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Effect of The Combination of Commercial Feed and Maggot *Black Soldier Fly* (*Hermetia illucens*) on the Length and Weight of Dumbo Catfish (*Clarias gariepinus*)

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Abstract

Feed is one of the important factors and sources of energy needed by fish to support growth, reproduction, and survival. The high price of protein source feed ingredients is an obstacle in fish farming. Natural food that can be used as an alternative to fish feed is the larvae of the black soldier fly (Hermetia illucens) because it meets the requirements as a source of protein. The purpose of this study was to determine the effect of the combination of commercial feeding and maggot on the growth of Dumbo catfish (Clarias gariepinus). This study used a Randomized Block Design with 5 treatments and 4 replications. The frequency of feeding is carried out 2 times a day at 08.00 and 16.00 Central Indonesian time with a dose of 5% fish biomass. The results of the study showed that the best combination of commercial feed and maggot was found in treatment 3 (P3) with a combination of 50% commercial feed and 50% maggot, with an average length of 144.03 mm and an average weight of 61.11 gr.

Keywords: Feed, maggot, length, weight, Dumbo catfish

Introduction

Dumbo catfish (*Clarias gariepinus*) is a type of freshwater fish resulting from a cross between a female catfish from Taiwan and a male catfish mother from Kenya, Africa (Manastas, 2013). Dumbo catfish is referred to as king catfish, this is because dumbo catfish have a larger body than local catfish. This fish also has various variations of names that are known by people in the Nusantara region. Dumbo catfish has the advantage that its growth is much faster than local catfish whose growth takes up to 5-6 months. Adult dumbo catfish have a body weight of 2-3 kg per head and the fecundity of the sow reaches 8,000-10,000 grains (Djuriono, 2018).

Feed is one of the important factors and a source of energy that is needed by fish to support their growth, reproduction, and survival. Fish feed consists of natural feed and artificial feed. Natural feed is a live feed given to fish fry, and contains a complete nutritional composition and is easy to digest by fish fry, while, artificial feed is feed made with a certain arrangement of ingredients and nutrients that suit your needs (Mahyudin, 2010).

One of the natural feeds of concern is maggots or larvae of the black soldier fly (*Hermetia illucens*) which can be used as an alternative feed because it has a high protein content with a percentage of 44.26%, where this protein content is higher than in commercial feed which has 20-25% protein (Putri *et al*., 2019). Maggots can be given in fresh form and also in processed form in the form of pellets. It is hoped that the use of maggots as an alternative ingredient for fish feed can reduce the cost of fish production and the price of the feed can be reached by the wider community at a low price.

Materials and Methods

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Time and Place

This study was conducted in January – March 2022. The maintenance of dumbo catfish fry is carried out at Camp Hijau, Belimau Road, Lempake, Samarinda, East Kalimantan.

Materials and Tools

The tools used in this study are aerators, 45-liter plastic buckets, DO meters, cloth meters, pH meters, aerator hoses, digital thermometers, digital scales. While the materials used in this study were 200 dumbo catfish fry (*Clarias gariepinus*), black soldier fly maggots (*Hermetia illucens*) and commercial feed (Prima Feed PF-100 brand).

Research Design

This study has several stages, namely preparation of test feed, preparation of research containers, stocking of dumbo catfish fry (*Clarias gariepinus*), maintenance and feeding, fish observation, and observation of water quality. The maintenance of dumbo catfish is carried out for 60 days with a frequency of feeding twice a day, namely in the morning at 08.00 and in the afternoon at 16.00 Central Indonesian Time with a dose of 5% of fish biomass. The method carried out in this study used a Randomized Block Design (RBD) with 5 treatments and 4 replications, which were treated in this study, namely:

Treatment 1 = Commercial feed 100% (Control)

Treatment 2 = Commercial feed 75% and maggot 25%

Treatment 3 = Commercial feed 50% and maggot 50%

Treatment 4 = Commercial feed 25% and maggot 75%

Treatment 5 = Maggot 100%

The parameters observed in this study were the length and weight of the fish. The observed parameter data will be analyzed using the following formula:

Absolute Length Growth

The growth of catfish length during maintenance can be calculated using the formula of Indra *et al.,* (2021) as follows:

$L = L_t - L_0$

Information:

L = absolute length growth (mm)

L_t = average length of fish at the end of maintenance (mm)

L_0 = average length of fish at the beginning of maintenance (mm)

Absolute Weight Growth

The growth of catfish weight during maintenance can be calculated using the formula of Indra *et al.,* (2021)

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as follows:

$W = Wt - W_0$

Information:

W = absolute weight growth (gr)

Wt = average weight of fish at the end of maintenance (gr)

W_0 = average weight of fish at the beginning of maintenance (gr)

The observed parameter results will be analyzed using a one-way analysis of variance (one-way ANOVA) at a 95% confidence level to evaluate whether the treatment differs markedly against catfish growth. The data was analyzed using SPSS software version 25.0. If the results of the analysis show a marked difference, then proceed with the Duncan Multiple Range Test (DMRT) to determine the difference in influence between treatments.

