PRO 2647

Report on Analysis of Live Feed Usage (Brine Shrimp) In Nursery Stage Fish at Ingiriya By Feeding Trial

TSK/4696

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1. Introduction

Artemia is a genus of aquatic crustaceans known as brine shrimp.

Artemia, the only genus in the family Artemiidae, has changed little externally since the Triassic period.

Artemia populations are found worldwide in inland saltwater lakes, but not in oceans.

Artemia are able to avoid cohabiting with most types of predators, such as fish, by their ability to live in waters of very high salinity.

The ability of the *Artemia* to produce dormant eggs, known as cysts, has led to extensive use of *Artemia* in aquaculture.

Commonly used for feeding tropical fish raised in aquariums, brine shrimp usually grows no more than 1.30 centimeters in length.

Several varieties of brine shrimp exist, but all of them are considered to belong to a single species under a single genus (Artemis).

They are generally characterized by their compound eyes, which are stalked, as well as their tapered bodies, which consist of a trunk to which eleven pairs of leaf like legs are attached.

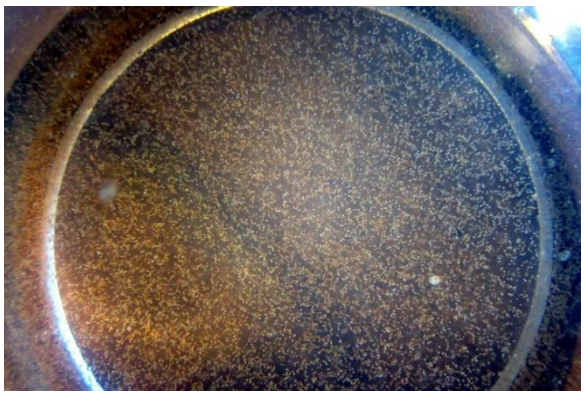

Figure 1: Hatched brine shrimp eggs

1.1 Useful traits of brine shrimp cysts

They are soft and easily digestible and contain enzymes that help fish to better utilize other feeds.

They are high in protein, ranging from 55% to 60% protein by dry weight, supporting rapid weight gain in young fish.

They can be enriched with other feeds or additives, a process often referred to as "bio-encapsulation" in order to deliver antibiotics, or other nutrients to the target species.

They can be fed to both marine and freshwater fish, surviving and swimming for hours even in fresh water.

They originate in hyper-saline biotopes and, therefore, they are seldom vectors for diseases that affect fish.

They grow quickly, multiplying in weight 500-fold in three to four weeks and increasing in size from 450 microns to 1.5 centimeters in length.

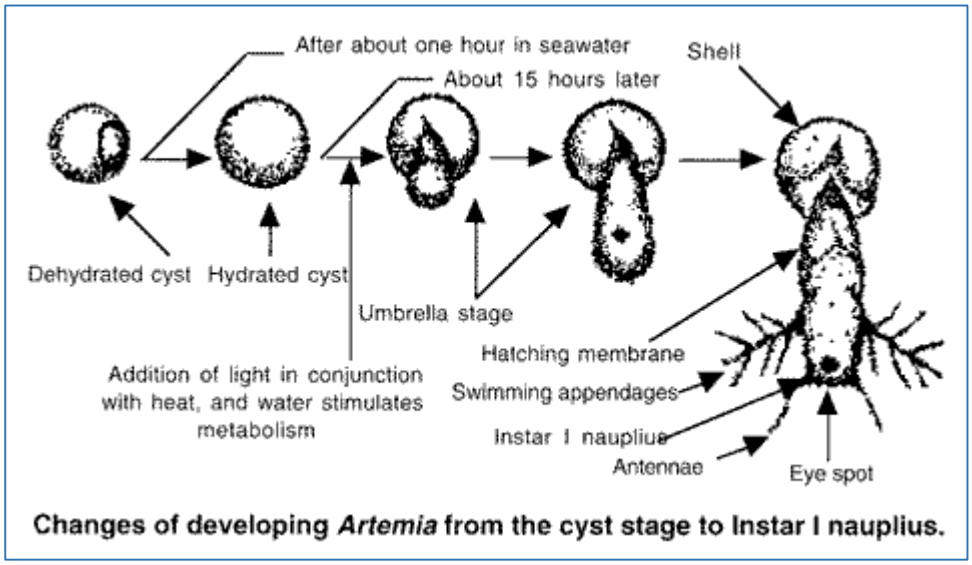

Figure 2: Stages during the hatching period of brine shrimp

1.2 Suitable hatching environment

- Salinity:

25 parts per thousand (ppt) salt solution, or approximately 1 and 2/3 tablespoons of salt per quart (or liter) of water. This equates to around 1.018 specific gravity as measured with a hydrometer. Be sure to use marine salt or solar salt.

- pH:

Proper pH is important in hatching brine shrimp. A starting pH of 8.0 or higher is recommended. In areas where the water pH is below 7, Epson salt or magnesium sulfate can be added at the rate of 1/2 teaspoon per quart of solution to buffer the hatching solution.

