CULTURE OF MIXED-SEX NILE TILAPIA WITH PREDATORY SNAKEHEAD

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INTRODUCTION

- Nile tilapia is one of the potential aquaculture species both in intensive and semi-intensive systems.
- Feeding on lower trophic levels provides its greatest potential for efficiency in semi-intensive system.
- Easy breeding and free seed availability is an opportunity to small scale resource poor farmers.
- However, overpopulation and stunted growth in stocked pond has been considered a greatest problem.

INTRODUCTION (Cont'd)

- Mono-sex culture of Nile tilapia has been popular for population control.
- Efficient hatchery are needed to produce mono-sex fry which are not available in many developing countries and out of reach to resource poor farmers.
- Various predatory fish species have been used for the control of recruitments as a biological method with varying success.
- Snakehead is a valuable food fish and also cultured to some extent and, is highly predaceous and reported to prey effectively on live tilapia fry.

OBJECTIVES

- To assess the efficiency of snakehead in controlling overpopulation of of mixed-sex Nile tilapia in ponds.
- To assess the growth and production of Nile tilapia in monoculture and polyculture with snakehead.

MATERIALS AND METHODS

- **Treatments: 6; Replication: 3; Design: RCBD**

  (A) Monoculture of sex-reversed all male tilapia

  (B) Monoculture of mixed-sex tilapia

  (C) Polyculture of snakehead and mixed-sex tilapia at 1:80 ratio

  (D) Polyculture of snakehead and mixed-sex tilapia at 1:40 ratio

  (E) Polyculture of snakehead and mixed-sex tilapia at 1:20 ratio

  (F) Polyculture of snakehead and mixed-sex tilapia at 1:10 ratio

- **Culture species:**

  Sex-reversed Nile tilapia (*Oreochromis niloticus*) 10.5-11.6 g

  Mixed-sex Nile tilapia (*Oreochromis niloticus*) 7.2-8.1 g

  Snakehead (*Channa striata*) 88.0-100.0 g

MATERIALS AND METHODS (Cont'd)

- Stocking density

- Nile tilapia 2 fish m^{-2} in all treatments (A to F)
- Snakehead 0.025, 0.05, 0.1 and 0.2 fish m^{-2} in treatments C, D, E and F, respectively.

- Experimental conditions:

Earthen ponds of 200 m^2 each

Fertilized pond system

Duration: March to October 2000 (194 days)

Experimental site: Asian Institute of Technology, Thailand)

RESULTS

Growth performance of Nile tilapia in fertilized earthen ponds in sex-reversed (A) and mixed sex (B) monoculture treatments and, snakehead and mixed-sex tilapia polyculture treatments C to F.

Treatment	Initial (g)	Final (g)	Weight gain (g/d)	Survival (%)
A. Sex-reversed	9.0	157.7	0.77	83
B. Mixed-sex	7.4	149.8	0.73	83
C. 1:80	7.7	158.0	0.77	81
D. 1:40	7.5	152.9	0.75	78
E. 1:20	7.6	158.2	0.78	81
F. 1:10	7.7	155.3	0.76	82

RESULTS (Cont'd)

Mean recruit number and yield and total NFY and GFY of Nile tilapia in treatment A to F.

Treatment	Recruit (no)	Recruit yield (t/ha/yr)	Adult NFY (t/ha/yr)	Total NFY (t/ha/ yr)	Total GFY (t/ha/yr)
A. Sex-reversed	--	--	4.54	4.54[a]	4.88[a]
B. Mixed-sex	951	0.88	4.33	5.21[b]	5.49[b]
C. 1:80	--	--	4.50	4.50[a]	4.79[a]
D. 1:40	--	--	4.19	4.19[a]	4.48[a]
E. 1:20	--	--	4.51	4.51[a]	4.79[a]
F. 1:10	--	--	4.47	4.47[a]	4.76[a]

RESULTS (Cont'd)

Growth performance of snakehead in polyculture with Nile tilapia (Mean).

Parameter	Treatment C (1:80)	Treatment D (1:40)	Treatment E (1:20)	Treatment F (1:10)
Stocked wt. (g)	94.5	93.7	95.8	95.7
Harvest wt. (g)	441.3^{a}	292.0^{b}	179.3^{c}	123.3^{d}
Survival (%)	91	84	95	88
Daily growth (g/d)	1.79^{a}	1.02^{b}	0.43^{c}	0.14^{d}
Net yield (t/ha/yr)	0.14^{a}	0.14^{a}	0.13^{a}	0.05^{b}
Gross yield (t/ha/yr)	0.18^{a}	0.23^{b}	0.31^{c}	0.41^{d}

RESULTS (Cont'd)

Combined yield of Nile tilapia and snakehead in fertilized pond.

Treatment	Adult tilapia + snakehead		Adult and recruit tilapia + Snakehead	
	Net yield (t/ha/yr)	Gross yield (t/ha/yr)	Net yield (t/ha/yr)	Gross yield (t/ha/yr)
A. Sex-reversed	4.54	4.88	4.54	4.88
B. Mixed-sex	4.33	4.61	5.21*	5.49
C. 1:80	4.63	4.97	4.63	4.97
D. 1:40	4.39	4.71	4.39	4.71
E. 1:20	4.64	5.11	4.64	5.11
F. 1:10	4.52	5.16	4.52	5.16

RESULTS (Cont'd)

Partial budget analysis (US $) based on 200-$m^2$ pond in 194-day experiment.

Parameter	Treatment					
	A mono	B mixed	C 1:80	D 1:40	E 1:20	F 1:10
Gross revenue						
Adult tilapia	19.46	18.36	19.08	17.87	19.10	18.98
Recruits	--	1.16	--	--	--	--
Snakehead	--	--	1.91	1.82	1.67	1.08
Total	**19.46**	**19.55**	**20.99**	**19.69**	**20.77**	**20.05**
Variable cost						
Tilapia fingerling	5.00	1.67	1.67	1.67	1.67	1.67
Snakehead fingerling	--	--	0.07	0.14	0.29	0.58
Urea	6.75	6.75	6.75	6.75	6.75	6.75
TSP	6.56	6.56	6.56	6.56	6.56	6.56
Working capital cost	0.78	0.64	0.64	0.64	0.65	0.66
Total cost	**19.09**	**15.62**	**15.69**	**15.76**	**15.92**	**16.22**
Net Return	**0.37**	**3.93**	**5.30**	**3.92**	**4.85**	**3.83**

CONCLUSIONS

- Snakehead were able to completely control tilapia recruitment at very low snakehead : tilapia ratio of 1:80 indicating high efficiency in recruitment control.
- Snakehead growth decreased with increasing ratio and carrying capacity of snakehead was exceeded at the ratio of 1:10, and poor growth occurred due to limited food items available.
- Growth of sex-reversed all male tilapia was only 5% faster than mixed-sex tilapia with no significant difference.

CONCLUSIONS (Cont'd)

- Final size and yield of harvested adult tilapia were no significant differences among treatments.
- Partial budget analysis showed that it is better to use mixed-sex tilapia with low ratio snakehead instead of using sex-reversed tilapia in semi-intensive system.


Thank you