Growth Performance of Tilapia Fed Soy-Based Feed in Low Volume, High Density Cages on Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam

Results of ASA-IM/Soy-in-Aquaculture 2006 Feeding Demonstration Project

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ABSTRACT

A feeding demonstration was conducted at the Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam to demonstrate the growth potential of tilapia (*Oreochromis niloticus*) cultured using soy-based feeds in 4-m^3 LVHD cages. Tilapia fingerlings of 145 g were stocked into three 4-m^3 cages at 1,200 fish per cage. Fish in all three cages were fed a soybean meal based, extruded feed that was produced domestically in Vietnam. After 72 days of culture the tilapia reached an average size of 495 g with an average FCR of 2.17:1. Gross production averaged 145.75 kg/m^3 of cage volume.

INTRODUCTION

The American Soybean Association International Marketing (ASA-IM), under the Soy-in-Aquaculture (SIA) Project and in cooperation with a local hatchery owner, Mr. Tran Quoc Minh, at Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam, conducted a 72-day feeding demonstration with tilapia in cages. The objectives of the project were to demonstrate the feasibility of culturing tilapia in low volume, high density (LVHD) cages using an extruded, soy-based feed.

MATERIALS AND METHODS

Three, 4-m^3 (2 m x 2 m x 1 m) cages at the Ninh Binh Joint Stock Fish Breeding Company cage farm site in the Phu Long Reservoir, were used for the demonstration. The cages were constructed of 2-cm nylon mesh netting, weighted in the corners to maintain the cage shape. Each cage was equipped with an internal feed enclosure and a light blocking cover as specified in the ASA-IM LVHD Manual "Principles and Practices of High Density Fish Culture in Low Volume Cages". The three demonstration cages were situated on a floating platform with all demonstration cages at the outside edge of the cage farm and spaced to provide at least one cage length of open water on all sides of each cage to facilitate water exchange.

Tilapia fingerlings of size 145 g were obtained from the cooperator's hatchery and were stocked in the demonstration cages at a density of 1,200 fish per cage. Fish in all three cages were of uniform size and age at stocking. Tilapia production targets were 500 g per fish and 600 kg per cage, or 150 kg/m^3 of cage volume.

Tilapia were fed twice daily with an extruded, floating, pelleted feed formulated to contain 32% crude protein and 6% crude lipid (32/6). The 32/6 feed was least-cost formulated by ASA-IM and contained 45-50% dehulled soybean meal. The 32/6 feed was produced domestically in Vietnam by two feedmills, Feedmill A and Feedmill B. The three cages were treated as replicates of a single feed treatment, with fish in all cages fed identically at each feeding using the ASA-IM satiation feeding technique.

Cage management was based on the ASA-IM LVHD cage production model. At the conclusion of the project, all cages were completely harvested and all fish weighed and enumerated. These results were used to determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

RESULTS

Tilapia were cultured a total of 72 days between April 13 and June 24, 2006. Tilapia fed the formulated feed grew from an average of 145 g to 495 g in this period (Table 4). Gross production in the cages averaged 583 kg, or 145.75 kg/m^3 of cage volume, with an average survival of 98% and average FCR of 2.17:1 (Table 4).

SUMMARY AND CONCLUSIONS

Tilapia may be grown using the ASA-IM LVHD cage technique with a soy-based, extruded feed. However, tilapia performance on formulated feed in this demonstration was compromised by a period when the fish were fed with a substandard (non-project) feed due to unavailability of the ASA-IM 32/6 diet. Approximately 12% of the total feed fed to each cage was a lower quality, locally produced and formulated feed. Additionally, a prolonged period of very high water temperatures was experienced, reaching a high of 35^{o}C and averaging over 34^{o}C in the afternoon for over three weeks. A follow-on demonstration at the same site in Vietnam, with particular attention to preventing any "feed gaps" and an earlier start date is recommended to better demonstrate the production and economic advantages of the ASA-IM LVHD technology and soy-based fish feed.

ACKNOWLEGEMENTS

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TABLE 1. Formula provided to Feedmill A for the ASA-IM 32/6, soymeal-based feed used in the 2006 ASA-IM SIA Tilapia Demonstration Project at the Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam that demonstrated growth performance of tilapia using the ASA-IM LVHD production model and floating formulated aquafeeds. The feed was fed in a 3-mm pellet size.

