

Preliminary Study on Growth, Feed Conversion and Production in Non-Improved and Improved Strains of the Nile tilapia *Oreochromis niloticus*



Mohammad T. Ridha

Aquaculture, Fisheries & Marine Environment Department
Kuwait Institute for Scientific Research.

mridha@mfd.kisr.edu.kw

INTRODUCTION

1. In Kuwait, the research on tilapia was initiated in the late 1970s by the Aquaculture, Fisheries and Marine Environment Department (AFMED), Kuwait Institute for Scientific Research (KISR) to accelerate the development of aquaculture sector in Kuwait.



Marina



Tilapia Hatchery

2. However, tilapia farming in Kuwait is still in its early stages.
3. At present it is estimated that about **65** Agricultural farms grow *O. niloticus* and *O. spilurus* in low-salinity underground water (**2-10 ppt**) available in limited amounts in Abdali and Wafra.



4. The total annual production is estimated to be **110 tons**.
5. However, tilapia growers are facing some constraint hindering the expansion of the tilapia farming industry in Kuwait :
 - Inadequate supply of quality seeds
 - Slow growth rate due to natural slow growth of the females
 - Poor feed conversion
 - High production cost that is reflected in a high selling price **(US\$4.5-6.0/kg)**
6. To solve some of these problems, the Genetically Improved Farmed Tilapia (GIFT) which exhibited faster growth rate than the local strains was introduced into Kuwait to test its performance under the country's conditions.

OBJECTIVES

To evaluate and compare:

- Growth rate
- FCR
- Survival rate
- Production rate

In: 1) Non-improved strain

2) Improved strains of the Nile tilapia

From:

1) Swim-up fry (0.01g) - 1.0 g, (Exp.1)

2) 1.0 g - 20.0 g.. (Exp.2)

MATERIALS & METHODS

Strains

1) **Non-improved Nile tilapia (NS): Control**

Egyptian *Ismaelia* imported from Aquasafra, USA.



2) **Improved strains:**

A) GIFT strain: Progenies of the 6th generation of the GIFT Project imported from BFAR-NFFTRC, Philippines (Eknath & Acosta 1998).

B) Selected line (SL): 13th generation (FaST) produced from within family selection of *O. niloticus* (Bolivar & Newkirk, 2000), imported from BFAR- NFFTRC, Philippines



Experimental Design

Exp.	Tank	Water System	Fish size	Density	Feeding	Days
Exp.1	120 L	Flow-through	Fry of 0.01 g	1650/m ³ 200/tank	4-5 times daily , Powdered Biomar, 50% CP@ 20-10%	42
Exp.2	420 L	Recirculating	>1.0 g	300/m ³ 90/tank	4-5 times daily, 0.3 & 1.5 mm Biomar , 50% CP @ 7.5-5%	56

Replication: 3 tanks / Strain / Experiment.

Temperature: Maintained at 29 ± 2.0 °C & regular monitoring of water quality.

Parameters: Mean weight, Daily growth rate, Feed conversion
Survival rate, Production rate.

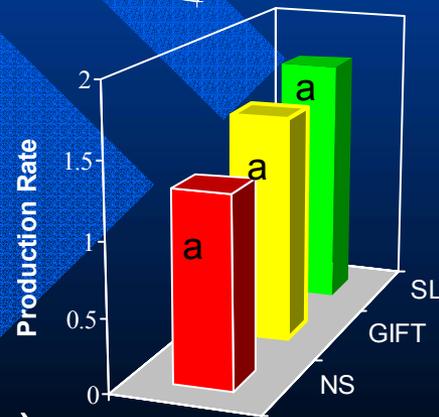
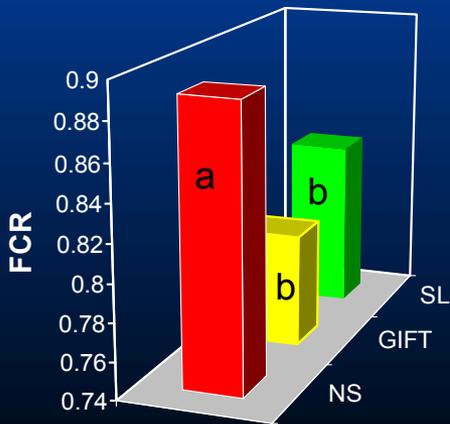
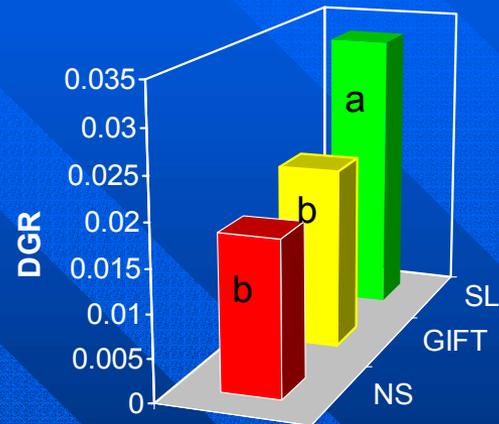
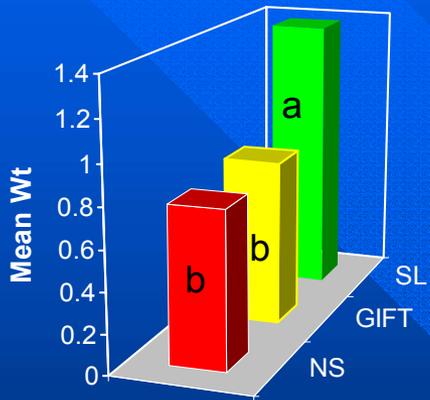
Statistical analysis: One-way ANOVA & Duncan's Test

