GSJ: Volume 8, Issue 6, June 2020, Online: ISSN 2320-9186
www.globalscientificjournal.com

ANALYSIS FROM THE BUSINESS PROFITS OF JUVENILE ENLARGEMENT TRANSGENIC MUTIARA CATFISH AND SANGKURIANG CATFISH USING MIXED FEED PELLETS AND LITTLE TUNA

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Keywords

Efisiensi pertumbuhan, Lele Mutiara transgenik G3, Lele Sangkuriang, PF - 500, Little tuna

ABSTRACT

This research was conducted to compare the growth efficiency and business of the G3 transgenic Mutiara juvenile catfish and the Sangkuriang juvenile catfish results of the broodstock G2 crossing. Growth efficiency parameters include growth rate, feed conversion rate, weight increase per week and business benefits including R/C ratio and BEP. This study used the mixture feed test of PF-500 pellets and boiled little tuna that given on transgenic Mutiara catfish G3 with feed treatment A (ratio 50:50), B (ratio 65:35) and C (ratio 80:20). As the control treatment is used Sangkuriang catfish with treatment D (ratio 50:50). The treatment repeats 3 times using the complete randomized design (CRD) method with the OneWay Anova significance test (SigmaPlot 12.3) to the daily growth rate parameters and feed conversion rate. The transgenic Mutiara catfish of the G2 (both positive transgenic, carrying CgGH) produces higher FR, HR and SR than Sangkuriang catfish ($p < 0.05$). The growth efficiency of G3 transgenic Mutiara is higher than the Sangkuriang catfish (SGR ranges from 4.08 – 4.89% and FCR ranges from 0.58 – 1.18). Meanwhile, the value of the business efficiency of G3 transgenic Mutiara juveniles enlargement for 42 days is higher than the Sangkuriang catfish (R/C by 1.12, BEP unit of 67.75 kg, and BEP price of Rp 1,490,570.00). Moreover, optimum growth efficiency apppeared on the treatment B of transgenic Mutiara catfish with 65:35 ratio of PF-500 and boiled-little tuna. The results of the business analysis showed that juveniles enlargement of Mutiara catfish are higher than Sangkuriang Catfish.

I. INTRODUCTION

Catfish is one of fresh water fish farming commodity which is growing rapidly due to market demand for consumption. The request level of catfish in 2018 was in the first position with production which rose from 841.75 thousand tons to 1.81 million tons (114.82%), followed by carp that rose from 169 thousand tons to 356.53 thousand tons (110.88%) And Patin fishes that rose from 245.75 thousand tons to 492 thousand tons (100.23%)[1]. Catfish is one among 10 excellent fishery commodities developed in Indonesia[1].The benefits of catfish are good taste, fast growth, and relatively easier maintenance. In the implementation, often the fertilization of catfish using the same broodstock for spawning, this will trigger the crossing of the inbreeding. The effect of the inbreeding will be a decrease in the genetic quality of fish, so that the performance of his offspring will decrease[2]. It also occurs in catfish that have decreased quality in its growth performance.

Breeding fish is one of the efforts to deal with market problems that occur that is a decline in the quality of national catfish production. Mutiara Catfish is a combination of crosses of Egyptian catfish, Paiton, Sangkuriang, and Dumbo, with a selection treatment for three generations on its growth. Mutiara catfish itself is the result of the breeding of catfish in the Balai Penelitian Pemuliaan Ikan of Sukamandi in 2014.

The Mutiara catfish showed a faster growth of up to 70% compared to other catfish. The speed of growth can be further improved by utilizing the transgenesis process in the Mutiara catfish[3].

The transgenic Mutiara catfish developed by Buwono et al. is a Mutiara catfish that contains two gene-containing growth hormone or GH in one body, the form of endogenous genes derived from the broodstock, and an exogenous gene that is being simulated from the GH catfish Dumbo (CgGH, measuring 600 bp) in Mutiara catfish (F0), with the method of sperm electroporation[4]. The advantages of this fish are faster fish growth compared to non-transgenic Mutiara catfish.

There are several other advantages resulting from this transgenic Mutiara catfish, including fish not easy to stress, high appetite, adaptive to natural and artificial feed, so that the pace of growth is faster than non-transgenic Mutiara catfish. In addition, the value of feed conversion ratio (FCR) in the transgenic Mutiara catfish is relatively low (FCR < 1) so that it can be said that the efficiency of the packaging is high and can accelerate its time of harvesting[5].

Further assessment of the hereditary transgenic Mutiara catfish crossing is still needed to stabilize the superior gene inheritance before mass production in community farming. The inheritance of this superior trait is related to the increase of the third generation's growth. To evaluate the growth performance of the G3 transgenic Mutiara fish is required test the use of feed which can be represented from the daily growth rate value and FCR (Feed Conversion Ratio).

