

Seed Certification for Shrimps in India: Ensuring Quality and Sustainability in Aquaculture

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ABSTRACT

Shrimp aquaculture is one of the most dynamic sectors of India's fisheries, contributing significantly to food security, livelihoods, and export earnings. The quality of seed forms the backbone of this industry, directly influencing survival, growth, and long-term sustainability. Seed certification ensures that hatcheries supply farmers with disease-free, genetically strong, and traceable shrimp seed, produced under strict biosecurity and environmental standards. The process covers multiple dimensions, including broodstock screening, water quality management, larval monitoring, pathogen testing, and transparent documentation, all of which safeguard both productivity and ecological integrity. However, several critical areas remain underemphasized, such as continuous training of hatchery staff, improved nutritional management, adoption of digital record-keeping, and systematic monitoring of environmental impacts. Addressing these gaps will not only strengthen certification but also build resilience against disease outbreaks and production losses. As India continues to expand its shrimp farming footprint, robust seed certification stands as a strategic tool to enhance global competitiveness, reduce ecological risks, and secure the prosperity of aquaculture communities. Ultimately, effective certification is about much more than compliance, it is about ensuring sustainability, farmer confidence, and India's leadership in

global aquaculture.

INTRODUCTION

Seed certification remains a vital component for growth and sustainability of shrimp farming in India. Aquaculture operations find a base for their shrimp seed, young shrimp. The level of seed quality determines of the success for shrimp farming, affecting to productivity as well as long-term sustainability. The seed certification process is governed by various agencies, for example, the National Fisheries Development Board (NFDB) along with the Department of Animal Husbandry, Dairying, and Fisheries (DAHD&F) under the Ministry of Fisheries, Animal Husbandry, and Dairying (MoFAHD). This certification ensures that shrimp hatcheries operate under certain standards, producing fairly healthy, disease-free, and genetically quite strong shrimp seed. As this article deeply explores it, India's process of shrimp farming seed certification is highlighting the scientific underpinnings and the regulatory frameworks, with the focus on the importance of this practice to ensure a more sustainable future for aquaculture.

Application of the document

Shrimp hatchery sends the State Fisheries Department or NFDB's Aquaculture Division one such specific certification application, that process starts. The application must include:

- I. *Basic Hatchery Information:* Details such as of the address, of the ownership, and of the hatchery's maximum production capacity (NFDB, 2023).
- II. *The Historical Production Data:* This also includes most survival rates, plus growth performance. Also, such data takes in each and every past health or disease-linked issue (FAO, 2021).

- III. *Disease Management Protocols:* Information about how diseases are managed, which includes biosecurity measures, quarantine practices, along with vaccination protocols (FAO, 2021).

Accurate Documentation

Sufficiently detailed plus accurate documentation of operational performance is often overlooked. The application in regard to certification (FAO, 2021) may be rejected, or delayed. Keeping a comprehensive record of past disease outbreaks and hatchery performance is critical for the certifying body to evaluate the applicant's reliability.

Pre-certification Inspection

After submission, a pre-certification inspection is conducted to evaluate the hatchery's physical and operational standards. The inspectors focus on:

- I. *Hatchery Infrastructure:* This includes biosecurity measures, waste management systems, and the integrity of water filtration systems (NFDB, 2023).
- II. *Water Quality:* Inspectors measure parameters such as salinity, pH, temperature, and ammonia levels to ensure optimal conditions for shrimp (Subasinghe et al., 2018).
- III. *Personnel Expertise:* The training and competency of hatchery staff in breeding, disease management, and biosecurity protocols are assessed (Sarkar & Hossain, 2020).

Human Resource Development

While infrastructure and equipment are often the focus, the training of hatchery personnel is

crucial for ensuring successful shrimp production. Staff should undergo ongoing education to stay updated with the latest in shrimp farming techniques and biosecurity practices (Sarkar & Hossain, 2020).

Health and Disease Testing

The most critical aspect of certification involves health screening to ensure that the shrimp seed is free from diseases. This step includes:

I. *Pathogen Testing*: Diagnostic methods like Polymerase Chain Reaction (PCR), enzyme-linked immunosorbent assays (ELISA), and histopathology are used to detect diseases such as White Spot Syndrome Virus (WSSV), Taura Syndrome Virus (TSV), and Early Mortality Syndrome (EMS) (FAO, 2021).

II. *Bacterial Testing*: Testing for bacterial pathogens like *Vibrio* spp. is also carried out, as these can lead to infections in shrimp larvae (Subasinghe *et al.*, 2018).

Seasonal and Environmental Variability

Disease prevalence can vary due to seasonal and environmental conditions. Temperature fluctuations, changes in salinity, and nutrient levels can influence the occurrence and spread of diseases. Thus, health testing protocols must be adapted based on these factors (Subasinghe *et al.*, 2018).

Broodstock Management and Certification

Broodstock (adult shrimp used for breeding) are a crucial element in the certification process. The broodstock must meet the following criteria:

I. *Disease-Free*: They must undergo comprehensive health screenings to ensure they are free from pathogens before breeding (FAO, 2021).

II. *Quarantined*: A quarantine period is necessary to confirm that no latent diseases are present in the broodstock (FAO, 2021).

