



Observe the Growth Performance and Adaptation of Exotic Fish Red Tilapia(hybrid) in climate of Fish Hatchery Chilya, Thatta, Sindh-Pakistan

A. MALIK⁺⁺, B. WARYANI*, I. B. KALHORO**, H. KALHORO*, S. A. SHAH, N. T. NAREJO*.

Directorate of Fisheries Sindh, Livestock and Fisheries Department, Government of Sindh

Received 18th May 2014 and Revised 9th September 2014

Abstract: The current experiment was conducted to evaluate growth and adaptation of Red Tilapia fish (hybrid) for the period of 150 days in cemented cisterns size (15 x 6 x 3 ft) at fish hatchery ChilyaThatta, Sindh Pakistan. fry having 2.0 g mean weight and 2.5 cm mean length were imported live from Thailand and stocked in cemented cisterns at hatchery. After acclimatization the fry were fed with formulated diet containing 30% gross protein tow times in a day at the rate of 5% of total biomass. The diet consists of fish meal (FM), mustered oil cake (MOC), rice bran (RB), wheat bran (WB), rice protein (RP), wheat flour (WF), salt and vitamin premix. The water quality parameters were recorded monthly basis and ranged between temperature 28-31°C, dissolved oxygen 5.2-6.5 mg/lit, pH 6.7-7.2, Ammonia 0.38-0.54 mg/lit and hardness 110-130 ppm were found within the suitable ranges for fish culture. The outcomes exposed that the growth increment of fry was higher afterward 30 days of rearing period. Finally at the end of experiment fish attained (281g mean weight and 29.4 cm mean length) in 150 days experiment.

Keywords: Red tilapia, growth, adaptation and cemented cisterns.

1. INTRODUCTION

Tilapia is the most important cultivable fish globally after carps and is also described as the most significant aquaculture species of the 21st century (Shelton, 2002). Tilapia cultivation is increasing worldwide in both developed and developing countries (Pillay, 1993). The fishes belonging to this group could be cultured in very simple circumstances, growing, surviving in very poor and hard environment and breed easily in captivity and so is ideal for rural subsistence farming (Abdel-Hakim *et al.*, 2001; El-Sayed, 2002). They are widely cultured in about 100 countries in the tropical and subtropical regions (FAO 200b). Red tilapia was first found in a pond in a northern Thailand, where *O. mossambicus* was introduced from Malaysia in 1949. Thus this fish was assumed to be a hybrid between *O. mossambicus* and *O. niloticus*. There is the scientific proof that the fish is a hybrid of *O. mossambicus* and *O. niloticus*. Red hybrid tilapia are gaining popularity among culturists due to resemblance with marine species such as sea bream (*Chrysophrys major*), red snapper (*Lutjanus campechanus*) (Fitzgerald 1979; Liao & Chang 1983; Stickney 2000), excellent growth and FCR in freshwater (Liao & Chang 1983). Excellent potential for market development is for fresh product in Japan and the United State West Coast. In Caribbean Landmasses a domestic market for red tilapias has been formed by the incapacity of marine catches to fulfil mandate for fish. Commercial tilapia culture in the Caribbean is effectively established in Jamaica, where red hybrid tilapia strains are favored by

customers (Chakalall, and Noriega-Curtis, 1992). Red tilapia fillets export to Florida has just started. In 1987 fish production is probable 2,600 MT from 720 hector area of fresh and brackish water ponds (0.00-10 ppt. salinity range). In Jamaica water resources are threatened but water resource is considered as significant constraint to further development of aquaculture (Chakalall, and Noriega-Curtis, 1992).