RESULTS

Experiment 1 (0.01 – 1.0 g)

Parameter	Non-improved	GIFT	Selected Line	Improv.% by GIFT	Improv.% by SL
Mean Wt.	0.78 ± 0.04 ^b	0.82 ± 0.05 ^b	1.38 ± 0.06 ^a	6.5	77.9
Daily Growth	0.018 ± 0.001 ^b	0.021 ± 0.002 ^b	0.033 ± 0.001 ^a	15.0	72.9
FCR	0.89 ± 0.002 ^a	0.80 ± 0.001 ^b	0.83 ± 0.002 ^b	11.3	8.4
Survival	98.8 ± 0.67 ^a	98.2 ± 0.93 ^a	75.2 ± 4.04 ^b		
Production	1.28 ± 0.059 ^a	1.54 ± 0.18 ^a	1.71 ± 0.02 ^a	20.3	33.6

- 1) The Selected line group had significantly higher MWT, DGR & lower FCR than the Non-improved group.
- 2) The low survival in the Selected line group was due to stocking.
- 3) The Selected line & GIFT had higher PR of 1.0 g fish than the Non-improved group.
- 4) Improvements over the Non-improved fish caused by the Selected group were higher than caused by the GIFT fish.

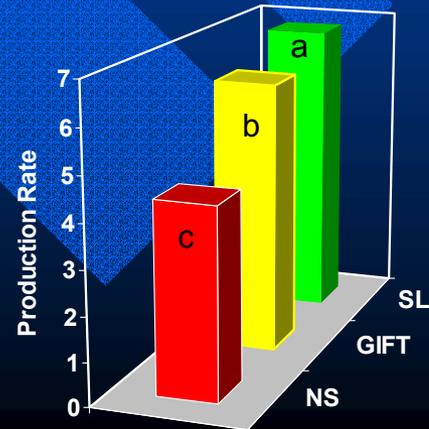
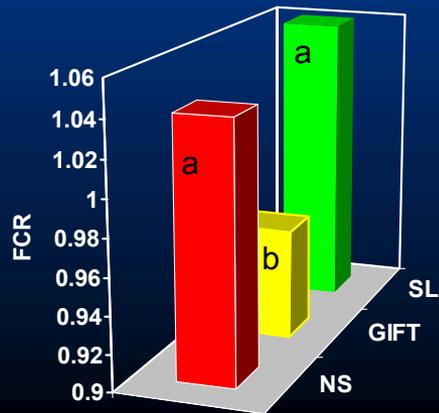
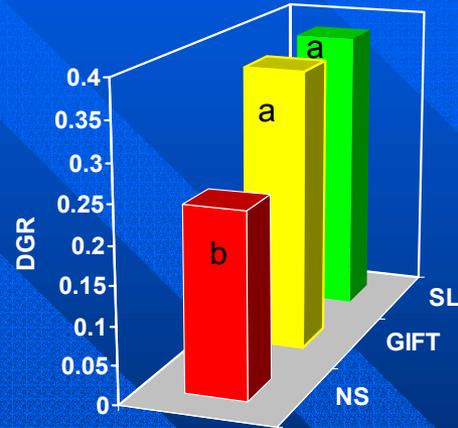
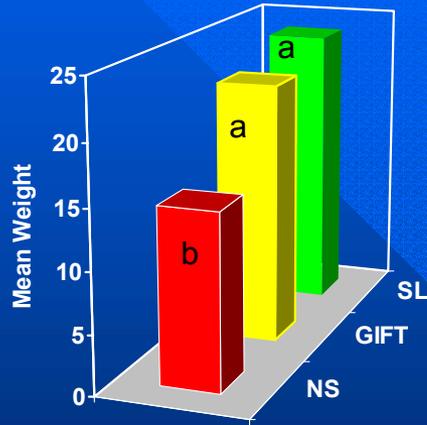
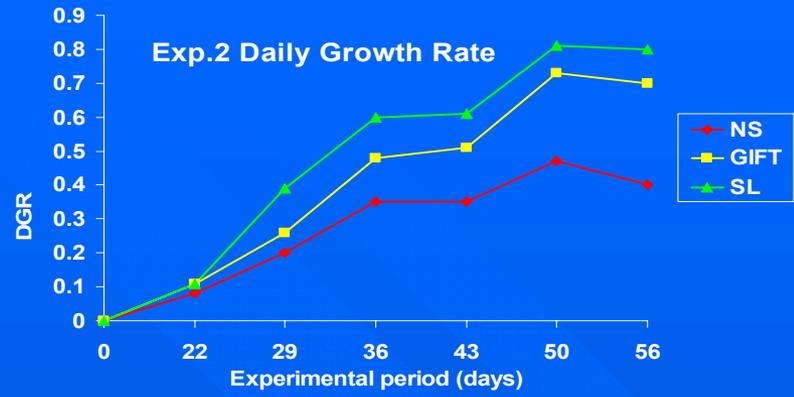