III. *Genetically Superior*: Broodstock must be sourced from certified, disease-free genetic lines to produce healthy, strong offspring (FAO, 2021).

Genetic Management

Genetic management, though often neglected, is vital for the long-term success of shrimp farming. Hatcheries should focus on managing genetic diversity to prevent inbreeding and maintain healthy, disease-resistant broodstock lines (Subasinghe *et al.*, 2018).

Larval and Post-Larval Monitoring

After egg fertilization, larvae and post-larvae are closely monitored for growth and survival. Key areas of focus include:

I. *Growth Performance*: Tracking the survival rates and growth patterns of larvae is important to confirm their health (Sarkar & Hossain, 2020).

II. *Water Quality*: Environmental factors like oxygen levels, pH, and salinity need to be constantly checked to ensure a healthy habitat for the larvae (Subasinghe *et al.*, 2018).

III. *Biosecurity*: Strict sanitation and disinfection protocols are followed to avoid disease outbreaks (NFDB, 2023).

Nutritional Management

Nutritional management is often underemphasized but is essential for the healthy growth of larvae. Providing the right diet at each developmental stage is key to enhancing seed quality and survival rates. Hatcheries should create detailed feeding plans to improve growth outcomes (Subasinghe *et al.*, 2018).

Certification of Shrimp Seed

Once the larvae pass the health tests and grow to a suitable size, they are officially certified. This certification assures that the shrimp seed is:

- I. *Disease-Free*: They pass all tests for pathogens like WSSV, TSV, and EMS (NFDB, 2023).
- II. *Genetically Sound*: Seed must originate from certified and healthy broodstock (FAO, 2021).
- III. *Produced Following Best Practices*: The hatchery adheres to strict biosecurity and operational protocols (Subasinghe *et al.*, 2018).

Traceability and Transparency

Proper traceability systems must be in place to track the seed from the hatchery to the farms. Without a proper system, ensuring that certified seed is being used correctly in farms becomes difficult (Sarkar & Hossain, 2020).

Post-certification Monitoring

After certification, shrimp hatcheries undergo routine post-certification monitoring to ensure ongoing compliance. This involves:

- I. *Scheduled Inspections*: Authorities regularly inspect the hatchery to ensure it adheres to certification standards (NFDB, 2023).
- II. *Health Monitoring*: Ongoing pathogen screening for broodstock and larvae (Subasinghe *et al.*, 2018).
- III. *Surveillance*: Continuous monitoring for emerging diseases in both larvae and broodstock (Sarkar & Hossain, 2020).

Ecological Impact Monitoring

While disease prevention is a major focus, monitoring the environmental impact of

hatchery operations is often neglected. Assessing water quality and sustainable resource usage can help reduce the ecological footprint of hatchery operations (FAO, 2021).

Record Maintenance and Traceability

Maintaining accurate records is mandatory for certified hatcheries. These should include:

1. Broodstock lineage and health history.
2. Health and disease test results for each batch of larvae and post-larvae.
3. Water quality logs for every stage of production (FAO, 2021).

Digital Record-keeping

Many hatcheries continue to keep records manually, which can introduce mistakes. Switching to digital systems for record-keeping can enhance the accuracy of data management, allowing for more efficient real-time tracking of important metrics (Sarkar & Hossain, 2020).

Certification Renewal

Shrimp seed certification typically lasts for a period of one to two years. Once this timeframe expires, hatcheries must reapply for certification, which involves further rounds of inspections and testing to ensure ongoing compliance (NFDB, 2023).

Peer Evaluation During Renewal

The process of renewing certification could be improved by incorporating peer evaluations from external experts. This would offer a more impartial and comprehensive review of hatchery practices, ensuring better alignment with industry standards (Subasinghe *et al.*, 2018).

Compliance Monitoring

Certification standards are enforced through strict regulations. Hatcheries that fail to adhere

to these regulations may face penalties, or risk losing their certification altogether (NFDB, 2023).

Transparency and Fair Enforcement

To ensure fairness, the enforcement of regulations needs to be clear and consistent. Hatcheries should be fully aware of the consequences of non-compliance, and certifying bodies must guarantee that penalties are applied transparently and justly (FAO, 2021).

CONCLUSION

Seed certification in shrimp aquaculture is not just a regulatory requirement; it is a strategic necessity for India's long-term food security, economic growth, and global competitiveness. By ensuring that hatcheries produce disease-free, genetically strong, and environmentally friendly seed, certification builds the foundation of sustainable shrimp farming. The process combines science, regulation, and management. It includes broodstock health, water quality, biosecurity, nutrition, and record-keeping to protect productivity and farmer livelihoods. However, to reach its full potential, the system must address neglected areas such as human resource development, digital record-keeping, nutritional improvement, and ecological monitoring.

Strengthening these aspects will improve resilience against disease outbreaks, lower environmental risks, and ensure a steady quality of seed for farmers. As India aims to be a global leader in aquaculture, effective and transparent seed certification will be essential for building trust, protecting ecosystems, and empowering coastal communities. In the end, a strong certification framework is not just about producing better shrimp; it is about securing a sustainable future for aquaculture and the millions who depend on it.

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