According to commercial culturists responsible for their development (Watanabe *et al.*, 1989), red tilapia hybrids originating in the United States were first established in the late 1970's via commercial fish breeder (Sipe) in Florida. Inbreeding of *Oreochromis mossambicus* created a modified with reddish-yellow pigmentation, which was selectively bred to improve the red and yellow coloration due to this decline in a market, growth and body form (Watanabe *et al.*, 1989). Red tilapia strains have become increasingly popular to fish farmer and entrepreneurs for their characteristic body color, fast growth, testy flesh and high demand in the market. These strains are commercially cultured in many tropical and sub-tropical countries of the world such as Taiwan, Philippine, Thailand, Malaysia, Indonesia, Israel, Guam, Greece, Brazil, Jamaica, Bangladesh and USA. That's we introduce the red tilapia in fish hatchery ChilyaThatta.

As it is a hybrid (hybrid) fish hence it should be collected from the known source. We collected Red tilapia from Thailand into Pakistan.

⁺⁺Corresponding author: Abdul Malik Email: malik.cemb@gmail.com Phone: +92-345-3298175

*Department of Fresh Water Biology and Fisheries, University of Sindh Jamshoro.

**Department of Anatomy and Histology Faculty of Animal Husbandry & Veterinary Science, Sindh Agriculture University Tando Jam.

2. MATERIAL AND METHOD

a) Collection and stocking of experimental fish

Fry's of Red tilapia size (length 2.5 ± 0.1 cm and weight 2.0 ± 0.2 g) Imported from Thailand, about 500 in numbers. Initially stocking has been taken place in the cemented tank ($15' \times 6' \times 3'$) at fish hatchery ChilyaThatta. The experimental fish acclimatized properly by maintaining temperature with water exchange for seven days. Before start the experiment in cemented cisterns. Tanks were treated with salt solution to prevent any fungal infections. Initially, the culture of experimental fish was fed with artificial pelleted feed with 5% body weight.

b) Pellet feed preparation

To prepare the formulated feed for feeding experimental fish fry, Fish meal (FM), Rice protein (RP), Mustered oil cake (MOC), Rice bran (RB), Wheat bran (WB), Salt and Vitamin Premix were mixed methodically and sieved from 0.5 mm mesh size by sieving device. The formulated feed contain 30% protein. All feed ingredients were mixed together according to the formulae and prepare the pellet feed of size 1 mm. The composition of pellet feed is shown in (Table, 1-2).

Table: 1. Ingredients of formulated feed with 30 % gross protein level.

S.No	Ingredient	Actual Protein (%)	% used	Protein (%)
1.	Fish Meal	60	23	13.8
2.	Rice Protein	45	15	6.75
3.	Mustered Oil Cake	30	20	6
4.	Rice Bran	12	20	2.4
5.	Wheat Bran	10	20	2
6.	Salt + Vitamin Premix	1	2	0.02
	Total		100	30.97

Table: 2. Growth parameters of Red Tilapia reared for 150 days in cemented cisterns fed with formulated feed.

S.No	Parameters	Readings
1.	Average initial weight (g)	2 ± 0.02
2.	Average initial length (cm)	2.5 ± 0.01
3.	Average final weight (g)	281 ± 56.0
4.	Average final length (cm)	29.4 ± 3.3
5.	Daily weight gain (DWG)	1.86 ± 01
6.	Specific growth rate (SGR)	5.2 ± 0.2
7.	Feed conversion ratio (FCR)	0.84 ± 0.5
8.	Survival rate (%)	94 ± 03
9.	Condition Factor (CF)	1.14 ± 01

c) Feeding and Sampling

Formulated feed were gavetwo times daily at 9:30 AM and at 5:30 PM at a rate of 5% of the wet body weight. Monthly sampling was done to adjust the feeding amount, by calculating the weight of fish and to witness the health condition of fish. The length of trial fish was measured in centimeters with an ordinary scale. Weight was measured to the nearest gram by portable electronic balance (Model AK- 3000H AFD), with the help of small plastic tub.

2.

