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Article Review

Comparison of janti (oreochromis niloticus larasati) and kunti (O. niloticus) tilapia selective breeding pups

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Abstract

This research uses the literature study method, this research discusses selective breeding in tilapia. Selective breeding is a biotechnology development process carried out on plants or animals with desired traits. Selective breeding is done in order to produce offspring with superior genetics. A selective breeding program using the individual selection method successfully improved the growth performance of Janti ss F5 white tilapia. Indicators of the success of the breeding program included an increase in weight, total length, and the genetic improvement value of measurable phenotypic traits. The results of a study comparing reproductive traits of Kunti tilapia F6 and F7 had a major impact. F6 tilapia outperformed F7 in several variables such as hatchability, egg weight and diameter, yolk weight and length, and yolk holding larvae weight and length.

Keywords: *Selective breeding, janti tilapia, kunti tilapia*

INTRODUCTION

Tilapia is one of the living things that come from the animal kingdom. Tilapia has the following taxonomy phylum: Chordata, Subphylum: Vertebrate Class: Osteichthyes, Subclass: Achantopterigii, Order: Perciformes, Suborder: Percoidei, Family: Cichlidae, Genus: Oreochromis, Species: Oreochromis niloticus. Initially, tilapia was categorized as Tilapia nilotica or a type of tilapia that does not incubate eggs and larvae in its mother's mouth. However, in its development, fisheries experts classified tilapia into the Sarotherdon niloticus species or a group of tilapia that incubate their eggs and larvae in the mouths of their males and females. Later, fisheries experts decided that the correct scientific name for tilapia is Oreochromis niloticus or Oreochromis sp., indicating its origin from the Nile river in Africa. Based on morphology, the Oreochromis fish group is indeed different from the tilapia group. In general, the body shape of tilapia is long with white edges. The lateral line is interrupted at the center of the body, then continues below a line that extends above the pectoral fins. The number of scales on the lateral line is 34. The dorsal and pectoral fins are black. The edge of the pectoral fin also appears black, while the edge of the dorsal fin is gray or black. When distinguished by sex, male tilapia have larger scales and their genitals are located in front of the anus, while the genitals of female tilapia have a separate genital opening with a urine outlet. The shape and color of the hind jaw of male tilapia is different from that of female tilapia. In addition, the dorsal and caudal fins of male tilapia have broken lines, while in female tilapia the lines are unbroken and circular. Tilapia first entered Indonesia through West Java in 1969, from Taiwan. In 1975, hybrids (crossbreeds of Tilapia nilotica and Tilapia mossambica) from Taiwan were imported. Red tilapia appeared in 1981, introduced from the Philippines. In 1988-1989, citralada tilapia parent stock from Thailand was also imported, but did not thrive.

Tilapia is one of the important commodities in the freshwater fish business in the world, because it has a high economic value. besides having a high economic value, this fish also has a taste that is liked by many people. Therefore, selective breeding in tilapia is needed to further improve the quality of tilapia. Selective breeding is a biotechnology development process carried out on plants or animals with desired traits. Selective breeding is done in order to produce offspring with superior genetics. Selective breeding is expected to produce tilapia pups that have superior quality than their parents, ranging from weight to hatchability. In this study, researchers wanted to compare selective breeding in janti tilapia with kunti tilapia.

RESEARCH METHODS

This research used the literature study method. Data were collected from various types of research on selective breeding. One of the articles that became literature in this study was an article written by Yuliana S. Rahayu et al and Dwi Ayu Prayuda et al. Both studies discussed selective breeding in tilapia but with different types. This research article was obtained from google scholar, and neliti with keywords for searching "selective breeding in tilapia"

RESULTS AND DISCUSSION

Selection activities began in 2004 and in 2009 successfully produced Larasati tilapia, which is the result of a cross between a female parent of GIFT (GG) strain black tilapia and a male parent of Singapore strain red tilapia (ss), which is considered a quality seed. Currently, selection activities focus on testing Janti red tilapia broodstock candidates, also known as Janti white tilapia strain Singapore (ss) males, as well as fifth-generation (F5) female GIFT strain black tilapia broodstock reared in swift water ponds.

Research on genetic improvement and differential selection of 5-month-old Janti white tilapia (ss) F5 broodstock candidates began with the rearing of 30-day broodstock candidates after being separated according to sex. Individual selection was conducted randomly on 400 male and 400 female 5-month-old Janti ss F5 tilapia broodstock candidates.

