

Due to substantial increase in production and export earning, brackishwater aquaculture, especially shrimp farming is one of the fastest growing food sectors in India. The sustainable growth of this sector is very much important to meet the nutrition security of fast growing population. But different diseases in brackishwater aquaculture system are major hindrance for the growth of this sector and very often lead to total crop loss. White spot disease (WSD) is the most important disease of cultured shrimp and the cumulative economic loss only due to WSD was as high as ₹ 3000 crores during 1995-2005. Very often, inadequate biosecurity measures, lack of monitoring of soil and water quality parameters, poor disease management and lack of awareness among the farmers are the important contributing factors to the occurrence of diseases both in semi-intensive and traditional farming systems. Education and awareness among the farmers on disease management and adoption of better management practices (BMPs) are of utmost importance to combat the disease problems in shrimp farms.

Important diseases of shrimp:

- ☛ White spot disease (WSD)
- ☛ Infectious hypodermal and haematopoietic necrosis disease (IHHN)
- ☛ Hepatopancreatic Parvovirus disease (HPV)
- ☛ Yellow Head disease (YHD)
- ☛ Taura Syndrome (TS)
- ☛ Infectious myonecrosis (IMN)
- ☛ Vibriosis
- ☛ Monodon Slow Growth Syndrome (MSGs)
- ☛ Loose Shell Syndrome (LSS)
- ☛ Black gill disease



White spot disease (WSD)

- ☛ Parasitic infection in gill e.g. *Zoothamnium* spp.



White spot on carapace in WSD



Black gill disease



Brown spot disease

Emerging shrimp diseases:

- ☛ Enterocytozoon hepatopenaei (EHP)
- ☛ Early mortality syndrome (EMS) or Acute Hepatopancreatic Necrotic Disease (AHPND)
- ☛ Running mortality syndrome (RMS)
- ☛ Covert Mortality Disease (CMD)
- ☛ White Muscle Syndrome (WMS)



White faeces syndrome

- ☛ White Faeces Syndrome (WFS)
- ☛ White Patch Disease
- ☛ Muscle cramp
- ☛ Bamboo shrimp syndrome

Diseases not present in India:

- ☛ Early mortality syndrome (EMS) or Acute Hepatopancreatic Necrosis Disease (AHPND)
- ☛ Yellow Head Disease (YHD)
- ☛ Taura Syndrome (TS)
- ☛ Covert Mortality Disease (CMD)
- ☛ Infectious myonecrosis (IMN)

Measures to be followed at field level for control of shrimp diseases: For shrimp aquaculture, two most important aspects for disease management are strict adherence to Better Management Practices (BMPs) and guidelines of Coastal Aquaculture Authority (CAA). The guidelines of CAA are available in the website, www.caa.gov.in. Some important measures are given below:

- ☛ Proper pond preparation: Proper pond preparation is the first step of brackishwater shrimp culture. Pond should be dried for at least three weeks and the black soil should be excavated. The excavated soil should not be dumped inside the farm. The pond bottom should be limed properly. The dose depends upon pH of the soil. For the quantity of lime required, please refer to the CIBA guidelines (<http://www.ciba.res.in/Books/ciba0295.pdf>). However, if the pH is not below 7.5, apply basal dose of 300-500 kg/ha.
- ☛ Biosecurity measures: It is very important to follow strict biosecurity measures to prevent entry of harmful vectors and pathogens. Suitable crab fencing and bird fencing should be installed. Farmers should keep potassium permanganate (3 mg/l) dip at the entry of the farm.
- ☛ Disinfect the pond water with optimum dose of bleaching at least 14 days before stocking.



Crab fencing

For each bigha area, apply 60-80 kg of bleaching (approx. 450 - 590 kg / ha), if



Potassium permanganate foot bath

depth of water is one meter.

- ☛ Source of post-larvae / shrimp: Always buy shrimp seed / post-larvae from reputed hatcheries. For *Penaeus vannamei*, the lists of CAA approved hatcheries are available at CAA website. The shrimp seed / post-larvae should be certified to be free from WSSV and IHHNV. Considering the emergence of EHP, the seed should also be screened for this pathogen.
- ☛ Stocking density: The chances of spreading infectious diseases including WSD increase with increase of stocking density. As per CAA guidelines, the maximum permissible stocking density are 30 and 60 per sq.m. in



Disease Management in Brackishwater Shrimp Culture



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- by testing of water in any competent laboratory. Different crucial water quality parameters include pH, salinity, dissolved oxygen, total ammonia-nitrogen, nitrate-nitrogen, nitrite-nitrogen, total alkalinity, dissolved inorganic phosphate, etc. If required, perform partial water exchange (5-30 %) with pretreated water
- Dispose the diseased and dead shrimp in a proper manner. Apply lime and bleaching to the diseased shrimps and bury those preferably away from the ponds.
- Provide separate nets and other equipments for each of the ponds in the farm.
- Keep an effluent treatment system for management of farm waste. This is mandatory for the farm with the area more than 5 ha.
- The workers in the farm should maintain a good health status and proper sanitary conditions.

