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Popular Article

Freshwater Pearl Culture Practices and Challenges in India

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Abstract

In India freshwater pearl farming has appeared as a promising sector with traditional aquaculture practices with modern technologies to meet commercial and global need for pearls. This article reveals the various freshwater mussel farming practices adopted in India, including mussel selection, nucleation methods, and water quality management, which are customized to meet the country's diverse climatic and ecological conditions. It also surveys the challenges faced by the industry, such as improper technology, lack of infrastructure, fluctuating water quality, and impacts of climate change. By highlighting advancements in farming techniques and sustainability practices, this article reveals the crucial role of freshwater pearl farming in promoting a balanced relationship between economic growth and environmental conservation.

Keyword: Molluscs, bivalves, gemstone, epithelial cells,

Introduction

As the Dictum says 'rare objects have more value'. Humankinds exhibits a value of rare objects such as precious metals and gemstones. Pearl is the only gemstone produced by a biological organism and may be considered an organic gemstone. Molluscs, an ancient group of organisms, can produce pearls as an immunological response to a foreign particle in their internal glands. Some studies have reported that the pearl-producing molluscs first appeared 530 million years ago. However not all molluscs can produce pearls in their nacre glands, only the bivalves can. According to studies, there are about 10,000 species of bivalve molluscs present around the world, but pearls of commercial value are commonly produced from a few species of selected bivalve. India ports around 3270 molluscan species including 1100 bivalves, and as many as 625 species of marine bivalves have been reported from India including 88 that indigenous to Indian waters.

In the past pearls were produced by cutting up mussels which were collected from the nature. This was an inconvenient process and it often led to the extinction of molluscs from the ecosystem. In 1970, a Japanese scientist Tokichi Nishikawa disentangled the riddle behind the production of pearls from molluscs and proposed the 'Pearl Sac Theory'. According to this theory,

a pearl is produced by the outer epithelial cells of the mantle tissue (mother of pearl) and can be persuades by placing foreign bodies or lesion into the mantle tissues. China introduced the freshwater mussels culture practices and produced pearls with the image of Buddha in *Cristaria plicata*. Mikimoto Kokichi, a Japanese entrepreneur known as the founder of modern cultured pearl, began mass production of pearls and commercialised his technology. Since then, the market for pearl has been expanded several and now it becomes a multi-billion-dollar sector of the aquaculture industry. In India initial experiments for freshwater pearl culture were conducted in Indian rivers and ponds in the 1980s, in 1990s CIFA developed techniques suitable for Indian conditions, including surgical implementation methods for pearl nucleation. After that freshwater pearl farming gained popularity, especially in states like Bihar, Uttar Pradesh, Tamil Nadu and Andhra Pradesh as an alternative income source.

PEARL CULTURE

Site selection-

The selected site for pearl farming should have a water supply without pollutants and no algal blooms. Water should be clean and has low turbidity as highly turbid water decreases the filtration rate of mussels.

Selection of mussels-

1. Specific freshwater mussel species are chosen based on their ability to produce high-quality pearls for commercial purposes (e.g., *Lamellidens marginalis* in India).
2. Healthy and mature mussels of a length and weight of ≥8 cm and ≥35 g are generally selected as they have a better success rate in the formation of pearls.

Pre-grafting culture-

Before surgical implantation process, the selected mussels are kept together for 24-36 hours for the relaxation of their adductor muscles. Basically the mussels are kept in FRP cement tanks. Crowding of the mussels causes the smooth opening of the valves of the mussels for the surgical procedure.

Grafting /Nucleation-

The most important step in the entire pearl production procedure is the implantation of the nuclei or beads into the mussel body. The nucleus, made up of acrylic powder or shell powder, which can be grafted along with the mantle graft. There are mainly three implantation procedures in practice namely-

1. **Mantle cavity implantation:** Out of the three methods, this is the simplest method which require minimum skill and expertise. In this method, the nucleus is carefully implanted into the cavity between the outer mantle layer and the inner surface of the mussel shell.
2. **Mantle tissue implantation:** In this method, the mantle graft and the nucleus is implanted

into the pockets made on the posterior side of the muscle, in both the left and right lobes, of the mantle tissues of the recipient mussel.