At the Freshwater Aquaculture Research Institute, a tilapia selection breeding program has been conducted to improve tilapia population growth. However, the sustainability of this program has not been optimal, although some agencies have begun to apply family and individual selection. This study used the individual selection method because it is simpler, cheaper, and utilizes a controlled source of environmental variance. Family selection was chosen when phenotypic heritability values were low and the rearing environment was uncontrolled.

The weight of Janti ss white tilapia broodstock at 5 months of age F5 showed an increase compared to F4 at the same age, and the weight gain between males and females of the two generations showed differences. Studies by Pandian & Sheela (cited in Maluwa, 2006) show that in tilapia, males tend to grow faster than females, and this difference in growth is apparent from the start, indicating sexual dimorphism. Several studies on Nile tilapia have shown that different rearing environments can have significant effects on fish weight (Charo-Karisa et al., 2006).

The average population weight growth of Janti ss white tilapia broodstock candidates at 5 months of age F5 increased compared to F4 at the same age. Based on this increase, the genetic improvement value of F5 against F4 was 30.12% for males and 27.92% for females, while the genetic improvement value of F4 against F3 was 25.36% for males and 14.81% for females. The genetic improvement value of F5 against F4 increased from the genetic improvement value of F4 against F3. The genetic improvement of F5 against F4 of Janti ss white tilapia broodstock candidates is greater than the estimated genetic improvement value for aquatic animals ranging from 10-20%. The value of genetic improvement for one generation of Janti ss white tilapia F5 to F4 candidates has reached the estimated value of genetic improvement for three generations.

The individual selection program successfully improved the weight growth of Janti ss white tilapia broodstock candidates. The results of this genetic improvement were better than those of studies that used the family selection method. The survival ability of Janti ss white tilapia F4 and F5 broodstock candidates was also high, with the same level of survival ability. The specific growth rate of Janti ss white tilapia F5 increased compared to F4. Feed conversion ratio also showed an increase in F5, indicating an improvement in feed efficiency.

Water quality that meets standard requirements is also an important factor in raising Janti ss F4 and F5 white tilapia broodstock. A selection breeding program using the individual selection method

successfully improved the growth performance of Janti ss F5 white tilapia. Indicators of the success of the breeding program included increases in weight, total length, and genetic improvement values of measurable phenotypic traits. In addition, the value of differential selection also showed good results, with the average weight of Top 100 fish greater than the average weight of the population.
The results showed fecundity, hatching rate, egg weight and diameter, yolk weight and length, weight and length of larvae released from the yolk, and number of larvae in the mouth of Kunti tilapia (O. niloticus).

Fekunditas

Based on the fecundity data of tilapia kunti (O. niloticus) during the study, a histogram was made which can be seen in Figure 1 histogram below.

