

Growth Performance of Common Carp Fed Soy-Maximized Feed in Low Volume, High Density Cages on Lake Maninjau, Indonesia

Results of ASA/Soy-in-Aquaculture 2004 Feeding Trial

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ABSTRACT

A feeding demonstration was conducted at Lake Maninjau, West Sumatra, Indonesia to demonstrate the growth potential of common carp (*Cyprinus carpio*) cultured using soy maximized feeds in 3.5-m³ cages. Common carp fingerlings of 44 g were stocked into three 3.5-m³ cages at 1,755 fish per cage. Fish in all three cages were fed a soybean meal maximized, extruded feed that was produced domestically in Indonesia. After 98 days of culture the common carp reached an average size of 314 g with an average FCR of 1.55:1. Gross production averaged 165 kg/m³ of cage volume.

INTRODUCTION

The American Soybean Association (ASA), under the Soy-in-Aquaculture Program and in cooperation with a local farmer, Mr. Mukhlis, at Lake Maninjau, West Sumatra, Indonesia, conducted a 98-day feeding demonstration with common carp in cages. The objectives of the project were to demonstrate the feasibility of culturing common carp in low volume, high density (LVHD) cages, and to assess their performance on a soy-maximized feed.

MATERIALS AND METHODS

Three, 3.5-m³ (1.7 m x 1.7 m x 1.2 m) cages at the Mukhlis cage farm site in Lake Maninjau, 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 LVHD Manual “Principles and Practices of High Density Fish Culture in Low Volume Cages”. The three demonstration cages were attached to a floating platform frame 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.

Common carp fingerlings of size 25 g were obtained from a local hatchery and grown on site to about 44 g for the demonstration. Common carp were stocked in the demonstration cages at a density of 1,755 fish per cage. Fish in all three cages were of uniform size and age at stocking. Common carp production targets were 350 g per fish and 614 kg per cage, or 176 kg/m³ of cage volume.

Common carp 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 formulated by ASA to maximize soybean meal use, and contained 52% dehulled soybean meal. The 32/6 feed was produced domestically in Indonesia by JAPFA/COMFEED Feedmill in Cirebon, Java. Two other formulated COMFEED feeds, (Pakan Ikan and Pakan Apung), were used with ASA approval as a substitute for the 32/6 feed during portions of the trial. 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 satiation feeding technique.

Cage management was based on the ASA LVHD cage production model. At the conclusion of the trial, all cages were completely harvested and all fish weighed. Ten percent of the harvested fish (about 200 fish) were enumerated when weighed to obtain an average fish size and to estimate fish survival. This was done to limit stress as the fish were not of marketable weight at the project conclusion and were to be transferred to another cage for further culture. Results were used to determine fish survival, average fish weight, gross fish production and feed conversion ratio (FCR).

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RESULTS

Common carp were fed a total of 97 days between February 27 and June 4, 2004. Common carp fed the formulated feeds grew from an average of 44 g to 314 g in this period (Table 3). Gross production in the cages averaged 578 kg, or 165 kg/m³ of cage volume, with an average survival of 91% and 1.55:1 FCR (Table 3).

SUMMARY AND CONCLUSIONS

Common carp may be grown using the ASA LVHD cage technique with a soy-based, extruded feed. However, common carp performance on formulated feed in this demonstration was compromised by a reported problem with spoiled (moldy) feed during part of the project, perhaps as a result of inappropriate storage techniques. Also, there was a substitution of a nutritionally deficient feed for the ASA 32/6 feed during a significant portion of the demonstration. A possible outcome of these problems was that common carp growth was 10% below the target of 350-g, survival was 4% below a standard level of 95%, FCR was higher than the expected level of $\leq 1.25:1$ and time of culture was 39 day longer than typically observed. (Note, since no comparison cages were used, it is difficult to determine if this was a general phenomenon.) FCR was impacted by both potentially spoiled feed and the poor quality of the substitute feed. A follow-on demonstration at an alternative site in Indonesia, which is both closer to the cooperating feedmill and the demonstration protocols and feed specifications are closely adhered to, is recommended to better demonstrate the production and economic advantages of the ASA LVHD technology and soy-maximized fish feed.

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TABLE 1. Formula provided to JAPFA/COMFEED Feedmill for the ASA 32/6, soymeal-based feed used in the 2004 ASA-SIA Common Carp Demonstration Project at Lake Maninjau, West Sumatra, Indonesia that demonstrated growth performance of common carp using the ASA LVHD production model and floating formulated aquafeeds. The feed was fed in 2-mm and 3-mm pellet sizes.

**32/6¹ Freshwater Fish Growout Feed
2004 Indonesia Common Carp**

Ingredient	% Inclusion Rate
U.S. SBM 47.5%	52.00
Wheat flour 12%	22.40
Wheat bran 15%	8.00
CGM 60%	8.00
Fish oil	5.00
Ca-mono-P	2.30
Lecithin	1.50
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C 35%	0.03
Ethoxyquin 100%	0.02

¹The 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.

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TABLE 2. Vitamin and mineral premix formulas provided to JAPFA/COMFEED Feedmill for the ASA 32/6 soymeal-based feed used in the 2004 ASA-SIA Common Carp Demonstration Project at Lake Maninjau, West Sumatra, Indonesia

Vitamin Premix PMX-F2¹

Nutrient	Unit	As fed
Vitamin A	IU/kg	1200000
Vitamin D3	IU/kg	200000
Vitamin E	IU/kg	20000
Biotin	mg/kg	40
Folic acid	mg/kg	1800
Niacin	mg/kg	40000
Pantothenate	mg/kg	20000
Pyridoxine (B6)	mg/kg	5000
Riboflavin (B2)	mg/kg	8000
Thiamin (B1)	mg/kg	8000
Vitamin B12	mcg/kg	2000
Ethoxyquin	mg/kg	500

Mineral Premix PMX-F1¹

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

¹Premix ingredient quantities are per kg of premix.

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TABLE 3. Results of the 2004 ASA-SIA Common Carp Demonstration Project at Lake Maninjau, West Sumatra, Indonesia that demonstrated growth performance of common carp using the ASA LVHD production model with LVHD cages and floating formulated aquafeeds.

Cage No.	Treatment	Stocking size (g)	Stocking rate (fish/cage)	No. days fed	Harvest weight (g)	Gross Production (kg/cage)	Gross Production (kg/m³)	Survival (%)	FCR
1	ASA LVHD	44	1755	98	303	583.3	167	95	1.53
2	ASA LVHD	44	1755	98	317	570.1	163	88	1.58
3	ASA LVHD	44	1755	98	323	580.6	166	89	1.54
	Mean	44	1755	98	314	578.0	165	91	1.55