PEARL CULTURE-A REVIEW FROM CLASSICAL TO FUTURISTIC BIOTECH

Abstract

Started from Kokichi Mikimoto in 1888 of Japan, Pearl culture has a long journey up to completion of genome map of Pinctada fucata, Pearl oyster in 2017.Now attempts are made to isolate the nacre secreting gene(s), combine with other vectors and insert to a suitable host to get quality Pearl for Commercial Pearl farming .The present chapter includes a review of the biotechnology involved in it.

Keywords: Nacre, Nacrein, mineralization, reverse transcription PCR, linkage group.

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I. INTRODUCTION

Pearls appear as jewellers envy, the legislature of astrologers, medicines of Ayurved ,the symbol of Aristocracy ,the Pride of ornaments and units of Peerless wealth. From the beginning of human civilization till date of genetic Engineers it has attracted human being with its great lusture. The art of Pearl culture started as a classical Biotechnology by Kokichi Mikimoto (1888) and still remains unexplored with a great futuristic Potentiality.

In Sanskrit literature, it is mentioned that during “Swati Naksharta”,when a drop of water fall between the mantle and nacre layer ,then Pearl develops in an oyster. Chineese are known to use Pearl since 2300BC. Koutilya has also explained about Pearl in his “Arthasastra”. Now various institutions like CMFRI, Tutikorin are actively involved in Pearl culture Practices.

II. WHAT IS PEARL?

Naturally Pearl is mostly a spherical or irregular body formed by deposition of nacre secreted by epithelial cells of mantle in response to irritations caused by external or internal stimuli like sand grains ,Parasites and other foreign Particles composition includes CaCO3,chonchiolin (C32H18N2O11) in the matrix which also contains Chitin ,fibroin ,Ca++,Zn++ ,mg++ and soluable acidic proteins for crystal nucleation GAGs. Any improportionate composition disfigures Pearl. Health of the oyster and Ecology of the water also plays and important role in Pearl formation.

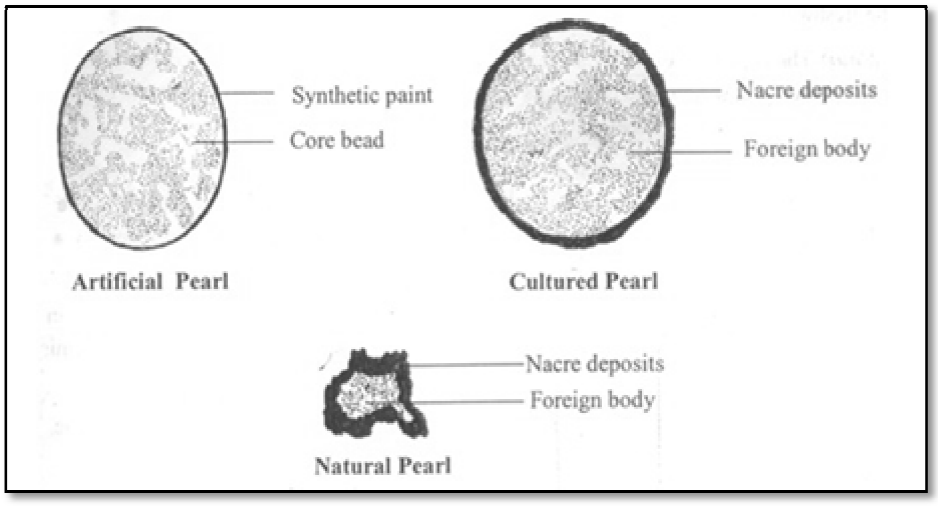

Figure1: Types of Pearls

III. MAJOR PEARL OYSTERS

The Pearl oysters are mostly marine bivalves belonging to the genus Pinctada ,under the family Pteriidae ,order Lanellibronchiata.

