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Analysis on the Survival Rate and Growth of Larasati Tilapia (*Oreochromis niloticus*) F5 seed in Saline Media

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Abstract

The aim of this research was to observe the impact of different saline media towards the survival rate and growth of red tilapia, variety Larasati Tilapia (*O. niloticus*) F5 seed cultured in saline media. This research was carried out on March - August 2012 at Satker PBIAT (Centre of Fresh Water Fish Hatchery Working Unit), Janti – Klaten, Central Java Province. Sample used were F5 red Larasati Tilapia seed from selective breeding with approximate length of 3-5 cm. A completely randomized design method was used with 5 treatments and 3 replications. Different saline media for the treatments were A (0‰); B (15‰), C (20‰), D (25‰) and E (30‰). The seeds were cultivated in a plastic container with water capacity of 20 liter and density of 20 fish per container. Result showed that in water media with salinity up to 15‰ the survival rate is equal to salinity of 0‰ at amount of 81.67±2,89%. Increase in salinity of the media result in the decrease of the survival rate where at the saline media of 30‰ the survival rate drops until 71.67±2,89%. Similarly, growth in weight and length. F5 red Larasati tilapia reared in saline media up to 30‰ are still experiencing good growth both in weight and length, but slowed. The best growth was obtained in 15‰ saline medium with gaining in weight and length for 1.40±0.01 grams and 1.89±0.02 cm, respectively

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Keywords: tilapia, red, variety,Larasati, saline media,survival rate, growth

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1. Introduction.

Natural resources that support the development of fish farming is very abundant (1) Based on the natural resources data, therefore on 2010 the Ministry of Marine and Fisheries have designated that the aquaculture production should reach 353% or become world's largest aquaculture producer in 2015 (2).

Central Java province is rich in natural resources have the potential of establishing aquaculture production through 2015 should be increased to 258%. According to (3) tilapia production in Central Java in 2010 was targeted at 29.449 tones and to reach 65.965 tons by 2014.

Method of producing tilapia is currently done in still water and running water ponds and in floating net cage. The feature of tilapia is the ability to adapt ~~in~~ high salinity. Its known as a euryhaline fish, as stated by (4) that tilapia is classified into fish with wide range of salinity tolerance from 0 – 35 ‰.

Euryhaline adaptation of tilapia should be used to support tilapia production considering there are many idle brackish water ponds. According to the Ministry of Marine and Fisheries there are total of 450 thousand hectares (ha) of potential brackish water ponds to be utilized from total of 1.2 million hectares. That means only 36‰ of potential brackish water ponds is currently used. Furthermore, Director of Aquaculture Production estimated from those brackish water ponds area 35-45‰ of them are idle (5).

In order to boost tilapia production by utilizing the idle brackish water ponds, superior tilapia seed which have high tolerance towards salinity is needed. (6) suggested that Larasati tilapia is a new variety from selective breeding and hybridization of the 5th generation (F5) and have excellent survival rate and growth in fresh water.

The purpose of this study was to determine the survival rate and growth of Larasati tilapia (O. Niloticus) F5 cultured in different saline media. It is expected that the result of this research will illustrate the prospect of Larasati tilapia cultured in the idle brackish water ponds. Tilapia fish farming activity in saline water has been done by researchers before (7-10)

2. Material and Method

Experimental fish used were red Larasati tilapia (*O.niloticus*) seeds from genetic improvement 5th generation (F5) of selective breeding (6) with length of 3-5 cm and range weight between 0.70 – 1.3 grams approximately. A complete random design method was used in this research. There were 5 treatments and each treatment was replicated 3 times. The treatments were different saline media, i.e. A (0‰); B (15‰), C (20‰), D (25‰) and E (30‰). Data collected were survival and growth rate and were analyzed using MSustat ver. 4.11 and analyzed descriptively.

Fish seeds were maintained in a plastic container with volume of 20 liter and density of 20 fish/container. Prior to treatment, the fish were acclimatized with saline media. Salinity acclimation of 1-2‰ was done everyday starting from salinity 30‰, 25‰, 20‰, 15‰. The data collection were started when the fish were stable. This research was carried out on March-August 2012 at Working Unit of Fresh Water Fish Seed Centre, Janti-Klaten, Central Java.

3. Result and Discussion

3.1. Survival Rate

Result of survival rate of F5 Larasati tilapia fish (*O. niloticus*) cultured in different saline media is shown in Table 1 as follows:

Tabel 1. Survival rate (%) of F5 Larasati Tilapia (*Oreochromis niloticus*)

Treatments	Replications			Average±sd
	1	2	3	
A (0 ‰)	85	80	80	81.67±2,89
B (15 ‰)	80	85	80	81.67±2,89
C (20 ‰)	75	80	80	78.33±2,89
D (25 ‰)	75	70	80	75,00±5,00
E (30 ‰)	70	75	70	71.67±2,89

The treatment of different saline media towards survival rate shows that treatment A (0‰) as control generated 81.67±2.89 % while treatment B (15‰) was 81.67±2,89 % which is the same as treatment A. Treatment C(20‰), D (25‰) and E(30‰) showed ~~a~~ decrease and treatment E showed the lowest result in survival rate of 71.67±2,89%.

