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The Effect of a Combination of Tofu Drugs and Maggot Flour (*Hermetia Illucens* L) as an Alternative Feed on the Growth of Sangkuriang Catfish (*Clarias Gariepinus Var*)

Lariman*, Fatmawati Patang, Reni Agustiani, Reni Kurniati

Biology Study Program, Faculty of Mathematics and Natural Sciences, Mulawarman University, Jl. Barong Tongkok No.4, Gunung Kelua Campus, Samarinda Ulu, Samarinda, East Kalimantan, Indonesia 75123.

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ABSTRACT

Feed is a crucial thing to support the production and growth of catfish. Most catfish farmers still rely on commercial feed or factory feed. Meanwhile, factory feed prices are currently still relatively high. Maggots can be an alternative feed that meets the requirements as a protein source. Apart from Maggot, fish also need a source of vegetable protein such as tofu dregs which has the advantage of having chemical properties that are dominated by protein so that it can be used as an alternative feed ingredient. The aim of this research is to determine the effect of the combination of tofu dregs and maggot flour (*Hermetia illucens* L) as an alternative on the growth of Sangkuriang catfish (*C. gariepinus var*) and to determine the percentage of the combination of tofu dregs and maggot flour (*Hermetia illucens* L) that can provide the best growth influence on the growth of Sangkuriang catfish (*C. gariepinus var*). This research used an experimental method using a Completely Randomized Design (CRD) consisting of 5 treatments with 4 replications. The frequency of feeding is 2 times a day, namely morning and evening. Measurement of length, weight, viability and water quality, once every 15 days. The results of the research showed that there was a combination effect between maggot pellets and tofu dregs. The best combination percentage was in treatment D (25% tofu dregs + 75% maggot flour) with an average length and weight of fish of 3.86 cm and 6.24 kg with a survival rate of 100%.

Keyword: Alternative, Feed, Growth, Fish

INTRODUCTION

Fish farming activities in Indonesia are increasingly developing to meet increasing fish consumption. Irawan & Helmizuryani (2014) stated that one of the opportunities for cultivating freshwater fish that is promising and has many benefits is cultivating catfish. The success of fish cultivation is greatly influenced by the feed provided regularly, because feed is one of the factors that can influence the growth and survival of fish.

Fish feed is crucial to support the production and growth of catfish. Most catfish farmers still rely on commercial feed or factory feed. Meanwhile, factory feed prices are currently still relatively high. This can cause the costs incurred during the production process to be unbalanced, because 60% of the total costs come from feed costs. An alternative way to solve this problem is to make homemade feed using simple techniques using relatively cheap raw materials (Pamungkasih & Soecahyo, 2021).

According to research by Fauzi & Sari, (2018) stated that maggots have great potential to be cultivated as an alternative food for catfish. Maggots are the larvae of the black soldier fly (*Hermetia illucens* L). Maggots are decomposing organisms, because they tend to consume organic material. Maggots can be an alternative feed that meets the requirements as a protein source. Maggot contains 31-35% ether extract, 41-42% crude protein, 4.8-5.1% calcium, 14-15% ash and 0.6-0.63% phosphorus in dry form. Maggots have a fairly high protein content, so they have a good effect on increasing the fish's immune system.

According to research by Anggraeni NM & Abdulgani N (2013) regarding the use of tofu dregs as organic catfish (*Clarias batrachus*) feed, it can increase the growth rate of catfish by 3.28% - 11.75%. The content of tofu dregs in this study was 65.60% carbohydrates, 25.96% protein and 5.78% fat. Tofu dregs have the

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advantage of having chemical properties that are dominated by protein so they can be used as alternative feed ingredients. By utilizing this waste, of course the pellets produced are cheaper than commercial feed or factory-produced feed (Fauzi, RUA, & Sari, ERN (2018).

Changing community cultivation patterns from using factory feed to artificial feed made from local raw materials is certainly not easy, but the community will easily accept an innovation if it has been proven successful in the community. Therefore, this research was carried out as an effort to reduce the dependence of farmers on using factory feed as well as to encourage the use of artificial feed with local raw materials.