Exp.1 (0.01-1.0 g)

Experiment 2 (1.0 - 20.0 g)

Parameter	Non-improved	GIFT	Selected Line	Improv.% by GIFT	Improv.% by SL
Mean Wt.	14.6 ± 0.61 ^b	21.7 ± 0.91 ^a	23.7 ± 0.72 ^a	48.7	58.7
Daily Growth	0.24 ± 0.01 ^b	0.37 ± 0.017 ^a	0.38 ± 0.012 ^a	52.2	57.8
FCR	1.04 ± 0.003 ^a	0.96 ± 0.02 ^b	1.06 ± 0.009 ^a	7.3	0
Survival	99.6 ± 1.59 ^a	98.3 ± 1.20 ^a	95.2 ± 1.0 ^a		
Production	4.35 ± 0.13 ^c	6.18 ± 0.22 ^b	6.80 ± 0.18 ^a	40.9	54.5

- 1) The GIFT & Selected line fish had higher MWT, DGR than the Non-improved fish.
- 2) GIFT had the lowest FCR. Survival rate was high in all groups.
- 3) The Selected line & GIFT had higher production rate of 20 g fish than the Non-improved fish .
- 4) The Selected line had higher improvements than the GIFT fish.



Exp.2 (1.0-20 g)

DISCUSSION

Growth Performance

- The higher MWT and faster DGR in the Selected line fish suggests superior growth performance that was evident from the early stages of life.
- The faster DGR will shorten the length of the production cycle allowing for more production cycles per season.
- The better growth performance obtained by the improved strains is in agreement with those reported in the literature, e.g: Beniga & Circa (1997), Hussain *et al.* (2000), Mather & Nandlal (2000) and Bolivar & Newkirk (2000).
- The improvement rates obtained in this study in the Selected line & GIFT strain were higher than the 41 & 15.8%, respectively reported by Beniga & Circa (1997) in cages.

Feed Conversion Ratio

- The improved FCR in the Selected line & GIFT strains indicates more efficient utilization of food than the non-improved strain.
- The improvement in FCR in the Selected line & GIFT strains was comparable to the rate of **11.9%** reported by Mather & Nandlal (2000).
- The impact of FCR on the production cost would be more significant during the grow-out stages due to the much greater amount of consumed feed.

Survival Rate

- Survival rate in the three strains were generally better than the rates obtained by Dey *et al.* (2000) in ponds for 1.0 g GIFT (**69%**) and non-GIFT (**53%**) tilapia.
- Survival rate was higher than the **85.3** & **86.6%** reported by Beniga and Circa (1997) for **3.3 g** selected line and non-improved strains, respectively in freshwater cages.

Production Rate

- The production criteria in this study for FCR of less than 1.0 kg feed/wet weight gain and the survival rate greater than 95% was met by the Selected line and the GIFT strains.
- The improvement in production of 1.0 & 20 g encountered in the Selected line and GIFT groups was caused by the better growth rate and FCR.
- The improvements in production realized in the Selected line and GIFT strains were higher than those reported by Dey *et al.* (2000) in ponds and by Beniga & Circa (1997) in cages

CONCLUSION

- The selected and GIFT strains of the Nile tilapia had better growth rate, FCR and production rates than the non-improved strain.
- The selected line or the GIFT strain could be considered as potential strains to improve tilapia production, reducing the production cost and increasing the profitability of tilapia farms in Kuwait.
- Before replacing the existing stocks of the Nile tilapia, further studies are required to determine the growth of both strains to the market size, and to evaluate their reproductive potential.