Growth Comparison of Three Strains of Nile Tilapia in Fertilized Ponds

Work Plan 7, Thailand Study 9

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Introduction

Three preliminary experiments using sex-reversed Freshwater Aquaculture Center (FAC) *Oreochromis niloticus* and genetically male tilapia (GMT) produced by breeding YY- male with female Egypt-Swansea *O. niloticus* were conducted from 1991 to 1994 (Hopkins et al., 1994). In those experiments, the yields attained with FAC *O. niloticus* were considerably lower than the yields of GMT Egypt-Swansea fish and were lower than yields of Thai *O. niloticus* at the CRSP project at the Asian Institute of Technology in Bangkok. Also, the net yield of FAC *O. niloticus* at fertilizer rates of 14 kg N / ha / wk and 28 kg / ha / wk were not significantly different even though linear relationships between N inputs and yield were observed in Thailand (Szyper et al., 1991). Two major questions were raised by these observations. First, is the growth rate of FAC *O. niloticus* less than the growth rate of Thai *O. niloticus*? Second, do different strains of tilapia have differential abilities to utilize the increased primary productivity induced by the higher fertilizer rates? The objective of this study was to answer those questions.

Materials and Methods

Fingerlings of three strains of *O. niloticus* were grown in twelve 500 m^2 ponds at the Freshwater Aquaculture Center (FAC) located on the campus of Central Luzon State University, Munoz, Nueva Ecija, Philippines. The FAC strain is descended from *O. niloticus* imported to the Philippines in the 1970s and kept at FAC. These fish are believed to be intro-gressed with wild *O. mossambicus*. (Pullin, 1988). The Thai strain was imported from Thailand in the 1980s for breeding by the Bureau of Fisheries and Aquatic Resources and ICLARM (Eknath et al., 1993). The Egypt-Swansea strain originated with fish collected from Lake Manzala in 1979 that were used to create a laboratory stain at the University College of Swansea during the 1980s. Several adults and several hundred fry from this laboratory stock were subsequently transferred to FAC in 1979 as part of a project to develop YY-male tilapia. These fish, like the Thai strain used in this study, are carefully maintained and monitored.

The FAC and Thai fingerlings were sex-reversed with methyl-testosterone before stocking. The Egypt-Swansea fish were not sex-reversed because they had been produced by crossing YY-males with normal females, thereby yielding only genetically-male tilapia (GMT). Fingerlings were stocked at 2 fish per m^2 and at an initial size of 3-4 g each. The culture period was 137 days.

Two inorganic fertilizers, urea and ammonium phosphate, were applied once a week on Wednesdays. The fertilizers were mixed with water and then broadcast into the ponds. The nitrogen fertilizer rate was 4 kg N / ha / d in three treatments (3 ponds per strain = 9 ponds) but was reduced to 2 kg N / ha / d in a fourth treatment with Egypt-Swansea fish (3 ponds). The N:P ratio was 5:1 in all treatments.

Water supply was from a well. Water depths were maintained at approximately 1 m. Makeup water was added weekly to replace seepage and evaporation. Initial alkalinity were approximately 200 mg $CaCO_3$ / liter. The average water temperature was 30°C.

Complete counts of all the fish were made at stocking and harvest. The bulk weight of all fish was taken at harvest. Sample weights were determined monthly throughout the culture period.

Results and Discussion

The extrapolated fish yields (mean + s.e.) in ponds receiving 4 kg N / ha / d were:

FAC strain: 2389 + 251 kg / ha / yr
Egypt-Swansea strain: 5265 + 514 kg / ha / yr
Thai strain: 4991 + 418 kg / ha / yr

There was no significant difference between the Egypt-Swansea and Thai strains while the FAC strain showed a significantly lower yield. When the nitrogen fertilization level was reduced to 2 kg N / ha / d, the yield of Egypt-Swansea strain fish was 4675 + 666 kg / ha / yr. This yield was not significantly different from the yield attained with 4 kg N / ha / d.

This experiment verified earlier observations that the FAC strain had significantly lower growth performance than the Egypt-Swansea strain. Also, the poor performance of the FAC strain versus the Thai strain offers an explanation for why earlier studies at FAC had lower yields than those attained in Thailand with similar fertilizer rates. Another concern with the FAC fish is that average yield with this strain appears to be rapidly decreasing. In early 1992, extrapolated yields averaged 4691 kg / ha / yr. In late 1992, they were approximately 4069 kg / ha / yr. In 1993, the yield was 3941 kg / ha / yr. But in the current study, the yield of FAC strain was only 2389 kg / ha / yr. The obvious conclusion to be made from these results is that the FAC strain needs to be replaced by higher yielding strains.

Of equal importance to the economic sustainability of these systems is the observation that the yields attained with 2 kg N / ha / d were equivalent to those attained with 4 kg N / ha / d. This result with Egypt-Swansea strain had been observed previously with FAC strain. The result appears to be quite different from the results of experiments in Thailand in which 4 to 5 kg N / ha / d provided significantly higher yields (Szyper et al., 1991). The reason for these disparate results needs to be determined.

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