This research aims to determine the effect of a combination of tofu dregs and maggot flour (*Hermetia illucens* L) as an alternative on the growth of sangkuriang catfish (*C. gariepinus var*). And to find out the percentage of the combination of tofu dregs and maggot flour (*Hermetia illucens* L) which can have the best growth effect on the growth of sangkuriang catfish (*C. gariepinus var*).

MATERIAL AND METHOD

Time and place

This research was carried out in August - October 2023. Sangkuriang catfish seeds were obtained from cultivation products originating from Jl. Meranti Talang Sari, Lempake Village, North Samarinda sub-district, Samarinda. The manufacture of feed formulations is carried out on Jl Karya Mulya, Lok Bahu Village, Sungai Kunjang District, Samarinda. Maintenance of Sangkuriang catfish seeds and data analysis were carried out at the Animal Ecology and Systematics Laboratory, Faculty of Mathematics and Natural Sciences, Mulawarman University, Samarinda.

Tool And Material

The tools used in this research were cloth meters, buckets, trays, pans, trays, cameras, LJK boards, feed making tools, ovens, *styrofoam*, digital scales, DO meters, thermometers, pH meters, aerators, aerator hoses, filters, blenders. , 20 sockets, trays, basins measuring (45L) with a diameter of 52 cm and a height of 30 cm, net covers and writing utensils.

The materials used in this research were *black soldier fly maggots* (*Hermentia illucens L),* 200 catfish seeds (*C. gariepinus var) aged ± 30-40 days, clean water, tofu dregs, tapioca flour, fish meal, bags* plastic, paper labels and commercial feed (Prima Feed Brand PF – 1000).

Research design

The method used in this research used a Completely Randomized Design (CRD) with 5 treatments and 4 repetitions for 60 days.

The formula to determine repetition is:

$$\mathbf{t(n-1) \geq 15}$$

The treatments used in this research are as follows:

Treatment A : Commercial Feed (Control) 100%
Treatment B : Alternative feed (tofu dregs) 75% and maggot pellets 25%
Treatment C : Alternative feed (tofu dregs) 50% and maggot pellets 50%
Treatment D : Alternative feed (tofu dregs) 25% and maggot pellets 75%
Treatment E : 100% maggot pellets

Sampling was carried out 5 times with measurement intervals and data collection every 15 days. Feeding is given based on 5% of the fish weight. The main parameters include growth in Sangkuriang catfish, while supporting parameters include several water quality parameters such as temperature, dissolved oxygen and pH.

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Research procedure

1. Preparation of fish keeping containers
2. Preparation of test fish
3. Maintenance of test fish
4. Preparation for making maggot flour
5. Preparation for making tofu dregs flour
6. Preparation for making feed formulations
7. Feed application
8. Measuring fish growth
9. Water quality measurement

Parameters Measured

Absolute Length Growth

Absolute length growth is calculated using the Effendie (2002) formula as follows:

$$\boldsymbol{P = P_t - P_0}$$

Information:

P = Absolute Length Growth (cm)
P_t = Length of fish at the end of rearing (cm)
P_0 = Length of fish at the start of rearing (cm)

Absolute Weight Growth

Absolute weight growth is calculated using the Effendie (2002) formula as follows:

$$\boldsymbol{W = W_t - W_0}$$

Information :

W = Absolute weight growth (g)
W_t = Final average weight (g)
W_0 = Initial average weight (g)

Life Graduation (SR)

Survival is the percentage value of the number of fish that live during the rearing process (Irawan, D., & Helmizuryani, H. (2014).). Survival in fish can be determined using the formula:

$$\boldsymbol{SR = \frac{N_t}{N_0} \times 100\%}$$

Information:

SR = *Survival Rate*
N_t = Number of fish alive at the start of rearing, in time (t)
N_0 = Initial number of stockings (t = 0)

Analysis Data

The results of the observed parameters were analyzed using *analysis of variance* (one-way ANOVA) at a confidence level of 95% to evaluate whether the treatments had a significant effect in goldfish growth. The

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data were analyzed using SPSS version 27.0 *software.* To investigate the differences between treatments *Duncan Multiple Range Test* (DMRT) (Duncan, 1955) was used to determine the differences between treatments.

