Production of Red Drum in 6.4-m^3 Cages In Coastal Waters in Quanzhou, China

Results of ASA/China 2004 Feeding Trial 35-04-100

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ABSTRACT

A feeding trial was conducted in Quanzhou, Fujian Province, China to demonstrate growth performance of red drum from sub-market to market size in near-shore coastal cages with a high soybean meal inclusion feed. Red drum were stocked in three, 6.4-m^3 cages at a density of 1,000 fish per cage. Red drum were fed a 43% crude protein, 12% crude lipid diet formulated with soybean meal at a 32% inclusion rate as partial substitution for fish meal.

Red drum grew from 227 g to an average weight of 1,037 g per fish in 89 days of feeding. Gross production averaged 121 kg/m^3 (775 kg per cage) in the three trial cages. The average survival rate for fish in the three cages was 74.9%. Average FCR was 1.77:1. Average net economic return was RMB 3,096 ($375) per cage, yielding a 26.6% return on investment.

Red drum demonstrated rapid growth with the high soy-inclusion feed, growing to more than twice the 500-g target size in 89 days. FCR was significantly impacted by high fish mortality following a net change and fish handling stress after day 55 of the trial.

INTRODUCTION

The American Soybean Association (ASA), in cooperation with Quanzhou Fisheries Technology Extension Center and the China National Fisheries Extension Center (NEC), conducted a three-month cage feeding trial with red drum (*Sciaenops ocellatus*). The objective of the trial was to demonstrate red drum growth and economic performance from sub-market to market stages in low volume high density (LVHD), near-shore ocean cages with a high soybean meal inclusion feed.

MATERIALS AND METHODS

Three cages of average size 6.4-m^3 (underwater volume) at the Xiaocuo Aquaculture Technology Development Company cage fish farm at Xiao Cuo Yang Yu Bay, Xiaocuo, Quanzhou City, Fujian Province, were used for the feeding trial. Cages were constructed of nylon netting over a rigid cage frame. Cages were individually fitted with an opaque cover and a feed enclosure to contain extruded, floating feed pellets. Cage placement was at the perimeter of the cage farm, with a minimum spacing of two meters between and on all sides of each cage.

Fish were 227-g red drum produced in the 2003 ASA red drum trial in Quanzhou. Red drum were stocked in the three trial cages on 23 May at a density of 1,000 fish per cage. Fish in all three trial cages were of uniform size and age at stocking. Target market size for red drum was 500 g per fish on a 90-day production schedule.

Red drum were fed a modified form of the ASA 43/12 marine growout feed in extruded, floating pellet form (Table 1). The feed was modified from the standard ASA 43/12 formula to use regular, 44% crude protein soybean meal instead of dehulled, 47.5% crude protein soybean meal. Dehulled soybean meal was not available in the China market due to high soybean meal prices prevalent in 2004. The modified feed was formulated with soybean meal at a 32% inclusion rate as partial replacement for fishmeal. Fish were fed to satiation twice daily, with fish in all three cages fed identically at every feeding. Feed pellet size was increased as the fish grew so that the maximum size pellet that all fish could consume was being fed.

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 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

Red drum were fed a total of 89 days between 23 May and 20 August 2004. Red drum grew from 227 g to an average weight of 1,037 g during this feeding period (Table 2). Gross production averaged 775 kg per cage, or 121.1 kg/m^3 (Table 2). Average red drum survival rate was 74.9%. Average FCR for red drum with the high soy-inclusion feed was 1.77:1.

Average feed cost per kilogram of fish growth was RMB 10.62 ($1.28/kg)[1]. Net economic return for the 89-day production cycle averaged RMB 3,096 per cage ($374.82) at a red drum market price of RMB 19/kg ($2.30/kg) (Table 2). Return on investment averaged 26.6% for the three trial cages (Table 2).

SUMMARY AND CONCLUSIONS

Red drum exhibited rapid growth and good feed conversion efficiency with the 43/12 high soy-inclusion feed. Red drum grew to more than twice the 500-g target market size within the planned 90-day culture cycle. FCR was significantly impacted by high fish mortality that occurred following a net change after day 55 of the trial. Mortality was believed to be related to fish handling stress.

Cooler weather than normal during the trial period was believed to have been beneficial in stimulating fish growth and in reducing fish disease. Water temperature in Xiao Cuo Yang Yu Bay normally reaches 30^{o}C in June, but did not reach this level until late July in 2004.

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[1] RMB 8.26 = $1.00

Table 2. Formula for the 43/12,, high soy-inclusion marine fish feed used in the 2004 red drum trial conducted at Cuo Yang Yu Bay, Quanzhou City, Fujian Province, China.[1]

Ingredient	Percentage of feed
Fishmeal 68/10	40.00
Soybean Meal 44	32.00
Wheat Flour	17.25
Fish Oil, Unspec.	6.95
Corn Gluten Meal	2.00
Soy Lecitin	1.00
Vit PMX F-2	0.50
Min PMX F-1	0.25
Stay C 35	0.03
Ethoxyquin	0.02
TOTAL	100.00

[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.

Table 2. Results of the 2004 ASA aquaculture trial in Cuo Yang Yu Bay, Quanzhou that demonstrated sub-market to market growth performance of red drum in 6.4-m^3 coastal cages with a high soy-inclusion feed.

Cage No.	Fish stocking size (g)	Stocking rate (fish/cage)	No. days fed	Fish harvest wt. (g)	Fish production kg/cage	Fish production kg/m^3	Survival (%)	FCR	Net (RMB/cage)	ROI (%)
1	227	1,000	89	1,085	735	114.8	67.7	1.90	2,327	20.0
2	227	1,000	89	1,030	782	122.2	75.9	1.76	3,224	27.7
3	227	1,000	89	996	809	126.4	81.2	1.63	3,738	32.1
Mean	227	1,000	89	1,037	775	121.1	74.9	1.77	3,096	26.6