Theoretically, the exogenous GH transmission on the third generation will increase and lead to an overexpression of the G3 fish growth, which can be seen phenovely in the performance aspects of the third generation fish growth[6]. Therefore, it needs to be proven research on the growth of genetically modified this G3 transgenic Mutiara by conducting growth test and to meet the market needs regarding the increase in catfish consumption used by comparing the level of profit between the juvenile enlargement of transgenic Mutiara catfish with Sangkuriang catfish as a non-transgenic catfish to see the comparison of the efficiency of the business.

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II. MATERIALS AND METHODS

Research on fish maintenance conducted in Hatchery Faculty of Fisheries and Marine Sciences Universitas Padjadjaran. The study was conducted from January to October 2019.

The tools used in growth performance evaluation research are fibre tubs, injections, palms fiber, gallons, buckets, aquariums (60 x 40 x 30) cm^3, aeration installations, heaters, measuring boards, and cameras. As for the materials used in the study is the test broodstock of the female and male G2 transgenic Mutiara catfish B[7], the broodstock of the female and male Sangkuriang catfish, the juveniles G3 transgenic Mutiara catfish as many as 7 fishes/aquarium, juveniles Sangkuriang catfish as control, Ovaprim, boiled-little Tuna, pellets PF – 500, Artemia Mackay, and Methylen blue.

G3 Juvenile Multiplication

The broodstock candidate is selected before being pared. The male broodstock are ready clusters aggressive characterised, large and long genital papillae, and reddish-coloured. For females, characterised by bullied stomach, genital papilla swelling and red color. When it will be transferred, the broodstock is measured in length and weight, then injected ovaprim hormone at a dose of 0.2 ml/kg for the male broodstock and 0.5 ml/kg for the female stem diluted with aquades 1 ml. Male and female broodstocks have injected ovaprim hormones, inserted into the fibre-filled body and given a heater, and then closed black trashbag.

After 10 – 12 hours injection, a reduction in the palms fiber is done. If you have an egg that has been wrapped with green to brass, palms fiber inserted into the aquarium that has been aerated and heater with a temperature of 28°C. Set up Hatchery Artemia sp. As much as 7 g on a gallon filled with 10 liters of water and salt 200 g.

Eggs will hatch after 18 hours of fertilized, larvae fed by *Artemia* sp. with a frequency of giving three times a day. After being two weeks old, the juveniles were fed in the form of tubifex worm with a frequency of giving twice a day. Fish are maintained until the age of one month.

Degrees of fertilization, hatching and survival

The third generation of trasngenic Mutiara catfish production is carried out by cross over the second generation Mutiara catfish (G2) which has been verified to be a transgen CgGH. The number of broodstock used is a male transgenic Mutiara catfish and female transgenic Mutiara catfish, as well as for non-transgenated fish with a cross-whaling male Sangkuriang catfish and Sangkuriang female catfish.

The result of the egg that is drawn from the cross of the transgenic fish is sampled as much as 500 eggs/replay then separated into three containers as a replay. It is done to calculate the fertilization degree, and its hatting degrees. The fish Larva sample is maintained to a age of 14 days to be counted degrees of survival.

The formula of the fertilization, hatching and survival rate is[8]:

Fertilization rate :

$$FR = \frac{\sum Fertlized\ eggs}{Total\ amount\ of\ eggs}\ x\ 100\%$$

Hatching rate :

$$HR = \frac{\sum Hatching\ eggs}{\sum Fertlized\ eggs}\ x\ 100\%$$

Survival rate :

$$SR = \frac{\sum Larvae}{Total\ amount\ of\ larva\ samples}\ x\ 100\%$$

The observation results are analyzed quantitatively, with One Way ANOVA and the advanced test of Dunu's Multiple Range Test when there are significant differences, the analysis using Software Sigmalot ver. 12.2.

G3 Fish Growth Performance

The juvenile of transgenic Mutiara catfish that has been 3 weeks old is used for the growth performance testing as much as 7 fishes/aquarium, and for comparison used the juvenile of Sangkuriang catfish as its control.

Research is conducted using complete randomized design (CRD) with four treatments and three repeats. The test treatment is made differently based on the percentage ratio of PF-500 pellets and the boiled-little tuna given on the juveniles of the G3 transgenic Mutiara catfish. The treatment used is as follows.

Treatment A : Mixture of PF-500 (50%) and boiled-little tuna crumbs (50%)
Treatment B : Mixture of PF-500 (65%) and boiled-little tuna crumbs (35%)
Treatment C : Mixture of PF-500 (80%) and boiled-little tuna crumbs (20%)
Treatment D : Mixture of PF-500 (50%) and boiled-little tuna crumbs (50%) (Control) on Sangkuriang catfish

