Research and Development towards Sustainable Shrimp Pond

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ABSTRACT:
Shrimp industry nowadays is moving forward to Bio/Green/Circular economy concepts. This was due to the need of sustainable production to secure the world food requirement. In the past, shrimp cultivation was carried out in coastal areas using earthen ponds. The transformation to polyethylene sheet lining ponds instead of soil bottom ponds is commonly applied and farm recirculation has been regulated by the governmental authority. However, appropriate technologies for water quality management and disease control for intensive shrimp cultivation are not yet applicable in common practice. Recent shrimp ponds can be classified into two categories. The first category is subjected to low turbidity water with high water exchange. With this category, water in shrimp tank or pond is agitated by high-rate paddle wheels or intense air bubbles generating strong water movement holding high suspended solids. Water treatment with chemical disinfection or filtration is applied for makeup and exchange water. The pond walls are regularly cleaned by polishing. Solid waste is removed through center drain incorporate with high rate of water exchange e.g., more than 50% per day. Hence, water exchange is the major process for water quality control and external treatment ponds is therefore essential. Flow through system and in-pond raceway system (IPRS) may also be classified in this category. The second category is the shrimp pond with internal treatment process. Since shrimp culture density is less than 10 kg/m^3, water treatment using natural processes inside the pond is possible and water exchange can be kept to a minimum. Examples of internal treatment processes are biofloc and nitrification treatments. Nitrogen wastes are treated by either assimilation process with heterotrophic bacterial or dissimilation process with nitrifying bacteria. Towards the sustainable shrimp pond, research and development for the next generation shrimp pond technology is necessary. High efficiency and low energy consumption aerator, accurate feeding protocol and devices, water quality control and real time monitoring of shrimp growth and health are among the challenges for the future development of a smart shrimp farm. Moreover, new techniques such as microbiome/metagenome analysis and biogeochemical analysis become a powerful tool for an understanding of natural treatment processes which leads to the consistency of shrimp production under recirculating aquaculture system concept.

KEYWORDS:
Shrimp pond, Recirculating Aquaculture System, Biofloc, Nitrification, BCG economy