Analysis of variance indicated that different saline media gave significant difference (p<0,05) towards survival rate, the higher the level of saline media caused decreased in survival rate. Larasati tilapia (*Oreochromis niloticus*) F5 cultured in fresh water and in 15‰ saline media showed no significant difference, this indicate that tilapia can be classified as euryhaline and can grow well in 15‰ of salinity. Accroding to (8,10,11) tilapia can adapt in a wide range of salinity from brackish to sea water. Nevertheless, the data showed that the higher the salinity result in higher mortality and a decrease in survival rate. It is assumed that fish cultured in high salinity (> 20‰) are experiencing high osmotic pressure and mortality occurred when fish cannot reach its iso-osmotic. This phenomenon happened because osmolarity of blood plasma during acclimatization significantly increase and is related to the readiness of osmo-regulation organ when it is moved to water with higher salinity (12). According to (13) when tilapia fish moved into higher salinity media, it will increase Na+-K+-ATPase activity, gills will try to excrete NaCl, kidney will also excrete salts and decreases plasma osmolarity in fish.

Fig 1. Showed that survival rate decreases as salt level is increased. Treatment A (0‰) has the same result with treatment B (15‰), while treatment C, D and E, where salinity of the media were increased, survival rate decreased. Indicator of death fish are it floating and swimming abnormally. However, although the survival rate in treatment E (30‰) of 71.67±2,89% and considered the lowest among treatments, but it is still in the range of Indonesian (14) i.e. survival rate of 70%. Therefore, F5 Larasati Tilapia culture in order to utilize idle ponds has fulfill the national standard of seed.

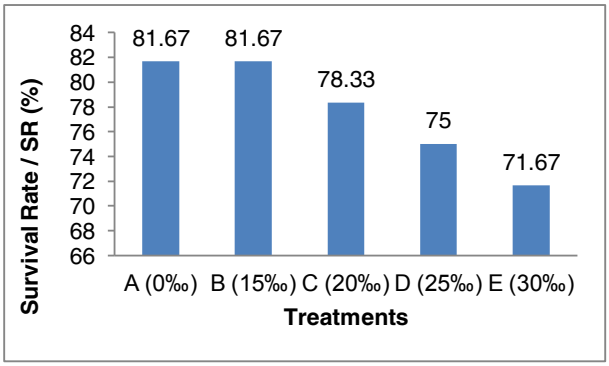

Fig 1. Correlation between different saline media and survival rate of F5 Larasati Tilapia

2.2 Growth

At the end of the research, it was observed that there was an increase in weight of red Larasati tilapia (*O. niloticus*) seed which is shown in Table 2.

Table2. The weight gain (gram) of F5 LarasatiTilapia (*Oreochromis niloticus*) at different saline media

Treatments	Replications			Average ± SD
	1	2	3	
A (0 ‰)	1.41	1.37	1.40	1.39±0.02
B (15 ‰)	1.40	1.41	1.40	1.40±0.01
C (20 ‰)	1.32	1.34	1.29	1.32±0.03
D (25 ‰)	0.81	0.83	0.76	0.80±0.04
E (30 ‰)	0.54	0.58	0.51	0.54±0.04

The weight gain (grams) of F5 Larasati tilapia reared at different salinity media showed, that in treatment A (0‰) an increase of 1.39±0.02grams was equal with those at treatment B (15‰), i.e. 1.40±0.01grams and there were not differ between treatments A, B and C. However, in treatment D (25‰) only a slight weight gain was found 0.80±0.04 gram, and the smallest weight gain was found in treatment E (30‰) with only 0.54±0.04 gram during the observation period.

Results of analysis of variance showed that the different in salinity media shows significant differences (P <0.05) on the weight gain (gram) of fish, where the higher the level of salinity the smaller the growth (weight gain).

Fig 2. Showed that there is a trend of weight gain in red Larasati Tilapia cultured in different saline media,

however, the amount of weight gain differs between treatment. Treatment B (salinity 15‰) has similar weight gain to treatment A (0‰). While in treatment C (20‰) the amount of weight gain starts showing a significant decline and it continues in treatment D (25‰) and the greatest decrease in treatment E (30‰)

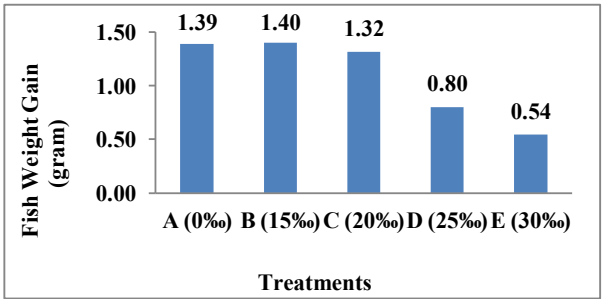

Fig 2. Correlation between different saline media and weight gain (grams) of F5 Larasati Tilapia

The observation of the increase length (cm) of F5 Larasati tilapia (*O niloticus*) after being cultured in the different saline media is shown in Table 3

