

Comparative studies on growth of fry of GIFT and existing strain of Nile tilapia (*Oreochromis niloticus* L.)

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Abstract

Comparative study on growth of fry in nursery system of Genetically Improved Farmed Tilapia (GIFT) and Existing strain of Nile tilapia (*Oreochromis niloticus*) was performed. The trials were conducted in a series of hapa for two months. The initial mean weight of GIFT and Existing strains of tilapia were 1.03 and 1.12g, respectively and the stocking density for both the strains was maintained at 150/m³. Fishes were fed with supplementary feed 31.29% of protein level. After two months the final cumulative mean weight of GIFT and Existing strain were observed to be 8.38 and 5.51 g, respectively. The net gain for weight of GIFT and Existing strain were estimated to be 666% and 368% and the mean survival were 95.75% and 81.25%, respectively. The GIFT strain showed significantly ($P<0.05$) higher net gain in growth in weight and also higher ($P<0.01$) survival than that of Existing strain.

Key words : *O. niloticus*, GIFT, Hapa-net

Introduction

Tilapia culture is increasing significantly in Asia particularly in China, Indonesia, Philippines, Srilanka, Thailand and Vietnam and elsewhere in the Indian subcontinent and Pacific region countries. Tilapia has been dubbed the "Aquatic Chicken" (Maclean 1984) of which the most widely farmed stock is the Nile tilapia (*Oreochromis niloticus*). Nile tilapia are widely recognized as one of the most important tilapia species for farming in a wide range of aquaculture systems from single small scale waste fed fish ponds to intensive culture systems (Pullin 1985).

The introduction of tilapia in Bangladesh from Thailand was first initiated in 1954 with *O. mossambicus* (Ahmed 1956) and later with *O. niloticus* (Rahman 1985) with a hope that it would make a significant contribution in fish production but the attempt was not successful because of very little efforts were made to understand the culture management by the farmers. Fisheries Research Institute

again brought a fresh batch of *O. niloticus* from Thailand in 1987 and developed low input and low-cost culture technologies.

Recently the International Centre for Living Aquatic Resources Management (ICLARM) has developed after four years of research, the 'Genetically Improved Farmed Tilapia' known as GIFT strain through several generations of selections involving eight different pure breed Nile tilapia, *O. niloticus*, strain. In on-farm trials, the GIFT fish grew, on an average of 60% better in growth and 50% in survival than a normal farmed breeds. The GIFT strain has been introduced in Bangladesh from Phillipines in July 1994 through International Network on Genetics in Aquaculture (INGA) under ICLARM.

Fisheries Research Institute has, therefore, initiated GIFT strain evaluation research in connection with the implementation of DEGITA Bangladesh project with the objective to compare the performances in growth and survival between GIFT and Existing strain, *O. niloticus* in nursery conditions.

Materials and methods

The study was conducted at the Fisheries Research Institute under its Freshwater Station for a period of two months (January to March'95). Eight nylon net hapas (mesh size of 2.5 mm), 3.0 m³ each (2.0 x 1.5 x 1.0 m³) were set in a small well prepared 1000 m² pond with bamboo poles in two columns. Four hapas under treatment-I were stocked with fry of GIFT (1.02 ± 0.12 g) and the rest four hapas under treatment-II with existing Nile tilapia (1.11 ± 0.03 g) at a stocking density of 150 fry/m³.

A prepared supplemental feed consisted of ingredients of rice bran (25%), wheat flour (30%), mustard oil cake (15%) and fish meal (30%) with crude protein level of 31.19% were supplied to the fishes twice a day at 8% (according to Guerrero 1987) of the total body weight.

Thirty fry from each hapa were sampled at fortnightly intervals to assess the growth and feeding ration was adjusted on the basis of estimated weight of fish biomass. Water samples were taken at weekly intervals between 6:00 and 7:00 a.m. from inside the hapas during the trial and analysed for assessing some environmental parameters viz. water temperature, pH and dissolved oxygen (DO).