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periodically for pH, turbidity, salinity, total hardness, magnesium hardness, calcium hardness, hydrogen sulfide, total ammonia nitrogen (TAN), nitrite nitrogen, nitrate nitrogen, total phosphorus, etc.

- Avoid using aquaculture medicines indiscriminately without expert consultation.
 - Don't use antibiotics. Use of almost all antibiotics is banned.
 - As much as possible avoid exchange of water. Water exchange increases the probability of introduction of pathogen to the cultured ponds. During water exchange special care should be taken to avoid high fluctuation of water quality.
 - Use the feed at optimum level. Overfeeding and underfeeding should be avoided. Store the feed / feed ingredients in dry place. Moist feed is very much prone to fungal contamination that leads to aflatoxin production.
 - Depth of water: The optimum depth of water for shrimp culture is 125 cm. Reduced depth of water causes stress in the cultured shrimp.
 - Inlet and discharge canal should be separate to avoid the chances of mixing.
 - Always use one pond as reservoir, if possible. Reservoir ponds are mandatory for the farms having area beyond 2 ha. Farmers having small farms can adopt group farming with a common reservoir.
 - Filter the intake water through net filter to prevent the entry of vectors of different pathogens. Ideally, the farm should have one reservoir, where treated water is always available in the farm for use in emergencies.
 - Monitor different water quality parameters
- Any colour change on the body surface.
 - Deviation of normal colour of the gut. Presence of white gut line.
 - Any ulceration or wound on any parts of body.
 - Accumulation of excess fluid in any parts of body.
 - Presence of any visible parasite in the gills. If possible, check the gill with a hand lens.
 - Any discolouration of the gill.
 - Variation of growth (body weight and length).
 - Crowding near water inflow.
 - Empty gut after feeding.
 - Yellowish discolouration of cephalothorax.
 - Bending of body of the shrimp.
 - Melanization or petichae on any part of the body.
 - Abnormal swimming behaviour.
 - Red discolouration of body especially pleopods and telson
 - Soft and weak shell.
 - Presence of white thread like faeces in the water of the pond.
 - Gap between shell and muscle.
- Some diseases like Yellow Head Disease, Early Mortality Syndrome, Taura Syndrome, Infectious myonecrosis, etc. are not reported in India till date. However, they are prevalent in many other Asian countries. If any new symptoms in cultured shrimps are observed by farmers, these should be reported to aquaculture experts or competent authorities immediately.
 - Monitor the water and soil-water-interface properly throughout the culture period. Test the water and soil-water-interface samples,

case of *P. monodon* and *P. vannamei*, respectively. This should be followed strictly.

- During stocking, acclimatize the post-larvae (seed) to prevailing pH, temperature and salinity of the pond water by gradual mixing of pond water to the pack of post-larvae.

- The human traffic should be controlled in the farms. Do not allow any unauthorized person inside the shrimp farm.

- Never discharge pond water immediately after harvesting. After harvesting, bleach the water in the ponds (60-80 kg/bigha or 450-590 kg/ha), hold for at least 7 days before discharging.

- Monitor the cultured shrimp regularly for any abnormal symptoms or behaviors. If observed, report immediately to any aquaculture health expert. The samples should be brought to the laboratory for PCR and other screening procedures. Followings are very common abnormal behaviours and symptoms observed in cultured shrimps:

- Lethargy
- Any sudden change in feeding behaviour (Excessive feeding / reduced feeding / cessation of feeding). Less feed intake during moulting period is normal.
- Mortality: The pattern of mortality should be noted, i.e. mass mortality or continuous low level mortality.
- Presence of dead shrimp at the pond bottom.
- Presence of white spots on the external surface especially on the carapace.
- Crowding at the surface or edges of the water body.
- Broken antennae, broken rostrum, runt deformities, etc.
- Difficulty in moulting.