The treatment of PF – 500 and boiled-little tuna crumbs should be done in different ratios. The goal is to find the right formula for fish to grow optimally. Transgenic Mutiara catfish given the boiled-little tuna feed 100% have a growth rate of 3.41%[9]. The feeding of the combination of pellets and earthworm in Dumbo catfish, get the result that the ratio of 50:50 is better compared to the feeding of the pellet is 100% without other ingredients, where the growth rate of Dumbo catfish is given a combination of pellets 50% and earthworm 50% has a growth rate of 1.82%, while the Dumbo catfish given feed pellets 100% have a growth rate of 1.60% which means with combination feed can accelerate growth by 1.14 times faster (57%)[10]. Therefore, different ratio being made to the test fish with the hypothesis that the ratio of 50:50 will result in the best growth with the feed mixture. The 3 weeks old test fish was carried out randomly and inserted into each of the aquariums with a fish density of 7 fishes/aquarium. Fish maintenance is done for 42 days. PF – 500 and boiled-little tuna mixed feed delivery is given according to the treatment frequency of administration twice daily. Little tuna gained from the market separated from the meat from other parts such as thorns, then torn into small size.

The observed parameter to the growth performance test of the G3 transgenic Mutiara catfish includes:

Feed Conversion Ratio
A value that indicates how much feed is needed to produce one kg of fish meat. The feed conversion rate is calculated by the formula[11] :

$$FCR = \frac{F}{(Wt + D) - Wo} \; x \; 100\%$$

Description:
FCR = Feed conversion ratio
F = amount of feed eaten by fish
Wt = Final weight of fish (g)
W0 = Initial weight of fish (g)
D = Dead fish weight (g)

Specific Growth Rate
To know the daily growth rate of fish test with the formula[8] :

$$SGR = \frac{\ln(\mathrm{Wt}) - \ln(\mathrm{Wo})}{\mathrm{t}} \; x \; 100\%$$

Description :
SGR = Specific growth rate (% biomass/day)
Wt = Weight of the average fish at the time t (g)
Wo = Weight of the average fish at the beginning of the study (g)
t = Number of days

Average Weight per Fish in the end of Research
The average weight of the fish can be noted using the formula[8]:

$$Wt = \frac{\sum \mathrm{W}}{\mathrm{N}} \; x \; 100\%$$

Description :
Wt = Average final weight per fish (g)
$\sum$W = Biomass of fish (g)
N = Number of fish

For the Spesific Growth Rate and Feed Conversion Ratio parameters done with analysis of variance (ANOVA). When the treatment is significant differences, it continues to Duncan Multiple Range Test (DMRT) with a confidence level of 95% using SigmaPlot 12.2 software[12].

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Profit analysis

To know the total cost of production and the amount of income and profits obtained by farmingers who perform transgenic Mutiara catfish juveniles enlargment, conducted the following analysis:

1. The Total cost of production, can be written with the formula[13]:

$$TC = VC + FC$$

Description :

TC = Total cost

VC = Variable cost/cycle

FC = Fixed cost/cycle

2. Gross Income, written in the formula[14]:

$$GI = Y \times Py$$

Description :

GI = Gross income

Y = Transgenic Mutiara catfish production

Py = Selling price

3. Net income, written in the formula[14]:

$$NI = GI \pm TC$$

Description :

NI = *Net Income*

GI = *Gross Income*

TC = *Total cost*

4. Business efficiency

To see the efficiency, it is necessary to see the comparison between the reception and the business cost analyzed by using the formula[15]:

$$Rasio\ R/C = \frac{Revenue}{Cost}$$

Description :

R = Revenue

C = Cost

Criteria of R/C ratio Analysis:

R/C < 1, the business suffered a loss

R/C = 1, the business was not profitable and did not lose

R/C > 1, the business experienced a profit

5. *Break Event Point* (BEP)

To address the business efficiency, the break event point (BEP) analysis was used. BEP analysis can be calculated[16]:

$$BEP\ unit = \frac{FC}{SP - VC}\ , BEP\ value = \frac{FC}{(SP - VC)} x\ SP$$

Description :

VC = Variable cost/kg

FC = Fixed Cost

SP = Selling Price/kg

III. RESULTS AND DISCUSSION

Fertilization, Hatching, and Survival Rate

The result of fertilization, hatching and survival rate of the third generation of transgenic Mutiara catfish (G3) and Sangkuriang catfish are presented in Figure 1. In the results diagram of fertilization is no significance between the crossing of transgenic Mutiara catfish and Sangkuriang catfish, and shows that the highest value is obtained from the crossing of transgenic Mutiara catfish with a value of 82.40 ± 1.80%, while the value of the fertilization of Sangkuriang catfish only 80.33 ± 1.00%. This results in accordance with the research results that the transgeneous (PhGH) present in the transgenic fish does not affect the ability of sperm to fertilize the egg[17]. In other, there is no significant difference in conception between carp (*Cyprinus Carpio*. L.) transgenic and non-transgenic ranging from 89.1 ± 2.80% and 86.4 ± 2.10%[18].