Statistical analysis with student's t-test was incorporated on the data to see whether the two strains show any differences or not i.e., to identify the level of significance in differences, if any, in growth patterns and survival during experimental period.

Results

The data of growth in length and weight, fortnightly gain, net gain and daily gain as mean values of GIFT and Existing strain of Nile tilapia (*O. niloticus*) are

Comparison of growth of GIFT and existing tilapia

given in Table 1. The initial mean length and weight of GIFT and Existing strains were 3.75 and 3.79 cm and 1.03 and 1.12 g, respectively. After 60 days, the final cumulative mean growth in length and weight were recorded at 7.59 ± 0.77 and 6.44 ± 0.21 cm and 8.39 ± 1.87 and 5.51 ± 0.29 g. The net gain for length and weight were estimated to be 102 & 70% and 666 & 368%, respectively. The mean survival rate of GIFT and Existing strains of tilapia were 95 and 81%, respectively.

Table 1. Average cumulative growth of GIFT and existing strain of tilapia (*Oreochromis niloticus*) in terms of increase in length (cm) and weight (g) and fortnightly gain in percentage (in parenthesis) over a period of 60 days

Growth parameter	Treatment	1st sampling	2nd sampling	3rd sampling	4th sampling	5th sampling	Net gain	Daily gain
Length (cm)	1	3.75	4.94	5.36	7.08	7.59	3.83	0.06
		± 0.14	± 0.20	± 0.26	± 0.60	± 0.77		± 0.01
		(31.84)	(8.63)	(32.21)	(7.27)	(102.41)		
	11	3.79	4.37	4.78	5.79	6.44	2.64	0.04
		± 0.10	± 0.26	± 0.26	± 0.22	± 0.21		± 0.00
			(15.70)	(9.44)	(21.40)	(11.37)		
Weight (g)	1	1.02	2.59	3.52	6.72	8.38	7.35	0.07
		± 0.12	± 0.31	± 0.63	± 1.60	± 1.86		± 0.03
		(155.25)	(36.87)	(89.43)	(89.08)	(666.17)		
	11	1.11	1.80	2.70	4.18	5.50	4.39	0.07
		± 0.01	± 0.31	± 0.63	± 0.18	± 0.28		± 0.00
		(61.46)	(56.39)	(56.05)	(31.58)	(368.46)		

On the sequential fortnightly estimated mean values of length and weight of both the strains, the student t-statistic indicates insignificant differences ($P > 0.05$) between the two strains in only the initial sampling whereas significant differences ($P < 0.05$ and $P < 0.01$) were found in all other sampling, with an exception for weight ($P > 0.05$) in the 3rd sampling. GIFT strain showed significantly higher ($P < 0.05$) net gain and daily gain in growth (length and weight) and also higher ($P < 0.01$) survival than that of Existing strain [Table 2(a) & 2(b)].

Table 2(a). t-test for data of nursery trials (length and weight)

Trial No.	Calculated				t-statistics		Degree of freedom
	GIFT		Existing		Length	Weight	
	Length	Weight	Length	Weight			
1st Sampling	3.75 ±0.14	1.02 ±0.12	3.79 ±0.13	1.11 ±0.01	0.455 ^{NS}	1.45 ^{NS}	6
2nd Sampling	4.94 ±0.20	2.59 ±0.31	4.38 ±0.26	1.8 ±0.38	3.324*	3.20*	6
3rd Sampling	5.36 ±0.26	3.52 ±0.63	4.78 ±0.26	2.70 ±0.24	3.120*	2.40 ^{NS}	6
4th Sampling	7.08 ±0.60	6.72 ±1.60	5.79 ±0.22	4.18 ±0.18	4.031**	3.12*	6
5th Sampling	7.59 ±0.76	8.38 ±1.86	6.42 ±0.21	5.50 ±0.28	3.242*	3.04*	6

Note : NS - Not-significant at 0.95 confidence limit i.e., $P > 0.05$

* - Significant at 0.95 confidence limit i.e., $P < 0.05$

** - Significant at 0.99 confidence limit i.e., $P < 0.01$

$t_{0.05}$ - 2.447 with d.f. 6

$t_{0.01}$ - 3.707 with d.f. 6

Table 2(b). t-tests for nursery trials (net gain, daily gain and survival rate)

