

Growth Performance of Yellow Croaker Fed Extruded Feed and Fresh Fish Rations in Cage Trials at Ningbo and Wenzhou, China

Results of ASA/China Feeding Trials 35-00-119 and 35-00-122

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ABSTRACT

Yellow croaker (*Pseudosciaena crocea*) growth in cages was evaluated from fingerling to sub-market size with extruded pellet and fresh fish rations in ASA feeding trials at Xiangshan, Ningbo and Nanji Island, Wenzhou. The extruded feed was a soymeal-based ration containing 43% crude protein and 12% fat and was fed in extruded, floating pellet form. Fresh fish was fed in chopped form. Yellow croaker fingerlings were stocked in 8.0-m³ cages at 200 fish per m³ in the Ningbo trial and 175 fish per m³ in the Wenzhou trial. In the Ningbo trial, yellow croaker grew from 3.2 g to 37.9 g in 103 days on the extruded feed, with an FRC of 1.69:1, and from 3.4 g to 44.0 g in 103 days on the fresh fish ration, with an FCR of 9.92:1. Net income and ROI were 27% and 82% higher, respectively, for fish fed the extruded feed than for fish fed the fresh fish ration in the Ningbo trial. In the Wenzhou trial, yellow croaker grew from 5.4 g to 23.4 g in 62 days on the extruded feed, with an FCR of 1.53:1, and from 5.6 g to 25.4 g in 62 days on the fresh fish ration, with an FCR of 4.98:1. Net income and ROI in the Wenzhou trial were nearly identical for the two feed treatments, but any increase in the cost of fresh fish above the RMB 1.0/kg rate that prevailed during the trial would favor the use of the extruded feed. Results of both trials demonstrated good growth performance, feed conversion and economic return with the soymeal-based extruded feed and ASA cage technology. 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 yellow croaker.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with the Ningbo Municipal Fisheries Bureau, the Ping Yang County Fisheries Bureau of Zhejiang Province, and the National Fisheries Extension Center in Beijing, conducted two feeding trials to evaluate yellow croaker (*Pseudosciaena crocea*) growth in cages using ASA LVHD technology and manufactured feeds. The objectives of the trials were to determine the feasibility of culturing yellow croaker in LVHD cages and to compare fish growth performance with an extruded, soy-based feed and a traditional fresh fish diet.

MATERIALS AND METHODS

Ningbo Trial

Six, 8.0-m³ cages (2 m x 2 m x 2 m) in the vicinity of the Ningbo Haiwan Aqua Stock Breeding Center, Xiangshan County, Ningbo, Zhejiang Province, were used for the trial. Cages were constructed of mesh netting with a rigid top frame and opaque covers. Three of the cages were fitted with feed enclosures to contain floating feed pellets.

Cages were stocked with yellow croaker fingerlings of size 3.2 g to 3.4 g that had been produced in an earlier ASA fry to fingerling cage trial. One half of the fingerlings in the earlier trial had been fed from the advanced fry stage with wild caught fresh fish ground to a paste. The other half of the fingerlings had been fed a high protein, manufactured starter feed. Yellow croaker fingerlings were stocked in cages at a density of 200 fish per m³.

Croaker fingerlings in three of the cages were fed chopped, wild caught fresh fish. Fish in the other three cages were fed the ASA 43/12 marine feed in extruded, floating pellet form (Table 1). Fish in all cages were fed to satiation twice daily. Fish in replicate cages of each feed treatment were fed identically. Feed treatment replications were randomly assigned to the six trial cages.

Trial management was based on the ASA LVHD cage production model. Fish in all cages were sampled once per month on the same date each month. All cages were harvested at the conclusion of the trial to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

Wenzhou Trial

Six, 8.0-m³ floating cages (2 m x 2 m x 2 m) at Nanji Island off the coast of Wenzhou, Zhejiang Province, were used for the trial. Cages were constructed of mesh netting with a rigid top frame and opaque covers. Three of the cages were fitted with feed enclosures to contain floating feed pellets.

Cages were stocked with yellow croaker fingerlings of size 5.4 g to 5.6 g that had been produced in an earlier ASA fry to fingerling cage trial. One half of the fingerlings in the earlier trial had been fed from the advanced fry stage with wild caught fresh fish ground to a paste. The other half of the fingerlings had been fed a high protein, manufactured starter feed. Yellow croaker fingerlings were stocked in cages at a density of 175 fish per m³.

