1981

Fry to fingerling production of Tilapia nilotica in aquaria using phytoplankton as natural feed

Pantastico, J.

Aquaculture Department, Southeast Asian Fisheries Development Center

Pantastico, J., Espegadera, C., & Reyes, D. (1981). Fry to fingerling production of Tilapia nilotica in aquaria using phytoplankton as natural feed. SEAFDEC Aquaculture Department Quarterly Research Report, 5(1), 15–21.

http://hdl.handle.net/10862/2385

Fry to fingerling production of *Tilapia nilotica* in aquaria using phytoplankton as natural feed

J. Pantastico, C. Espegadera and D. Reyes

Two experiments were conducted to test the efficiency of phytoplankton as natural feed in fry to fingerling production of *Tilapia nilotica.*

In the second experiment, *T. nilotica* were grown in "green" water with phytoplankton concentrations adjusted to the following densities: a) high, 150-175 x 10^3 cells/ml; b) moderate, 90-120 x 10^3 cells/ml; and c) low, 50-60 x 10^3 cells/ml.

Algal feeding of tilapia fry enhanced growth considerably (Fig. 1 and Table 1). This was apparent as early as the first week, becoming more pronounced at later stages of development up to the eighth week. Increase in weight of fry given a sustained supply of phytoplankton occurred at a very fast rate compared to that of the control grown in tap water and fed with rice bran. The sluggish growth of tilapia fry in the control lot was evident for the first five weeks when the growth curve appeared almost flat. Weight increased during the last three weeks although growth was still very poor compared to that of the treated lot fed with phytoplankton. In the eighth week, increase in mean weight of treated lots over the control was 93%.

Phytoplankton density during the experimental period ranged from 38 thousand to 3.2 million cells/ml. The predominant species in the rearing medium consisted of *Chlorella* sp., *Nannochloris* sp. and *Scenedesmus* sp.

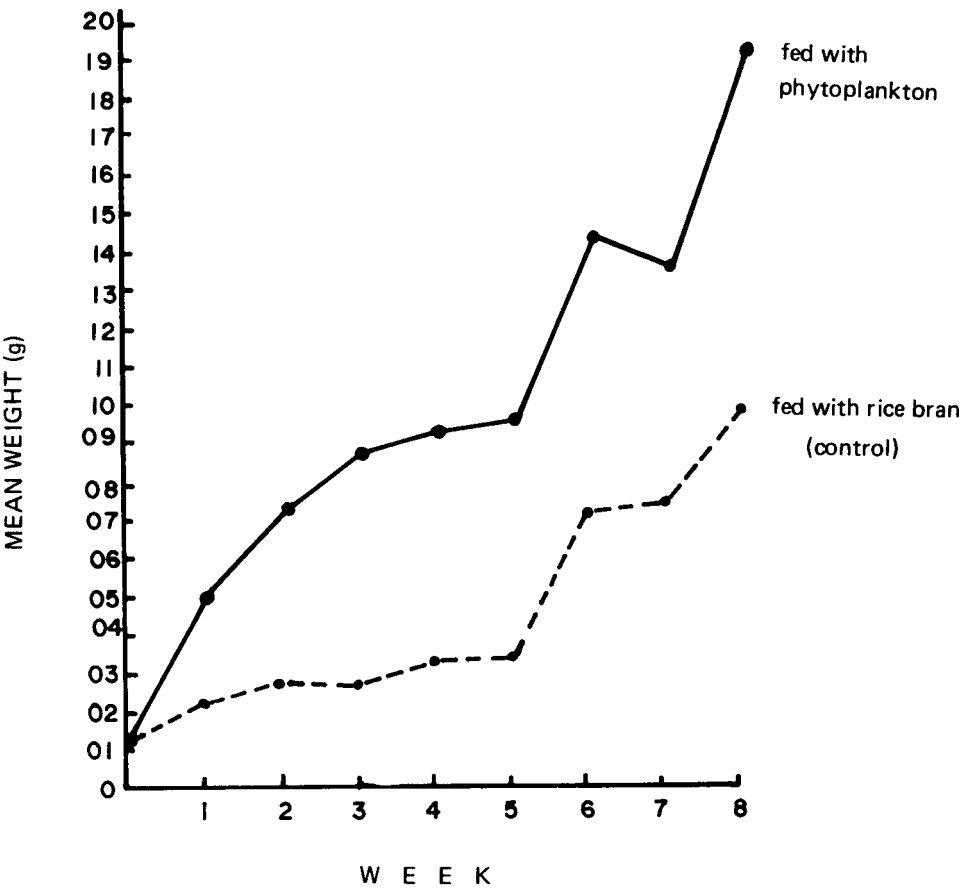

Fig. 1. Growth of tilapia fry with and without phytoplankton.