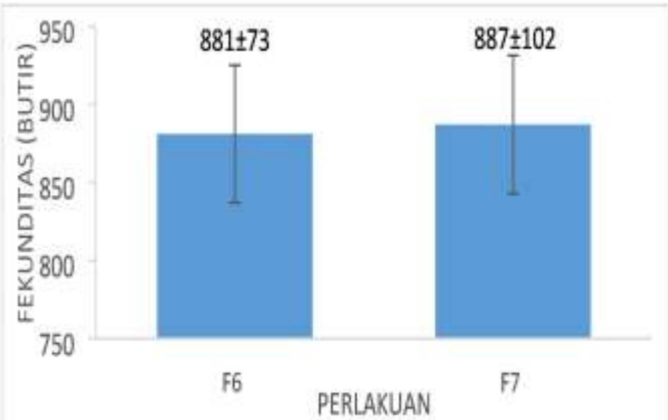

Figure 1. histogram of fecundity of kunti tilapia broodstock

Based on the results of the study, the fecundity of Kunti tilapia (O. niloticus) in F6 was 881 ± 73 individuals compared to F7 which amounted to 887 ± 102 individuals. Based on the calculation results, the birth rate increased by 0.68% from F6 to F7. According to SNI (2009), the fecundity of tilapia broodstock with a spawning weight of 500 grams is 1000 eggs or 200 eggs/100 grams. Therefore, when comparing the fecundity of F6 with SNI, the fecundity of F6 increased by 34%. A 51% increase compared to F7. Based on the results of the research calculations, it is known that the average fecundity value in the study exceeds SNI and selection increases the fecundity of tilapia kunti broodstock from F6 to F7. The difference in reproductive performance from F6 to F7 is most likely due to an increase in performance from the previous generation (F6) to the next generation (F7) after selection. These differences are genetic expressions resulting from selection. According to Tave (1986), selection is very effective in improving the genetic quality of fish. However, differences in fertility can also occur because they are influenced by different environmental conditions, especially related to food availability. According to Fujaya (2001), the reproductive ability of each female varies depending on age, body size, species, and environmental conditions (food availability, water temperature, season). According to Effendie (2002), variations in the number of fish eggs can be caused by differences in fish size groups. From the calculation of the heritability of egg fertilization rate, a value of -0.81 was obtained. This value is generally not in accordance with the value of heritability, because the value of heritability is between 0 and 1. The value of heritability is expressed in numbers 0 to 1 (Rusfidra, 2006).

Hatching Rate (HR)

Based on the hatching rate data of tilapia kunti (O. niloticus) during the study, a histogram was made which can be seen in Figure 2 histogram below.

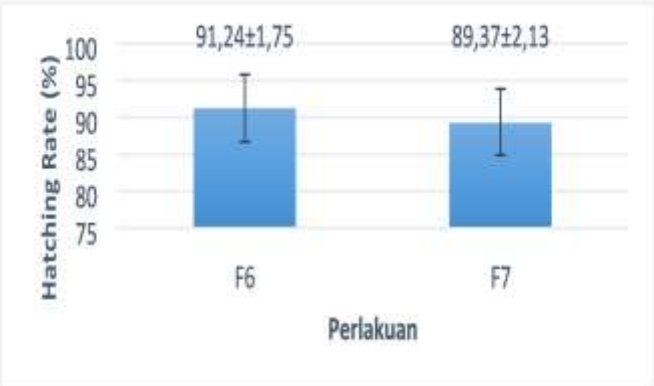

Figure 2 Tilapia hatching rate

Based on the results of the study, the value of hatching rate (HR) in the table is 91.24 ± 1.75% in F6 and 89.37 ± 2.13% in F7, while the standard value of HR for common tilapia is 80%. (Kuswoyo Kompri, 2102). There was no difference in the treatment performed. B. The collected eggs were carefully managed and the breeding containers kept sterile to avoid vibration and protected from fungal and protozoan attacks. However, results obtained in the field showed a difference in heart rate, possibly due to shock or disease attack, which can lead to a decrease in heart rate and a decrease in egg hatchability. The development of disease is often caused by poor water quality, which triggers parasites to attack the eggs. Wynarovich and Horvath (1980) state that egg death can be caused by, among other things, lack of oxygen, inadequate temperature, unfertilized eggs due to poor egg or sperm quality, mechanical disturbances such as shock or friction, or migration or parasites. explains that it occurs due to attack, etc. bacteria, fungi, etc. Fungi, insect larvae, and other animals. This is supported by the results of the heritability calculation analysis. The determined hatchability heritability (HR) value was -0.08. This value is generally not in accordance with the value of heritability, because the value of heritability is between 0 and 1. The value of heritability is expressed in numbers 0 to 1 (Rusfidra, 2006). This is because negative heritability values or double heritability values are unlikely to occur, but if found, it is caused by homogeneity caused by differences in the environment of different family groups, inappropriate statistical methods, and others. This is in accordance with Warwick (1995) who argues that there is a possibility that an error occurred during sampling.

Egg Weight And Diameter

Based on data on the weight and diameter of tilapia kunti (O. niloticus) eggs during the study, histograms were made which can be seen in Figures 3 and 4 of the histogram below.

Figure 3. histogram of egg weight of Kunti tilapia broodstock

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Figure 4. histogram of egg diameter of Kunti tilapia broodstock