RESULTS AND DISCUSSION

Average Weight of Sangkuriang Catfish

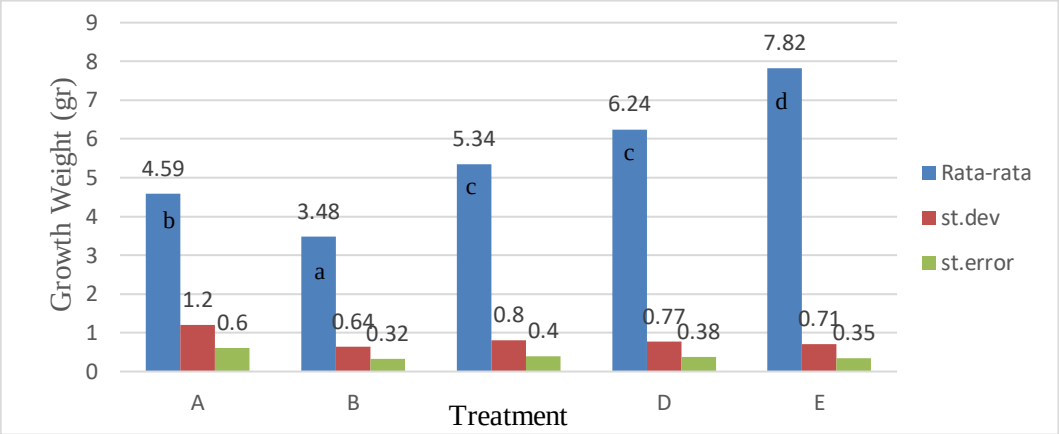

Figure 1 Average weight of catfish Sangkuriang during Study

From the results of research carried out for 60 days, there was an increase in fish weight from the start of rearing to the end of rearing (Figur 1). The weight of Sangkuriang catfish at the start of rearing ranged from 2 - 2.9 grams and at the end of the study, the weight of catfish ranged between 4.62 - 11.67 grams. This shows that providing different levels of protein in alternative feed can affect the weight of Sangkuriang catfish.

The results of research conducted on treatment B had the lowest average weight value, namely 3.48 grams. Treatment B consisted of a combination of 75% tofu dregs and 25% maggot pellets. The low average weight value in treatment B obtained from the research results was due to the high fiber contained in the feed containing tofu dregs with a high combination of tofu dregs. It can be seen that the smaller the percentage of tofu dregs used, the better the fish growth obtained during the research. This is in accordance with the opinion of (Hartami & Rusydi, 2016) which states that the low nutrition of the feed is thought to be due to the high fiber contained in the feed which comes from tofu dregs fiber, which can reduce digestibility and growth in Sangkuriang catfish. The high amount of crude fiber in feed will result in a decrease in feed quality and indirectly crude fiber can reduce fish growth and if there is too much crude fiber it will disrupt the fish's digestive process and the process of absorbing food essence (Hendra, E. 2022).