Survival rates for the treated and control lots were comparable during the first seven weeks as computed based upon the number of dead fish found (Table 1). However, at the end of the experimental period (8th week) the actual number of survivors were counted. The beneficial effect of feeding with phytoplankton was evident as shown by the higher survival rate of 65% as compared to only 43% obtained in the control.

Table 1. Mean weights (g) and survival rates (%) of *T. nilotica* fry.

Treatments	Week 0	1	2	3	4	5	6	7	8
Without Phytoplankton	0.013 g	0.022	0.028	0.028	0.036	0.037	0.071	0.078	0.100
	100%	96	93	91	90	89	89	89	43
With Phytoplankton	0.012 g	0.051	0.072	0.089	0.093	0.097	0.145	0.138	0.193
	100%	97	94	91	90	90	90	90	65

Table 2. Means of weight measurements and survival rates of *T. nilotica* fry

Treatments	Weight (g) 0	2nd wk	4th wk	6th wk	Survival rate %	Growth rate (g/day)
Phytoplankton Density						
High	0.008	0.164[a]	0.481[a]	0.546[a]	93[a]	0.0133
Moderate	0.008	0.098[b]	0.330[b]	0.363[b]	93[a]	0.0089
Low	0.008	0.033[c]	0.099[c]	0.192[c]	62[b]	0.0047
Rice bran	0.009	0.024[c]	0.045[c]	0.186[c]	36[c]	0.0045

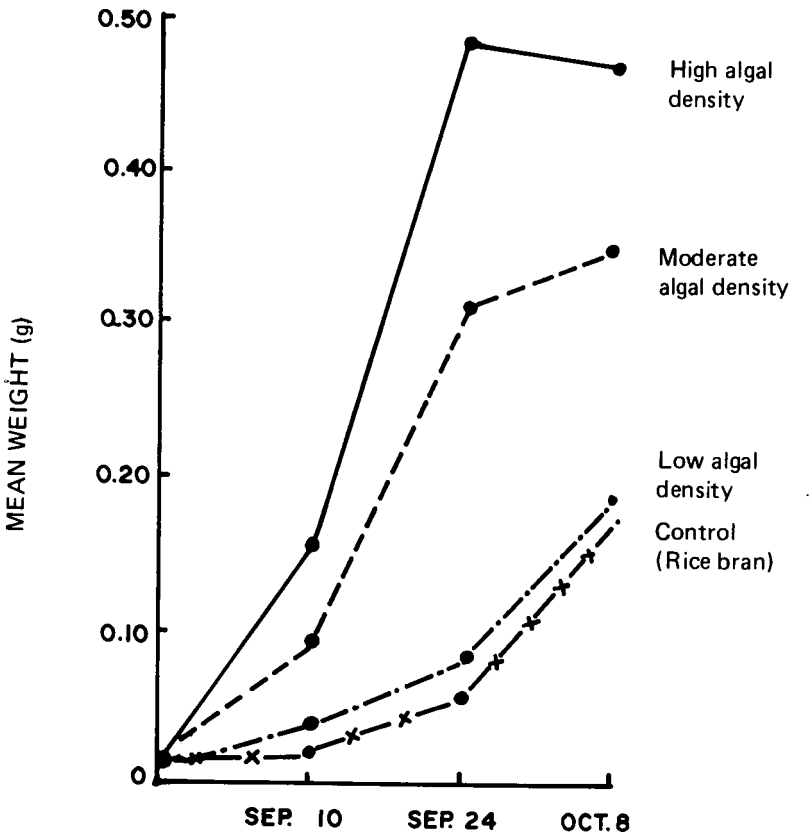

Fig. 2. Growth of *T. nilotica* fry given varying levels of phytoplankton as natural feed.

Increasing the phytoplankton density in the rearing medium resulted in a proportionate increase in growth of tilapia fry (Fig. 2). This was evident at the highest phytoplankton concentration tested where the computed growth rate of tilapia fry was 13.3 mg/day (Table 2). Fish grown in "green" water with moderate phytoplankton density gave a growth rate of 8.9 mg/day or about 65% of the increase obtained at the highest level of phytoplankton feeding. On the other hand, growth of fry fed with limited amounts of phytoplankton (50-60 x 10^3 cells/ml) was poor and comparable to that of the control fed with rice bran.