Croaker fingerlings in three of the cages were fed chopped, wild caught fresh fish. Fish in the other three cages were fed the ASA 43/12 marine feed in extruded, floating pellet form (Table 1). Fish in all cages were fed to satiation twice daily. Fish in replicate cages of each feed treatment were fed identically. Feed treatment replications were randomly assigned to the six trial cages.

Trial management was based on the ASA LVHD cage production model. Fish in all cages were sampled once per month on the same date each month. All cages were harvested at the conclusion of the trial to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

RESULTS

Ningbo Trial

Yellow croaker were fed for 103 days between 1 July and 14 October 2000. Croaker fed the ASA extruded feed grew from 3.2 g to 37.9 g with an FCR of 1.69:1 (Figure 1; Table 2). Croaker fed fresh fish grew from 3.4 g to 44.0 g with an FCR of 9.92:1 (Figure 1; Table 2). Croaker growth on the two feed rations was essentially the same, given the approximately 7% difference in fish size among treatments at the start of the trial. Average fish survival was 75% in the extruded feed treatment and 70% in the fresh fish diet treatment (Table 2).

Net income and ROI were RMB 186/m³ and 120%, respectively, for croaker fed the extruded feed, and RMB 146/m³ and 66% for croaker fed fresh fish (Table 2). Net income and ROI were 27% and 82% higher, respectively, for croaker fed the extruded feed than for croaker fed the fresh fish ration.

Wenzhou Trial

Yellow croaker were fed for 62 days between 10 July and 10 September 2000. Croaker fed the ASA extruded feed grew from 5.4 g to 23.4 g with an FCR of 1.53:1 (Figure 2; Table 3). Croaker fed fresh fish grew from 5.6 g to 25.4 g with an FCR of 4.98:1 (Figure 2; Table 3). Croaker growth on the two feed rations was essentially the same, given the approximately 4% difference in fish size among treatments at the start of the trial. Fish survival was 89.1% with the extruded feed and 87.5% with the fresh fish.

Net income and ROI were RMB 153/m³ and 48.5%, respectively, for croaker fed the extruded feed, and RMB 156/m³ and 51.5% for croaker fed fresh fish.

SUMMARY AND CONCLUSIONS

Results of both trials demonstrated that yellow croaker could be efficiently cultured in 8-m³ cages using the ASA LVHD technology and that croaker growth performance was as good with a soymeal-based extruded feed as with fresh fish. Use of the extruded feed greatly reduced labor and increased work efficiency in comparison to feeding fresh fish. The added benefits of quality consistency, less nutrient loading of the aquatic environment, ease in shipping and storing, and absence of potential pathogens make extruded feed a better choice than fresh fish for feeding yellow croaker.

Economic return favored the ASA soymeal-based feed over fresh fish. Net income and ROI were considerably higher for croaker fed the extruded feed in the Ningbo trial, where the extruded ASA feed cost was RMB 5.2/kg and fresh fish cost was RMB 2.2/kg. At Wenzhou, net income and ROI were nearly identical for the two feed treatments at the prevailing prices of RMB 5.2/kg for the ASA feed and RMB 1.0/kg for fresh fish. Any increase in the cost of fresh fish above RMB 1.0/kg at Wenzhou, however, would economically favor the use of the ASA feed.

ACKNOWLEDGEMENTS

ASA gratefully acknowledges the Ningbo Municipal Fisheries Bureau, the Ping Yang County Fisheries Bureau, the Zhejiang Provincial Fisheries Extension Center, and the Director and staff of the National Fisheries Extension Center for their assistance and support for this aquaculture trial. ASA participation in this trial was jointly funded by U.S. soybean farmers and the U.S. Foreign Agricultural Service.

Chinese Currency and Production Unit Conversions:

