

Production of Red Tilapia in 1-m³ Cages with Soybean Meal-Based Diets

Results of 1997 ASA/China Feed-Based Production Trials

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INTRODUCTION

The American Soybean Association (ASA), in cooperation with the China National Fisheries Extension Center (NEC) and its affiliate provincial agencies, has conducted a series of production trials with native and imported fish species since 1991 to demonstrate and evaluate the technical and economic feasibility of feed-based fish culture in China. Tilapia have been one of the key imported species evaluated for both pond and cage production in China. ASA continued its evaluation of tilapia in 1997 with a feeding trial that examined the production performance of red tilapia in LVHD cages with soybean meal-based feeds.

MATERIALS AND METHODS

Fish

Red strain tilapia nilotica (*Oreochromus niloticus*) fingerlings were used in an LVHD cage trial conducted in Shan Zai Reservoir in Fujian Province, China. Fingerlings averaged 50.6 g in weight at stocking, and were stocked in cages at a density of 400 fish per m³. Target market size for the red tilapia was ≥ 400 g.

Cages

Six nylon net cages of size 1.2-m³ were used in the trial. Cages were suspended in the water so that 1-m³ of cage volume was submerged below the water surface and the top 20 cm of the cage was above the water surface. Cages were fitted with feed containment boxes that extended vertically from the underside of the cage lid to approximately 40 cm below the water surface. Opaque covers were attached to the tops of the cages and cages were aligned in a single row with a minimum of one meter of open water between cages. Each feed treatment was replicated in three cages. Feed treatments and replications were randomly assigned to cages within the trial.

Feed

Two ASA soybean meal-based diets were tested in the trial: a 32% crude protein diet formulated with 50% soybean meal and 0% fish meal ('J' diet); and a 32% crude protein diet formulated with 40% soybean meal and 5% fish meal ('H' diet)(Table 1). Both diets were tested in extruded (floating) feed form. The feeds were produced by the Shanghai DaJiang and Fwuso Shanghai aquafeed mills based on ASA diet formulations.

Frequency of feeding and daily feed quantity were based on feeding directions contained in the ASA manual *High Density Fish Culture in Low Volume Cages*. Where multiple daily feedings were required, the total daily feed ration was divided equally among the multiple feedings. Feed quantity was increased every 10 days using an estimated feed conversion ratio of 1.7:1, and readjusted according to average fish weight determined at 30-day sampling intervals.

RESULTS

Red tilapia fingerlings weighing 51 g at stocking grew to average weights of 482 g and 443 g in 139 days on the 'H' and 'J' diets, respectively (Table 2)(Figure 1). Growth performance with the two diets was not significantly different ($P > 0.05$). Fish fed both diets reached the target market size of ≥ 400 g. Average net production for red tilapia was 169 kg/m³ with the 'H' feed, and 155 kg/m³ with the 'J' feed. Net fish production was not significantly different ($P > 0.05$) for the two diets.

Average tilapia survival for all cages and test diets was 98.7%. There was no significant difference in survival among the feed treatments. There was no difference in FCR for the two test diets. FCR was 1.76:1 with the 'H' diet and 1.77:1 with the 'J' diet.

Net economic return and return to investment were not significantly different ($P > 0.05$) for fish fed the two diets. Net economic return for tilapia fed the 'H' diet was RMB 2,047 per m³. Tilapia fed the 'J' diet netted RMB 1,930 per m³. Return to investment was 95.8% for 'J' diet fish and 92.3% for fish fed the 'H' diet.

DISCUSSION

Results of the red tilapia fingerling to market size cage culture trial in Shan Zai Reservoir demonstrated the technical and economic feasibility of culturing red tilapia in mountain reservoirs in Fujian Province. Red tilapia fingerlings weighing 51 g at stocking in 1-m³ cages grew to >440 g in 139 days. Results indicate that a 50% soybean meal, all-plant protein diet is adequate for culturing red tilapia in cages, and that there is no growth or economic advantage to incorporating 5% fish meal in the diet for this species. Net production of ≥ 155 kg/m³ can be expected in 1-m³ cages with red tilapia.

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Chinese Currency and Production Unit Conversions:

RMB 8.26 = US\$1.00

1.0 kg = 2.2 lb

TABLE 1. Composition of the two ASA diets tested in the 1997 red tilapia fingerling to market grow-out trial in 1-m³ cages in Fujian Province, China.

Ingredient	Percentage by weight	
	H' diet	'J' diet
Fish Meal	5.00	0.00
Soybean Meal (44% CP)	40.00	50.00
Cottonseed Meal (41% CP)	5.00	5.00
Rapeseed Meal	5.00	0.00
Corn Gluten (60% CP)	10.70	10.00
Corn (extrusion cooked, 8.5% CP)	0.00	20.00
Rice Bran	20.00	0.00
Wheat Middlings (12% CP)	0.00	11.60
Wheat flour	10.50	0.00
Lysine HCl	0.50	0.50
Vegetable Oil (soybean)	2.00	1.60
Mineral Premix	0.10	0.10
Vitamin Premix	0.05	0.05
Vitamin C (coated)	0.10	0.10
Dicalcium Phosphate (18% P)	1.05	1.05
TOTAL	100.00	100.00

TABLE 2. Growth performance of red tilapia (*Oreochromis niloticus*) in fingerling to market size LVHD cage trials with soybean meal-based feeds containing 0% fish meal (J) and 5% fish meal (H) at Shan Zai Reservoir, Fujian Province, China, in 1997.

