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Largemouth Bass Production with a 30% Soybean Meal Inclusion Feed

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INTRODUCTION

A feeding trial was conducted cooperatively by the American Soybean Association International Marketing (ASA-IM) program and the Shanxi Provincial Fishery Extension Center to test feed-based production of advanced fingerling to market largemouth bass in ponds with a 30% soymeal-inclusion fish feed developed by ASA-IM. The trial was conducted at the Taiyuan Municipal Fish Stock Farm in Taiyuan, Shanxi Province, China.

FEEDING TRIAL PROTOCOLS

The trial was conducted using the ASA-IM 80:20 pond technology model, with largemouth bass as the fed species and silver carp as the service species. Three, 2.0-mu (0.13-ha) ponds were used for the feeding trial. Largemouth bass advanced fingerlings produced at the Taiyuan Municipal Fish Stock Farm were stocked in the trial ponds on 8 June 2008 at a density of 1,000 fish per mu (15,000/ha), together with 125 silver carp per mu (1,875/ha). Mean weight of the largemouth bass at stocking was 191 g. Mean weight of the silver carp at stocking was 197 g. Target size for largemouth bass for the trial was 400 g.

Largemouth bass were fed the ASA-IM 43/12[1] marine fish growout feed in extruded, floating pellet form (Tables 1, 2 and 3). Feed pellet size was increased appropriately as the fish grew, with pellet size maintained at approximately one-half the full open mouth size of the fish. Largemouth bass were fed to satiation twice daily, with fish in the three trial ponds receiving the same amount of feed at each feeding. The feed was least-cost formulated by ASA-IM, and produced for ASA-IM by Techbank Feed Company in Ningbo, Zhejiang Province.

[1]The numerical component of the feed description refers to the percentage of protein and fat, respectively, in the ration, i.e. 43/12 indicates 43% crude protein and 12% crude fat.

Data on fish survival, gross and net production, average fish weight, and feed conversion efficiency were obtained at harvest for fish in each pond. All fish from each pond were weighed at harvest and sub-samples from each pond counted to get the average fish weight for each species in each pond population. Data on production input costs was recorded throughout the trial to determine the economic return with the ASA-IM feed and technology.

FEEDING TRIAL RESULTS

Largemouth bass grew from 190 g to an average weight of 384 g per fish in 125 days of feeding between 13 June and 15 October 2008 (Table 4). Largemouth bass production averaged 377 kg/mu (5,655 kg/ha) in the three trial ponds. The ponds yielded an additional 86.5 kg/mu (1,298 kg/ha) of silver carp at harvest. The average survival rates for largemouth bass and silver carp in the three trial ponds were 98.2% and 99%, respectively. The average feed conversion ratio (FCR) for largemouth bass with the 30% soymeal inclusion 43/12 feed was 1.30:1.

The trial yielded an average net economic return of RMB 1,588 per mu ($3,555/ha) at a market value of RMB 26/kg ($3.88/kg) for largemouth bass and RMB 5/kg ($0.75/kg) (Table 4). Return on investment (ROI) for the three trial ponds averaged 18.6%.

SUMMARY AND CONCLUSIONS

Largemouth bass were successfully cultured to market size on the 30% soybean meal inclusion diet without the use of supplemental fresh fish. Average daily weight gain for largemouth bass was 1.85 g during the 125 days of feeding. Largemouth bass exhibited good feed conversion efficiency with the 43/12 diet, yielding an average FCR of 1.30:1 for the 194 g of growth attained. Water quality remained good throughout the trial as a result of the high quality of the extruded feeds. No drugs or chemicals were used in the trial, allowing the harvested fish to conform to high quality “green” product standards.

Largemouth bass in the ASA-IM feeding trials conducted at the Taiyuan Municipal Fish Stock Farm in both 2007 and 2008 exhibited advanced gonad development and some reproduction was evident at harvest. This, combined with the relatively slow growth of the bass, indicate that the genetic quality of the bass stock has deteriorated in recent years and that new genetic stock is needed to improve fish performance and yield.

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Table 1. Formula for the ASA-IM 43/12 marine fish growout feed fed to largemouth bass in the 2008 feeding trial conducted in Taiyuan, Shanxi Province, China. The feed was produced as a least-cost formulation by Techbank Feed Company in Ningbo, Zhejiang Province, under supervision of ASA-IM. The feed was produced in extruded, floating pellet form.

Ingredient	Percent of total
Soybean Meal 46.5%	30.00
Fish Meal, Anchovy 64.5%	28.00
Wheat Flour 11.5%	16.00
Fish Oil	7.70
Blood Meal, spray dried 90%	6.00
Wheat Midds 16.5%	4.90
Corn Gluten Meal 65%	4.50
Soy Lecithin/Corn Blend	2.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Choline Chloride 50%	0.05
Mold Inhibitor	0.05
Stay C – 35%	0.03
Ethoxyquin, SQ mixture 6	0.02
TOTAL	100.00

Table 2. Calculated nutritional profile of the ASA-IM 43/12 marine fish growout feed used in the 2008 largemouth bass pond feeding trial in Taiyuan, Shanxi Province, China. The feed was produced in extruded, floating pellet form.

Nutrient	Value, As Fed
DE Fish (extruded)	3,432
NFE	25.16
Starch	15.04
Protein, crude	43.07
Protein, digestible	40.61
DE:DP Ratio	8.45:1
Fish Protein	18.06
Soy Protein	13.95
Fat	12.02
W-3 (omega 3 fatty acid)	2.60
W-6 (omega 6 fatty acid)	0.95
Fiber	2.16
Ash	7.08
Calcium	1.21
Phosphorus, available	0.60
Choline	2,555
Vitamin C	105
Ethoxyquin	134.50
Arginine	2.49
Lysine	2.91
Methionine	0.91
Methionine + Cystine	1.44
Threonine	1.76
Tryptophan	0.49

Table 3. Vitamin and mineral premix formulations used in the ASA-IM 43/12 marine fish feed used in the 2008 largemouth bass feeding trial in Taiyuan, Shanxi Province. Quantities of vitamins and minerals are per kilogram of premix. Premixes were produced by the Phoenix Feed Mill premix plant in Chengdu, Sichuan Province, under supervision of ASA-IM.

Ingredient	Unit	Amount
Vitamin Premix F-2		
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
Mineral Premix F-1		
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 2008 ASA-IM aquaculture trial in Taiyuna, Shanxi Province that evaluated growth performance of largemouth bass in ponds using the ASA 80:20 production model and 30% soymeal inclusion 43/12 fish feed fed in extruded, floating pellet form.

Pond No.	LMB[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 (%)
		LMB	SiC[2]		LMB	SiC	LMB	SiC	LMB	SiC			
1	180.5	1,000	125	125	383	718	374.5	71.6	97.8	100	1.24	1718	20.5
2	184.7	1,000	125	125	400	970	388.4	95.6	97.1	98	1.18	2090	24.6
3	206.5	1,000	125	125	368	919	367.3	92.4	99.8	100	1.49	956	10.6
Mean	190.6	1,000	125	125	384	869	376.7	86.5	98.2	100	1.30	1588	18.6

[1]LMB = Largemouth Bass

[2]SiC = Silver Carp

[3]P_G = Gross Production

[4]RMB exchange rate: RMB 6.7 = $1.00