Average Length of Sangkuriang Catfish

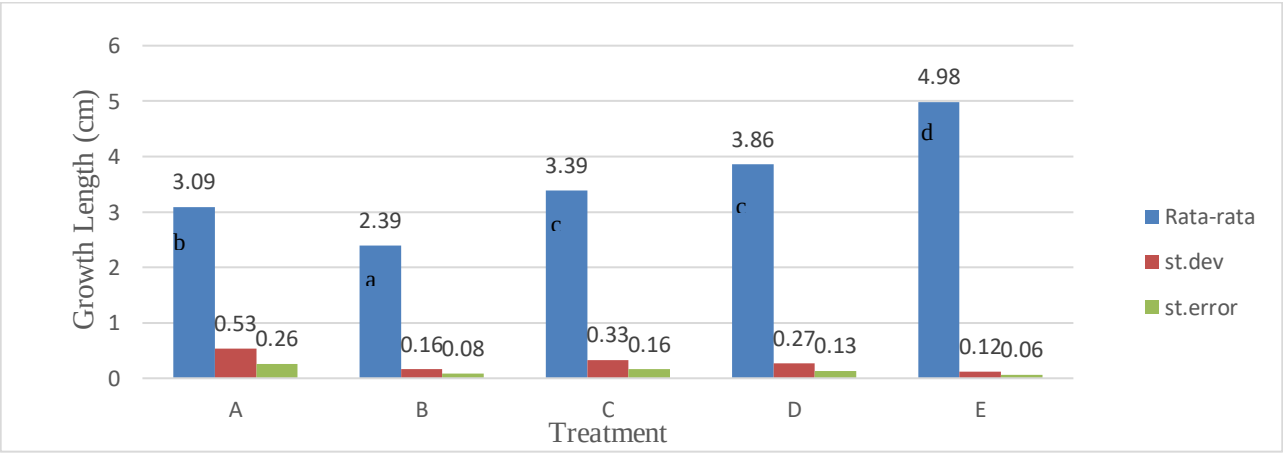

Figure 2 Average length of catfish Sangkuriang during Study

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From the results of observations that have been made and presented in Figure 2, it was found that the length of Sangkuriang catfish increased from the beginning of rearing to the end of rearing for each treatment. The initial average length of the fish was found to be 5.85 – 6.99 cm and at the end of rearing the average fish was 8.36 – 12.11 cm.

The research results showed that the average length of Sangkuriang catfish was the highest in treatment E with a value of 4.98 cm. Treatment E is 100% maggot pellets. This is in accordance with research by Ranggana et al. (2023) that in research conducted on the absolute length of 100% dry maggot feed, the average length of fish was greater, namely 0.83 cm, while fish fed commercial feed had a lower average length, namely 0. .79 cm. Maggot feed has a chewy texture and has the ability to produce natural enzymes, this can increase good digestibility in Sangkuriang catfish. Providing food that is liked by fish can trigger fish growth. Wulansari & Razak (2022) stated that the relatively high protein content in mangos has great potential for additional feed in growing Sangkuriang catfish fry.

Survival Rate

The survival rate is a comparison between the number of fish alive at the start of the study and the number of fish alive at the end of the study. The survival rate of Sangkuriang catfish during the study in each treatment A, B, C, D and E ranged from 92.5% - 100%. The highest average value was obtained in treatments C, D and E, namely 100%. Treatment B was 95% and the treatment with the lowest average value was treatment A at 92.5%. Data and analysis of variance The survival rate of Sangkurianag catfish during the study can be seen in Figure 4.3 and in Table 4.1

Table 1. Average Number Survival of Sangkuriang Catfish

Repetition	**Life Graduation (SR)**				
	Treatment				
	A	**B**	**C**	**D**	**E**
1	80	90	100	100	100
2	90	90	100	100	100
3	100	100	100	100	100
4	100	100	100	100	100
Average (SR) %	92.5	95	100	100	100

