



LUMINESCENT BACTERIA IN SHRIMP HATCHERY AND THEIR CONTROL THROUGH BETTER MANAGEMENT PRACTICE



Luminescent bacteria (LB) are ubiquitous in the coastal and marine environment. *Vibrio harveyi*, a gram negative luminescent bacterium (Fig. 1) is associated with mass mortality of penaeid larval shrimp and often responsible for huge economic loss to shrimp hatcheries. Control of luminescent bacterial disease (LBD) using antibiotics has been reported to be effective in laboratory trials, while its efficacy in field conditions is reportedly very low. However, shrimp hatcheries continue to resort to use of antibiotics. This leaflet is for advising the hatchery operators on better management practices (BMPs) to prevent LB problems.

Work done in CIBA

Investigations were carried out to understand the distribution of luminescent bacteria during shrimp larval production cycles in commercial shrimp hatcheries during various stages of seed production. A total of 1195 samples drawn from seawater source, sand-filtered water, nauplius, zoea, mysis and post larval rearing tanks, maturation and spawning tanks, *Artemia* hatching tank and algal culture tanks were processed for luminescent bacteria using conventional microbiological techniques.

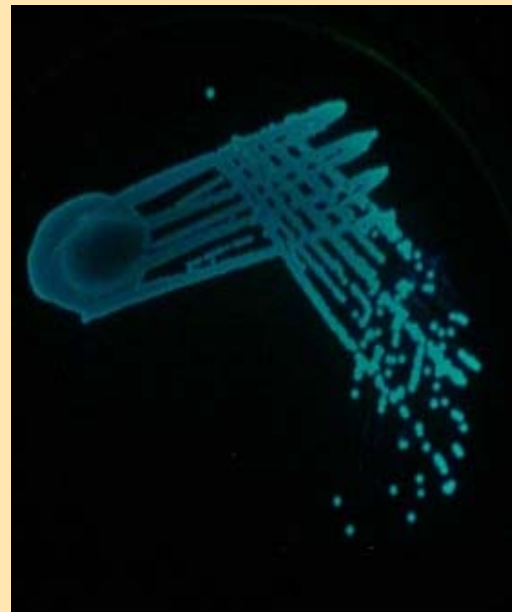


Fig 1. Pure culture of *Vibrio harveyi* on tryptone soya agent

Salient findings

- The predominant source of luminescent bacteria was found to be the brood shrimp and their rearing tanks in maturation and spawning facilities as revealed by the rate of isolation of these bacteria.
- Among the luminescent bacteria isolated from shrimp hatcheries, 92 percent were *V. harveyi*, and the rest belonged to *V. splendidus*, *V. logei*, *V. fischeri* and *Photobacterium* sp.
- Although the occurrence of luminescent bacteria was more frequent in the maturation and spawning tanks, luminescent bacteria were not recovered from eggs and nauplii. The eggs were washed with iodine and formalin soon after collection as a management practice in hatcheries, which has helped a great deal in their containment after spawning.
- During the seed production cycle affected by LB disease, LB could be recovered from the nauplii tank water samples while in seed production cycle free from LB disease, LB was detected only from subsequent zoea stage onwards. This could be due to presence of low counts of LB in eggs and nauplii, which could not be detected by the routine cultural methods used. Another plausible reason could be existence of LB in “viable but non-culturable” state followed by their resuscitation in the tanks during the subsequent larval developmental stages.

Advice to hatcheries

1. The occurrence of luminescent bacteria during nauplii stage in the rearing tank water could be an indicator of impending luminescent bacterial disease outbreak in the larval rearing tanks and possibly help in the prognosis of LBD in shrimp hatcheries.
2. Recognize that brood shrimp is the main source of LB in hatcheries, for which the following management measures (adopted from Better Management Practices (BMP) Manual for Black Tiger Shrimp, *Penaeus monodon* Hatcheries in Viet Nam by NACA, 2005) may be followed to avoid the occurrence of the disease:
 - Broodstock should be placed immediately after collection in filtered and UV treated sea water individually and transported.
 - Disinfect the broodstock thoroughly in the quarantine unit by immersing in a bath of 100 ppm (1 ml/10 l) potassium permanganate (KMnO₄) or liquid povidone (PVP) iodine for 30-60 seconds before releasing in maturation/ spawning tanks.
 - Add 10-30 ppm of EDTA in holding tanks for chelating heavy metals and reducing bacterial contamination.
 - Disinfect the area around the ablated eye with pure liquid povidone (PVP) iodine solution after ablation.
 - For spawning, the matured spawners should be kept individually in waters filtered through activated carbon, cartridge filters (1-5 μ) and preferably treated with UV.
 - Following spawning, the broodstock should be quickly removed from the spawning tanks. After about 1-5 hours the tanks should be drained slowly through a preliminary 300 μ mesh filter (to retain faeces and other debris) and then through 50-60 μ nylon net partially submerged in a tank/bucket (to retain the eggs).
 - The eggs should then be washed for 5 minutes with a steady, but slow current of clean seawater. After washing, the eggs are gathered in the net and then dipped into an aerated bath of 50 ppm povidone iodine solution (0.5 ml in 10 l of water) for one minute. Finally, they are washed once again for 5 minutes with a steady, but slow current of clean seawater.
 - After hatching, only nauplii that are attracted to the light should be collected, since these are the healthiest. The nauplii should then be washed for 5 minutes with a steady, but slow current of clean seawater. After washing, the nauplii are gathered in the net and then dipped into an aerated bath of 100-300 ppm (1-3 ml/10 l) of formalin for 30 seconds. They are then dipped into an aerated bath of 50 ppm (0.5 ml/10 l) povidone iodine solution for one minute. Finally, they are washed again for 5 minutes with a steady, but slow current of clean seawater.
 - During larval rearing, uneaten food and faeces may need to be siphoned out from the bottom of the tanks periodically. This should be done by turning off the air supply and allowing the larvae to come to the surface of the tank.
 - *Artemia nauplii* should be disinfected with 50% hydrogen peroxide with strong aeration and the floating debris are removed. The disinfected nauplii are washed in clean fresh or sea water before use.

(This advisory is based on the work on Luminescent bacteria carried out by Dr S.V. Alavandi under a project funded by Indian Council of Agriculture Research)