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Songpu Variety Common Carp Exhibit Rapid Growth on Soy-Based Diet in Harbin Feeding Trial

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INTRODUCTION

A feeding trial was conducted cooperatively by the American Soybean Association International Marketing (ASA-IM) program and the Heilongjiang Provincial Fishery Extension Center to test feed-based production of Songpu variety common carp in ponds in the short production season of northeastern China, latitude 46° north. The trial was conducted at the Heilongjiang Provincial Fishery Extension Center Demonstration Fish Farm near Harbin. The feeding trial evaluated Songpu carp performance on an ASA-IM soymeal-based feed and the resulting economic value to fish farmers in northeast China.

FEEDING TRIAL PROTOCOLS

Three, 5-mu (0.33-ha) ponds were used in the feeding trial to assess feed-based production of Songpu carp. Songpu carp were stocked in the ponds at a density of 450 fish per mu (6,750/ha), together with 100 silver carp per mu (1,500/ha). Mean weight of the Songpu carp at stocking was 179 g. Songpu carp were stocked in the ponds on 9 May 2006, and fed for 129 days with the ASA-IM 32/6¹ feed. The ASA-IM feed is a least-cost formulated, all or primarily plant protein ration that has soybean meal as the primary source of protein. Songpu carp were fed the 32/6 feed to satiation twice daily, with fish in the three trial ponds receiving the same amount of feed at each feeding. All feed was fed in extruded, floating pellet form. Target market size for the Songpu carp was 1,000 g per fish.

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.

FEEDING TRIAL RESULTS

Songpu carp grew from 179 g to an average weight of 1,107 g per fish during the 129-day trial period (Table 4). Fish production averaged 480.4 kg/mu (7,206 kg/ha) for Songpu carp and 74.4 kg/mu (1,116 kg/ha) for silver carp. The average survival rates for Songpu and silver carp were 96.4% and 91%, respectively. The feed conversion ratio (FCR) for Songpu carp with the soy-based 32/6 feed averaged 1.27:1 for the three trial ponds.

The trial yielded an average net economic return of RMB 956 per mu (\$1,815/ha) at market prices of RMB 8/kg (\$1.01/kg) for Songpu carp and RMB 4/kg (\$0.50/kg) for silver carp (Table 4). Return on investment (ROI) for the three demonstration ponds averaged 30%.

SUMMARY AND CONCLUSIONS

Songpu carp grew well on the soy-based feed and exceeded the target market size of 1,000 g by 10.7% in 129 days in the short aquaculture production season of northeastern China. The low FCR of 1.27:1 indicated excellent feed utilization efficiency, despite some feed waste due to heavy winds in the area. No drugs or chemicals were used in the trial, and the ASA-IM soy-based feed produced a quality “green” product of good body conformation and taste. The trial also demonstrated water conservation techniques by minimizing water exchange in compliance with ASA-IM water conservation technology.

The cooperator indicated it was very easy to train the Songpu carp to take the soy-based extruded feed, and that it only required 2-3 days. It was also noted that stocking with uniform size fingerlings yielded better survival and larger, more uniform fish at harvest than the cooperator normally experiences.

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Table 1. Formula for the ASA-IM 32/6 soy-based feed used in the 2006 Songpu carp pond feeding trial in Harbin, Heilongjiang Province, China. The feed was produced as a least-cost formulation by Techbank Feed Mill, Shanghai, under supervision of ASA-IM. The feed was fed in extruded, floating pellet form. Feed batch formulations varied slightly during the trial period depending on specific ingredient nutrient profiles and ingredient availability.

Ingredient	Percent of total
Soybean Meal 46%	51.00
Wheat Middlings 14%	14.00
Wheat Flour 11%	12.00
DDGS, 27/10	11.50
Fish Meal, 65/8	3.00
Ca Phosphate Mono 21%	2.00
Soy Oil	1.50
Soy Lecithin	1.50
Corn Gluten Meal 60%	1.50
Fish Oil	1.20
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C – 35%	0.03
Ethoxyquin, SQ mixture 6	0.02
TOTAL	100.00

Table 2. Calculated nutritional profile of the ASA-IM 32/6 soy-based feed used in the 2006 Songpu carp pond feeding trial in Harbin, Heilongjiang Province, China. The feed was produced in extruded, floating pellet form.

Nutrient	Value, As Fed
DE Fish (extruded)	2369.68
NFE	39.83
Starch	17.89
Protein, crude	32.74
Protein, digestible	29.82
Fish Protein	1.95
Soy Protein	23.46
Fat	6.07
W-3 (omega 3 fatty acid)	0.57
W-6 (omega 6 fatty acid)	2.08
Ash	6.06
Calcium	0.60
Phosphorus, available	0.61
Choline	2469.93
Vitamin C	105.00
Ethoxyquin	134.50
Arginine	2.06
Isoleucine	1.63
Lysine	1.85
Methionine	0.50
Methionine + Cystine	1.00

Table 3. Vitamin and mineral premix formulations used in the ASA-IM 32/6 soy-based carp feed. Quantities of vitamins and minerals are per kilogram of premix.

Ingredient	Unit	Amount
<u>Vitamin Premix F-2</u>		
Vitamin A	IU/kg	1,200,000
Vitamin D3	IU/kg	200,000
Vitamin E	IU/kg	20,000
Vitamin K	mg/kg	0
Vitamin C	mg/kg	0
Biotin	mg/kg	40
Choline	mg/kg	0
Folic Acid	mg/kg	1,800
Inositol	mg/kg	0
Niacin	mg/kg	40,000
Pantothenate	mg/kg	20,000
Pyridoxine (B6)	mg/kg	5,000
Riboflavin (B2)	mg/kg	8,000
Thiamin (B1)	mg/kg	8,000
Vitamin B12	mcg/kg	2,000
Ethoxyquin	mg/kg	500
<u>Mineral Premix F-1</u>		
Iron	ppm	40,000
Manganese	ppm	10,000
Copper	ppm	4,000
Zinc	ppm	40,000
Iodine	ppm	1,800
Cobalt	ppm	20
Selenium	ppm	200

Table 4. Results of the 2006 ASA-IM aquaculture trial in Harbin that demonstrated fingerling to market growth performance of Songpu strain common carp in ponds using the ASA 80:20 production model and a 32/6 soy-based feed fed in extruded, floating pellet form.

Pond No.	CoC ¹ stocking size (g)	Stocking rate (fish/mu)	No. days fed	Harvest wt. (g)		P _G ³ (kg/mu)		Survival (%)		FCR	Net income (RMB/mu) ⁴	ROI (%)
				CoC	SiC ²	CoC	SiC	CoC	SiC			
1	179	450	129	1,149	805	499.8	73.2	96.7	91	1.21	1,107	34.7
2	179	450	129	1,101	817	474.6	75.2	95.8	92	1.28	913	28.7
3	179	450	129	1,071	831	466.8	74.8	96.8	90	1.31	849	26.7
Mean	179	450	129	1,107	818	480.4	74.4	96.4	91	1.27	956	30.0

¹CoC = Common Carp, Songpu strain

²SiC = Silver Carp

³P_G = Gross Production

⁴RMB exchange rate: RMB 7.9 = \$1.00