Live preys in shrimp culture: nutritional and sanitary considerations on the use of Artemia in New Caledonia.

Dominique PHAM, Nelly WABETE, Jean-René MAILLIEZ, Francis BROUTOI, Liet CHIM

IFREMER - Département Lagons Ecosystèmes Aquaculture Durable, BP 2059, 98846 Nouméa, New Caledonia
dpham@ifremer.fr

Introduction

Up to now, live preys are still widely used in larviculture. In shrimp culture, even if partial replacement of live food with artificial one is more and more praticated, Artemia is still essential to obtain good growth and survival rates in the early life of shrimp. However (i) the availability of the brine shrimp can be highly variable from one year to another and only 20 % of the aquaculture demand could be satisfied in the late 90’s and (ii) their sanitary status is of concern as Artemia can be a pathogen carrier (Lopez-Torres et al., 2001) and can affect larval survival rates.

In these conditions, the production cost of the juveniles greatly depends on the disponibility and the quality of the live preys.

The use of Artemia in shrimp industry in New Caledonia

In penaeid larviculture in New Caledonia, Artemia is given as the main food and in excess from zoea 3 to P10 (ten days old post-larvae). The amount of live preys increases during the rearing as shown in table 1.

Table 1 : Artemia quantity depending on the larval stage in shrimp culture in New Caledonia

<table>
<thead>
<tr>
<th>Larval stage</th>
<th>Zoea 3</th>
<th>Mysis 1 and 2</th>
<th>Mysis 3</th>
<th>From P1 to P3</th>
<th>From P4 to P10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artemia per day (per liter)</td>
<td>40</td>
<td>55</td>
<td>65</td>
<td>70</td>
<td>75</td>
</tr>
</tbody>
</table>

Artemia cysts are incubated for 24 hours at 28°C and 28 ppt before being used in larviculture. These conditions promote the development of bacteria and 10^3 to 10^5 cfu/ml of Vibrio can be detected in hatched Artemia tank (table 2). Considering that 40 to 70 g of Artemia (i.e. 8 to 14 million of Artemia) are added every day per cubic meter of larval rearing water, a Vibrio quantity of 8.10^4 to 14.10^4 per ml is introduced daily in the tank.

Table 2 : Vibrio concentration in Artemia incubation tank

<table>
<thead>
<tr>
<th>Day of sampling</th>
<th>Vibrio-concentration (CFU per ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>115</td>
<td>3.10^4</td>
</tr>
<tr>
<td>136</td>
<td>3.9.10^4</td>
</tr>
<tr>
<td>158</td>
<td>7.5.10^4</td>
</tr>
</tbody>
</table>

An assessment of the bacterial load in the larval tank according to the day of rearing has shown that a Vibrio peak could be observed at day 4, after the first feeding with Artemia (Pham et al. 2008, see figure 1). And antibiotics are used to control the bacterial growth.

Determination of the optimum amount of artemia according to the Litopenaeus stylirostris larval stage.

Materials & methods

For the experiment, larvae were rearred in the same tank until they reached the desired stage. 18 x 100 larvae were then transferred from the larval tank in 800 ml vials (ie. 125 per liter). Three development periods were tested: Mysis 2 to P2, P1 to P4, and P5 to P8 on 6 treatments (increasing Artemia doses) and three replicates each. The temperature was maintained at 29°C. All the water and uneaten Artemia of each container were removed every day to be replaced with new water and freshly hatched Artemia. During this operation, survival rate was estimated. At the end of the 3 days experiment, all survivors were collected and the final dry weight was measured for each replicate and compared to the initial dry weight.

Results & Discussion

From Mysis 2 to two days old postlarvae (Fig. 2):
- less than 20 Artemia per animal negatively affects growth and/or survival rate,
- 30 to 40 Artemia seem enough to ensure a maximum growth,
- more than 40 Artemia do not improve the growth compared with lower doses.

From one day old postlarvae to four days old postlarvae (Fig. 3):
- the Artemia quantity (120 Artemia per animal) to reach the maximum growth is 3 to 4 times as big compare to the previous stage,
- lower doses affect the growth but not the survival rate of the shrimp during the experiment.

From five days old postlarvae to eight days old postlarvae (Fig. 4):
- less than 50 Artemia per animal impacts both growth and survival,
- a high quantity of Artemia must be available to the postlarvae (around 150 Artemia per animal) to obtain the best growth,
- but with a higher amount, the growth rate declines.

Conclusion

With this protocol, Artemia quantity can be half reduced during the larval stage (from Z3 to M3). It is particularly important as no water exchange is practiced during this period which can favour opportunistic pathogens.

However, feed requirements seem to be higher in the next postlarval stages, and the optimum amounts recorded in these experiments are higher than those previously advised. In the fact, artificial diets are used to partially replace live preys in the commercial hatcheries and daily water exchange is operated to maintain a low bacterial level in the rearing tank.

Bibliographie