Based on the histograms in Figures 3 and 4, the average egg weight and diameter of Kunti tilapia F6 was 8.05 ± 0.53 mg. The egg weight and diameter of Kunti tilapia F7 was 3.08 ± 0.30 mm, and the result was 6.87 ± 0.36 mg. 2.71±0.41mm. Based on the above data, we show that the egg diameter in our study is in accordance with SNI. The same applies to egg weight. According to SNI (2009), tilapia eggs weigh less than 7 mg, while F6 tilapia got an egg weight of 8.05 mg from selection (Setyantoro, 2011). The results showed that the difference in weight and diameter of F6 and F7 eggs may be due to the influence of environmental factors and possibly genetic factors. According to Pulungan (1994), egg size affects fish survival. This is because in fish and invertebrates there is often a bimodal or bimodal distribution of egg diameter, namely the first mode consists of immature gonadal eggs and the second mode consists of mature eggs. In accordance with the statement of Effendie (2002). This spawning model is called partial spawning. The relationship between egg diameter and TKG shows that the greater the TKG, the greater the diameter of the eggs obtained or the greater the variation in egg diameter. This indicates that the more developed the fish gonads, the greater the diameter of the eggs that develop in them. This is in accordance with the opinion of Effendie (2002) that the more developed the gonads, the larger the diameter of the eggs due to the deposition of oil particles which coincides with the development of the maturity level of the gonads. This is supported by the results of heritability calculation analysis, with a heritability value of 0.67 for egg diameter. According to Tave (1986) and Rusfidra (2006), the heritability value is in the high category, indicating that individual selection is very effective. The heritability value of egg weight was -0.097. This value is generally not in accordance with the heritability value, because the heritability value is between 0 and 1. This is because negative heritability values or double heritability values are unlikely to occur, but if found, it is caused by homogeneity caused by differences in the environment of different family groups, inappropriate statistical methods, and others. This is in accordance with Warwick (1995) who argues that there is a possibility that an error occurred during sampling.

Yolk Larvae Weight And Length

Based on data on the weight and length of larval yolk of tilapia kunti (O. niloticus) during the study, histograms were made which can be seen in Figures 5 and 6 of the histogram below.

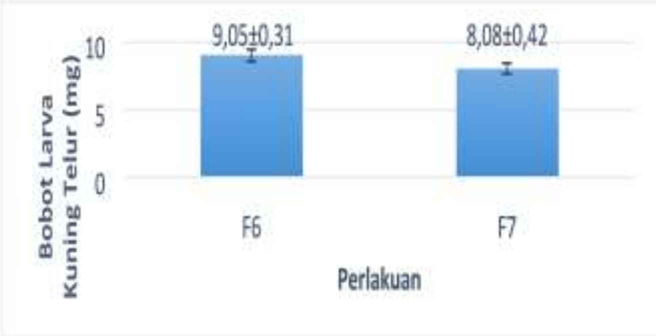

Figure 5. histogram of larval yolk weight of kunti tilapia broodstock

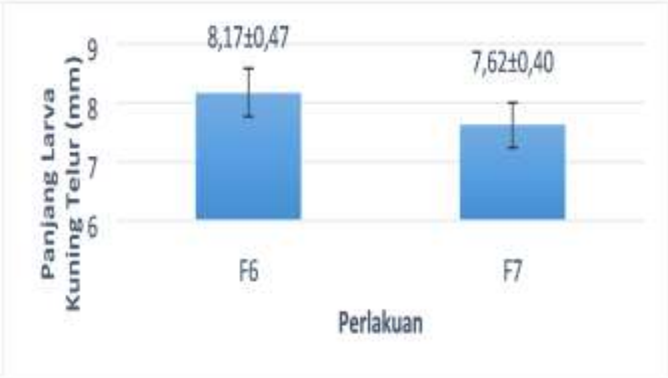

Figure 6. Histogram of larval yolk length of kunti tilapia broodstock

Based on the histograms in Figures 5 and 6, it can be seen that the average value of yolk weight and body length of Kunti tilapia F6 generation larvae was 9.05 ± 0.31 mg. The body weight and body length of Kunti tilapia larvae of F7 generation were 8.17 ± 0.47 mm and 8.08 ± 0.42 mg, respectively. 7.62±0.40mm. The weight and diameter of eggs produced by F6 elders were larger than those of F7, so the length and weight of yolk larvae from F6 elders were more predictable. Therefore, the condition of the eggs produced is directly proportional to the condition of the larvae after hatching. For salar salmon, a positive relationship between larval size and egg size has been reported (Kamler 1992). Larval development after hatching is an important stage in the life cycle of aquatic organisms such as fish. Because this stage is very important for sustainable aquaculture activities. Nutrient-deficient larvae can cause abnormal body shape and even death. If this happens, the fry become unsuitable for planting. From the calculation of heritability of larval yolk body length, a value of 0.05 was obtained, which is classified as low heritability. According to Noor (1996), the heritability value of a trait should be low between 0 and 0.2. Medium between 0.2 and 0.4. Values above 0.4 are considered high. The heritability value of larval yolk weight was -0.11. This value is generally not in accordance with the value of heritability, because the value of heritability is between 0 and 1. The value of heritability is expressed in numbers 0 to 1 (Rusfidra, 2006). This is because negative heritability values or double heritability values are unlikely to occur, but if found, it is caused by homogeneity caused by differences in the environment of different family groups, inappropriate statistical methods, and others. This is in accordance with Warwick (1995) who argues that there is a possibility that an error occurred during sampling.

