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Wild versus domesticated: A TSV-resistance comparison

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Farm study finds performance of TSV-resistant PL from Colombia superior to wild Guatemalan shrimp postlarvae

Mayasal S.A. evaluated postlarvae performance under commercial growout conditions at its farm in Guatemala.

In Guatemala, Taura Syndrome Virus (TSV) has negatively affected the shrimp-farming industry since 1994, reducing overall shrimp survival from 81 percent to 30 percent. To combat the disease, several farms in Guatemala began in 1999 to use domesticated, TSV-resistant postlarvae (PL) from Colombia.

Although results were positive, the high cost of the postlarvae – up to 16 times higher than local or wild-caught seed – was a deterrent to further use. To further examine the benefits of the TSV-resistant PL, Mayasal S.A. compared the performance of Colombian and local wild PL under commercial grow-out conditions at its farm in Guatemala.

Pond selection

Three production ponds were selected to stock TSV-resistant PL imported directly from the Corporación Centro de Investigación de la Acuicultura de Colombia (CENIACUA). Nine ponds adjacent to the ponds with Colombian seed received wild Guatemalan PL from the collection area known as “El Ahumado.” All ponds were similarly prepared and stocked during the rainy season in June and July 1999.

Acclimation and stocking

Colombian and local PL arrived at the farm at 15 to 17 ppt salinity. They were acclimated for two hours to equalize transport temperatures to those of the ponds, and then stocked in ponds with 14 to 17 ppt salinities. Wild PL were stocked at about 52 animals per m^2, and Colombian PL at 25 per square meter to compensate for the expected poorer performance of the wild postlarvae. Survival bags were used for determining survival at 24 and 92 hours, and 15 days to better evaluate the results of stocking.

Pond management

All ponds were managed to achieve maximum production in the shortest time possible, with a target size of 11 to 13 grams for the European market. Ponds were harvested when the shrimp reached the predetermined harvest size.

Feeding

All ponds received the same feed by manual broadcasting from a boat, with feeding trays used daily to monitor feed consumption. Consumption and population sampling determined maximum feeding levels.

Monitoring

Data on dissolved oxygen, turbidity, water exchange, and temperature were collected daily. Shrimp growth and biomass were estimated once or twice a week. Shrimp showing clinical signs of disease and animals from ponds with heavy mortalities were collected and processed by histology and polymerase chain reaction (PCR) for TSV.

Production

Growth

The average growth rate of the Colombian PL was 0.87 grams per week – 34 percent higher than that of the Guatemalan wild seed, which grew at an average of 0.64 grams per week (Fig. 1). Colombian animals reached an average harvest size of 11.58 grams in 93.3 days, while the wild shrimp reached an average size of 10.78 grams in 119.3 days.

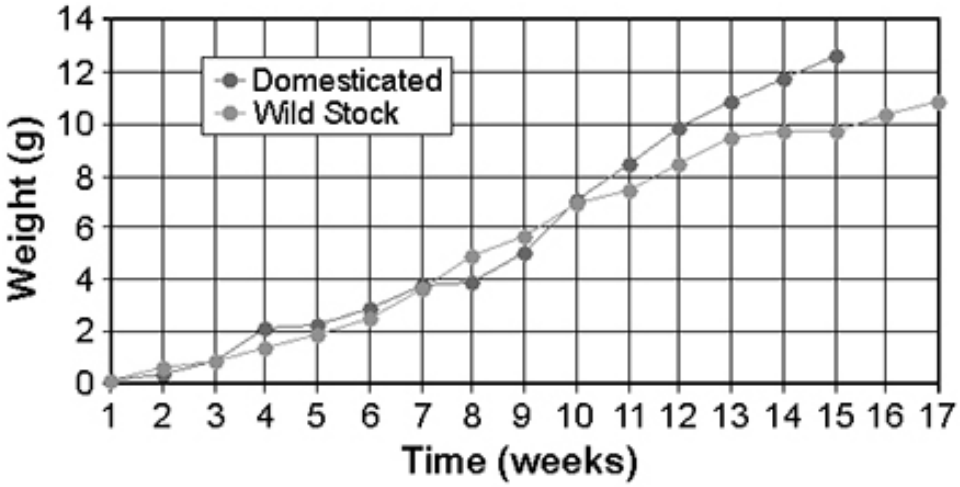

Fig. 1L Growth rates of domesticated Colombian post-larvae and wild PL.