Figure 1 also shows a result of hatching degrees from both crosses which are not real different. The highest value is on the crosses of the transgenic Mutiara catfish with a value of 84.73 ± 1.67% followed by a crossing of Sangkuriang catfish with a value of 78.66 ± 2.27%. The same is also evident in the results which shows the transgenic catfish that the gene (PhGH) can be inherited in the G3 and has a higher degree of hatching compared to non-transgenic fish but is not very influential (not as distinct) [19]. There is also found no significant difference in the hatching rate between carp (*Cyprinus Carpio*. L.) transgenic and non-transgenic ranging from 82.3 ± 11.20% and 80.0 ± 4.20%[18].

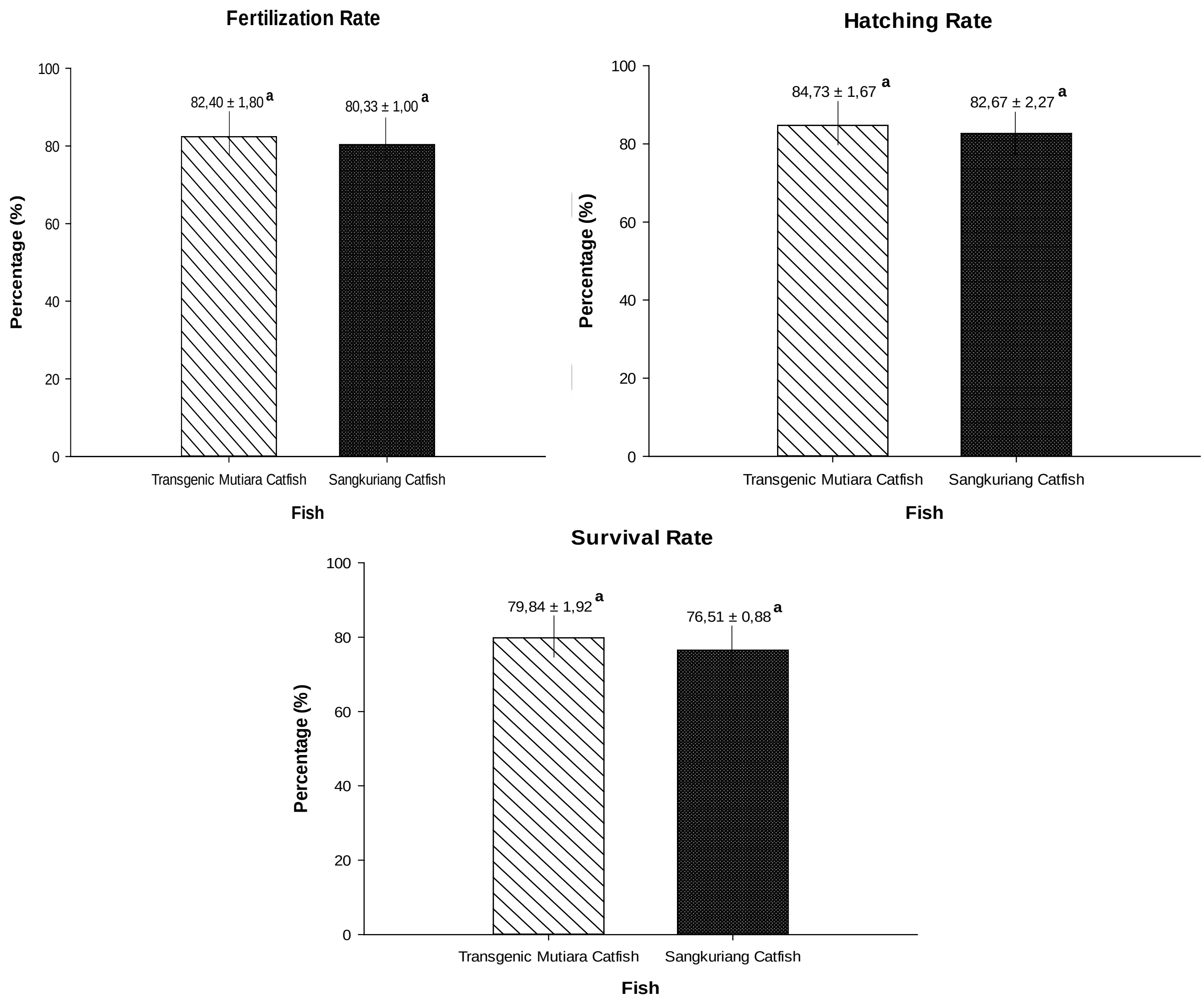

Figure 1. Data diagrams fertilization, hatchery and survival rate of the G3 transgenic Mutiara catfish larva and Sangkuriang

On the outcome of survival rate there is no significance between the crossing of transgenic Mutiara catfish with Sangkuriang catfish. The highest value is on the results of the crosses of transgenic Mutiara catfish with a value of 79.84 ± 1.92% or 1047 fish, followed by the crossing of Sangkuriang catfish with a value of 76.51 ± 0.88% with the amount of 996 fish. The high survival rate in transgenic fish is thought to result from a better immune system and endurance compared to non-transgenic fish. It is in accordance with the statement that GH can improve immune system function including non-specific immune system, cytotoxic activity, phagocytic, haemolytic, and lysozyme[20].

