

# **Crucian Carp Fingerling Production in Ponds in Harbin Using Soy-Based Feeds and Zero Water Exchange Technology**

## **Results of ASA/China 2002 Feeding Trial 35-02-102**

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### **ABSTRACT**

A feeding trial was conducted in Harbin, Heilongjiang Province, to demonstrate fry to fingerling production of crucian carp using the ASA 80:20 pond production model and soy-based feeds, together with zero water exchange technology. Crucian carp were stocked in three, 3.5-mu ponds at a density of 4,000 crucian carp and 1,000 silver carp per mu. Crucian carp grew from 0.25 g to an average weight of 31.8 g per fish in 104 days of feeding. Crucian carp FCR with the ASA soymeal-based fry and fingerling feeds averaged 1.18:1. The average survival rate for crucian carp was 77.3%. Average net economic return was RMB 248 per mu, for an average return on investment (ROI) of 27%. Results of the feeding demonstration showed that it was feasible to culture crucian carp fingerlings with the ASA feeds and 80:20 model, together with zero water exchange technology. Crucian carp exhibited good growth performance and FCR with the ASA soymeal-based feeds and 80:20 production technology. The Pengze crucian carp from Jiangxi Province tested in this trial were found to have a poorer feeding response than other varieties of crucian carp previously tested, such as the Yuyi. The use of zero water exchange was found to be of critical importance in water restricted regions such as northeast China, and its application is recommended for fish production throughout this region.

### **INTRODUCTION**

The American Soybean Association (ASA), in cooperation with the Heilongjiang Provincial Fisheries Extension Center and its demonstration fish farm, and the China National Fisheries Extension Center (NEC), conducted a 3.5-month pond feeding trial with crucian carp. The objective of the trial was to demonstrate crucian carp growth and economic performance from fry to fingerling stages with the ASA 41/11 and 36/7 soymeal-based feeds and 80:20 pond production model, together with zero water exchange technology. Zero water exchange technology uses only minimal pond water exchange during the production season and is designed for areas with critical water shortages and/or poor aquaculture source water that restricts water availability.

## **MATERIALS AND METHODS**

Three ponds of average size 3.5-mu at the Demonstration Fish Farm of the Heilongjiang Provincial Fisheries Extension Center in Harbin, Heilongjiang Province, were used for the feeding trial. Pond water depth averaged approximately 1.5 m. All ponds were equipped with stand-by aeration. The ponds were operated using the zero water exchange management concept in which water is added during the production cycle only to replace seepage and evaporation losses. Dissolved oxygen content of the water in each trial pond was monitored on a daily basis with a dissolved oxygen meter and recorded.

Fish were 0.25-g Pengze strain crucian carp purchased from Jiangxi Province. Crucian carp were stocked in the three trial ponds in late May at a density of 4,000 fish per mu, together with 1,000 silver carp fry per mu. Fish in all three trial ponds were of uniform size and age at stocking. Target fingerling size for the crucian carp was 50 g.

Crucian carp were fed the ASA 41/11, soy-based fry feed in crumble form from the time of stocking to fish size 3.0 g (Table 1). At fish size 3.0 g the crucian carp were weaned to the ASA 36/7 fingerling feed in extruded, floating pellet form (Table 2). Initial floating pellet size was 1.5 mm. 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 ponds receiving an identical amount of feed at each feeding. The feeds were formulated by ASA and produced by Cargill in Jiangsu Province.

Trial management was based on the ASA 80:20 pond production model, together with zero water exchange. Fish in all ponds were sampled once per month on approximately the same date each month. At the conclusion of the trial, all ponds were drained and the mirror and silver carp in each pond 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 ROI were calculated at the end of the trial.

## **RESULTS**

Crucian carp were fed a total of 104 days between 8 June and 20 September 2002. Crucian carp grew from 0.25 g to an average weight of 31.8 g during this feeding period (Figure 1; Table 3). Gross production averaged 98.3 kg/mu for crucian carp and 37 kg/mu for silver carp (Table 3). Average crucian and silver carp survival rates were 77.3% and 71.2%, respectively. Average FCR for mirror carp with the combination of 41/11 and 36/7 soymeal-based feeds was 1.18:1.

Net economic return averaged RMB 248 per mu at a market price of RMB 10/kg for crucian carp and RMB 5/kg for silver carp (Table 3). ROI averaged 27% for the three trial ponds (Table 3).

## **SUMMARY AND CONCLUSIONS**

It was technically and economically feasible to culture crucian carp fingerlings using the combination of ASA soymeal-based feed, 80:20 model and zero water exchange. Fish exhibited good health and were disease-free for the duration of the feeding trial. Water was added to the ponds only to compensate for seepage and evaporation losses. No water was pumped out of the ponds, thereby saving both water and energy, as well as reducing external environmental impact.

No drugs or chemicals were required throughout the trial, which produced a contamination free “green” product.

Average fish production of less than 100 kg per mu was substantially below the 400 kg per mu carrying capacity of the ponds, and did not test the application of zero water exchange technology at optimal carrying capacity. It is recommended that the similar trials be conducted, using zero water exchange technology, but higher fish stocking rates. This will allow demonstration of zero water exchange in situations where fish production is at or near the optimal 400 kg per mu carrying capacity.

Pengze mirror carp were difficult to establish on extruded feed. They did not readily consume the extruded feed at the water surface, even after training. Pengze strain crucian carp were found to be more difficult to wean than other varieties of crucian carp, such as Yuyi. As a result of reduced feeding, crucian carp in this trial did not reach the target fingerling size of 50 g.