Location	Feed	Stocking density (fish/m ³)	Stocking size (g/fish)	Cage volume (m ³)	No. days fed	Harvest		Survival (%)	FCR	Net income (RMB/m ³)	Return to investment (%)
						kg/m ³	wt/fish (g)				
Shan Zai Reservoir	H-float	400	51	1.0	139	169	482	99	1.76:1	2047	92.3
Shan Zai Reservoir	J-float	400	51	1.0	139	155	443	99	1.77:1	1930	95.8

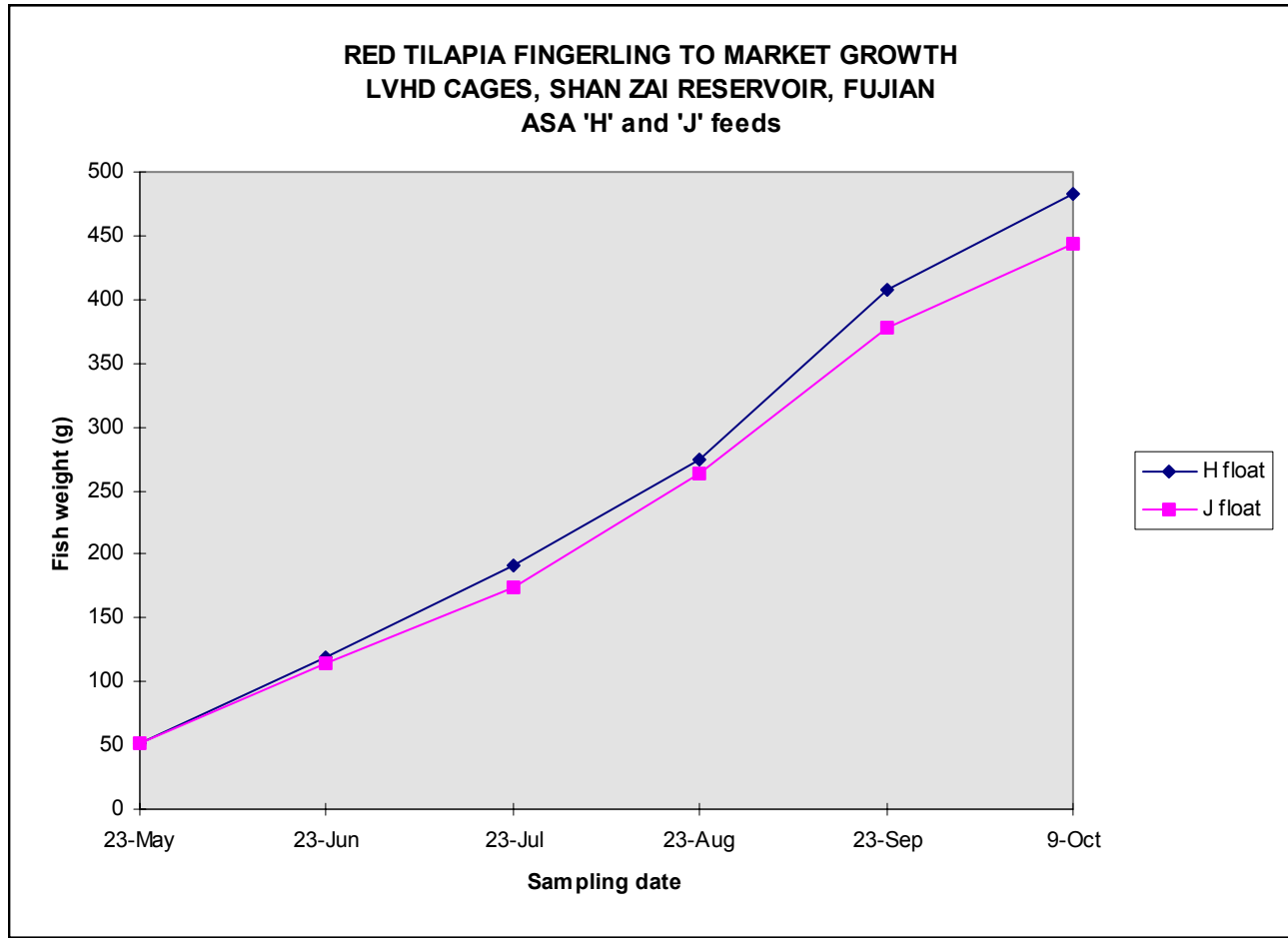


FIGURE 1. Growth performance of 51-gram red tilapia nilotica fed soybean-based diets containing 0% fishmeal (J) and 5% fish meal (H) in 1-m³ cages in Fujian Province, China, in 1997.