- Temperature:

Optimum water temperature for a 24-hour complete hatch is 80-82°F or 26-28°C. Lowering the temperature would result in a longer hatching time. Do not exceed 30°C.

- Light:

Illumination is necessary to trigger the hatching mechanism within the embryo during the first few hours of incubation. Maintaining a light source during the entire incubation period is recommended to obtain optimum hatch results and for temperature control.

- Aeration:

Constant aeration is necessary to keep cysts in suspension and to provide sufficient oxygen levels for the cysts to hatch. A minimum of 3 parts per million dissolved oxygen during the incubation is recommended. Strong aeration should not damage or hurt the brine shrimp cysts or nauplii.

- Stocking Density:

1 gram per liter or quart or approximately 1/2 level teaspoon of cysts per quart is recommended. A higher stocking density will result in a lower hatch percentage.

- Hatching Cone:

Flat-bottom hatching vessels should be avoided. Cone or "V" bottomed containers are best to insure that the cysts remain in suspension during hatching. Be sure to thoroughly wash the hatching cone with a light chlorine solution, rinse, and allow to air-dry between uses. Avoid soap. Soap will leave a slight residue which will foam from aeration during hatching and leave cysts stranded above the water level.

- Incubation Period:

Generally, the optimum incubation time is 24 hours. Egg which has been properly stored for more than 2-3 months may require additional incubation time up to 30-36 hours. Oftentimes, eggs will hatch in as few as 18 hours. If a smaller size nauplii (Instar I) is desired, a harvest time of 18 hours is recommended.

2 Objective

To analyze the live feed usage (Brine shrimp) in nursery stage fish at Ingiriya farm by feeding trial

3 Methodology

3.1 Feeding brine shrimp cysts

Two experiment tanks were selected as B 17 and B 81 with below condition.

Tank Size: 10*5 feet

Number of guppy fry (Black): 2000

Water level: 14 cm

Both tanks were fed with same amount of dry fish feed, but different amount of live feed (brine shrimp cysts).

In here, one tank was fed with lower amount (5 g per 14 tanks) of brine shrimp and another tank was fed with required amount of brine shrimp cysts (calculate at least 80 cysts per fish).

Allowed to grow fish until reach sortable size while providing same conditions to the both tanks.

3.2 Analysis of brine shrimp hatching percentage

1 g of brine shrimp eggs were added into 1 l of water.

It was allowed to hatch 24 hours with proper aeration and water quality parameters.

Salinity - >40 ppt

pH – 9.4

Salt 850 g and 1 table spoon of $NaHCO_3$ were added to adjust the above water quality parameters.

After incubation period, 1 ml of water sample was taken out and amount of naupli were counted.

Finally hatching percentage was calculated.

According to the hatching percentage, required brine shrimp amount was calculated.

4 Observation

Figure 3: Measuring brine shrimp cysts for experiment tanks

Figure 4: testing water Salinity of hatchery

Figure 5: Adding NaHCO3 to adjust pH

Figure 6: Adjusting preferable pH

Figure 7: Within first hours, allow to soak buoyancy eggs

Figure 8: Taking 1 ml of sample to test hatchability

Sorting Details

After one month and three days, fry were reached to sortable level in tank B 17 while, after 25 days, fry were reached to the sortable level in tank B 81.

Table 1: Sorting details of experiment tanks

	Tank B 17	Tank B 81
Initial count	2000	2000
Male	770	875
Female	755	890
Nursery	**320**	**90**
Discard	**130**	**56**
Total Remaining	1975	1911