The quality factor of water also determines the survival rate of the larva, the quality of water during the maintenance period is at a temperature range of 28 – 32^{o}C, pH 7.76 – 7.90, and DO 3.70 – 4.20 mg/L and has already fulfilled the standards proposed by SNI. The range of water quality needed in the maintenance of catfish is temperature of 25 – 30^{o}C, pH 6.50 – 8.50, and DO > 2 mg/L [21].

Feed Conversion Ratio

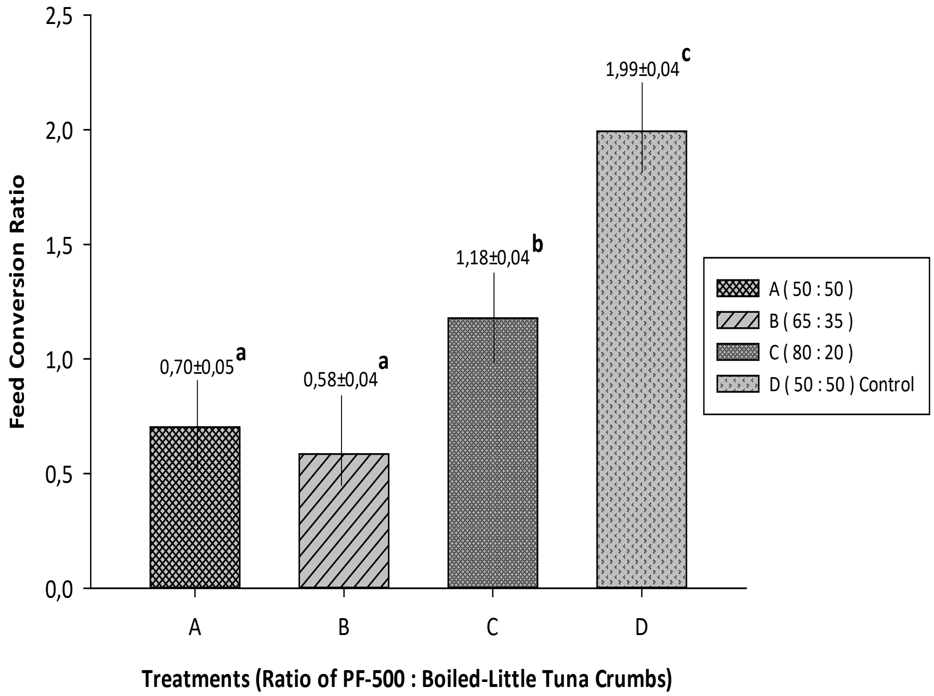

Figure 2. Feed conversion ratio of fishes test.

Based on the results of F test with a 95% confidence level, it is known that different pellets and little tuna ratio is given to transgenic Mutiara catfish and Sangkuriang catfish resulting in a significant feed conversion ratio value in the treatment of B, C, and D. While the A treatment and B treatment did not significant.

Lowest value obtained in the treatment B or transgenic Mutiara catfish with a mixture of pellets and boiled-little tuna of 65:35, with a feed conversion rate value of 0.58 ± 0.04, while the highest feed conversion rate value in the treatment D or Sangkuriang catfish with a mixture of 50:50, with the value of feed conversion rate of 1.99 ± 0.04. The low value of FCR on transgenic Mutiara catfish due to this fish used to possess two types of GH, endogenous GH and exogenous GH, while Sangkuriang catfish has only endogenous GH. Decreased feed conversion ratio value in the transgenic Mutiara catfish G3 to a value of 0.58 ± 0.04 due to the expression of the exogenous GH which caused a change in the endocrine and metabolic of genetically modified catfish[17]. Exogenous GH will lead to growth stimuli and additional protein synthesis in transgenic fish, thus the utilization of feed for more tissue protein production and increasing the conversion of feed given[22]. In addition to that exogenous GH will also increase the absorption of feed in the intestines and the ability to absorption of proteins thereby increasing feed efficiency [23] [24].

This result is also still lower than the Mutiara catfish which has the value of FCR 1.00[3], transgenic Mutiara catfish G1 which is only worth 0.85[25], and transgenic Mutiara catfish G2 which is worth 0.75[7]. This is in line with the stating that the transgenic catfish have a better rate of feed efficiency so that the resulting FCR will be lower[4] [19].

