Red Tilapia Production in Ponds from Fry to Market Size with Soy-Based Feeds

Results of ASA/China 2004 Feeding Trials 35-04-91and 35-04-92

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ABSTRACT

A two-stage feeding trial was conducted near Haikou, Hainan Province, to evaluate fry to market growth performance of red tilapia using the ASA 80:20 pond production model and ASA soymeal-based feeds. In the first stage, juvenile fish were stocked in one 2.0-mu (0.13-ha) and two 2.5-mu (0.17-ha) ponds at a density of 4,000 red tilapia and 1,000 silver carp per mu (60,000 tilapia and 15,000 silver carp per hectare). Red tilapia grew from 1.0 g to an average weight of 51.3 g per fish in 62 days of feeding, with an average FCR of 0.97:1. At fish size 50 g, the fish were restocked at 800 red tilapia and 200 silver carp per mu (12,000 tilapia and 3,000 silver carp per hectare). Red tilapia grew from 50 g to an average weight of 573 g in 110 days, with an average FCR of 1.16:1. Total production time from fry (1-g) to market size (573 g) was 172 days. Red tilapia demonstrated excellent growth performance and feed conversion efficiency with the ASA soymeal-based feeds and 80:20 production technology throughout the production cycle, and yielded market size fish from fry within the constraints of a single production season.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with Beijing Municipal Fishery Extension Center and its Hainan Fish Breeding Center in Haikou, Hainan, and the China National Fisheries Extension Center (NEC) in Beijing, conducted a 6-month pond feeding demonstration trial with red tilapia. The objective of the trial was to demonstrate red tilapia growth and economic performance from fry to market size in a two-stage production system with ASA soymeal-based feeds and the ASA 80:20 pond production model.

MATERIALS AND METHODS

Two ponds of average size 2.5 mu (0.17 ha) and one pond of size 2.0 mu (0.13 ha) at the Hainan Fish Breeding Center in Haikou, Hainan, were used for the feeding trial. Pond water depth averaged approximately 1.5 m. All ponds were equipped with water exchange and stand-by aeration.

Fish were 1.0-g red tilapia produced by the Hainan Fish Breeding Center. A two-stage production system was used, in which red tilapia were cultured from fry to advanced fingerling size in stage one, and then restocked at a lower density for culture to market size. In stage one, red tilapia were stocked in the three trial ponds in late April 2004 at a density of 4,000 fish per mu (60,000 fish per hectare), together with 1,000 silver carp fry per mu (15,000 fish per hectare).[1] Fish in all three trial ponds were of uniform size and age at stocking. Stage one target size for red tilapia was 50 g per fish. In stage two, red tilapia were stocked in the three trial ponds at a density of 800 fish per mu (12,000 fish per hectare), together with 200 silver carp per mu (3,000 fish per hectare). Stage two target market size for red tilapia was 500 g.

Red tilapia were fed the ASA 41/11 fry feed in crumble form from fish size 1-g to fish size 3-g (Table 1). At size 3-g, the tilapia were weaned to the ASA 36/7, soymeal-based fingerling feed in extruded, floating pellet form (Table 2). At fish size 50-g, the tilapia were weaned to the ASA 32/6, soymeal-based growout feed in extruded, floating pellet form (Table 3). All feeds were formulated by ASA and produced by the Fwusow feedmill in Xiamen, Fujian Province. Fish were fed to satiation twice daily, with fish in all three ponds fed identically at each feeding.

Trial management was based on the ASA 80:20 pond production model. Fish in all ponds were sampled once per month on approximately the same date each month. At the conclusion of each stage of the trial, all ponds were drained and the red tilapia and silver carp in each pond were counted and weighed to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

[1] 15 mu = 1 hectare

RESULTS

Red tilapia were fed a total of 172 days between 27 April and 25 October 2004. In stage one, red tilapia grew from 1.0 g to an average weight of 51.3 g in 62 days (Table 4). Gross production of red tilapia averaged 205.3 kg/mu (3,079.5 kg/ha) (Table 4).[2] Average red tilapia survival rate was 99.6%. Average FCR for red tilapia with the combination of ASA soymeal-based fry and fingerling feeds in stage one was 0.97:1.

In stage two, red tilapia grew from 50 g to an average weight of 573 g in 110 days of feeding (Table 4). Gross production averaged 452 kg/mu (6,780 kg/ha) for red tilapia and 55.6 kg/mu (834 kg/ha) for silver carp (Table 4). Average red tilapia and silver carp survival rates were 98.5% and 95.5%, respectively. Average FCR for red tilapia fed the ASA 32/6 all-plant protein, soymeal-based feed was 1.16:1 (Table 4). Feed cost, including shipping, per kilogram of fish growth was RMB 5.42 (US$0.66). Net economic return was RMB 5,823 per mu (US$705/mu), at a market price of RMB 20/kg for red tilapia. Red tilapia were marketed locally to specialty markets to optimize market price. Red tilapia were uniform in size and had good body coloration and conformation at harvest.