Weight And Length Of Yolk Separated Larvae

Based on data on the weight and length of larvae released from the yolk of tilapia kunti (O. niloticus) during the study, histograms were made which can be seen in Figures 7 and 8 of the histogram below.

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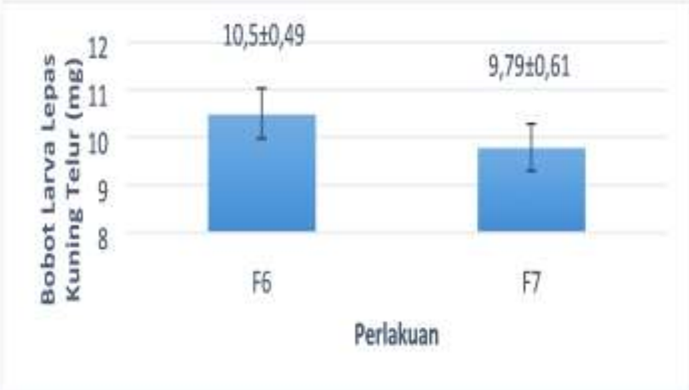

Figure 7: Histogram of the weight of larvae released from the yolk of kunti tilapia broodstock.

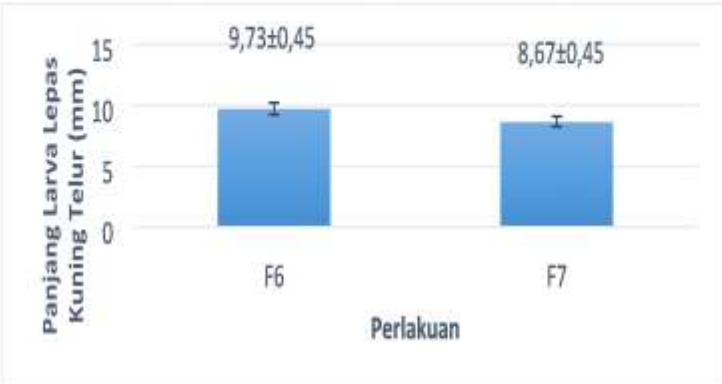

Figure 8: Histogram of the length of larvae released from the yolk of tilapia kunti broodstock.

Based on the histograms in Figures 7 and 8, it can be seen that the average weight and length of larvae released from the egg yolk of Kunti tilapia F6 parents resulted in an average value of 10.5 ± 0.49 mg. 9.73 ± 0.45 mm, and the weight of yolked tilapia larvae and body length of Kunti tilapia F7 generation were 9.79 ± 0.61 mg. 8.67 ± 0.45mm. Since the weight and diameter of eggs and the weight and length of hatched larvae from the F6 elders were greater than those from F7, the length and weight of yolkless larvae from the F6 elders were better predicted. The increase in larval hatching is directly proportional to the condition of yolkless larvae. This could be due to environmental factors and the place where the larvae live, as well as the size of the egg before hatching. This is because egg size affects how much yolk it retains upon hatching and how long the yolk is retained. . According to SNI (1999), the size of the egg until the larvae hatch does not change between treatments, so the yolk absorption time is the same and the water quality of the larval hatchery is also appropriate. . Similar to Lim et al. Al. (2005) and Lyytikainen (1998) state that after egg hatching, larval lifespan is influenced by environmental factors. However, performance may decrease after selecting F6 to F7. The difference is the expression of genes resulting from the selection that has taken place. This is supported by the results of the heritability calculation analysis, with a heritability value of 0.49 for the weight of larvae released from eggs. According to Tave (1986) and Rusfidra (2006), heritability values are in the high category, indicating that parental genetic influences are stronger than environmental influences. The heritability value of larval length without yolk was 0.47. According to Tave (1986) and Rusfidra (2006), heritability values are in the high category, indicating that parental genetic influences are stronger than environmental influences. According to Noor (1996), the heritability value of a trait should be low between 0 and 0.2. Medium between 0.2 and 0.4. Values above 0.4 are high.