RESULTS

The growth increment of Red tilapia (Hybrid) was observed during throughout rearing period in terms of mean initial length, mean final length, mean initial weight, mean final weight, daily weight gain, specific growth rate (SGR % per day), feed conversion ratio (FCR) and survival rate (SR) were calculated and are shown in table 3. During the rearing period (150 days) fish attained average 281 ± 56.0 weight (g) and length (cm) 29.4 ± 3.3 respectively shown in (Fig.1).

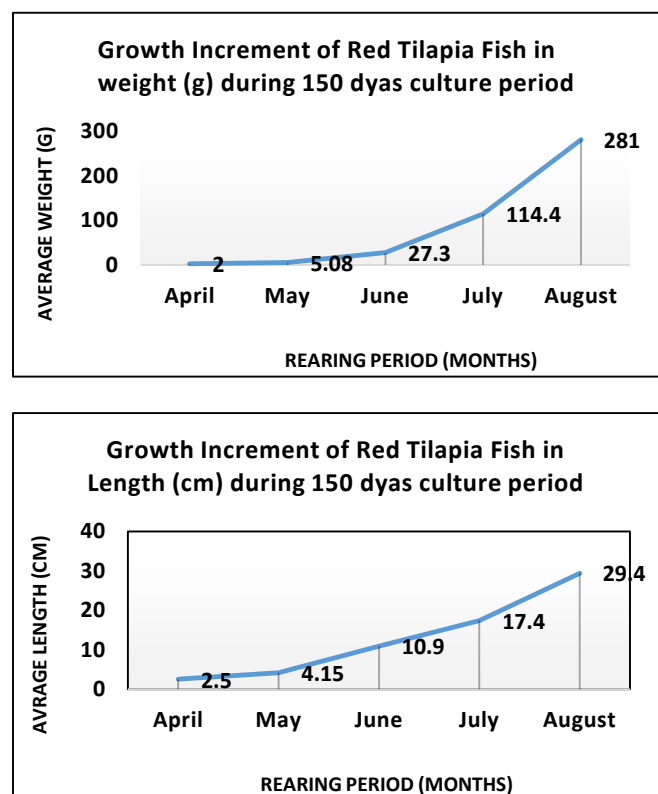


Fig. 1: Growth increment of Red Tilapia (Hybrid) in weight & length during 150 days rearing period.

These results shows that Red tilapia were grow slow at initially rearing period due to new environment adaptation but after one month better increment in weight and length was observed.

The water quality parameters and their monthly variations recorded during rearing period and found within the appropriate ranges for tilapia culture such as temperature 28-31 °C, dissolved oxygen 5.2-6.5 mg/lit, pH 6.7- 7.2, Ammonia 0.38-0.54 mg/lit and hardness 110-130 ppm shown in **(Table-3)**.

Table: 3. Showed month-wise variation in water quality parameters of Red tilapia (hybrid) throughout the 150 rearing period.

Months	Water Quality Parameters				
	Temperature (°C)	pH	Dissolve Oxygen (mg/L)	Ammonia (mg/L)	Hardness (ppm)
April	28	6.8	5.2	0.54	122
May	29	6.7	5.5	0.48	110
June	30	7.2	6.1	0.38	112
July	31	7.1	6.2	0.44	130
August	30	6.8	6.5	0.50	122

3. DISCUSSION

The Red tilapia, (hybrid) is widely cultured in many tropical and subtropical countries of the world. Initially when Red tilapia was introduced into the local environment of Sindh-Pakistan, fish showed slow growth initially because of new environment adaptation but after 30 days fish stock grew better. The fish stock which is introduced into new environment always shows a slow growth rate but when they adopted grow rapidly and show a higher growth rate on artificial feed, and transportation should take place with intensive care and before stocking all preventive measure should be taken place to get an accurate and desired growth.

In the present study of 150 days rearing period fish attained 281 ± 56.0 weight (g) and length (cm) 29.4 ± 3.3 respectively, these results matched with pervious researched by (Popma and Masser, 1999, Hussain, 2004).

