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Study seeks optimum probiotic dosing for fish fry

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Testing a commercial probiotic designed to lower stress prior to and during transport

Carp fry in the treatment that received probiotic at 10 ppm (top) had the highest survival and growth.

The packing and transportation of fish fry in hatcheries can cause stress, which results in mortalities and reduced performance. Many factors affect the survival of fish during transportation. Water exchange to provide oxygen for respiration and removal of toxic metabolites is limited, and fish often receive limited food before packing to lower their metabolism. Water temperature is also reduced to lower metabolism.

The fish are concentrated to permit more efficient transportation. Handling, crowding and poor water quality can impose severe stress on fragile fry and fingerlings.

Probiotic study

In a study, the authors tested a commercial probiotic product designed to lower stress response prior to and during transport of live fish fry and fingerlings. The probiotic was a combination of microbial cultures and selected nutrients for use in shrimp, fish and reptilian hatcheries.

The Indian major carp (*Catla catla)* which is known to be sensitive to transportation stress, was used as a model species in the trials to determine the optimum dose of probiotic treatment prior to and during transport.

Study setup

Catla catla fry with initial total length of 2.48 cm and body weight of 1.04 grams were stocked into four tanks at the rate of 25 fry per liter. In each tank, 1,600 fry were stocked and fed ad libitum for three days.

During this time, each tank was treated with probiotic at the rate of 0 (control), 5, 10 or 15 ppm after water exchange, but before first feeding. The fry were not fed on the fourth day, when survival and final weight were recorded. Three replicates were maintained for each treatment.

On the fifth day, the fry were packed in plastic bags at a density of 400 fry per liter. The water in the bags contained added probiotic at doses corresponding to those used in the fry tanks. The bags were packed at 5:00 p.m. and left in the laboratory undisturbed until unpacking the following morning at 7.30 a.m.

Survival was monitored immediately after unpacking. The fry were restocked in tanks at the rate of 25 fry per liter. They were fed ad libitum 3 times per day, but no further treatment with probiotic was applied. Growth and survival were monitored for five days after the restocking.

Results

Treatment with the probiotic at 10 ppm resulted in the highest survival and growth of fry prior to packing. Mean survival of the fry in tanks with probiotic at 0, 5, 10 and 15 ppm were 79.6, 78.6, 85.1 and 78.5 percent, respectively (Table 1). Fry treated with probiotic at 0, 5, 10 and 15 ppm had grown to final mean weights of 1.10, 1.18, 1.22 and 1.10 grams, respectively (Table 2).

Raj, Cumulative survival of *Catla catla* fry, Table 1

Treatment (ppm)	Survival (%) Day 1	Survival (%) Day 2	Survival (%) Day 3	Survival (%) Day 4
0	95.18	90.62	85.25	79.68

5	94.56	87.68	82.81	78.62
10	96.56	91.75	88.00	85.18
15	94.68	86.93	82.25	78.50

Table 1. Cumulative survival of Catla catla fry treated with probiotic before packing.

Raj, Weight of *C. catla* fry, Table 2

	Control	5 ppm	10 ppm	15 ppm
Initial length (cm)	2.480 ± 0.219	2.480 ± 0.219	2.480 ± 0.219	2.480 ± 0.219
Initial weight (g)	1.040 ± 0.296	1.040 ± 0.296	1.040 ± 0.296	1.040 ± 0.296
Final length (cm)	2.550 ± 0.246	2.630 ± 0.123	2.680 ± 0.169	2.800 ± 0.421
Final weight (g)	1.098 ± 0.028	1.180 ± 0.024	1.220 ± 0.021	1.100 ± 0.049

Table 2. Weight of *C. catla* fry treated with probiotic before packing.

Treatment with probiotic at 10 ppm also resulted in better survival after unpacking. Mean survival rates immediately after unpacking were 90.8, 80.1, 92.8 and 89.1 percent, respectively, for probiotic treatments of 0, 5, 10 and 15 ppm. During the five-day “posttransportation” period, the mean survival of the fry that previously received probiotic at doses of 0, 5, 10 and 15 ppm was 84.1, 84.4, 91.6 and 82.1 percent, respectively. The corresponding final mean weights of the fish were 1.20, 1.21, 1.28 and 1.10 grams, respectively (Fig. 1).

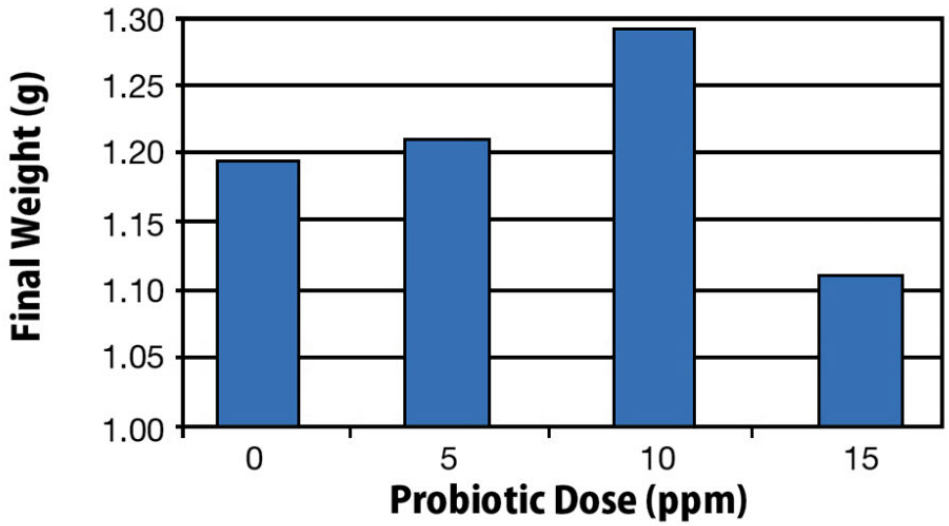

Fig. 1: Final weight of *Catla catla* fry treated with probiotic after stocking.

The study indicated that probiotic treatment at 10 ppm produced the highest fry performance in terms of survival and growth prior to, during and after transport. The reasons why the lower and higher doses sometimes resulted in poorer performance than the control are not known.

The higher dose almost always resulted in poorer performance when compared to the control. Based on the results obtained in this trial, it is prudent to avoid overdosage during probiotic treatments.

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