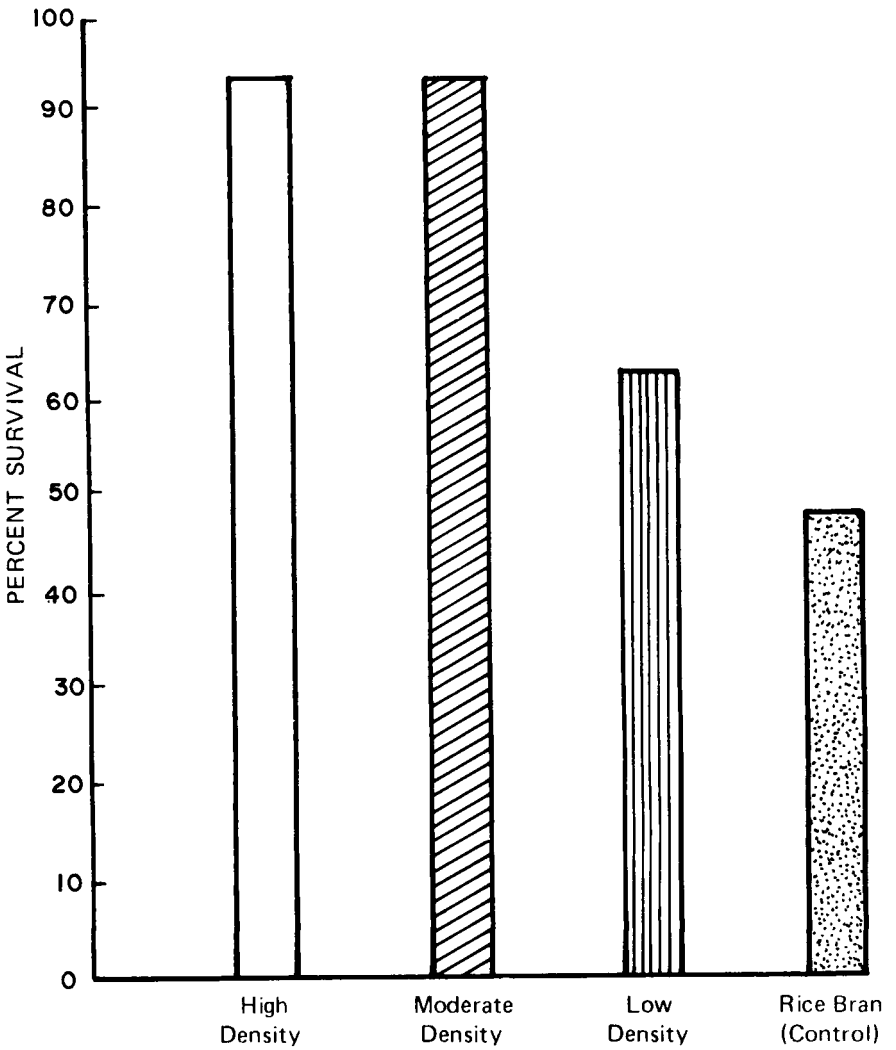

Fig. 3. Survival of *T. nilotica* fry given varying levels of phytoplankton as natural feed.

Survival of *T. nilotica* fry was greatly enhanced with adequate supply of phytoplankton (Fig. 3, Table 2). At high and moderate algal cell concentrations, the survival was 93%. A low phytoplankton density reduced the survival rate to 62%. The control lot gave a low survival of 36%.

The above results support the findings of Moriarty (1973) that tilapia produce acidic secretions that enable them to lyse blue-green algal cells, although green algae belonging to the order Chlorococcales were used in the experiments. More recent observations showed that tilapia digested plant proteins better than channel catfish (Lovell, 1980).