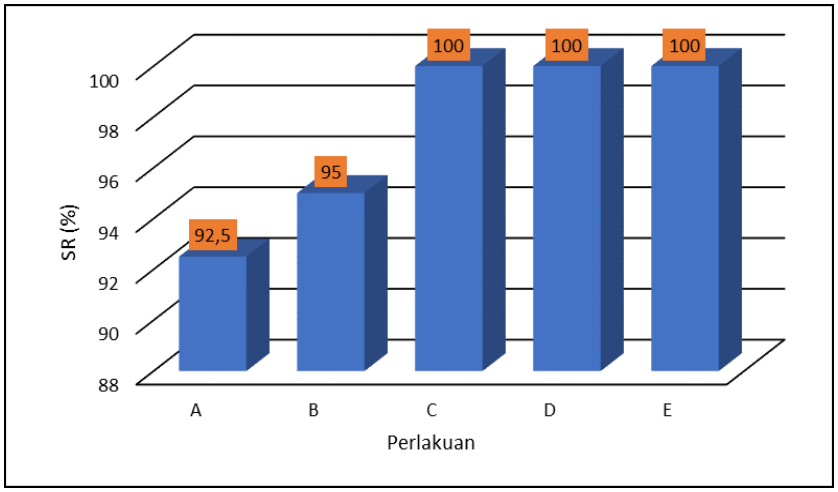

Figure 3 Amount average graph Survival of Sangkuriang Catfish

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Death occurs around weeks 1 and 2. The high level of fish mortality is also influenced by the fact that when stocking is carried out, the fish are immediately fed, resulting in a high risk of disease and threat of death. So it is thought that the remaining results of fish feed accumulate because the large amount of feed is wasted due to the feed being easily dissolved in the water, possibly stressing the fish due to changes in water quality. This is based on research conducted by (Liswahyuni et al., 2021). The accumulated leftover feed causes toxic compounds that can cause death to catfish fry. The poison that comes from rearing comes from ammonia which is the end result of the decomposition of food waste protein and fish metabolism products.

Water quality

The water quality parameters measured in this research are temperature, pH and DO. The results of observations of the water quality of Sangkuriang catfish (*C. Gariepinus var*) obtained a temperature range between 28 ^{0} C - 30 ^{0} C. The pH value ranged from 6.2 - 7.7 and DO ranged from 6.2 - 6.8 mg/L . Water quality data during the research can be seen in Table 4.2 below:

Table 2 Analysis of Average Water Quality During Study

Parameter	**A**		**B**		**C**		**D**		**E**	
	Max	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**
Temperature	30	28	30	28	30	28	30	28	30	28
pH	7.7	6.2	7.6	5.9	7.7	6	7.7	6	7.7	6
DO	6,8	6.2	6.6	6.2	6,8	6.2	6,7	6.2	6,8	6.3

Based on Table 4.2, it can be seen that the average temperature in each treatment is in the temperature range, namely between 28 ^{0} C - 30 ^{0} C. This temperature range is a good and normal temperature range in fish rearing media . According to SNI the range of water quality parameters in catfish cultivation is 25 ^{o} C - 30 ^{o} C. If the rearing temperature is less than the range or low temperature it will cause the activity of the Sangkuriang catfish to be low and the catfish's appetite will decrease, so it will inhibits fish growth.

Based on Table 4.2, the average pH in each treatment ranges from 5.9-7.7. According to Suminto, et al. (2019) stated that if the pH value is <5 it will cause mucus to clot in the gills which can cause death and if the pH value is >9 it will cause the catfish fry's appetite to decrease.

The average dissolved oxygen (DO) during the study was 6.2-6.8 mg/L, this range is still in the normal category for catfish cultivation. Based on SNI the DO content requirement for catfish cultivation is >3 mg/L. If the oxygen content is not able to meet the fish's needs, it will cause a decrease in the fish's immune system, namely reproduction, swimming and growth.

CONCLUSION

There is a combination effect between maggot pellets and tofu dregs. The combination and amount of protein contained in the alternative feed that has been made can accelerate the increase in weight and length in Sangkuriang catfish (*C. gariepinus var*). The best combination percentage was in treatment D (25% tofu dregs + 75% maggot flour) with an average length and weight of fish of 3.86 cm and 6.24 kg, with a survival rate of 100%. The combination with a high percentage of tofu dregs is not good for the growth of Sangkuriang catfish.

SAYING ACCEPT LOVE

On chance this writer Lots thank you love to: for prayers and moral support in the form of immeasurable knowledge, input and suggestions, thoughts and energy to guide and direct the author in writing this thesis. Then to my parents, siblings and extended family always give support Good prayer nor material to writer so

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