Survival

Colombian animals had substantially higher survival rates, averaging 66.89 percent, versus 32.70 percent for shrimp grown from wild-caught seed. This resulted in essentially the same harvest densities at around 16 shrimp per square meter, even though wild shrimp were stocked at twice the density of the Colombian animals.

Based on previous trials at this and other farms, these results were expected. As most mortality of wild seed occurred during the first 20 to 35 days, the resulting densities after initial mortalities were almost the same for all ponds.

Feed conversion

At 1.66:1, the feed-conversion rate of Colombian animals was markedly better than the 2.00:1 for wild animals, due partly to their faster growth. Results for both these parameters could have been even better, because ponds were underfed during the first two weeks due to higher-than-expected survival rates.

Yield

Production for ponds stocked with Colombian PL was 20 percent higher (average 1,954 kilograms per hectare) than for ponds stocked with wild PL (average 1,626 kilograms per hectare).

Economic results

For the Mayasal S.A. study, fixed costs were considered the same for all ponds. These costs included labor, fuel, maintenance, insurance, depreciation, and other farm expenses. On a per-day basis, fixed costs increased with length of cycle. Feed and PL costs were considered variable. Fixed and variable costs are shown in Table 1.

deBeausset, Cost data used in study, Table 1

Item	Cost (U.S. $)
Total Fixed Cost	$12.51/ha/day
Feed Cost	$0.1715/lbs
Colombian PL (Deliv.)	$5.60/1,000
Wild PL (Delivered)	$0.50/1,000

Table 1. Cost data used in study.

Net income

Table 2 shows the prices for head-on shrimp in effect at the time of the study. The significantly higher cost of Colombian seedstock was offset by their superior yield, resulting in greater net income (Table 3).

deBeausset, Shrimp prices, FOB Guatemala, Table 2

Size Class	Grams	Price FOB (U.S. $)
70/90	12.5	$5.00
80/100	11.1	$4.50
100/120	9.1	$3.70
120/140	7.7	$3.10

Table 2. Shrimp prices, FOB Guatemala, heads-on.

deBeausset, Net income/ha/crop for ponds, Table 3

Pond	Fixed Costs (U.S. $)	Feed Costs (U.S. $)	Seed Costs (U.S. $)	Total Costs (U.S. $)	Gross Income (U.S. $)	Net Income (U.S. $)
Colombian	$1,113	$1,154	$1,324	$3,591	$8,102	$4,511
Colombian	$1,150	$1,145	$1,458	$3,753	$8,981	$5,228
Colombian	$1,238	$1,284	$1,460	$3,982	$9,707	$5,725
Average	$1,167	$1,194	$1,414	$3,775	$8,930	$5,155
Wild	$1,213	$893	$257	$2,363	$3,940	$1,577
Wild	$1,500	$1,065	$269	$2,834	$5,175	$2,341
Wild	$1,725	$1,492	$322	$3,539	$9,100	$5,561

Wild	$1,663	$1,515	$268	$3,446	$9,867	$6,421
Wild	$1,675	$1,539	$289	$3,503	$9,168	$5,665
Wild	$1,863	$1,405	$243	$3,511	$7,628	$4,117
Wild	$1,075	$539	$256	$1,870	$5,074	$3,204
Wild	$1,500	$1,249	$294	$3,043	$8,117	$5,074
Wild	$1,212	$950	$265	$2,427	$8,237	$5,810
Average	$1,492	$1,180	$275	$3,244	$7,367	$4,419

Table 3. Net income/ha/crop for ponds stocked with domesticated Colombian postlarvae and wild Guatemalan PL.

Almost all ponds in this study tested positive for Taura Syndrome Virus in double-nested polymerase chain reaction (PCR) tests. Done once, histology showed Colombian animals to be negative and wild animals positive for TSV, with no significant indications of other diseases. At the end of the cycle, when the Colombian animals had already been harvested, shrimp from three ponds with wild PL were determined positive for White Spot Syndrome Virus.

Conclusion

The Colombian postlarvae derived from TSV-resistant stocks outperformed wild-caught Guatemalan PL in all production parameters. Net income from ponds stocked with Colombian PL averaged 16 percent higher than ponds with wild PL, despite much higher cost for Colombian PL. A higher profit could have been achieved if ponds stocked with Colombian animals were harvested later, and better feeding supplied at the beginning of the cycle to promote faster growth.

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