Specific Growth Rate

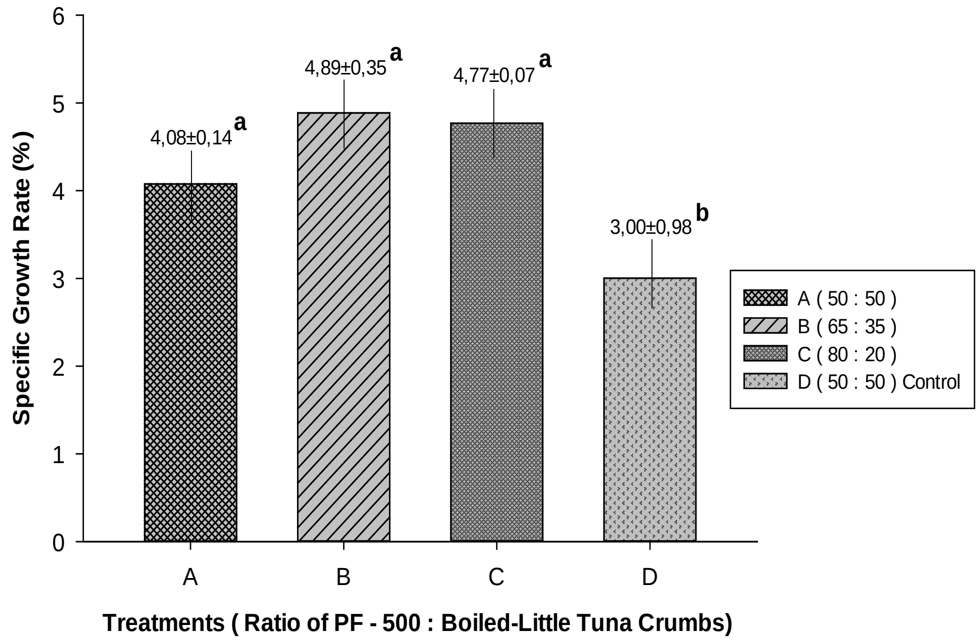

Figure 3. Specific growth rate of fishes test.

Based on the test results of F (confidence 95%), there is a significant difference between the daily growth rate of transgenic Mutiara catfish (A, B, C) with Sangkuriang (D) catfish. However, the daily growth rate of transgenic Mutiara catfish between treatment A, B, C is no significant difference.

On average the highest daily growth rate is obtained at B treatment, transgenic Mutiara fish with a mixture of pellet and boiled-little tuna for 65:35, frequency of feeding twice daily, which results in daily growth rate of 4.89 ± 0.35% biomass. Day. While the lowest daily growth rate occurs in the treatment D, the Sangkuriang catfish with a mixture of 50:50 and the frequency of feeding twice a day, which results in a daily growth rate of only 3.00 ± 0.98% biomass. Day. While in non-transgenic catfish (*Clarias gariepinus*) Others also have a daily growth rate of 1.5 – 1.9%[26]. In addition, the rate of growth of G3 transgenic Mutiara catfish is also larger than transgenic carp G3, which is only 3.29% in the same phase of the juvenile with an average weight of 1.53 g[27].

In biomass, the increase in weight occurring in test fish is as follows

Table 1. Wight average increase in fish test biomass

Treatments	Weight average increase in biomass
A	364,41 ± 29,84[a]
B	270,72 ± 31,11[a]
C	136,42 ± 35,65[a]
D	73,55 ± 36,67[b]

*The average value followed by a different letter indicates a significantly difference

Table 1 shows that the average total weight increase of A treatment is 364.41 g and 4.95 times higher than D treatment, B treatment of 270.72 g and 3.68 times higher than D treatment, and C treatment of 136.42 g and 1.85 times higher than Sangkuriang (D) catfish which has average total weight increase of 73.55 g.

The results of this study also aligned with stating that the transgenic catfish have a growth performance of 1.7 times compared to non-transgenic catfish[19]., as well as the research of that states the transgenic Mutiara catfish has a multiples growing 2.76 to 3.53 times the size of non-trangenic Mutiara catfish on the G1 and 3 – 4 times on G2[27][28].