All of the trial ponds were newly constructed. Well water was used to fill the ponds. The combination of new ponds and well water resulted in limited natural food organism availability and the production of nuisance aquatic weeds in the ponds. Both factors impacted fish production.

## **ACKNOWLEDGEMENTS**

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## **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

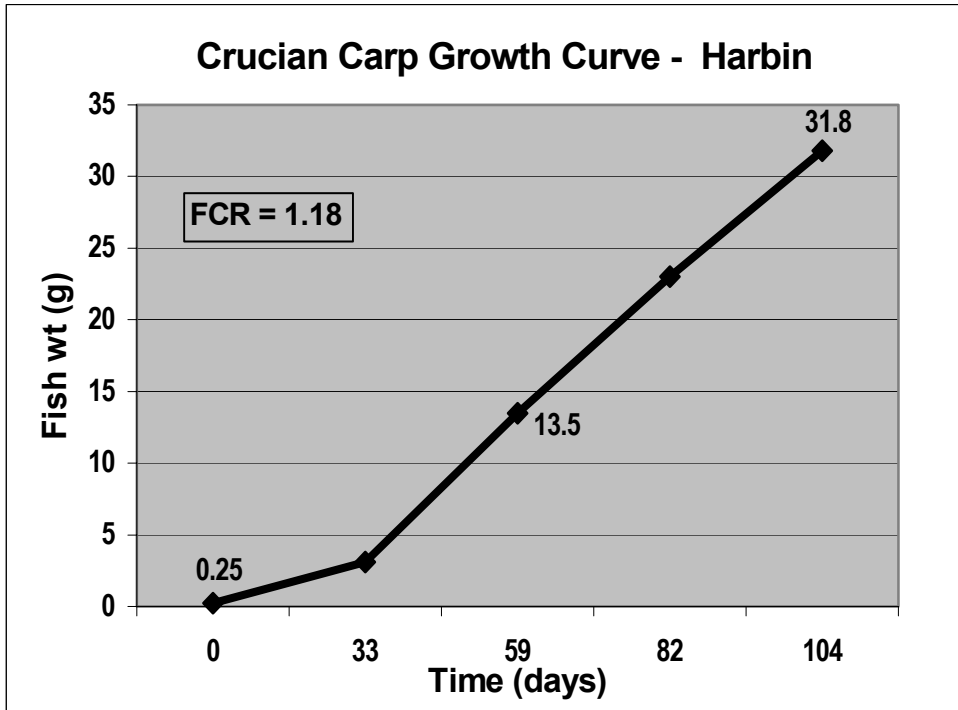


FIGURE 1. Growth curve for crucian carp produced in Harbin, northeastern China, in zero water exchange ponds with ASA soy-based feeds. Crucian carp grew from 0.25 g to 31.8 g in 104 days with an average feed conversion ratio of 1.18:1.

Table 1. Formula for the ASA 41/11, soymeal-based fry feed used in the 2002 crucian carp demonstration feeding trial in Harbin, Heilongjiang Province, China. The feed was fed in crumble form to fish from size 0.25-g to 3.0-g.

Ingredient	41/11 Fry Feed <sup>1</sup>
Soybean meal 47.5	46.3
Corn gluten meal 60%	15.0
Fishmeal, Anchovy 65/10	14.0
Wheat, SWW	13.0
Fish oil	4.03
Soy oil	4.00
Soy lecithin	1.50
Ca phosphate mono	1.70
Vit PMX Roche 2118	0.20
Min PMX F-1	0.25
Ethoxyquin	0.02
Total	100.00

<sup>1</sup>The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 41/11 indicates 41% crude protein and 11% crude fat.

Table 2. Formula for the ASA 36/7, soymeal-based fingerling feed used in the 2002 crucian carp demonstration feeding trial in Harbin, Heilongjiang Province, China. The feed was fed in extruded, floating pellet form to fish from size 3.0-g.

Ingredient	36/7 Fingerling Feed <sup>1</sup>
Soybean meal 47.5	46.3
Wheat, SWW	19.0
Corn gluten meal 60%	10.0
Fishmeal, Anchovy 65/10	8.0
Wheat midds 15%	8.0
Fish oil	4.58
Soy lecithin	1.50
Ca phosphate mono	2.20
Vit PMX Roche 2118	0.15
Min PMX F-1	0.25
Ethoxyquin	0.02
Total	100.00

<sup>1</sup>The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 36/7 indicates 36% crude protein and 7% crude fat.

Table 3. Results of the 2002 ASA aquaculture trial in Harbin that demonstrated fry fingerling growth performance of Pengze strain crucian carp using soy-based fry and fingerling feeds and a combination of the ASA 80:20 production model and zero water exchange technology.

Pond No.	CrC <sup>1</sup> stocking size (g)	Stocking rate (fish/mu)	No. days fed	Harvest wt. (g)		P <sub>G</sub> <sup>3</sup> (kg/mu)		Survival (%)		FCR	Net (RMB/mu)	ROI (%)
				CrC	SiC <sup>2</sup>	CrC	SiC	CrC	SiC			
1	0.25	4,000	104	31.8	53.2	100.3	33	78.9	62.3	1.16	248	27.0
2	0.25	4,000	104	30.6	50.9	96.0	31	78.4	61.9	1.21	195	21.2
3	0.25	4,000	104	33.1	52.0	98.6	47	74.5	89.4	1.18	301	32.7
Mean	0.25	4,000	104	31.8	52.0	98.3	37	77.3	71.2	1.18	248	27.0

<sup>1</sup>CrC = Crucian carp

<sup>2</sup>SiC = Silver carp

<sup>3</sup>P<sub>G</sub> = Gross Production