Grass Carp Growth Performance from Fingerling to Market Size with a Soy-Based Diet

Results of ASA/China 1999 Feeding Trial 35-99-64

Michael C. Cremer and Zhang Jian
American Soybean Association
Room 902, China World Tower 2
No. 1 Jianguomenwai Avenue
Beijing 100004, P.R. China

ABSTRACT

Two fingerling sizes of grass carp were grown to market size in ponds using the ASA 80:20 production model and a soy-based diet. Fish were stocked at 600 grass carp per mu together with 100 silver carp per mu. Fingerlings of sizes 70 g and 100 g grew respectively to 797 g and 827 g in 178 days of feeding. Net production for the three, 100-g fingerling ponds averaged 438 kg/mu of grass carp and 113 kg/mu of silver carp. Net production for the three, 70-g fingerling ponds averaged 429 kg/mu of grass carp and 108 kg/mu of silver carp. The 100-g fingerlings reached a target market size of 750 g in 156 days, while the 70-g fingerlings reached 750 g in 165 days. FCR with the ASA all-plant protein, soy-based diet was 1.22 for the 70-g fingerlings and 1.19 for the 100-g fingerlings. Use of this diet in the extruded, floating form allowed the Xu Xing Zhang farm manager to closely monitor fish feeding performance and fish health and prevented over-feeding of fish and wasting of feed. Net economic return and return on investment were RMB 804/mu and 24% for the 70-g fingerling treatment, and RMB 449/mu and 11.7% for the 100-g fingerling treatment.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with the Beijing Xu Xing Zhang Fish Culture Farm and the National Fisheries Extension Center (NEC) and its Beijing Municipal affiliate, conducted a study in 1999 to evaluate grass carp growth performance from fingerling to market size with an all-plant protein, soy-based feed. The trial was the second year of a two-year sequential trial initiated in 1998. The objective of the two-year trial was to establish feed-based growth parameters for the fry to fingerling and fingerling to market production phases of grass carp so that fish farmers could better plan production and marketing strategies for this species. The 1999 feeding trial reported in this paper evaluated fingerling to market growth performance of two fingerling sizes of grass carp.

MATERIALS AND METHODS

Fish for this trial were grass carp fingerlings produced in a 1998 ASA fry to fingerling trial at the Xu Xing Zhang Fish Culture Farm in Beijing. These fish were grown to fingerlings in 1998 at stocking densities of 4,000 and 6,000 fish per mu using the ASA feed-based, 80:20 pond production model and a 36% protein, soy-based feed. Fingerlings from these stocking densities averaged 98 g and 71 g at harvest in October 1998 after 117 days of feeding. The two fingerling

size groups were segregated and over-wintered at the Xu Xing Zhang farm for use in the 1999 growout study.

In 1999, approximately 9,000 fingerlings of each of the two fingerling size groups were randomly selected for use in the fingerling to market growout study. Fingerlings of the two size groups averaged 100 g and 70 g, respectively, when they were restocked in six, 5.0-mu ponds (Table 1). Each fingerling size group was stocked in three ponds. Grass carp fingerlings were stocked at a density of 600 fish per mu together with 100 silver carp fingerlings per mu. Pond water depth averaged approximately 1.5 m. All ponds were equipped with water exchange and stand-by aeration.

Grass carp were fed an extruded (floating) feed formulated by ASA and produced by Shanghai Fwuso aquafeed mill. The feed was formulated to be an all-plant protein diet with 32% protein and 6% fat. Dehulled soybean meal (47.5% crude protein) was the primary protein source (Table 2). Feeding rate and frequency varied with fish size and water temperature following ASA guidelines. Target market size for the grass carp was $\geq$750 g.

Fish in all ponds were sampled once per month on the same date each month. At the conclusion of the trial, all ponds were drained and the grass carp and silver carp in each pond counted and weighed to determine average fish weight, gross and net production, feed conversion ratio (FCR) and survival.

RESULTS

Feeding commenced in April for the two fingerling size groups and ended in October. The 100-g and 70-g grass carp fingerlings grew to 827 g and 797 g, respectively, in the 178-day feeding period (Table 1; Figure 1). The 100-g and 70-g fingerlings grew to the target market size of 750 g in 156 days and 165 days, respectively (Figure 1).

Net production from the 100-g fingerling ponds averaged 438 kg/mu of grass carp and 113 kg/mu of silver carp (Table 1). The 70-g fingerling ponds had an average net production of 429 kg/mu of grass carp and 108 kg/mu of silver carp. Net production was not significantly different for the two fingerling size groups.

Feed conversion ratios for the 100-g and 70-g fingerling treatments were 1.19:1 and 1.22:1, respectively (Table 1). Average survival was 90% for the 100-g fingerlings and 92% for the 70-g fingerlings (Table 1).

Net economic return and return on investment (ROI) averaged RMB 804/mu and 24%, respectively, for the 70-g fingerling treatment, and RMB 449/mu and 11.7% for the 100-g fingerling treatment (Table 1).

SUMMARY AND CONCLUSIONS

Feed-based production of grass carp using the ASA 80:20 pond production model and an extruded, soy-based diet was feasible with both fingerling sizes tested. Grass carp fingerlings of

70 g and 100 g at stocking both exceeded the target market size of ≥750 g before the end of the production season. The 100-g fingerlings reached the 750-g target size in 156 days, while the 70-g fingerlings reached 750 g in 165 days (Figure 1).

