

Red Drum (*Sciaenops ocellata*) Advanced Fry to Fingerling Growth on Manufactured Feed and Fresh Fish Rations

Results of ASA/China 2000 Feeding Trial 35-00-124

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ABSTRACT

Red drum growth from advanced fry to 3-g fingerlings was compared using wild caught fresh fish and manufactured feed rations. Wild caught fresh fish was fed in a ground, paste form. Manufactured feeds were fed as No. 3 (1.1-1.5 mm) crumbles and 1.5-mm extruded pellets. Red drum fry were stocked in 2.25-m³ cages at a density of 2,500 fish per cage at 36 days post swim-up. Red drum fry grew from an average weight of 0.21 g to 3.24 g and 3.42 g, respectively, on the manufactured feeds and fresh fish paste in 24 days. Feed conversion ratios for the manufactured feeds and fresh fish paste were 1.43:1 and 5.17:1, respectively. Fish survival was 91.5% for fish fed the manufactured feeds, and 81.0% for fish fed the fresh fish paste. While growth was 5% better with the fresh fish paste, higher fish survival and better feed conversion with the manufactured feeds resulted in higher fish production and greater economic return. Results indicate that manufactured feeds can effectively replace fresh fish as the starter food for advanced red drum fry in cages.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with the Ningbo Municipal Fisheries Bureau, conducted a study in July-August 2000 to compare the growth performance of red drum (*Sciaenops ocellata*) advanced fry on manufactured and fresh fish diets. The objective of the study was to demonstrate that red drum could be weaned to a manufactured feed at approximately 35 days post swim-up and grown to fingerling size on manufactured feeds 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

Red drum fry of age 36 days post swim-up were stocked in six, 2.25-m³ cages at the Xiang Shan Cage Fish Farm in Xiang Shan County, Ningbo on 18 July 2000. Fry were stocked at a density of 2,500 fish per cage. Red drum fry averaged 0.21 g in weight at the time of stocking in the cages.

Red drum fry were fed one of two feed treatments, with each feed treatment replicated in three cages. Feed treatment one was wild caught fresh fish fed in a ground, paste form. Feed

treatment two was a combination of nutritionally balanced starter and growout feeds formulated by ASA and manufactured by the Shangahi Fwusow aquafeed mill. The starter feed was formulated to contain 52% crude protein and 16% fat (Table 1). The growout feed was formulated to contain 43% crude protein and 12% fat (Table 2). The starter feed was fed for one week in No. 3 crumble (1.1-1.5-mm particle size) form, followed by the growout feed fed as 1.5-mm extruded, floating pellets. Both the fresh fish paste and manufactured feeds were fed to satiation, with all three cages of each feed treatment receiving the same amount of feed daily. Fish were fed twice daily. Feeding was initiated on 18 July 2000.

The trial was terminated after 24 days of feeding 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 feed conversion ratio (FCR) determined for each of the treatments.

RESULTS

Red drum fed fresh fish paste grew from 0.21 g to 3.42 g in 24 days of feeding (Table 3). Fish fed the manufactured ASA feeds grew from 0.21 g to 3.24 g (Table 3). FCR was 1.43:1 with the ASA feeds, and 5.17:1 with the fresh fish paste (Table 3). Fish survival was 91.5% for fish fed the manufactured feeds, and 81.0% for fish fed the fresh fish paste (Table 3).

Cannibalism and biting was reported to be a problem in all six trial cages. Injured fish developed fin rot and died. This was a particular problem in cages where fish were fed the fresh fish paste. Average mortality among the fish fed fresh fish paste was 19%, compared to less than 10% for fish fed the manufactured feeds.

Per kilogram costs for the manufactured feeds were RMB 12.00/kg for the 52/16 starter feed and RMB 5.20/kg for the 43/12 growout feed. Average fresh fish cost was RMB 2.00 per kilogram. Total feed cost per cage was RMB 76.60 for the manufactured feeds and RMB 66.20 for the wild caught fresh fish. While per cage feed cost was RMB 10.40 higher for the ASA feeds than for the fresh fish paste, the additional cost of the ASA feeds was more than offset by the 10.5% higher fish survival with the ASA feeds.

SUMMARY AND RECOMMENDATIONS

Results of the trial indicate that manufactured feeds can effectively replace fresh fish as the starter food for advanced red drum fry in coastal production cages. Fish grew from 0.21 g to >3 g in 24 days on both the fresh fish paste and the manufactured (ASA) feeds. While fish grew 5% larger with the fresh fish paste, better feed conversion and higher survival among fish fed the ASA feeds resulted in greater fish production and profitability. The added benefits of feed quality consistency, less nutrient loading of the aquatic environment, ease in shipping and storing, reduced labor, and absence of potential pathogens make the ASA feeds a better choice than fresh fish for feeding young red drum.

The tested feeding regime of one week of feeding with the ASA 52/16 high-protein starter feed in crumble form, followed by weaning to the ASA 43/12 growout feed in 1.5-mm extruded, floating pellet form worked well with red drum fry. However, the 1.43:1 FCR for the 24-day feeding period indicated it might be advantageous to feed a higher protein fingerling feed as an intermediate feed between the starter and growout diets.

Feed pellet size should be increased from 1.5-mm to 2.0-mm after two weeks of feeding with the 1.5-mm extruded pellets. Extruded pellet size should be increased periodically throughout the production cycle to the largest pellet size that all of the fish in each cage are able to consume.

Fish size variation should be minimized at stocking to prevent cannibalism and to increase fish survival rate and economic return.

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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 52/16 starter feed fed in the FY00 red drum advanced fry to fingerling trial 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. Diet formulation for the ASA 43/12 growout feed fed in the FY00 red drum advanced fry to fingerling trial conducted at the Xiang Shan Cage Fish Farm, Ningbo area of Zhejiang Province, China.

Ingredient	% of total
Soybean Meal 47.5	40.00
Fishmeal, anchovy 65/10	34.00
Wheat, SWW	16.50
Fish Oil (imported)	8.03
Corn Gluten Meal	1.00
Vit PMX Roche 2118	0.20
Min PMX ASA F-1	0.25
Ethoxyquin	0.02
TOTAL	100.00

TABLE 2. Results of the FY00 ASA aquaculture trial to evaluate red drum (*Sciaenops ocellata*) advanced fry to fingerling growth in cages with fresh fish and manufactured ASA 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	0.21	24	3.42	81.0	5.17
ASA feed	2.25	2,500	0.21	24	3.24	91.5	1.43