



TECHNOLOGY OF DESIGNER PEARL PRODUCTION

Chief Guest

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INTRODUCTION

- Pearls have captivated human beings for thousands of years, symbolizing purity, beauty and spiritual perfection across civilizations. India's demand for pearls remains high, but with the development of indigenous technologies at the Vizhinjam Regional Centre of ICAR-CMFRI, designer pearl production is now a reality.

SPECIES USED FOR DESIGNER PEARL PRODUCTION

- The Indian pearl oyster *Pinctada fucata* is the primary species used for designer pearl production, and the Centre has perfected techniques to create image pearls—pearls that take the shape of idols, motifs, and other artistic designs through natural nacre deposition. The black-lip pearl oyster *P.margaritifera* is also suitable for producing high-quality designer pearls, offering additional possibilities in size, colour, and aesthetic appeal.

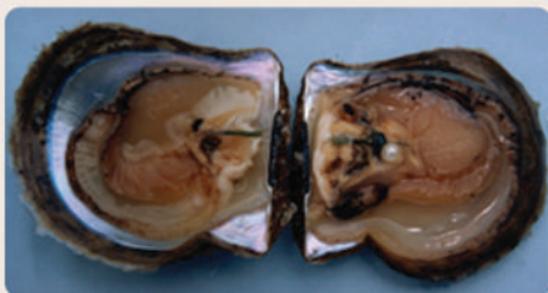
The technology integrates breeding, controlled hatchery seed production, on-sea farming and precise nucleus making, resulting in designer pearls of remarkable lustre and colour. These pearls combine traditional craftsmanship with biological science, offering excellent prospects for entrepreneurship, women self-help groups and coastal livelihood enhancement.



Indian pearl oyster, *Pinctada fucata*

NATURAL, CULTURED & DESIGNER PEARLS

- Natural pearls are formed when a foreign particle or parasite enters an oyster and becomes coated with nacre as the animal tries to isolate the irritant. Cultured pearls begin in a similar manner, except that a trained technician implants a bead and mantle graft in the animal for predictable pearl formation. Once the initial step is completed, both natural and cultured pearls develop in the same way, with nacre coating deposited layer by layer.



*Spherical Pearl
inside the
gonadal tissue*



*Designer pearls
on the
inner shell*

Designer pearls differ from normal cultured pearls in their method of implantation. Instead of inserting a round bead into the soft gonadal tissue, a shaped nucleus is attached to the inner shell surface. The oyster responds by coating this shape with nacre, producing an designer pearl. These pearls are aesthetically unique, easier for the oyster to tolerate, and formed in a shorter period. Their attractive shapes and natural hues make them ideal for jewellery, gifting and artistic collections.

The culture period for designer pearls is also very short—around 50–55 days from implantation, compared to cultured pearl production, which requires 3 months to 12 months for a nucleus of 2–6mm.

Designer pearls offer a major advantage, as they can be produced in any desired shape or size, unlike natural pearls, which are typically limited to spherical or near-round forms. The price of a designer pearl ranges from Rs. 2,500 to 3,000 per piece, and there is a high market demand for these products.

HATCHERY NURSERY & FARMING

- Designer pearl production begins with the careful selection of broodstock. Oysters with desirable shell traits and colour are chosen, and gametes are gently extracted using a biopsy method. The eggs and sperm are mixed in filtered seawater and fertilization is induced, allowing embryos to develop. These embryos grow into D-veliger larvae within about twenty-four hours, and with regular feeding of *Isochrysis galbana*, other flagellates and diatoms, they metamorphose into spat within a month. The spat is nursed for about sixty days on a mixed algal diet dominated by *Chaetoceros calcitrans*.



Spat in silos



Juveniles



*Adult Pearl Oysters
in box cage*



Pearl oyster cleaning

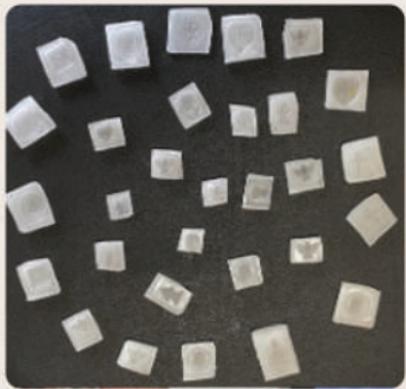
Once the spat grow to a suitable juvenile size, they are transferred to mesh bags held inside cages and suspended from rafts in Vizhinjam Bay. The oysters grow rapidly in the nutrient-rich waters and are cleaned and sorted every month. As they increase in size, they are moved to progressively larger mesh cages to avoid overcrowding. After sixteen to twenty-four months of sea farming, the oysters attain the ideal size of 60-70 mm and shell condition for designer nucleus implantation.