The growth parameters in the current study indicated that fish FCR values where 0.84 these are similar to results reported by Quiming and Yang (2004) that FCR values of 0.8-1.2 when fed on artificial feed containing 28-30% crude protein at 2-4% body weight per day. Survival rate was 94 % these results are contrast to (Jobling, 1983 and Cui *et al.*, 1997). SGR values were 4.22 and daily weight gain is 1.86. Present results are in contrast to the findings of Dey M.M (1996). Abdel-Hakim *et al.* (2001) reported non-significant variances in weight between fish given to different feeding managements.

In fish farming, ammonia is the major lethal metabolic by-product. Total ammonia ratio 0.38-0.54 mg/l obtained in this study was similar with the range of 0.2 to 0.6 mg/l testified by Siddiqui *et al.* (1998). The D.O concentration of 5.2-6.5 mg/l obtained was

nearby to the optimum level and was satisfactory for best fish growth (Rahman, 1992). The pH values found 6.7-7.2 mg/l which is under the tolerance range of 5-11 for tilapia reported by Rahman (1992). Water temperature was recorded during the study period and found 28-31°C range which is within the optimum range for tilapia survival and growth reported by (Popma and Masser, 1999). It has been reported by (Rahman, 1992; Burelet *et al.*, 1996; Narejoet *et al.*, 2002; Narejoet *et al.*, 2003; Narejoet *et al.*, 2005). Stated that water parameters are key factors which directly affect metabolism, food intake and nutritional efficiency the fish. The results of present study indicated that Red tilapia (hybrid) can be culture in Sindh-Pakistani environment on semi-intensive and intensive farming methods and will be helpful to Aquaculture promotion into Sindh-Pakistan.

5. CONCLUSION

Red Tilapia fish (hybrid) fry were introduced in Fish Hatchery Chilya, Thatta, Sindh, Pakistan for rearing and breeding purpose. After the rearing phase completed fish attained 281 ± 56.0 weight (g) and 29.4 ± 3.3 cm in length now they are adult and able to breed at this hatchery in this way we can produced mass seed for local fish farmers they will culture this species at high stocking densities with supplementary or totally artificially feed to enhance the aquaculture advancement and to overcome food deficiency in Pakistan and also they will increase their income.

6. ACKNOWLEDGEMENT

Authors are very thankful to Mr. Ghulam Mujtaba Wadhar, Director Fisheries Sindh (Inland), Mr. Syed Ashraf Ali Shah, Deputy Director Fisheries, Fish Hatchery Chilya Thatta, Mr. Khalil-ur-Rehman Wagan ADF Fisheries Training & Research Institute Chilya Thatta and Mr. A. Sattar Abro ADF Chilya Thatta to support and proper guidance throughout the research period and Authors are also grateful to Dr. S.M. Rahmatullah, Prof Department of Aquaculture, Bangladesh Agricultural University, Mymensingh for giving scientific guidance throughout the experiment.

REFERENCES:

- Abdel-Hakim, N.F., M.S. Hussein, M.N. Bakeer and M.A. Soltan, (2001). Effect of protein level and stocking density on growth performance of Nile tilapia (*Oreochromis niloticus*) cultured in tanks. Egyptian J. Nutr. Feed, 4: 763-780.
- CUI, Y. (1997) Growth performance of juvenile whitemullet as affected by feeding regimen. *Progr. Fish-Cult.*, Bethesda, vol. 59, 31-35.
- Dey, M.M. (1996). Summary activities of the project on dissemination of genetically improved Nile tilapia in