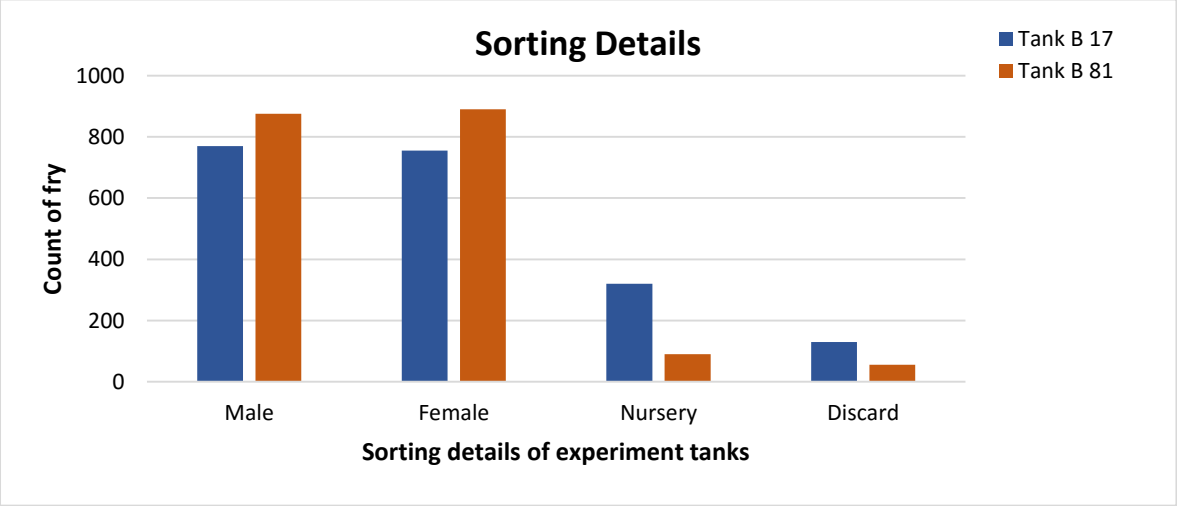

Figure 9: Sorting details of experiment tanks

5 Discussion

5.1 Calculation of hatching percentage

Naupli per 1 ml of sample (N): 170

N * 1000 = NPG (naupli per gram) count

170 * 1000 = NPG

Average hatchability : 200,000 eggs per gram

Hatching percentage (%) = NPG/200,000

= 170,000/200,000

= 85%

5.2 Calculation of required brine shrimp amount for Ingiriya farm

Minimal requirement of hatched brine shrimp eggs per fish for a day = 80

Average total number of nursery guppy fish in Ingiriya farm = 170,000

Required amount of naupli per day = 170,000 * 80

= 13,600,000

Required total amount of naupli per week = 13,600,000 *7

Required total amount of brine shrimp cysts per week

= 13,600,000 *7/ 170,000

= 560 g

= 560/400 (tin)

= 1.4 tin

Brine shrimp egg is sometimes very buoyant. In order to maximize the hatching percentage, it is sometimes helpful to swirl the water inside the hatching container with finger once or twice at intervals in the first 4 to 6 hours of incubation in order to knock down eggs that have been stranded on the side of the container above the water-line. After about 6 hours, the eggs are usually well-hydrated and will stay in the water column.

After hatching brine shrimp, turn off or remove aeration and wait several minutes for the shells and baby brine shrimp (or nauplii) to separate. Newly hatched nauplii will settle to the bottom. Then the shells will float to the surface. Once separated, the nauplii can be siphoned from the bottom with a length of air tubing. It is better to have a Cone or "V" bottomed containers to insure that the cysts remain in suspension during hatching.

The warm incubation temperatures and metabolites from the hatching medium create ideal conditions for a bacteria bloom. Rinsing of the baby brine shrimp in a fine mesh net or sieve using clean fresh or salt water is important before feeding them to the fish.

6 Conclusion

Both discard amount and nursery amount were lower in tank which were fed with 80 brine shrimp naupli per day. It is the minimal requirement to gain higher growth rate of guppy fish.

7 Recommendation

There are several number of hatching buckets in current usage at Ingiriya farm.

It cause to,

- Waste money for additional amount of salt, $NaHCO_3$ and electricity for aeration.

It is not need to maintain such amount of hatchery buckets.

At Ingiriya, there are two nursery sections. Upper part is consist of 34 tanks and lower part is consist of 52 tanks. Because of sorting and other practices, all 86 tanks are not filled with fry daily.

Figure 10: required number of buckets in Current practices

Simply it can be used 2 buckets per each part daily; One bucket for morning and another one for evening.

7.1 Procedure for determine the amount of required brine shrimp eggs per one meal (morning/evening) in Nursery section.

1. Count the number of tanks, you should feed with brine shrimp in nursery section (stocking density should be 2000 fry per one tank)
2. Then, use below formula to find out the brine shrimp amount;

$$\textbf{Required brine shrimp eggs (g)} = \frac{(\textbf{Number of tanks} \times \mathbf{8})}{\mathbf{17}}$$

Above mentioned amount is enough for one meal (for one bucket)

Use two buckets for daily requirement.

Water level can be used as 1.5 L per 1 g of brine shrimp cysts.

7.2 Procedure for determine the amount of required brine shrimp eggs per one meal (morning/evening) in Growing 1 section.

Here, stocking density is 1000 of fry per one tank.

1. Count the number of tanks, you should feed with brine shrimp in nursery section
2. Then, use below formula to find out the brine shrimp amount;

$$\textbf{Required brine shrimp eggs (g)} = \frac{(\textbf{Number of tanks} \times 4)}{17}$$

Above mentioned amount is enough for one meal (for one bucket)

Use two buckets for daily requirement.

7.3 Current practices which should be corrected during hatching

Observed, feeding hatched brine shrimp just after hatching without stopping aeration. It should be corrected as below.

After hatching brine shrimp, it should be turned off or remove aeration and wait several minutes for the shells and and baby brine shrimp (or nauplii) to separate.

Newly hatched nauplii will settle to the bottom. Then the shells will float to the surface. Once separated, the nauplii can be siphoned from the bottom.

8 References

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