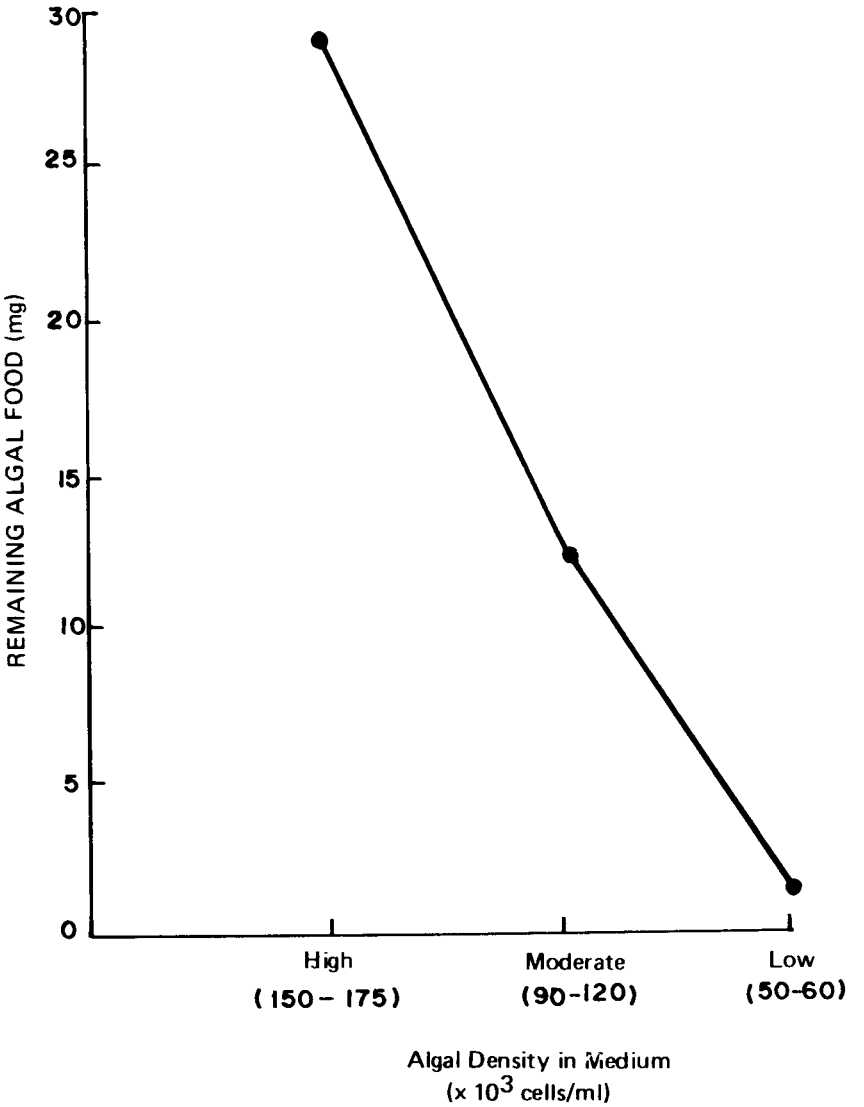

Fig. 4. Remaining algal food after 24 hours in the gut of *T. nilotica* fingerlings growing in "green" water with varying phytoplankton densities.

The algal food remaining in the gut of tilapia determined after 24 hours (Fig. 4, Table 3) gives an estimate of the relative intake of algal food at varying levels of feeding. When the phytoplankton density was low, the remaining algal food was about 8.4 and 13.8% of the values for high and moderate phytoplankton densities, respectively, computed on a fresh weight basis.

Based on the overall results obtained from this study, it may be concluded that the availability of high concentrations of phytoplankton in the rearing medium favored growth of *T. nilotica* fry to fingerling. In ponds, the relationship between plankton measurements and

Table 3. Remaining Algal Food in the Gut of *T. nilotica* after 24 hours.

Phytoplankton Density	Mean Weight (mg) of Gut					
	Fresh Weight			Dry Weight		
	Unstarved	Starved	Difference	Unstarved	Starved	Difference
High	66.1	36.2	29.9[a]	6.6	4.7	1.9[a]
Moderate	37.4	19.4	18.0[ab]	4.3	3.2	1.1[ab]
Low	15.8	13.3	2.5[b]	2.2	2.3	0.1[b]

Note: Mean differences with the same superscript are not significantly different using Duncan's New Multiple Range Test.

fish production was linear when the phytoplankton density was from 3,000 to 20,000 cells/ml (Almazan and Boyd, 1978). Beyond this number, additional plankton growth resulted in smaller increases of tilapia biomass. It may be noted that results of the aquarium experiments presented on growing fry to fingerlings showed proportionate increases in mean weight with increasing phytoplankton density reaching up to 175,000 cells/ml.

Literature cited:

Lovell, T. 1980. Aquaculture Magazine 7(1):42.

Moriarty, D.J.W. 1973. J. Zool. Lond. 171(1);25.

Almazan, G. and Boyd, C.E. 1978. Aquaculture 15:75.