Economic return was best for the 70-g fingerling group. Net economic return averaged RMB 804/mu for the 15 mu of ponds used to evaluate this fingerling size group. An ROI of 24% for the 70-g fingerling size group was more than twice that obtained with the 100-g fingerlings. Results indicate there is no economic incentive to producing larger fingerlings by stocking fish at a lower density during the fry to fingerling production phase. The 70-g fingerlings tested in the 1999 trial were produced in 1998 at a stocking density of 6,000 fish per mu using the ASA 80:20 pond production model and a 36% protein, soy-based diet.

The all-plant protein, soy-based ASA growout diet resulted in excellent feed conversion efficiency with both fish size groups tested in the 1999 trial. FCR ranged from 1.19:1 to 1.22:1. Use of this diet in the extruded, floating form allowed the Xu Xing Zhang farm manager to closely monitor fish feeding performance and fish health and prevented over-feeding of fish and wasting of feed.

ACKNOWLEGEMENTS

ASA gratefully acknowledges the Xu Xiang Zhang farm staff, Beijing aquaculture extension personnel, and the Director and staff of the National Fisheries Extension Center for their assistance and support for this aquaculture trial.

Chinese Currency and Production Unit Conversions:

RMB 8.26 = US$1.00
15 mu = 1.0 hectare (ha)
kg/mu x 15 = kg/ha
1.0 kg = 2.2 lb
6 mu = 1.0 acre (ac)
kg/mu x 13.2 = lb/ac

TABLE 1. Results of the 1999 ASA aquaculture trial at the Beijing Xu Xing Zhang Fish Culture Farm that evaluated pond production performance of two fingerling sizes of grass carp using the ASA 80:20 production model and an all-plant protein, soy-based diet.

Fingerling stocking size (g)	Stocking rate (fish/mu)		No. days fed	GrC harvest weight (g)	Net production (kg/mu)		Survival (%)	FCR	Net return (RMB)	ROI (%)
	GrC[1]	SiC[2]			GrC	SiC				
100	600	100	178	827	438	113	90	1.19	449	11.7
70	600	100	178	797	429	108	92	1.22	804	24.0

[1]GrC = grass carp
[2]SiC = silver carp

TABLE 2. Feed formula for the ASA all-plant protein, soy-based growout diet used in the 1999 grass carp growout trial at Xu Xing Zhang Fish Culture Farm, Beijing.

Ingredient	Percentage of ration
Soybean meal 47.5	52.8
Wheat, SWW	23.6
Wheat midds	10.0
Corn gluten meal 60%	6.0
Fish oil	3.53
Soy lecithin	1.0
Ca phosphate mono	2.7
Vit PMX Roche 2118	0.1
Min PMX F-1	0.25
Ethoxyquin	0.02

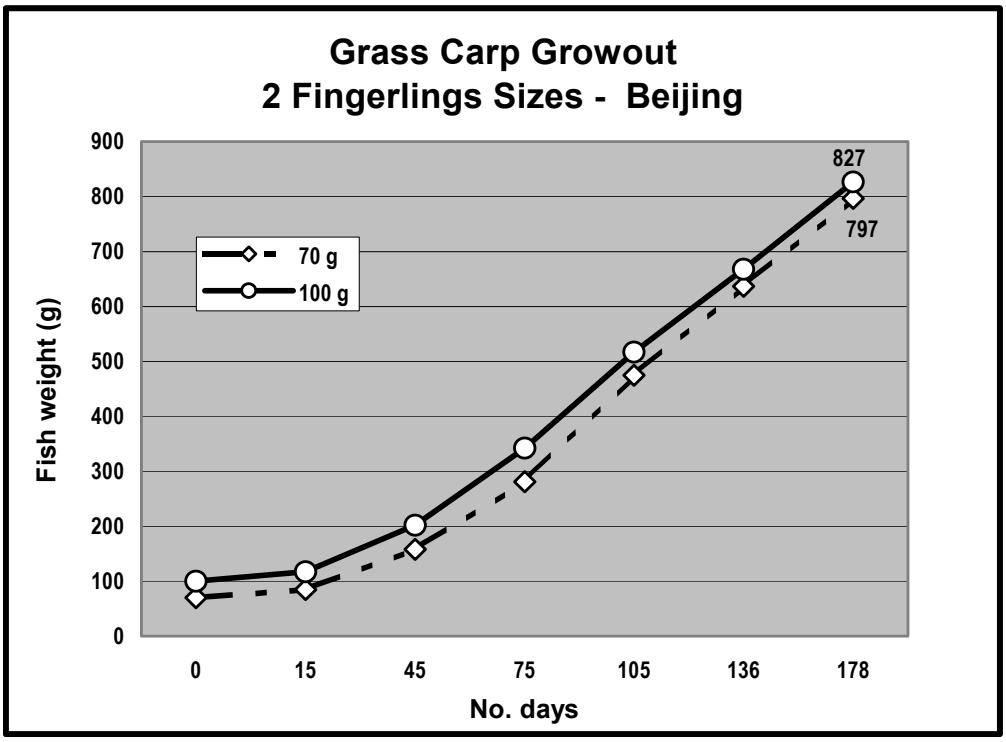

Figure 1. Growth curves for 70 g and 100 g grass carp fingerlings grown to market size in the 1999 ASA trial at Xu Xing Zhang Fish Culture Farm in Beijing, China. Data points represent fish size at monthly sampling intervals. The two fingerling size groups reached the minimum target market size of 750 g in approximately 156 and 165 days. Feeding with a soy-based, 32% protein diet for 178 days produced fish averaging 797 g and 827 g in weight from the 70 g and 100 g fingerling sizes, respectively.