

Use of StartSmart to Reduce Fish Mortality During Transport

This study was conducted by the India College of Fisheries, Professor Jayaraj (principle investigator). The purpose of the study was to evaluate the ability of StartSmart batches (procedures outlined below) in reducing fish mortality during transport. The study included evaluation of spawn, fry, and fingerlings. In all cases, the fish were placed in 18 liter bags at stocking densities comparable to those used in fish transport in India. StartSmart was added to test bags, while no StartSmart was dosed to the control bags. The spawn, fry, and fingerlings were examined in the laboratory setting, and the time to 50% mortality was recorded. Procedures for batching StartSmart and results for all phases are shown below.

A. Batching StartSmart for Use in Fish Transport

Initial batch

- 16 liters of StartSmart (4 gallons)
- 600 grams StartSmart Activator (1 and 1/3 pounds)
- Into 200 liter drum (55 gallon drum), filled with water
- Aerate 14 days
- Use half

Ongoing batches

- Refill with 4 liters StartSmart (one gallon)
- 600 grams StartSmart Activator (1 and 1/3 pounds)
- Aerate 7 days
- Use half
- Repeat

B. Standard dose during India testing:

Use 5 liters of water with spawn, fry, or fingerlings (equivalent stocking density of fish in the transport truck), in 18 liter plastic bag, filled with 6 to 8 liters pure oxygen (medical oxygen)
Add 250 ml of solution from the batching of StartSmart described in Part A above.

$5000 / 250 = 1$ part StartSmart bioreactor product per 20 parts fish transport volume

C. Volume of Fish Transport Trucks:

The fish transport containers range from small specialty tanks, up to specially designed trucks. The general range of volume for specially designed trucks is about 300 to 3000 gallons in size. The larger trucks may be equipped with temperature control (cooling) and pure oxygen generation.

D. StartSmart Dose Used During India College of Fisheries Study:

For a 500 gallon truck, based on the dose used in the India College of Fisheries tests, a 25 gallon batch of prepared StartSmart would be needed. The following components scale up for a 500 gallon transport truck volume:

For 500 gallon tank volume, use 25 gallons of prepared StartSmart batch, which requires
1 gallon of StartSmart
600 grams (1 and 1/3 pounds) of StartSmart Activator
In a 50 gallon drum, aerated 7 days (ongoing batching), using one half of the batch or about 25 gallons

Results – Spawn Transportation

Spawn loading information:

- Mean length of spawn: 0.52cm
- Mean weight of spawn: 0.0015g
- Packing density: 10,000 spawn/bag
- 8 liters medical oxygen

Test spawn received 250 ml StartSmart bioreactor product, control spawn did not. Bags were observed under laboratory conditions until 50% mortality

Control reached 50% mortality in 2 days and 22 hours (70 hours)

Test reached 50% mortality in 7 days and 5 hours (173 hours)

Addition of StartSmart bioreactor product extended the time to 50% mortality by 2.5 times from 70 hours (control) to 173 hours (test)

Results – Fry Transportation

Fry loading information:

- Mean length of fry: 1.72 cm
- Mean weight of fry: 0.0296g
- Packing density: 600 fry/bag
- 8 liters medical oxygen

Test fry received 250 ml StartSmart bioreactor product, control fry did not. Bags were observed under laboratory conditions until 50% mortality

Control reached 50% mortality in 8 hours

Test showed ZERO mortality at 8 hours

Test showed ZERO mortality at 24 hours

Without StartSmart bioreactor product addition, mortality of fry reached 50% in 8 hours. With addition of StartSmart bioreactor product, ZERO mortality was exhibited at 8 hours, and also at 24 hours.

Results – Fingerling Transportation

Fingerling loading information:

- Mean length of fingerlings: 6.30 cm
- Mean weight of fingerlings: 2.13 g

- Packing density: 250 fingerlings/bag
- 8 liters medical oxygen

Test fingerling received 250 ml StartSmart bioreactor product, control fingerling did not. Bags were observed under laboratory conditions until 50% mortality

Control reached 50% mortality in 5 hours and 30 minutes (330 minutes)
Test showed 50% mortality in 1 day, 14 hours, and 30 minutes (2310 minutes)

StartSmart bioreactor product dosing increased the fingerling time to 50% mortality by a factor of 7 (2310 minutes compared to 330 minutes).

Results – Fingerling Transportation – No Pure Oxygen Added

Fingerling loading information:

- Mean length of fingerlings: 6.30 cm
- Mean weight of fingerlings: 2.13 g
- Packing density: 250 fingerlings/bag
- 8 liters ATMOSPHERIC oxygen

This test was conducted to assess the performance of StartSmart dosing with just atmosphere, compared to control but with pure oxygen

Control, with pure oxygen, reached 50% mortality in 5 hours and 30 minutes (330 minutes)
Test, with atmospheric oxygen, showed 50% mortality in 6 hours and 30 minutes (390 minutes)

StartSmart bioreactor product with atmospheric oxygen outperformed pure oxygen addition, without StartSmart by about 20%.

In the situation where pure oxygen is available, using StartSmart with pure oxygen compared to control and pure oxygen, the StartSmart dosing extended the time to 50% mortality by a factor of 7.

When comparing StartSmart dosing (with atmospheric oxygen) to control (but using pure oxygen), StartSmart still showed a 20% improvement. In this situation, where pure oxygen might not be available, the results showed that dosing with StartSmart but with just atmospheric oxygen provided slightly better results than using pure oxygen (without StartSmart addition)