Trial No.	Calculated means		t-statistic	Degrees of freedom
	GIFT	Existing		
Net gain in length	3.83 ±0.76	2.64 ±0.30	2.90*	6
Net gain in weight	7.35 ±1.80	4.39 ±0.28	3.24*	6
Daily gain in weight	0.12 ±0.03	0.07 ±0.00	3.24*	6
Daily gain in length	0.06 ±0.01	0.04 ±0.00	2.90*	6
Survival rate	95.75 ±2.62	81.25 ±2.75	7.61**	6

Note : * - Significant at 0.95 confidence limit i.e., $P < 0.05$

** - Significant at 0.99 confidence limit i.e., $P < 0.01$

$t_{0.05}$ - 2.447 with d.f. 6

$t_{0.01}$ - 3.707 with d.f. 6

The physico-chemical parameters of water revealed that the values of water temperature, pH and dissolved oxygen ranged from 18.67 ± 1.21 to $25.16 \pm 2.29^{\circ}\text{C}$, 7.87 ± 0.48 to 8.01 ± 0.25 and 4.05 ± 1.36 to 5.97 ± 1.18 mg/l, respectively during the study period (Table - 3).

Table 3. Physico-chemical characteristics of pond water during the study period

Parameter	January	February	March
Water temperature ($^{\circ}\text{C}$)	18.67 ± 1.21	21.87 ± 2.47	25.16 ± 2.29
Dissolved oxygen (mg/l)	4.05 ± 1.36	5.84 ± 0.94	5.97 ± 1.18
pH	7.90 ± 0.32	7.87 ± 0.48	8.01 ± 0.25

Discussion

The present study investigates on nursery trial of GIFT strain in comparison to Existing strain of *O. niloticus* in hapas, placed in pond with a view to observe their comparative performances . Apparently literature is rarely available on nursery trial of *O. niloticus* in cages or hapas in pond. Most of the literatures are confined on grow out trial of tilapia in cages and earthen pond. Cruz and Ridha (1989) are probably the only group of workers who provide information on nursery trial of tilapia in floating cages.

To evaluate the two strains of *O. niloticus*, same ecological conditions i.e., same environment was maintained where the fry of GIFT and Existing strains representing similar size were stocked at a density of 150 fish/m^3 and fed a formulated feed containing protein level of 31.29% for 60 days. Thus the GIFT strain was proved to be a significantly fast growing fish ($P < 0.05$).

Cruz and Ridha (1989) observed the performances of *O. spilurus* in nursing phase for 68 days in seawater cages. They found no significant differences in mean individual final weight, daily growth rate and survival rate among three stocking densities, but considerable higher yields were obtained when stocked with 400 and 600 fish/m^3 compared with that of 200 fish/m^3 . The fry were fed with a diet containing 55% crude protein throughout the experimental period after which they observed the weight of 28.65 -38.61 g. However, much lower final weight attained by both the strains in the present experiment in comparison to that of Cruz and Ridha (1989) could be the effect of sea water.

Whatever might be the stocking densities in nursery system for tilapia in pond cages in different experiments conducted by some authors, the supplemental feeding ration contained 70% rice bran and 30% fish meal at 5 -

20% of body weight (Eknath 1993), 20% ipil-ipil, 40% copra meal and 10% fish meal at 10 - 20% of body weight (Guerrero 1987). On the other hand, the feeding ration in the present experiment was quite low (8 - 10% of body weight) as to why the final body weight attainment of fish was comparatively lower to the others. It is evident from the present experiment that the GIFT strain showed higher ($P < 0.01$) survival than existing strain of Nile tilapia. Eknath et al. (1993) observed that the introduced African wild strains of tilapia performed better than the most widely farmed Asian strains. The experimental GIFT strain is also a derivative of these better performed strains of tilapia. However, this phenomenon of the better performance of GIFT strain might be the cause of stock improvement through several generation of genetic selection.

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