Weight Gains Average per Week

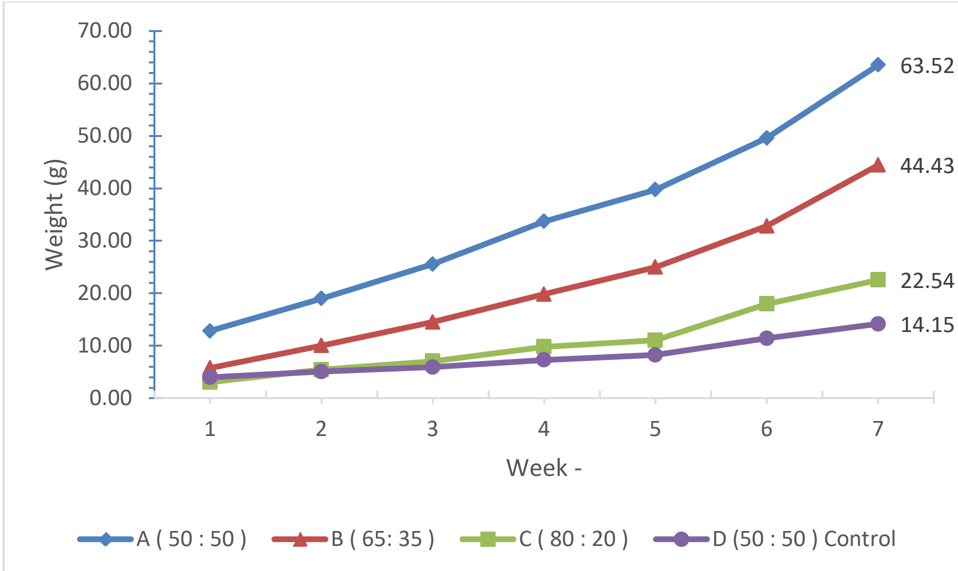

Figure 4. Weight gains average per week

Figure 4 is the average weight of the fish, where treatment A has a final weight of 63.52 g/fish, the treatment B 44.43 g/fish, C 22.54 g/fish treatment, and the treatment D (Control) 14.15 g/fish. Based on the image above, the highest per fish weight at treatment A amounted to 63.52 g (weight increase of 1.21 g/day) and the lowest in the Sangkuriang treatment D (Control) catfish by 14.15 g (weight increase 0.24 g/day). Based on increased growth in treatment A, to achieve comsumption size of 100 g/fish takes only 72 days, while the treatment D in Sangkuriang catfish need more than the 3 months harvest time in catfish as general[29]. This results showed the growth efficiency of transgenic Mutiara catfish better than Sangkuriang catfish in production activities in consumption size.

In addition, feed conversion rate can calculate the estimated expenditure and income in catfish juvenile enlargement activities until reaching a consumption size of 1 kg content of 10 fish (100 g/fish). To achieve the size and quantity, the price of 1 kg of catfish at Pasar Resik Jatinangor as the target market, at the price of Rp 22,000.00. When referring to the value of feed conversion rate (Fig. 2), for treatment A (0.70) requires 70 g of feed to produce a weight of 100 g where the weight is a standard weight of catfish consumption[30]. While the control treatment D (1.99) requires 199 g to reach the consumption size. Price of 1 kg PF – 500 sold at Rp 20,000.00 (Rp 2,000.00/100 g), while the price of 1 kg of boiled-little tuna around Rp 23,000.00 (Rp 2,300.00/100 g). The need for mixed feed to reach a 100 g weight requires 35 g PF – 500 and 35 g boiled-little tuna with a total price of Rp 1,505.00. While the Sangkuriang catfish (D) requires 99.5 g PF – 500 and 99.5 g boiled-little tuna at a price of Rp 4,278.00. Therefore, the cost of feed for 1 kg of 10-tailed fish requires a cost of Rp 15,050.00 in transgenic Mutiara catfish. As for the Sangkuriang catfish requires a fee of Rp 42,780.00.

Based on survival rate (Fig. 1), total amount juveniles of transgenic Mutiara G3 as much as 1047 tails and produce 104.7 kg catfish harvest size consumption with feed costs in Rp 1,575,735.00. While Sangkuriang catfish produce 996 tails and 99.6 kg catfish harvest consumption size with feed costs amount Rp 4,260,888.00.

Profit analysis

To compare the benefits of juvenile enlargement between the transgenic Mutiara catfish G3 and Sangkuriang catfish based on the previous points, analyzed through the following parameters:

1. Total Cost of production

   The total value of production costs can be known from the value of fixed fees or variable costs (Tab. 2 and Tab. 3) done in the juvenile enlargement activities of each fish. Broadly, for the cost of land, water, fibre, and electricity has been directly accommodated by Universitas Padjadjaran. So for catfish juvenile enlargement activities it takes a fixed fee and variables as figured in Table 2 and Table 3:

Table 2. Fixed cost and variable cost in G3 transgenic Mutiara catfish juvenile enlargement

Type	Unit	Price/Unit	Amount Price
Fixed Cost			
Blower	1 piece	Rp 220.000,00	Rp 220.000,00
Heater	3 pieces	Rp 75.000,00	Rp 225.000,00
Total			Rp 445.000,00
Variable Cost			
Feed	1047 tails		Rp 1.575.735,00
Medicinal (Methylen blue)	5 pieces	Rp 8.000,00	Rp 40.000
Total			Rp 1.615.735,00

Table 3. Fixed Cost and Variable Cost in Sangkuriang catfish juvenile enlargement

Type	Unit	Price/Unit	Amount Price
Fixed Cost			
Blower	1 piece	Rp 220.000,00	Rp 220.000,00
Heater	3 pieces	Rp 75.000,00	Rp 225.000,00
Total			Rp 445.000,00
Variable Cost			
Feed	996 tails		Rp 4.260.888,00
Medicinal (Methylen blue)	5 pieces	Rp 8.000,00	Rp 40.000
Total			Rp 4.300.888,00

Based on Table 2 and Table 3, the total cost of production on the juvenile enlargement of transgenic Mutiara catfish until the harvest time amounted to Rp 2,060,735.00 while for the activities of the Sangkuriang catfish juvenile enlargement requires a total production cost of Rp 4,745,888.00.