Results and Discussion

Length Growth of Dumbo Catfish (*Clarias gariepinus*)

The growth in catfish length during the study presented in Table 1 showed that the average length of dumbo catfish treated with a combination of commercial feed and maggots ranged from 80.53-144.03 mm. The highest length growth was obtained in treatment 3 (P3) with a value of 144.03 mm, treatment 4 (P4) with a value of 134.65 mm, P1 of 99.91 mm, P2 of 95.69 mm, and the lowest length growth was found in treatment 5 (P5) with a value of 80.53 mm.

Table 1 Absolute Length Growth of Dumbo Catfish

Treatment	Absolute Length Growth (mm)
P1	$99{,}91 \pm 2{,}33^{b}$
P2	$95{,}69 \pm 2{,}72^{b}$
P3	$144{,}03 \pm 2{,}22^{d}$
P4	$134{,}65 \pm 1{,}40^{c}$
P5	$80{,}53 \pm 4{,}01^{a}$

Information: Numbers followed by the same letter showed no real difference, while different letters showed a real difference in the Duncan test with a 95% confidence level

From the results of the Analysis of Variance (ANOVA) showed that each treatment made a real difference to the growth of the absolute length of dumbo catfish so that a Duncan follow-up test was carried out to determine the difference in each treatment. Based on the results of the Duncan test with a 95% confidence level which can be seen in Table 1, P1 as a control treatment differs markedly from P3, P4, and P5, but does not differ markedly from P2.

The combination treatments (P2, P3, and P4) differed from each other markedly, and the best combination treatment was obtained which was P3 (commercial feed 50% and maggots 50%).

The highest length growth was found in treatment 3 (commercial feed 50% and maggots 50%). This

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suggests that dumbo catfish can respond well to the combination of feed given. The provision of maggots as fish feed was also carried out by Setiawan *et al.* (2022), which showed that the combination of 50% maggots + 50% pellets produced the highest parameter value for the growth of maru fish. The feeding shows that fish do not only depend on 100% live feed but can adapt to artificial feed.

Weight Growth of Dumbo Catfish (*Clarias gariepinus*)

Based on the results of the weight growth analysis presented in Table 2, it shows that the average weight of dumbo catfish treated with a combination of commercial feed and maggots ranged from 23.45-61.11 grams, with the highest length growth obtained in treatment 3 (P3) which was 61.11 grams, treatment 4 (P4) with a value of 56.81 grams, P2 by 33.91 grams, P1 by 28.77 grams, and the lowest weight growth was found in treatment 5 (P5) with a value of 23.45 grams.

Table 2 Absolute Weight Growth of Dumbo Catfish

Treatment	Absolute Weight Growth (gr)
P1	$28,77 \pm 2,31^{b}$
P2	$33,91 \pm 1,86^{c}$
P3	$61,11 \pm 0,66^{d}$
P4	$56,81 \pm 0,79^{d}$
P5	$23,45 \pm 1,74^{a}$

Keterangan: Numbers followed by the same letter showed no real difference, while different letters showed a real difference in the Duncan test with a 95% confidence level

The results of the Analysis of Variance (ANOVA) showed that the treatment made a real difference to the weight growth of dumbo catfish. Furthermore, Duncan's follow-up test was carried out to determine the difference between each treatment. Based on the results of the Duncan test with a 95% confidence level can be seen in Table 2, P1 as a control treatment is significantly different from P2, P3, P4, and P5. This shows that the combined treatment of commercial feed with maggots (P2, P3, and P4) can provide different weight growth values from giving one type of fish feed found in P1 and P5.

The highest weight growth in this study was obtained in treatment 3 (commercial feed 50% and maggots 50%). This is in line with Murni 's research (2013) that the growth of the absolute weight of tilapia fed 50% pellet feed and 50% maggots produces the highest value. This can happen because the number of combinations of maggots and pellets is balanced so that the two feeds can produce growth in fish optimally. According to Hardini and Abel (2021), the average weight of fish will be lower if the dose from the use of maggot feed is increased. Therefore, for the use of additional feed in the form of maggots is recommended only up to 50%.

Water Quality

The observed water quality is water temperature, pH, and dissolved oxygen (DO). The water temperature during the study on each treatment ranged from 26-29°C. The temperature range was normal and good for fish growth. This is in accordance with Indra *et al.,* (2021) the temperature that can be tolerated by catfish is in the range of 25-30 °C. The pH value during the study ranged from 6.5-7.8. Such pH can be said to be good in the maintenance of fish. According to Azis and Ricky (2019) a good pH value in catfish rearing ranges from 6.5-8.5. Dissolved oxygen during the study ranged from 6.1-6.9 mg/L, these oxygen levels were also classified as good for fish survival. This is in accordance with Azis and Ricky (2019), who stated that

the optimal dissolved oxygen conditions for catfish to survive should be more than 5 mg/L.

Conclusion

The combination of commercial feed and maggots exerts a different influence on the growth of the length and weight of dumbo catfish (*Clarias gariepinus*). The combination of commercial feed and maggot that produces the best growth is found in treatment 3 (P3) with a combination of commercial feed 50% and maggot 50%.

Suggestion

Catfish cultivators can use a combination of 50% commercial feed and 50% maggot, because maggot is much cheaper, so in this way fish cultivators can reduce feed costs and get bigger profits.

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