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POPULAR ARTICLE

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Hydrogen Sulphide effect in Shrimp Culture

Saikat Kumar Maji*[1]

[1]Department of Coastal Aquaculture, Annamalai University

Correspondence
Saikat Kumar Maji, Department of Aquaculture, Annamalai University.
Email: smsaikat04@gmail.com

Conflict of Interest

The authors declare that the manuscript was formulated in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Authors Contribution

All authors listed have made a substantial, direct, and intellectual contribution to the work, and approved it for publication.

Abstract

The world's largest aquaculture industry is in India. The economy also benefits greatly from the shrimp industry. A major threat to Indian aquaculture industry is the loss of survival because of various types of diseases due to improper pond environment management and also groundwater being impacted by human and natural activities, which has also reduced productivity. Production could be facilitated by the utilization of the water reserve. Recently some of the problems in shrimp culture like Hydrogen Sulphide problem causes heavy mortality during running culture.

KEYWORDS

Shrimp; Vannamei; Hydrogen Sulphide; Toxic effect; Silent killer

INTRODUCTION

H_2S is created when sulphate-consuming bacteria decompose organic materials in water or in a damp environment without oxygen. In a shrimp pond, the bottom layer of mud, sludge, and bio flocs produces H_2S. H_2S kills silently. By decreasing average daily growth and survival rates, raising feed conversion ratios, and making people more susceptible to illness, it raises production expenses. Farmers frequently experience H_2S issues but lack the knowledge to handle them. Since H_2S is a constant in the pond, shrimp may be slowly killed each night. When farmers are unaware of the underlying cause of crop death or how to manage it, they may have suffered significant losses from crop to crop at times and have come to accept this as the standard.

HOW DOES H_2S HARM SHRIMP?

The first thing that H_2S does is prevent shrimp from absorbing oxygen. Shrimp become weaker and more vulnerable when H_2S levels are low, even if they are only exposed for a brief amount of time. Even after brief exposure, mass fatalities happen when H_2S levels are high. By causing irritation to the soft tissues in the gills, intestines, stomach walls, and hepatopancreas, H_2S can also lead to tissue corrosiveness. Shrimp are less resilient to infection as a result of stress caused by H_2S.

H_2S TOXICITY

The three main factors that affect H_2S toxicity are pH, temperature, and dissolved oxygen. The processes used by shrimp to transfer oxygen are hampered by H_2S. Over 5 ppm of dissolved oxygen aid in preventing the production of H_2S. Low pH, oxygen content, and temperature all contribute to H_2S's increased danger. As a result, keeping an eye on these three factors is essential to reducing H_2S toxicity. In ponds Giant Tiger Shrimp (*Penaeus monodon*), 0.03 ppm of H_2S is considered safe. White Leg Shrimp (*Penaeus vannamei*) post larvae can withstand up to 0.009 ppm, while juveniles can withstand up to 0.02 ppm.

WHY DOES H_2S OCCUR?

- Anaerobic conditions brought on by extremely deep ponds with low oxygen levels produce H_2S.
- Before stocking, algae grow on the bottom of ponds with clear water.
- Then, when phytoplankton blooms in the pond water, it obstructs the algae's light, causing it to crash and producing hydrogen gas (H_2S).
- Ponds having loose or sandy soil.
- Ponds with elevated levels of suspended organic matter. A favourable environment to produce H_2S is created when the organic matter sinks to the bottom of the pond.
- High-density polyethylene liners that leak in ponds. H_2S is produced when organic matter seeps beneath these liners and into an oxygen-free area.
- Ponds that experience high feed waste levels
- H_2S release is supported by acid sulphate ponds with low pH levels and high organic matter

contents.

HOW TO PROCEED IF H_2S IS FOUND?

• Replace the water to ensure that it stays clear and add probiotics (Photo Synthetic based) to clear the sludge toxicity.

• Use microorganisms such as Rhodobacter, Paracoccus which can metabolize H_2S.

• Use lime right away to raise the pH above 8.0.

• As soon as possible, reduce feed amounts by 50% for at least three days, or until normal conditions are restored.

• Immediately increase aeration (but be mindful of sludge disturbance when installing a new aerator).

HOW PHOTOSYNTHETIC (PS) PROBIOTIC WORKS WITH H_2S?

PS Probiotic contains Photoheterotrophic bacteria. It can multiply in both aerobic and anaerobic environments. They also aid in the breakdown of organic matter and the reduction of Hydrogen sulphide (H_2S) in pond water. This contains *Rhodobacter* sp., *Rhodococcus* sp.

HOW TO PREVENT H_2S IN SHRIMP POND?

- Throughout the entire crop, maintain a pH of 7.8 to 8.3 between 0.5 is the required pH range for the day.
- On demand Feed must be provide based on consumption and monitor by Check Tray.
- Make sure the dissolved oxygen level in your shrimp pond is always higher than 3 ppm at 3 meters from any sludge edge and 30 cm above the pond bottom by 3:00 a.m.

Fig.1: Hydrogen sulphide (H_2S) toxicity effect

CONCLUSION

The amount of hydrogen sulphide that is present in ponds is caused by several factors,

such as the presence of organic matter that causes sedimentation at the bottom of the pond and insufficient sunlight reaching the bottom of the pond. Anaerobic bacterial activity from organic matter produces hydrogen sulphide, a substance that is typically found at the bottom of ponds. This compound is typically found in pond bottoms that are oxygen-starved. Hydrogen sulphide concentrations in shrimp ponds should be ≤ 0.01 ppm. Application of PS bacterial contains probiotic can rectify this toxic problem in shrimp pond & create a good environment.

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