RMB 8.26 = US\$1.00

1.0 kg = 2.2 lb

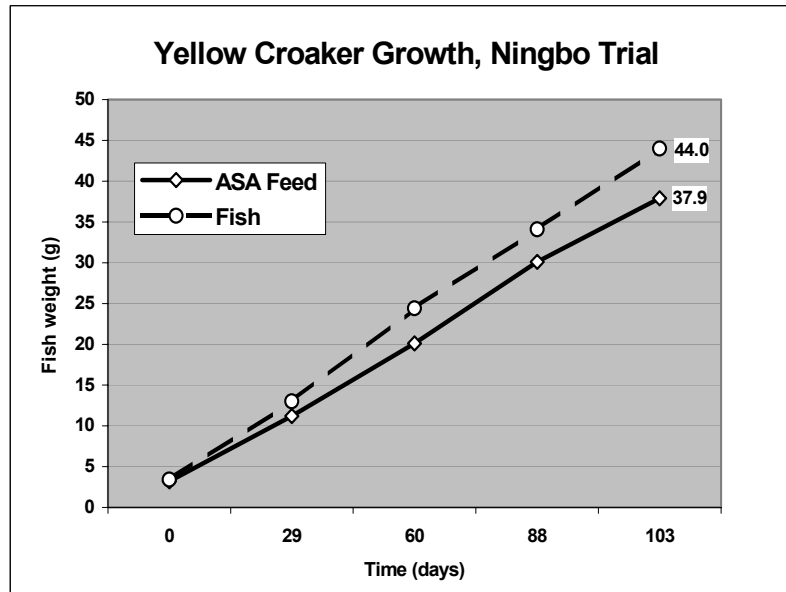


Figure 1. Growth curves for yellow croaker fed a soymeal-based extruded feed (ASA Feed) and chopped fresh fish (Fresh Fish) in a cage culture trial conducted at Xiangshan, Ningbo, China.

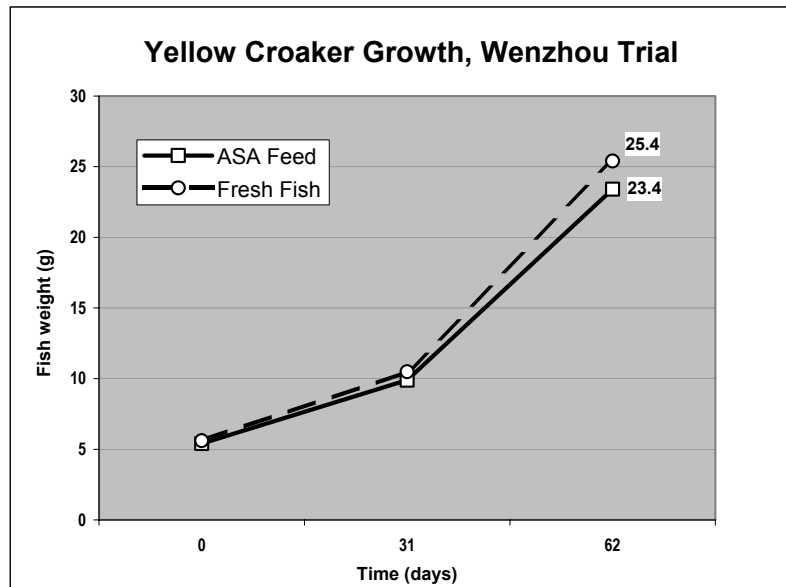


Figure 2. Growth curves for yellow croaker fed a soymeal-based extruded feed (ASA Feed) and chopped fresh fish (Fresh Fish) in a cage culture trial conducted at Nanji Island, Wenzhou, China.

Table 1. Formula for the ASA 43/12, soymeal-based marine fish feed used in the 2000 yellow croaker growout trials conducted at Ningbo and Wenzhou, China.

Ingredient	Percentage of feed
Soybean Meal 47.5	40.00
Fishmeal, anchovy 65/10	34.00
Wheat, SWW	16.50
Fish Oil, Unspec.	8.03
Corn gluten meal	1.00
Vit PMX Roche 2118	0.20
Min PMX F-1	0.25
Ethoxyquin	0.02
TOTAL	100.00

¹The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 43/12 indicates 43% crude protein and 12% crude fat.

Table 2. Results of the 2000 ASA aquaculture trial that evaluated yellow croaker growth performance in 8.0-m³ cages with a soymeal-based, extruded feed and fresh fish at Xiangshan, Ningbo.

Feed ration	Stocking rate (fish/m ³)	Initial fish weight (g)	No. days fed	Fish harvest weight (g)	Survival (%)	FCR	Net income (RMB/m ³)	ROI (%)
ASA Feed	200	3.2	103	37.9	75	1.69	186	120
Fresh Fish	200	3.4	103	44.0	70	9.92	146	66

Table 3. Results of the 2000 ASA aquaculture trial that evaluated yellow croaker growth performance in 8.0-m³ cages with a soymeal-based, extruded feed and fresh fish at Nanji Island, Wenzhou.

Feed ration	Stocking rate (fish/m ³)	Initial fish weight (g)	No. days fed	Fish harvest weight (g)	Survival (%)	FCR	Net income (RMB/m ³)	ROI (%)
ASA Feed	175	5.4	62	23.4	89.1	1.53	153	48.5
Fresh Fish	175	5.6	62	25.4	87.5	4.98	156	51.5