SUMMARY AND CONCLUSIONS

Red tilapia exhibited excellent growth and feed conversion efficiency with the soymeal-based fry, fingerling and growout feeds. Red tilapia growth was rapid, with fish growing from 1 g to 573 g in 172 days, confirming the ability to produce market size fish from fry within a single growing season. Average FCR for the full culture period from fry to market was 1.07:1. No disease problems were encountered during the trial. No drugs or chemicals were used, providing a healthy “green” market product.

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[2] kg/mu x 15 = kg/ha

Table 1. Formula for the ASA 41/11[1], soymeal-based fry feed used in the 2004 red tilapia demonstration feeding trial in Haikou, Hainan Province, China. Fwusow/Xiamen feed mill produced the feed in extruded, floating pellet form.

Ingredient	% of total
Soybean Meal 47.5	46.3
Wheat, SWW	13.0
Corn Gluten Meal 60%	15.0
Fishmeal, Anchovy 65/10	13.5
Fish Oil, Unspec.	3.93
Soy Oil	4.0
Soy lecithin	1.5
Ca Phosphate Mono	1.7
Vit PMX F-2	0.75
Min PMX F-1	0.25
Stay C-35%	0.05
Ethoxyquin	0.02
TOTAL	100.00

[1]The numerical component of the feed description refers to the percentage of protein and lipid, respectively, in the ration, i.e. 41/11 indicates 41% crude protein and 11% crude lipid.

Table 2. Formula for the ASA 36/7[1], soymeal-based fingerling feed used in the 2004 red tilapia demonstration feeding trial in Haikou, Hainan Province, China. Fwusow/Xiamen feed mill produced the feed in extruded, floating pellet form.

Ingredient	Percent of total
Soybean Meal 47.5	46.0
Wheat, SWW	19.0
Corn Gluten Meal 60%	10.0
Wheat middlings	8.0
Fishmeal, Anchovy 65/10	8.0
Fish Oil, Unspec.	4.0
Ca Phosphate Mono	2.2
Soy lecithin	1.75
Vit PMX F-2	0.75
Min PMX F-1	0.25
Stay C-35%	0.03
Ethoxyquin	0.02
TOTAL	100.00

[1]The numerical component of the feed description refers to the percentage of protein and lipid, respectively, in the ration, i.e. 36/7 indicates 36% crude protein and 7% crude lipid.

Table 3. Formula for the ASA 32/6[1], soymeal-based growout feed used in the 2004 red tilapia demonstration feeding trial in Haikou, Hainan Province, China. Fwusow/Xxiamen feed mill produced the feed in extruded, floating pellet form.

Ingredient	Percent of total
Soybean meal 47.5	52.8
Wheat, SWW	23.2
Wheat middlings	10.0
Corn gluten meal 60%	6.0
Fish oil	3.5
Soy lecithin	1.00
Ca phosphate mono	2.70
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C-35%	0.03
Ethoxyquin	0.02
Total	100.00

[1]The numerical component of the feed description refers to the percentage of protein and lipid, respectively, in the ration, i.e. 32/6 indicates 32% crude protein and 6% crude lipid.

Table 4. Results of the two-stage, 2004 ASA aquaculture trial in Haikou that demonstrated fry to market pond growth performance of red tilapia using the ASA 80:20 production model and soymeal-based fry, fingerling and growout feeds.

Stage One												
Pond No.	RTP[1] stocking size (g)	Stocking rate (fish/mu)	No. days fed	Harvest wt. (g) RTP	Harvest wt. (g) SiC[2]	P_G[3] (kg/mu) RTP	P_G[3] (kg/mu) SiC	Survival (%) RTP	Survival (%) SiC	FCR	Net (RMB/mu)	ROI (%)
1	1.0	4,000	62	53.0	-----	212.0	-----	99.6	-----	0.94	-------	-----
2	1.0	4,000	62	50.1	-----	200.4	-----	99.6	-----	0.98	-------	-----
3	1.0	4,000	62	50.9	-----	203.6	-----	99.7	-----	1.00	-------	-----
Mean	1.0	4,000	62	51.3	-----	205.3	-----	99.6	-----	0.97	-------	-----
Stage Two												
Pond No.	RTP[1] stocking size (g)	Stocking rate (fish/mu)	No. days fed	Harvest wt. (g) RTP	Harvest wt. (g) SiC[2]	P_G[3] (kg/mu) RTP	P_G[3] (kg/mu) SiC	Survival (%) RTP	Survival (%) SiC	FCR	Net (RMB/mu)	ROI (%)
1	50	800	110	568	305	451.0	59.4	99.3	97.5	1.22	6,529	1.22
2	50	800	110	580	280	455.9	52.6	98.3	94.0	1.08	7,186	1.12
3	50	800	110	567	288	448.0	54.7	98.7	95.0	1.29	5,450	1.14
Mean	50	800	110	573	284	451.6	55.6	98.8	95.5	1.17	6,388	1.16

[1]TRP = Red Tilapia

[2]SiC = Silver Carp

[3]P_G = Gross Production