

Grass Carp Production in LVHD Cages with A Soy-Based Feed: Guangxi Province

Results of ASA/China 2003 Feeding Trial 35-04-90

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ABSTRACT

A feeding trial was conducted in Li Yu Tang Reservoir in Guangxi Province to evaluate production of grass carp in LVHD cages with a soy-based, all-plant protein feed formulated by the American Soybean Association. Grass carp were stocked in three, 4.0-m³ cages at a density of 100 fish per m³. Grass carp grew from 198 g to an average weight of 700 g per fish in 109 days of feeding. Gross production averaged 66.8 kg/m³. Average survival rate for grass carp was 95.3%. Average FCR was 1.83:1.

Grass carp growth was erratic in the 4-m³ LVHD cages. This erratic growth resulted from frequent halting of feeding in response to a combination of storm conditions and local electro-fishing operations that were conducted immediately adjacent to the cages by local fishermen. The grass carp were fed only 109 of 139 days during the culture period. Despite the variable feeding response, grass carp were 17% larger at harvest than the 600-g target size.

The average fish biomass of 67.8 kg/m³ at harvest was nearly 40% higher than with traditional practices. Results from the trial indicate potential for LVHD cage culture of grass carp, but a follow-on evaluation is needed to fully assess the feasibility of the LVHD technology for culturing grass carp in cages with the ASA soy-based diet.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with the Guangxi Provincial Fisheries Extension Center and the China National Fisheries Extension Center (NEC), conducted a Low Volume High Density (LVHD) cage feeding trial with grass carp. The objective was to evaluate grass carp growth and economic performance with a soymeal-based feed and the ASA LVHD cage production model.

MATERIALS AND METHODS

Three, 4-m³ (2 m x 2 m x 1 m) nylon net cages in Li Yu Tang Reservoir in Hengxian County, Guangxi Province, were used for the feeding trial. Cages were constructed of nylon netting with an opaque cover as described in the ASA publication *Principles and Practices of High Density Fish Culture in Low Volume Cages*. Cage placement was in a single row on the outside perimeter of the cage farm, with a minimum of two meters spacing between and on all sides of each cage.

Fish were 198-g grass carp produced locally. Grass carp were stocked in the three trial cages at a density of 100 fish per m³. Fish in all three trial cages were of uniform size and age at stocking. Target market size for the grass carp was 600 g per fish.

Grass carp were fed an all-plant protein, soy-based feed containing 32% crude protein and 3% crude lipid (32/3) (Table 1). The feed was formulated to maximize soy product use, and contained 50% standard soybean meal (44% crude protein) and 16% soy hulls as percentages of total feed ingredients. The feed was fed in extruded, floating pellet form. Feed pellet size was increased as the fish grew, with pellet size maintained at approximately one-half the full open mouth size of the fish. Fish were fed to satiation twice daily, with fish in the three replicate cages receiving an identical amount of feed at each feeding. The feeds were formulated by ASA and produced by Fwusow in Fujian Province.

Trial management was based on the ASA LVHD cage production model. Fish in all cages were sampled once per month on approximately the same date each month. At the conclusion of the trial, all cages were emptied and the fish in each cage were counted and weighed to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival. Production input costs were recorded throughout the trial and net income and return on investment (ROI) were calculated at the end of the trial.

RESULTS

Grass carp were fed 109 of 139 days between 26 May and 11 October 2004. Grass carp grew from 198 g to an average weight of 700 g during this feeding period (Table 2). Gross production averaged 66.8 kg/m³ (Table 2). Average grass carp survival rate was 95.3%. Average FCR for grass carp was 1.83:1 (Table 2).

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Net economic return was RMB 450 (\$54.48)¹ per cage, or RMB 112.4/m³ (\$13.62). Average return on investment (ROI) for the three test cages was 23%.

SUMMARY AND CONCLUSIONS

Grass carp were stocked in the three trial cages by the cooperator at only one-third the designated density of 300 fish per m³ of cage volume. The resulting average fish biomass of 67.8 kg/m³ at harvest was only 38% of the targeted biomass. However, this biomass was still nearly 40% higher than with traditional grass carp culture practices in the area.

Grass carp growth was erratic in the 4-m³ LVHD cages. This erratic growth resulted from irregular feeding in response to a combination of frequent storm conditions and local electro-fishing operations that were conducted immediately adjacent to the cages by local fishermen. The grass carp were fed only 109 of 139 days during the culture period. Feeding was halted during 24 days of storm conditions. Storms were particularly prevalent during July and September, when heavy rain and wind conditions halted feeding for six and ten days, respectively. Despite the variable feeding activity, grass carp were 17% larger at harvest than the 600-g target size.

Results from this trial indicate potential for LVHD cage culture of grass carp, but a follow-on evaluation is needed to fully assess the feasibility of the LVHD technology for culturing grass carp in cages with the ASA soy-based diet.

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¹ RMB 8.26 = US\$1.00

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Table 1. Formula for the ASA 32/3¹, all-plant protein, soy-maximized feed used in the 2004 grass carp cage feeding trial in Li Yu Tang Reservoir, Guangxi Province, China. The feed is a reduced energy, high fiber feed fed in extruded, floating pellet form.

Ingredient	Percent of total
Soybean Meal 44	50.0
Wheat, SWW	20.6
Soy Hulls	16.0
Corn Gluten Meal 60%	8.9
Ca Phosphate Mono	2.43
Fish Oil, Unspec.	1.30
Vit PMX F-2	0.50
Min PMX F-1	0.25
Ethoxyquin	0.02
TOTAL	100.00

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 3% crude fat.

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Table 2. Results of the 2004 ASA aquaculture feeding demonstration in Guangxi Province that evaluated grass carp production in 4-m³ LVHD cages with a soymeal-based feed.

Cage No.	GrC ¹ stocking size (g)	Stocking rate (fish/m ³)	No. days fed	Harvest wt. wt (g)	P _G ² (kg/m ³)	Survival (%)	FCR
1	198	100	109	740	69.5	94	1.70
2	198	100	109	685	67.8	99	1.80
3	198	100	109	677	63.0	93	2.00
Mean	198	100	109	700	66.8	95	1.83

¹GrC = Grass Carp

²P_G = Gross Production