Yellow Croaker (*Pseudosciaena crocea*) Fry Growth on Manufactured Feed and Fresh Fish Rations

Results of ASA/China 2000 Feeding Trial 35-00-121

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ABSTRACT

Yellow croaker growth from the advanced fry to fingerling stages was compared using fresh fish and manufactured feed rations. Fresh fish was fed in a ground, paste form. A manufactured starter feed was fed in No. 2 crumble form. Croaker fry were cultured in 2.25-m^3 cages at a density of 2,500 fish per cage. Yellow croaker fry grew from an average weight of 0.67 g to 3.4 g and 3.2 g, respectively, on the fresh fish paste and manufactured feed in 45 days. Croaker had difficulty ingesting the crumble feed because of the small particle size. Observations suggest an optimal feeding regime of two weeks on crumble feeds, followed by extruded pellets beginning at fish size 0.7 g.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with the Ningbo Municipal Fisheries Bureau, conducted a study in May-June 2000 to compare the growth performance of yellow croaker (*Pseudosciaena crocea*) advanced fry on manufactured and fresh fish diets. The objective of the study was to demonstrate that yellow croaker could be weaned to a manufactured feed at approximately 50-days post swim-up and grown to fingerling size on the manufactured feed within the same time period as is required with a traditional fresh fish diet. In comparison to fresh fish, the manufactured feed would offer the advantages of having a more efficient FCR, consistency in quality and availability, less waste and nutrient loading on the aquatic environment, ease in shipping and storing, and elimination of feed as a potential disease vector. Results of the study and recommendations for a feeding regime with manufactured feeds are presented in this paper.

MATERIALS AND METHODS

Locally produced yellow croaker fry of age 52-days post swim-up were stocked in six, 2.25-m^3 cages at the Xiang Shan Cage Fish Farm in Xiang Shan County, Ningbo on 30 April 2000. Fry were stocked at a density of 2,500 fish per cage. Croaker fry averaged 0.4 g in weight at the time of stocking in the cages.

Croaker fry were fed one of two feed treatments, with each feed treatment replicated in three cages. Feed treatment one was fresh fish fed in a ground, paste form. Feed treatment two was a nutritionally balanced manufactured feed formulated to contain 52% protein and 16% fat (Table

1). This feed was fed in No. 2 crumble (0.6-1.0-mm particle size) form. Feeding was initiated on 30 April 2000. Fry in three of the cages were mistakenly fed a powdered eel feed in doughball form rather than the fresh fish paste for the first 16 days of the trial. As a result, the trial was restarted on 16 May with the correct feed treatments. Croaker fry averaged 0.67 g at the time the trial was restarted.

Fish in all six cages were sampled after 30 days to determine average fish weight. The trial was terminated after 45 days because the fry were judged to have reached the target harvest weight of 3 g. At the conclusion of the trial, all fish were harvested and fish survival, average weight and FCR determined for each of the treatments.

RESULTS

Yellow croaker advanced fry were fed for 45 days, beginning 16 May and ending 30 June 2000. Croaker fed the fresh fish paste ration grew from 0.67 g to 3.42 g (Table 2). Fish fed the manufactured crumble ration grew from 0.67 g to 3.20 g (Table 2). Fish fed the fresh fish paste were 6.8% larger than fish fed the manufactured feed at the termination of the trial. Growth data was not subjected to ANOVA testing because of a 12.8% variation in average fish weight within treatments at the time the trial was restarted on 16 May.

FCR for fish fed the fresh fish ration averaged 8.14:1 (Table 2). FCR for fish fed the manufactured feed ration averaged 1.55:1. Significant feed loss was noted with the manufactured feed because feed particle size was too small for the fish to easily ingest. Survival in both feed treatments exceeded 99% (Table 2).

A total of 55.8 kg of fresh fish was fed per cage in the fresh fish ration treatment, at an average cost of RMB 1.80/kg. A total of 9.8 kg of feed was fed per cage in the manufactured feed ration treatment, at an average cost of RMB 12.00/kg. Total feed cost was 17% higher for the manufactured feed than the fresh fish.

SUMMARY AND RECOMMENDATIONS

Yellow croaker fry grew well on both the fresh fish and manufactured feed rations. Fish grew from 0.67 g to 3 g in 30 to 35 days. Survival was nearly 100% with both feed rations. The cost of fresh fish during the trial period made it a more economical ration. Fresh fish price would have to increase 17% before the manufactured feed became cost competitive under current conditions.

Particle size of the No. 2 crumble manufactured feed was too small for the advanced yellow croaker fry cultured in this trial. The use of undersize feed particles resulted in significant feed loss and additional croaker energy expenditure to obtain sufficient feed. The use of proper feed particle size should improve FCR with the manufactured feed, making it cost competitive with fresh fish. However, even with the current price differential between fresh fish and manufactured feed, the added benefits of quality consistency, less nutrient loading of the aquatic environment, ease in shipping and storing, and absence of potential pathogens make manufactured feed a better choice than fresh fish for feeding young yellow croaker.

Observations made during the course of the trial suggest the following feeding regime with manufactured feeds for advanced yellow croaker fry.

1. Stock yellow croaker in production cages at 50 days post swim-up. Average fish weight should be approximately 0.4 g.

2. Feed fish for one week with the ASA starter feed in No. 2 crumble (0.6-1.0 mm) form.

3. Feed fish the second week with the ASA starter feed in No. 3 crumble (1.1-1.5 mm) form. By the end of the second week the fish should weigh approximately 0.7 g.

4. Feed fish during weeks 3 and 4 with an ASA marine fingerling feed in 1.5-mm extruded (floating) pellet form.

5. After 4 weeks, increase extruded pellet size to 2.0 mm.

6. Continue to increase extruded pellet size as fish grow.

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Chinese Currency and Production Unit Conversions:

RMB 8.26 = US$1.00
1.0 kg = 2.2 lb

TABLE 1. Diet formulation for the ASA 52% protein and 16% fat starter ration fed in the FY00 yellow croaker fry study conducted at the Xiang Shan Cage Fish Farm, Ningbo area of Zhejiang Province, China.

Ingredient	% of total
Fishmeal, white 68/8	51.0
Wheat, SWW	12.5
Fish Oil (Imported)	10.5
Blood ML mg. 93/.1	7.5
Soybean Meal 47.5	6.0
Yeast, Brewer's Dehydrated	5.0
Wheat Gluten	5.0
Soy lecithin	1.5
ASA Vit PMX-F1	0.5
ASA Min PMX T&S1	0.28
Stable Vitamin C 35%	0.20
Ethoxyquin	0.02
TOTAL	100.00

TABLE 2. Results of the FY00 ASA aquaculture trial to evaluate yellow croaker (*Pseudosciaena crocea*) fry growth in cages with fresh fish and manufactured feed rations.

Feed ration	Cage size (m^3)	Stocking rate (fish/cage)	Initial fish weight (g)	No. days fed	Final fish weight (g)	Survival (%)	FCR
Fresh fish	2.25	2,500	0.67	45	3.42	99.7	8.14
Manufactured feed	2.25	2,500	0.67	45	3.20	99.8	1.55