Number Of Larvae In The Mouth

Based on data on the number of larvae in the mouth of tilapia kunti (O. niloticus) during the study, a histogram was made which can be seen in Figure 9 histogram below.

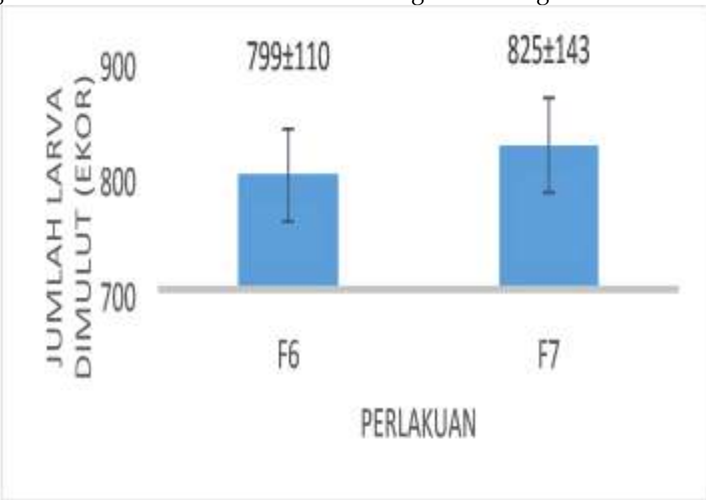

Figure 9: Histogram of the number of larvae in the mouth of the tilapia kunti broodstock

Based on the histogram in Figure 9, the average number of larvae in the mouth of Kunti F6 tilapia broodstock yielded 799, while Kunti F7 tilapia broodstock yielded 825, as you can see. . There is a 3.2% difference in the number of larvae in the mouth between F6 and F7. According to SNI (2009), the number of larvae produced by tilapia parents reaches 750 yen per head. Therefore, the number of larvae in the mouth of F6 parents increased by 6.5% when compared to SNI, but increased by 10% when compared to F7. The results of the number of larvae in the mouth of F6 and F7 parents were compared with Arie (2000). The results obtained were 52% for F6 and 75% for F7. A female tilapia mother weighing 600 grams produces 800 to 1000 larvae (Arie, 2000). The difference in the number of larvae in the mouth of F6 and F7 is likely due to improved performance after selection. These differences are genetic expressions resulting from selection. According to Tave (1986), selection is very effective in improving the genetic quality of fish. This is supported by the results of the heritability calculation analysis, with a heritability value of 0.69 for the number of larvae in the mouth. According to Tave (1986) and Rusfidra (2006), the heritability value is in the high category, indicating that individual selection is very effective. According to Noor (1996), the heritability value of a trait should be low between 0 and 0.2. Medium between 0.2 and 0.4. Values above 0.4 are high.

CONCLUSIONS

The main conclusion of this study is that a selection breeding program using the individual selection method has successfully improved the weight growth of Janti white tilapia Singapore strain (ss) broodstock. The better genetic improvement values from previous studies indicate the effectiveness and success of this approach in improving the genetic quality of the Top of population.

The results of a study comparing the reproductive traits of F6 and F7 Kunti tilapia had a big impact. F6 tilapia outperformed F7 in several variables such as hatchability, egg weight and diameter, yolk larvae weight and length, and yolk holding larvae weight and length. However, Kunti tilapia F7 performed well in terms of fecundity and number of larvae in the mouth, proving that the quality of tilapia F7 is maintained. Variables measured in Kunti tilapia F6 include fecundity value of 881 ± 73 and HR of 91.24 ± 1.75%. This is supported by data on other variables such as egg diameter, egg weight, weight and length of yolk larvae, and yolk weight. Supported length - free larval eggs and the number of larvae in the mouth. While the data on variable F7 has a fertility value of 887 ± 102 and HR of 89.37 ± 2.13% which is determined by egg diameter, egg weight, weight and length of yolk larvae, and free yolk. supported by data on weight and length of larvae, number of larvae in the mouth. The heritability value of fertility from F6 to F7 was -0.81, HR

-0.08, not in accordance with the general heritability value because the heritability value ranges from 0 to 1. Egg diameter and weight were 0.67 and 0.09, yolk larvae length and weight were 0.05 and -0.11, non-yolk larvae length and weight were 0.47 and 0.49, and the estimated number of larvae in the mouth was 0.69. This is due to genetic factors as well as inbreeding or hybridization factors that produce homozygous individuals, making individuals vulnerable to environmental changes.

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