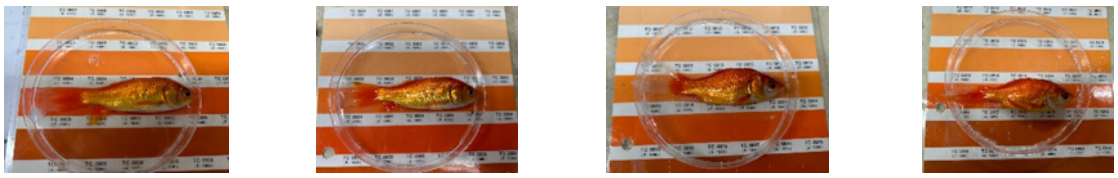
On the 40th day, fish from all treatments were given control feed to observe the effect of stopping feeding with shrimp head meal on the increased color brightness of the fish. A slight increase in color was seen in all treatments with the highest increase in color value occurring in treatment D (30 %) with an average score of 5.7.

Table 1. Average increase in comet fish color during the study

Treatment	Color Score (Body)		Improvement	Color Score (Head)		Improvement
	H-0	H-40		H-0	H-40	
A	1.3	4.4	70%	1.4	3.8	63%
B	1.3	4.7	71%	1.3	4.4	71%
C	1.3	5.0	73%	1.4	4.9	71%
D	1.3	5.7	76%	1.4	5.7	75%

Based on the results obtained, each treatment experienced significant color changes in comet fish from the beginning of the experiment (D-0) to the end of the experiment (D-40). Treatment A produced the lowest color increase compared to other treatments, namely 70% in body color and 63% in comet fish head color, while treatment D showed the most striking color change, followed by treatments C and B, respectively. In Treatment A, the increase in fish body during the study can be expected to occur due to increasing age of the fish. As fish age and body size increase, the color on their bodies tends to increase and become more clearly visible. As stated by Storebakken (1992), factors such as feed, environmental conditions and genetics of comet fish can influence the observed changes in fish color.

The color changes observed showed that treatment D (with a concentration of 30%) produced a more significant color change compared to treatment C. This is possibly caused by the axasantin content in rebon shrimp flour which can absorb carotenoids optimally (Fitriana et al., 2013). In treatment D (30%), a higher dose of rebon shrimp flour resulted in maximum absorption of astaxanthin in the feed by the fish. It is important to pay attention to the dosage of carotenoids because carotenoids have a maximum limit which, if exceeded, will not increase the color and can actually reduce the color value (Sulawesty, 1997). In addition, excessive administration of pigments such as carotenoids can reduce hormonal performance in fish



Kontrol 10% 20% 30%

Fig 1. Fish Color at the End of Research

A significant increase in color occurred in treatment D, namely where the feed was given the addition of 30% rebon shrimp flour. The value obtained provides an increase of 75-76% with a score on H-40 of 5.7 (Figure 1). This very high increase in color is thought to be because the fish absorb the carotene content from the feed given the addition of rebon shrimp flour. According to (Lesmana 2002), the results of carotene absorption in ornamental fish are usually visible after 14 days of cultivation.

Research shows that the addition of carotenoids in rebon shrimp flour affects the color of comet fish. The color of the fish changes due to astaxanthin in rebon shrimp flour. Astaxanthin is a carotenoid that plays a role in changing fish color. Sari et al. (2012) stated that color changes are influenced by stress, external and internal factors, water quality, and pigments in feed. Comet fish are thought to be able to absorb and accumulate carotene optimally without interfering with hormone performance, thereby regulating pigment cells in the appearance of color. Indarti et al. (2012) reported that fish absorb carotenoids from food and use them to increase the color intensity of their scales.

Amin et al. (2012) stated that the increase in different colors in fish occurs due to different levels of absorption of color pigments and doses. The value of fish body color is influenced by the total amount of carotenoids in the feed. Appropriate nutritional content can improve the performance of the fish, making the fish color brighter. The fat, protein and carotenoids in rebon shrimp flour are thought to influence the color quality. The fat content in rebon shrimp flour is quite high, namely 3.6%, as well as high protein and carotenoid content, which can improve the color quality of comet fish. Subandiyono (2010) states that the absorption of carotenoids increases if they are mixed with fat in feed or supplements, because carotenoids are fat soluble.

Water Quality

Water is a crucial factor because it functions as a habitat for fish. Various physical, chemical and biological parameters play an important role in supporting fish survival (Ayuniar & Hidayat 2018). Water quality is one of the things that needs to be considered in cultivation activities because it greatly influences the growth and development of fish. A good water source in cultivation activities should meet the standard criteria for water quality so that fish can grow and develop properly.

The results of measuring water quality parameters during the research are presented in Table 3 below.

Table 2. Water quality range during the study

Treatment	Water Quality Parameter Range		
	temperature (°C)	pH	DO (mg/l)
A	27,7 – 30,2	7,24 – 7,83	6,53 – 7,74
B	27,7 – 30,1	7,25 – 7,89	6,58 – 7,46
C	27,7 – 30	7,23 – 7,86	6,47 – 7,58
D	27,6 – 30,5	7,2 – 7,82	6,48 – 7,64
Optimum Range (Bachtiar, 2002)	25 – 32	5,5 – 9,0	5,0 – 8,0

Information:
A (Feed without the addition of 0% rebon shrimp flour),
B (Feed with the addition of 10% rebon shrimp flour),
C (Feed with the addition of 20% rebon shrimp flour),
D (Feed with the addition of 30% rebon shrimp flour).

The results of the water quality analysis show that the water conditions during the research were still within standard limits. Water temperature measurements during the study showed a range of 27.6–30.5°C, which is still in accordance with fish maintenance tolerance. According to Kordi and Ghafram (2010), tropical fish live optimally at temperatures of 28.0–32.0°C. Increasing temperature can accelerate the breakdown of carotenoproteins into protein and carotene by increasing the metabolic rate of fish, thus helping the formation of red pigment (Latscha 1990). Dissolved oxygen (DO) measurements showed levels of 6.47–7.74 mg/L, which is still suitable for ornamental fish. According to Kottelat et al. (1993), a good dissolved oxygen level for ornamental fish is 3.0–5.0 mg/L. Dissolved oxygen levels can affect the metabolic rate of fish (Rosariawari et al., 2019). pH measurements show a range of 7.2–7.8, which is ideal for Malawian cichlids such as peacock cichlids, which prefer alkaline water pH. According to Partical Fish Keeping (2013) the optimal pH for comet fish is 5.5–9.0.

CONCLUSSION

Based on the research results, it can be concluded that the addition of rebon shrimp flour to Commercial feed in concentrations of 10%, 20%, and 30% increased the color brightness of comet fish significantly compared to the control group. The best color improvement was found with the addition of 30% rebon shrimp flour in commercial pellets, reaching a value of 5.7 on Toca Color Finder paper.

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