3. **Gonadal implantation:** In this method, a small incision is made in the gonad of the recipient mussel and then the nucleus together with the mantle graft is put into the incision. A live graft of 2 to 3 mm, taken from the pallial mantle ribbon is inserted along with the round nucleus.

Post-grafting culture (pearl development)-

Following post-grafting care, the implanted mussels are transferred to the desired culture system where they are kept in hanging condition packed in nylon net bags. Either in FRP cement tanks or ponds the implanted mussels are cultured along with other compatible fish species. The culture period generally varies from 12 to 18 months depending on the method of the implantation followed. Proper soil and water quality parameters are conductive to the formation of good quality pearl in captive conditions.

Soil and water quality parameters-

Parameter	**Range**
Transparency of water	40-60 cm
pH of water	7.0-8.0
Temp. of culture medium	25-30°C
D.O.	4-8 ppm
Total hardness	60 ppm
Calcium in water	20-30 ppm
Magnesium of water	5-10 ppm
Total alkalinity	80 ppm
Ammonia	>0.004 ppm

Challenges in pearl farming in India

Freshwater pearl farming in India, despite being profitable and requiring minimal labour, is not as widespread as fish and shellfish farming. This is due to several challenges. There are very few pearl farmers, and the industry lacks proper organization Mussels needed for pearl farming are not easily available, and there are no clear methods to manage them effectively. Breeding techniques for mussel have not been standardize, and there are no proper guidelines for maintaining water quality in different climatic regions of the country. Only a few research institutes work on fresh water pearl farming, and there is a poor system for sharing knowledge and training farmers. While pearl farming has great potential, these issues need to be addressed to help the industry grow and make the technology more accessible.

Conclusion

In conclusion, freshwater pearl farming is a growing industry in India's aquaculture sector, and significant progress has been made in improving and standardizing farming techniques. However, several challenges still need to be addressed to help this industry grow further. One of the main issues is the lack of proper sharing of framing techniques with people who are interested in the field. Many potential farmers do not have access to the right information and training to start pearl faming. Another challenge is the need to develop better breeding methods for mussels. To make freshwater pearl farming more successful, scientists and researchers should focus on creating better mussel varieties that produce high-quality pearls. At the same time, they should work to improve the overall quality of the pearls produced. By addressing these issues, freshwater pearl farming can become a more significant contributor to India's aquaculture production and support the livelihoods of many people involved in this sector.

References

http://rawpearls.com.au/pearl_knowledge.

http://ucmp.berkeley.edu/taxa/inverts/mollusca/bivalvia.php.

Mohamed, K.S. and Venkatesan, V., 2017. Marine molluscan diversity in India—Exploitation, conservation.

Mohamed, K.S. and Sasikumar, G., 2016. Overview of bivalve fisheries of India. http://eprints.cmfri.org.in/2842/1/Article_13.pdf.

Janaki Ram, K., 1997. Freshwater pearl culture in India. Naga, the ICLARM Quarterly, 20(3-4), pp.12-17.

Gervis, M.H. and Sims, N.A. 1992. The biology and culture of pearl oysters(Bivalvia Pteriidae). Vol.21. WorldFish.

Southgate, P.C., Strack, E., Hart, A., Wada, K.T., Monteforte, M., Carin, M., Langy, S., LO, C., Acosta-Salmon, H. and Wang, A., 2008 Exploitation and culture of major commercial species. The pearl oyster, 303, p.355.

Zhu, C., Southgate, P.C. and Li, T., 2019. Production of pearls. In Goods and services of marine bivalves (pp. 73-93). Springer, Cham.

Subba Rao, N.V., 1989. Handbook, freshwater molluscs of India. Zoological Survey of India, Calcutta, pp:289.

Janakiram, K., 2003. Freshwater pearl culture technology development in India. Journal of Applied Aquaculture, 13(3-4), pp. 341-349.

Mandal, R.N., Kumar, K., Mohanti, U.L. and Meher, P.K., 2007. Estimation of gut contents of freshwater mussel, *Lamellidens marginalis* L. Aquaculture Research, 38(13), pp. 1364-1369.

Saurabh, S., Mohanti, U.L., Mohanti, J., Jayasankar, P., 2014. Pearl culture technology in freshwater environment. Aquaculture and Fisheries Environment. Discovery Publishing House PVT.LTD, New Delhi, India, pp. 51-78.