DESIGNER PEARL PRODUCTION

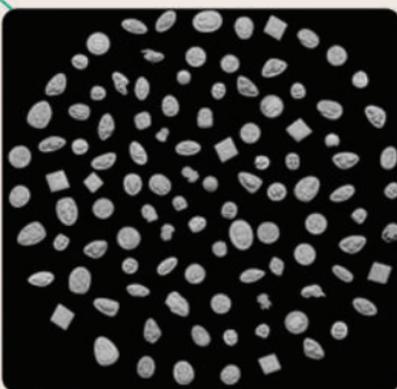
- The making of a designer pearl begins with the careful preparation of a high-quality nucleus, produced through a seven-step process. First, a metal impression of the desired image is created by embossing a copper sheet using a hydraulic press, forming a precise template of the design. In the second step, a wax mould is cast by heating the metal template, coating it lightly with oil, and pouring molten wax over the embossed surface. Once cooled, the wax mould is removed, washed, and dried for filling.



Metal template



Wax mould

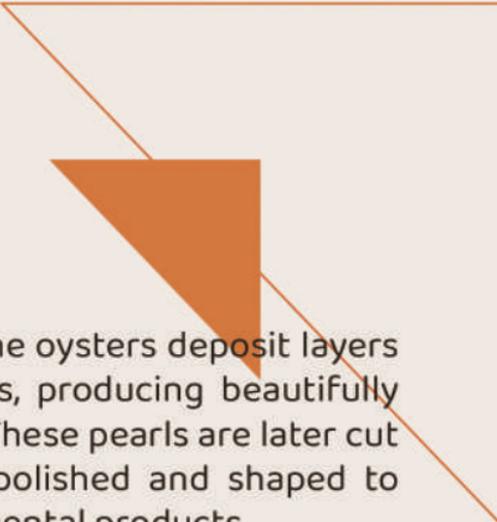


Designer pearl nucleus



Implantation

For implantation, oysters of at least seventy millimetres are narcotized with menthol so that their shells open naturally. The inner nacreous shell surface is inspected, and the nucleus is gently attached using a quick-drying adhesive. After implantation, the oysters are maintained briefly in aerated tanks and then returned to sea cages for post-operative farming. Over the next

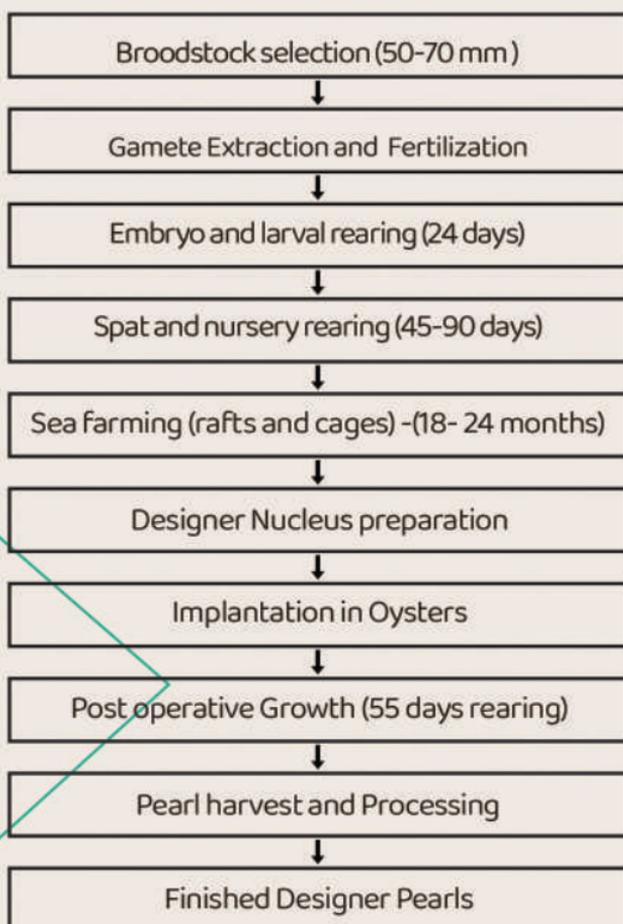


fifty to fifty-five days, the oysters deposit layers of nacre on the nucleus, producing beautifully coated designer pearls. These pearls are later cut and removed, cleaned, polished and shaped to create high-value ornamental products.

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Flow Chart





Designer pearls

Designer pearl production offers several advantages that make it a promising micro-enterprise for coastal communities, especially women SHGs and young entrepreneurs. The technology allows pearls to be crafted in customized shapes such as hearts, stars, leaves, idols, initials and other artistic motifs, giving them strong appeal in jewellery, boutique accessories, corporate gifting and souvenir markets. These pearls require low investment and have a short culture period, making production affordable while ensuring high profitability. With a selling price of ₹2,500–3,000 per piece, designer pearls generate excellent returns compared to their low production cost. Although pearl oysters require 18–24 months to reach implantable size and Indian *Pinctada fucata* produces fewer pearls per oyster compared to larger species like *P. margaritifera* or *P. maxima*, the high aesthetic value and market demand make the venture highly viable. Overall, designer pearl production holds strong potential for income generation and livelihood diversification in coastal and rural areas.



Pearl string with designer *pearl* pendant

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