- **Pinctada Maxima:** Gold/silver lip Pearl oyster Australia ,Burma ,Thailand ,Indonesia
- **Pinctada Fucata:** Yellow lip Pearl oyster,Red sea Persion ,India China ,Korea ,Japan and western Pacific ocean.

- **Pinctada Margaritifora**: Black lip Pearl oyster ,Persion Gulf ,Red sea ,Sudan ,Indonesia India , Japan and Pacific.
- **Pinctada Chemnizii:** Gulf of manner

Freshwater Pearl oysters include;

- Lamellidommarginalis
- Lamellidomcarrianus
- Lanellidomcorrugate

a) Fresh water **b) Marine water**

Figure 2: Pearl oysters

IV. FORMATION OF PEARL

Naturally formation of Pearl includes invasion of a foreign particle into the mantle epithelium followed by continuous secretion of nacre in concentric layers around it up to several years .This principle is exploited in artificial pearl culture practices .The entire biotechnology is based on this involving i) Selection of site ii) Supply and rearing of spot iii) Protection from enemies iv) Preparation and insertion of nucleus v)Post operative treatment vi) Harvesting

V. FUTURISTIC TRENDS

Future of Pearl Culture is bright with a great potential of commercial production through modern biotechnology (Chellam A. et.al.1998). To improve the technology of pearl production, the following measures are needed:

- Enhancement of the quality of environment.
- Improve biological needs of oysters
- Improve genetic and biological aspects of the oysters.

Environmental and biological needs are under continuous improvement over the years but the third aspect, i.e. genetic and biological improvements are highly essential. Various modern workers are involved in improvement of Pearl culture particles through various studies .A matrix protein “Pmarg-Pearlin” involved in nacre farm work formation has been identified in Pinctada margaritifera [Montagnaric etal.2011] Nature of development and

function of Pearl sacs from regenerated mantle graft tissue has been thoroughly studied in Pinctada margaritifora (Kishore P.etal.-2015) A complete genome map of Pinctada fucata has been worked out taking 14linkage groups in the species (Xiaoong Du et.al 2017) which shows that Pearl formation is a complex process involving many genes at a time for nacre secretion mineralization ,fibroin & Chitin deposition involvement of VWA Proteins and acidic glycosamine glycans.

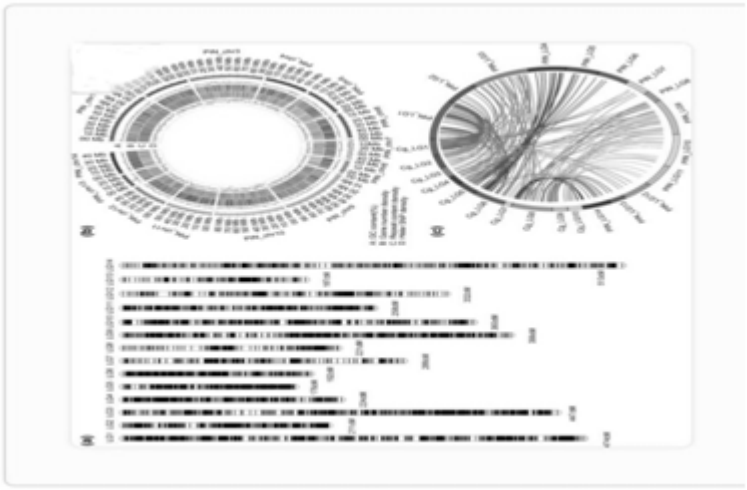

Figure 3: Complete Genetic Map of P. fucata martensii (Drawn from Xiaon Du et.al.2017)

VI. CONCLUSION

Something is known and Still more things are to be done for Pearl Culture in future. All the above processes are merely the foot steps towards a futuristic biotechnology of Pearl culture. Sequencing techniques have identified the genes responsible for Pearl formation .Events like selection of a suitable vector ,Preparation of recombinant DNA and insertion into a host need to come ahead to get good marketable quality Pearl in future .

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