- Asia (DEGITA). In: M.A. Mazid, M.G. Hussain and M.J. Alam (Editors), (2004) Proceedings of the workshop on current status and future strategy for dissemination of genetically improved farmed tilapia in Bangladesh. Bangladesh Fisheries Research Institute, Mymensingh, Bangladesh.
- El-Sayed, A.M. (2002). Effects of stocking density and feeding levels on growth and feed efficiency of Nile tilapia (*Oreochromis niloticus* L.) fry. *Aquacult. Res.*, 33: 621-626.
- FAO, (2004a). Yearbook of Fishery Statistics: Summary Tables, (www.fao.org).
- Fitzgerald W.J. (1979). The red orange tilapia: a hybrid that could become a world favorite. *Fish Farming International*, 6 (1): 26-27.
- Hussain, M. G. (2004) Farming of tilapia: Manual "Breeding plans, mass seed production and aquaculture techniques". 55 Kristawpur, Mymensingh 2200, Bangladesh, 149Pp.
- JOBLING, M. (1983). Effect of feeding frequency on food intake and growth of Artic Charr, *Salvelinus alpinus* L. *J. Fish Biol., London*, vol. 23, 177-185.
- Liao, I.C. and I.C. Chang. (1983). Studies of the feasibility of red tilapia culture in saline water. p. 524-543. In: L. Fishelson and Z. Yaron (Editors), *Proc. Int. Symp. on Tilapia in Aquaculture*, Nazareth, Israel. 8-13.
- Narejo, N. T., M. A. Salam, M. A. Sabur and S. M. Rahmatullah. (2005) Effect of Stocking density on growth and survival of indigenous catfish, *Heteropneustes fossilis* (Bloch) reared in cemented cisterns fed on formulated feed. *Pakistan J. Zool.*, 37(1): 49-52.
- Narejo, N. T., M. M. Haque and S. M. Rahmatullah (2002). Growth performances of snake eel, *Pisodonophis boru* (Hamilton) reared experimentally with different food items. *Bangladesh J. Train and Dev.*, 15 (1-2): 221-225.
- Narejo, N.T., S.M. Rahmatullah and M. Mamnur Rashid (2003) Effect of different feeds on growth, survival and production of freshwater mud eel, *Monopterus albus* (Hamilton) reared in cemented cisterns. *Indian J. Fish.*, 50 (4): 473-477.
- Pillay, T.V.R. (1993). *Aquaculture. Principles and Practices*. Blackwell, Oxford, 575 Pp.
- Popma T. and M. Masser (1999). *Tilapia life history and biology*, Southern Regional Aquaculture Center (SARC).
- Popma, T.J. and L.L. Lovshin. (1996). *Worldwide prospects for commercial production of tilapia. Development of semi-intensive aquaculture technologies in Honduras. Research and Development Series No. 41. International Center for Aquaculture and Aquatic Environments*, Auburn University, Alabama. U.S.A.
- Rahman, M. S. (1992). *Water Quality Management in Aquaculture*. BRAC, Prokashana, Mohakhali, Dhaka 120Pp.
- Shelton, W.L. (2002). Tilapia culture in the 21st century. In: R.D. Guerrero III and M.R. Guerrero-del Castillo (Editors), *Tilapia farming in the 21st century. Proceedings of the International Forum on Tilapia Farming in the 21st Century (Tilapia Forum 2002)*, Philippines Fisheries Association, Inc, Los Benos, Laguna, Philippines. 1-19.
- Siddiqui, A.Q., Al Hafedh, Y.S. and Ali, S.A. (1998). Effect of dietary protein level on the reproductive performance of Nile tilapia, *Oreochromis niloticus* (L.). *Aquaculture Research* 29: 349-358.
- Stickney RR. (2000). Status of research on tilapia. In B.A. Costa-Pierce and J.E. Rakocy, editors. *Tilapia Aquaculture in the Americas*, The World Aquaculture Society, Baton Rouge, Louisiana. vol. 2. 23-26.
- Watanabe W.O., R. I. Wicklund, B. I. Olla, D. H. Ernst and L. J. Ellingson (1989). Potential for saltwater Tilapia culture in the Caribbean. *Proc. Gulf Carib. Fish. Inst.* 39: 435-445.