Table3. Increased length (cm) of F5 Larasati Tilapia(Oreochromis niloticus) seeds at different saline media

Treatments	Replications			Average ± SD
	1	2	3	
A (0 ‰)	1.93	1.86	1.98	1.92±0.06
B (15 ‰)	1.90	1.87	1.91	1.89±0.02
C (20 ‰)	1.71	1.74	1.81	1.75±0.05
D (25 ‰)	1.54	1.67	1.68	1.63±0.08
E (30 ‰)	1.48	1.42	1.37	1.42±0.06

Increase in length (cm) of Larasati Tilapia F5 seed shows that although there was an increase of 1.92±0.06 cm in treatment A (0‰), but it was not significant different compare to treatment B (15‰) which grew 1.89±0.02 cm. A decrease in length growth was found in treatment C, D and treatment E showed the lowest in length growth which is only 1.42±0.06 cm during the research period. According of (7) showed that the Egyptian Nile tilapia *Oreochromis niloticus* is a wild fish at 15 ppt showed low growth rate which was lower than the zero and 5 ppt for growth rate, but according of (8) that the nila genetically improved as GIFT on the Salinity 37-40ppt) showed that the faster daily growth rate and specific growth rate, higher survival rate and lower feed conversion ratio.

The analysis of variance showed that the treatments of different saline media give significant difference ($P<0,05$) towards length growth (cm), where the higher the salinity of the media the slower the length growth

Fig 3. Showed the trend of increased length (cm) of fish based on the different treatment of saline media. F5Larasati tilapia reared in different saline media all experienced an increase in body length. It is believed to occur because all F5 Larasati tilapia seed were acclimated prior to treatment. Nevertheless, the length of growth differs between treatments. The fish at treatment B (15‰) showed the same growth of body length as the fish at treatment A (0‰), but from treatment C on-wards, length growth started to decrease with treatment E (salinity 30‰) showing the lowest length growth.

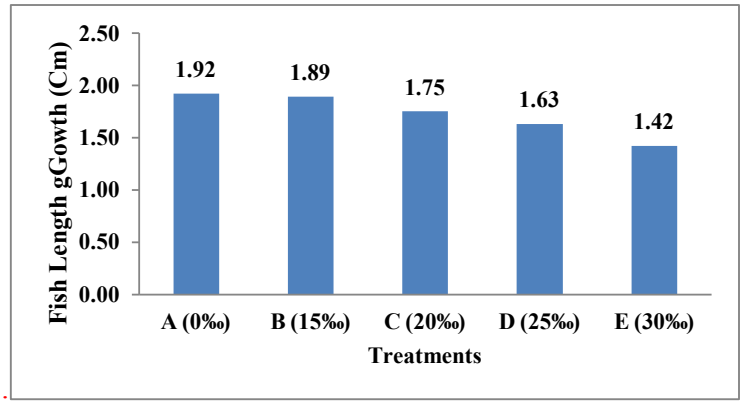

Fig 3. Correlation between different saline media and fish length growth (cm) of F5 Larasati Tilapia

Seed selection program in freshwater fish is proven to give positive impact on growth of fish that cultured from fresh water to saline media. The results of this research showed that F5 Larasati tilapia cultured in the freshwater media (0‰) until saline media up to 30‰ were still result in high survival rate and good growth both in body weight and length. This shows that Larasati tilapia is classified as euryhaline fish where the range of salinity tolerance is wide, however, the best survival rate and growth was found in the saline media of 20‰ (11) Fish growth decreased with increasing salinity were related to the readiness of the organs associated with osmoregulation (12) . The decline in fish growth is suspected that once salinity treatment was given, fish will try to keep its osmotic pressure by enhancing its Na+-K+-ATPase activity, fish gills will also try to secrete NaCl and spleen will secrete other forms of salts. Therefore, fish will drink more water which resulted in the decrease of feed intake for growing. According (15) a euryhaline fish will use the energy to change ATP to ADP in metabolite amonia and remove ammonia passed through their gills. Allegedly, the higher the use of Na+, the higher the energy used. As a result the higher the salinity will slowed growth. Besides releasing ammonia, the gill also worked hard releasing CO_2 from the blood in to the media during respiration and it needs energy (16).

Conclusion

Based on the research results and discussion it can be concluded that:

1. F5 Larasati Tilapia seed cultured in high salinity up to 30‰ still show a good survival rate 71.67±2,89%. The best survival rate of 81.67±2,89 % was found in treatment B (saline media of 15‰).
2. F5 Larasati tilapia reared in saline media up to 30 ‰ are still experiencing good growth both in body weight and length.
3. The best growth of body weight (1.40± 0.01 gram) and length (1.89± 0.02 cm) respectively was obtained at saline medium of 15 ‰

Suggestion

Based on the research result, discussion and conclusion, therefore it can be suggested that:

1. Larasati Tilapia F5 seed can be cultured in saline media up to 30‰, however, the best salinity level was 15%, therefore it can be cultured in idle brackish water ponds to boost tilapia production.
2. In order to obtain F5 larasati tilapia seed that can live in high level of salinity, a selective breeding program should be introduced.

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