2. *Gross Income*

Gross income can be seen from how much fish production is produced, multiplied by the selling price of the trade[14]. Based on market price information of catfish in the general public, the price per kg of catfish (contents of 10 fish) is Rp 22,000, 00/kg. The transgenic Mutiara catfish G3 produced in this study amounted to 1047 tails. Based on this number, harvesting catfish in this study gained 104.7 kg. Thus, the gross income gained in the cultivation of the transgenic Mutiara catfish G3 amounted to Rp 2,303,400.00. Meanwhile, for the Sangkuriang catfish only get 99.6 kg in its harvest. This means, the gross income gained in Sangkuriang catfish juvenile enlargement amounted to Rp 2,191,200.00.

3. *Net Income*

Net income is derived from gross income, minus the total cost of production during juvenile enlargement until harvest time[14]. The juvenile enlargement of transgenic Mutiara catfish has a gross income of Rp 2,303,400.00 with a total production cost of Rp 2,060,735.00, meaning net income or profit earned in the juvenile enlargement of trasngenic fish in G3 Mutiara amounted to Rp 242,665.00. Meanwhile, Sangkuriang catfish juvenile enlargement has a gross income of Rp 2,191,200.00 with a production fee of Rp 4,745,888.00. Therefore, Sangkuriang catfish juvenile enlargement in the study suffered a loss of Rp 2,554,688.00. Giving mixed feed in Sangkuriang catfish certainly did not give any benefit. Unlike the transgenic Mutiara catfish G3 which benefit in the use of mixed feed on its juvenile enlargement activities.

4. Business efficiency

Business efficiency is obtained by dividing the cost of the revenue (gross income) by the total cost of production. The juvenile enlargement of the transgenic Mutiara catfish G3 has a gross income of Rp 2,303,400.00 with a total production cost of Rp 2,060,735.00, meaning it shows that the value of the business efficiency of the transgenic catfish is at 1.12. Meanwhile, Sangkuriang catfish juvenile enlargement has a gross income of Rp 2,191,200.00 and total production cost of Rp 4,745,888.00. Thus, the value of business efficiency is at 0.46. Based on the R/C analysis criteria, the juvenile enlargement of the transgenic Mutiara catfish G3 with the value of business efficiency of 1.12 entered into the business activities that have benefited. While the juvenile enlargement of Sangkuriang catfish with the value of 0.46 in the category of business activities suffered losses.

5. Break Event Point (BEP)
   Break event point is a condition where a business does not earn profit and does not suffer, in other words a business is said to break even if the amount of income (revenue) equals the amount of cost, or if the contribution profit can only be used to cover the fixed costs[15]. There are two ways in determining the BEP, BEP in the unit and also BEP in the money. BEP units are obtained by dividing the fixed costs divided by the reduction in the selling price and the cost of the variable. While the rupiah BEP is obtained by dividing the fixed costs incurred during the cultivation activity, divided by the reduction in the selling price and variable costs, then the sale price per unit.

   The juvenile enlargement activity of transgenic Mutiara catfish G3 has a fixed fee of Rp 445,000.00, variable fee of Rp 15,432.00/kg, and a selling price of Rp 22,000.00/kg. Based on the value, BEP unit obtained 67.75 kg. The break even point of the business in juvenile enlargement of transgenic Mutiara catfish G3 must achieve of 67.75 kg production. As for the BEP in price, the sales must be reached to breakeven at Rp 1,490,570.00. For the activities of Sangkuriang catfish juvenile enlargement, it is certainly not experienced breakeven/BEP. This is because based on the results of the calculation of business efficiency, Sangkuriang catfish juvenile enlargement activity in the study suffered losses.

IV. CONCLUSIONS

Based on the results of the study, on the parameters of fertilization rate, hatching rate, and the survival rate of fish is not experiencing significance between the transgenic Mutiara catfish G3 and Sangkuriang catfish. However the highest survival rate is on the transgenic Mutiara catfish G3 with a total of 1047 tails while Sangkuriang catfish only 996 tails. For the FCR parameter, there is the significance of the feed mixture between transgenic Mutiara catfish and Sangkuriang catfish, but the best FCR value is at B treatment with the ratio of PF – 500 and boiled-little tuna 65:35 with a value of 0.58. The best daily growth rate is still at the treatment B of transgenic Mutiara catfish with a value of 4.89% while Sangkuriang catfish has the lowest daily growth rate. The increase in the average weight of transgenic Mutiara catfish juvenile enlargement has 4.95 times faster than Sangkuriang catfish in its growth. Based on the analysis of the advantages of the magnification activity of transgenic Mutiara catfish juveniles and Sangkuriang catfish for 42 days (6 weeks), it was found that in general, the benefits in juvenile enlargement occurred in transgenic Mutiara catfish (R/C value 1.12, BEP unit 67.75 kg, and BEP price Rp. 1,490,570.00) while Sangkuriang catfish losses (R / C value of 0.46).

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