32/6[1] Freshwater Fish Growout Feed
2006 Vietnam Tilapia

Ingredient	% Inclusion Rate
Soybean Meal - 44%	50.00
DDGS 27/10	14.00
Corn, whole grain	12.75
Wheat, Feed Flour - 12%	10.00
Fish, unspec 60/7	4.00
Calcium phos. di - 18.7%	3.83
Squid Oil, Unspec.	3.00
Blood ML rng. 93/.1	1.50
Vit. PMX-F2	0.50
Min. PMX F1	0.25
Cerqual 500	0.10
Stay C - 35%	0.03
Nutridox	0.03
Choline Chloride - 60%	0.02
Total	**100.00**

[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.

TABLE 2. Formula provided to Feedmill B for the ASA-IM 32/6, soymeal-based feed used in the 2006 ASA-IM SIA Tilapia Demonstration Project at the Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam that demonstrated growth performance of tilapia using the ASA-IM LVHD production model and floating formulated aquafeeds. The feed was fed in a 4-mm pellet size.

32/6[1] Freshwater Fish Growout Feed
2006 Vietnam Tilapia

Ingredient	% Inclusion Rate
Soybean Meal - 47%	45.00
Wheat Pollard 14	34.00
DDGS 27/10	6.00
Fish, Tuna 56/7	5.00
Fish Oil	3.90
Corn Gluten ML 60%	2.25
Calcium phos. mono - 21%	1.77
Blood ML con. 85/1	1.00
Vit. PMX-F2	0.50
Min. PMX F1	0.25
Antioxidant (Van Sanh)	0.20
Mold Inhib.	0.10
Lutavit C 35%	0.03
Total	**100.00**

[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.

TABLE 3. Vitamin and mineral premix formulas produced by Bayer Vietnam and provided to both Feedmill A and Feedmill B for the ASA-IM 32/6 soymeal-based feed used in the 2006 ASA-IM SIA Tilapia Demonstration Project at the Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam

Vitamin Premix PMX-F2[1]

BASF Product	Composition	BASF g product per kg premix	Vitamin Activity per kg BASF product	Vitamin Activity per kg premix
Lutavit A 500	50% vitamin A acetate	2.400	500,000,000 IU vitamin A	1,200,000 IU
Lutavit D3 500	50% activated 7-dehydrocholesterol	0.400	500,000,000 IU vitamin D3	200,000 IU
Lutavit E 50	50% dl-alpha-tocopheryl acetate	40.000	500,000 IU vitamin E	20,000 IU
Lutavit Biotin (H) 2% SD	2% d Biotin	2.000	20,000 mg biotin	40 mg
Lutavit Folic Acid 97	97% folic acid	1.856	970,000 mg folic acid	1800 mg
Lutavit Niacin 99.5	99.5% nicotinic acid	40.191	995,000 mg niacin	40,000 mg
Lutavit CalPan	100% calcium d-pantothenate	21.734	920,000 mg pantothenate	20,000 mg
Lutavit B6	99% pyridoxine hydrochloride	6.136	814,770 mg pyridoxine	5,000 mg
Lutavit Riboflavin SG 80	80% riboflavin	10.000	800,000 mg riboflavin	8,000 mg
Lutavit B1	98% thiamin mononitrate	8.897	899,052 mg thiamin	8,000 mg
Lutavit B12 - 1%	1% cyanocobalamine	0.200	10,000 mg vitamin B12	2 mg
Ethoxyquin, SQ mixture 6	66% ethoxyquin	0.758	660,000 mg ethoxyquin	500 mg
Wheat Flour - 13.2%		865.428		
Total		**1000.000**		

Mineral Premix PMX-F1[1]

Nutrient	Unit	As fed
Iron	ppm	40000
Manganese	ppm	10000
Copper	ppm	4000
Zinc	ppm	40000
Iodine	ppm	1800
Cobalt	ppm	20
Selenium	ppm	200

[1]Premix ingredient quantities are per kg of premix.

TABLE 4. Results of the 2006 ASA-IM SIA Tilapia Demonstration Project at the Phu Long Reservoir, Dalai, Ninh Binh, Yen Khanh District, Vietnam that demonstrated growth performance of tilapia using the ASA-IM LVHD production model with LVHD cages and floating formulated aquafeeds.

Cage No.	Treatment	Stocking size (g)	Stocking rate (fish/cage)	No. days cultured	Harvest weight (g)	Gross Production		Survival (%)	FCR
						(kg/cage)	(kg/m^3)		
1	ASA-IM LVHD	145	1200	72	507	597.6	149.4	98	2.09
2	ASA-IM LVHD	144	1200	72	508	596.2	149.05	98	2.09
3	ASA-IM LVHD	145	1200	72	471	555.2	138.8	98	2.32
	Mean	**145**	**1200**	**72**	**495**	**583**	**145.75**	**98**	**2.17**