Production of Monosex GIFT strain Tilapia in LVHD Cages with a Soy-Based Feed, Baiyang, Guangxi Province

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INTRODUCTION

A cooperative feeding trial was jointly conducted by the American Soybean Association International Marketing (ASA-IM) program and Nanning Baiyang Aquafeed Company to demonstrate feed-based production of monosex GIFT strain tilapia in LVHD cages with a soy-based feed. The trial was conducted at the Nanning Baiyang Fish Cage Demonstration Farm near Nanning, Guangxi Province.

FEEDING TRIAL PROTOCOLS

Three, 4-m^3 LVHD cages were used for the tilapia demonstration feeding trial. Fish were monosex GIFT strain tilapia produced at the Nanning Baiyang Jingguang fish farm from fry imported from Hainan. Tilapia were stocked in the LVHD cages at a density of 300 fish per m^3 (1,200 fish/cage). Mean weight of the tilapia at stocking was 28 g.

Hybrid tilapia were stocked in the cages on 13 May 2007 and fed with the ASA-IM 32/6[1] feed. The ASA-IM 32/6 feed was least-cost formulated by ASA-IM based on ingredients available at the Baiyang Feed Mill, where the feed was produced. Soybean meal was the primary source of protein in the diet (Tables 1, 2, and 3), and represented 50% of the feed content. Tilapia were fed the 32/6 feed to satiation twice daily, with fish in the three cages receiving the same amount of feed at each feeding. All feed was fed in extruded, floating pellet form.

Feeding commenced on 18 May and continued for 162 days to 25 October 2007. Target fish biomass at harvest was 170 kg/m^3 in the 4-m^3 cages, or 680 kg/cage. The target market size for tilapia was 600 g per fish.

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

Data on fish survival, gross and net production, average fish weight, and feed conversion efficiency were obtained at harvest for all cages. All fish from each cage were counted and weighed at harvest to obtain this data. Data on production input costs was recorded throughout the trial to determine the economic return with the soy-based ASA-IM feed.

FEEDING TRIAL RESULTS

Monosex GIFT tilapia grew from 28 g to an average weight of 557 g per fish in 162 days of feeding (Table 4). Tilapia production averaged 511 kg per cage, or 128 kg/m^3. Tilapia were fed a total of 652 kg of feed per cage, which produced a net yield of 478 kg of tilapia with an average FCR of 1.36:1.

Average survival for the hybrid tilapia was 76.5%. Average fish biomass at harvest was significantly below the trial target of 170 kg/m^3 due do the low fish survival rate. The high rate of fish mortality was caused by an undiagnosed disease episode that occurred during July.

Harvested tilapia produced a net profit of RMB 408/cage ($54.40/cage) at a market price of RMB 7.2/kg ($0.96/kg). Return on investment averaged 12.5% per cage. The low economic return was a result of the 23.5% fish loss resulting from disease. A lack of fish diagnostic and treatment services continues to be a critical constraint to the aquaculture industry in this region.

Baiyang Aquafeed Company reported that the LVHD tilapia trial yielded better production and FCR compared to larger local commercial cages, even though the LVHD stocking density was 3 times higher.

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Table 1. Formula for the ASA-IM 32/6, soy-based feed used in the 2007 monosex GIFT strain tilapia LVHD cage trial in Nanning, Guangxi Province, China. The feed was produced by Baiyang Feed Mill using a least-cost formula provided by ASA-IM. The feed was produced in extruded, floating pellet form. Feed batch formulations may have varied slightly during the trial period depending on specific ingredient nutrient profiles and ingredient availability.

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Ingredient	Percent of total
Soybean Meal 46%	50.00
Wheat Middlings 13.6%	13.00
Wheat Flour 11.2%	12.00
DDGS 27/10	10.50
Corn Gluten Meal 60.5/5	3.70
Soy Lecithin/Corn Blend	3.00
Fishmeal, local 60/10	2.50
Ca Phosphate Mono 21%	1.98
Soy Oil	1.50
Fish Oil, anchovy	1.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C 35%	0.03
Ethoxyquin, liquid 60	0.04
TOTAL	100.00

Table 2. Calculated nutritional profile of the ASA-IM 32/6, soy-based feed used in the 2007 monosex GIFT tilapia LVHD cage trial in Nanning, Guangxi Province, China. The feed was produced in extruded, floating pellet form by Baiyang Feed Mill, Nanning.

Nutrient	Value, As Fed
DE Fish (extruded)	2663
NFE	39.88
Starch	20.79
Protein, crude	32.89
Protein, digestible	29.96
DE:DP Ratio	8.9:1
Fish Protein	1.50
Soy Protein	23.00
Fat	5.93
W-3 (omega 3 fatty acid)	0.58
W-6 (omega 6 fatty acid)	2.13
Fiber	4.00
Ash	6.10
Calcium	0.61
Phosphorus, available	0.60
Choline	2391
Vitamin C	105
Ethoxyquin	124.5
Arginine	2.04
Lysine	1.80
Methionine	0.51
Methionine + Cystine	1.02
Threonine	1.28
Tryptophan	0.37

Table 3. Vitamin and mineral premix formulations used in the ASA-IM 32/6 soy-based feed. Quantities of vitamins and minerals are per kilogram of premix. Premixes were produced by the Phoenix Feed Mill premix plant in Chengdu, Sichuan Province, under supervision of ASA-IM.

Ingredient	Unit	Amount
Vitamin Premix F-2		
Vitamin A	IU/kg	1,200,000
Vitamin D3	IU/kg	200,000
Vitamin E	IU/kg	20,000
Vitamin K	mg/kg	0
Vitamin C	mg/kg	0
Biotin	mg/kg	40
Choline	mg/kg	0
Folic Acid	mg/kg	1,800
Inositol	mg/kg	0
Niacin	mg/kg	40,000
Pantothenate	mg/kg	20,000
Pyridoxine (B6)	mg/kg	5,000
Riboflavin (B2)	mg/kg	8,000
Thiamin (B1)	mg/kg	8,000
Vitamin B12	mcg/kg	2,000
Ethoxyquin	mg/kg	500
Mineral Premix F-1		
Iron	ppm	40,000
Manganese	ppm	10,000
Copper	ppm	4,000
Zinc	ppm	40,000
Iodine	ppm	1,800
Cobalt	ppm	20
Selenium	ppm	200

Table 4. Results of the 2007 ASA-IM aquaculture trial in Nanning that demonstrated fingerling to market growth performance of monosex GIFT strain tilapia using the ASA-IM LVHD cage model and a least-cost formulated 32/6 feed fed in extruded, floating pellet form.

Cage No.	GIFT[1] stocking size (g)	Stocking rate (fish/m^3)	No. days fed	Harvest wt. (g)	P_G[2] (kg/cage)	Survival (%)	FCR	Net income (RMB/cage[3])	ROI (%)
1	27.9	300	162	549	513.5	78.0	1.36	424	13.0
2	27.9	300	162	566	504.6	74.3	1.38	360	11.0
3	27.9	300	162	556	516.0	77.3	1.35	441	13.5
Mean	27.9	300	162	557	511.0	76.5	1.36	408	12.5

[1]NiT = Monosex GIFT Tilapia

[2]P_G = Gross Production

[3]RMB exchange rate: RMB 7.5 = $1.00