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Culture of pearl in freshwater mussels (*Lamellidens marginalis* Lamarck)

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Abstract
A pond trail on pearl culture in freshwater mussels, *Lamellidens marginalis* was carried out for one year in an artificial perennial pond. Four types of foreign particles of indigenous sources, sand, stone, fish eyeball and beads of artificial pearl nucleus were used as nucleus for pearl production. Among the nuclei inserted mussel highest survival rate (72%) was recorded for stone and lowest survival rate (50%) for artificial pearl by nucleus implantation. Highest pearl production rate (%) was recorded for the insertion of stone and lowest for the sand. All nuclei inserted mussel produced pearl accept the mussel which was inserted beads of pearl nucleus for pearl formation. Growth rate (length and weight) was found higher for uninserted mussel than nuclei inserted mussels.

Key words: *L. marginalis*, Pearl culture

Introduction

In Bangladesh, there is a good prospect for commercial pearl production from the joint venture with Japan, China or the countries which are technically developed in this sector. *Lamellidens marginalis* (Lamarck), an important pink pearl producing freshwater mussel is increasing demand in pearl producing countries (Ram 1989). *Placuna*, *Placenta*, *Mytilus*, *Hyriosis* species are found abundantly in Cox's Bazer, Moheshkhali, Sonadia, St. Martin Island of the country (Alam 1994). Despite of the favorable environment, our country could not develop the modern pearl culture techniques, though the pearl culture techniques is easy and simple. Ahmed (1968), Hossain (1983) and Begum *et al.* (1990) did some work on pearl culture from *L. marginalis*. Selection and production of low cost, available and suitable nucleus of indigenous sources for the insertion of the mussel is essential for pearl culture. Production rate, shape, size, colour and quality of pearl and acceptability of the nucleus by the mussel depends on the nucleus. The present studies were conducted to study the pearl culture system in a freshwater mussel *L. marginalis* using different indigenous nucleus materials.

Materials and methods

Experimental pond

The experimental pond was about 200 m^2 and the sources of water were rainfall and ground water from deep-tubewell. The pond was completely independent with an outlet on the western side to discharge excess rainwater. The average water depth of the pond varied from 1.2-1.6 meter. The bottom mud of the pond was silty and muddy with a depth ranged from 15-22 cm.

Pond management

The pond was fertilized with different chemical fertilizers. Urea was applied at the rate of 100 g/40m^2 and triple super phosphate at 50 g/40m^2 in the months from March to October. Lime was applied at the rate of 500 g/40m^2.

Cage materials

The cages of 100 cm x 100 cm x 90 cm (length, breadth and height) were made of steel framework with 1.5 cm mesh sized nylon netting. The cages were closed on all sides by net except the top. Cages were placed in the experimental pond at a water depth of 1 meter. Fifty mussels were kept in each cage.

Selection of foreign particles as nucleus for insertion

Different foreign particles of indigenous sources (1-2 mm diameter) like sand particles, stone (small pebbles), beads of pearl nucleus and dried eyeballs of small fishes were used as nucleus. To manage eyeballs of fishes, small fishes were boiled for half an hour and eyeballs (1-2 mm) were pressed out from soften head and kept at freezer after washing them at 5% alcohol.

Collection of the mussels

Bivalve mussels (*Lamellidens marginalis*) were collected on from the experimental pond, adjacent to the Department of Aquaculture and Management, BAU. These mussels were collected by hand from different depths ranging from 0.6 m to 1.5 m. The mussels were kept in the container and transferred to the laboratory immediately.

Insertion of foreign particles

The large mussels having 8.9 to 12.2 cm in length and 84.5 to 149.6 g in weight were sorted out in the laboratory. Weight and length (L: greatest dimension along the anteroposterior axis) of every specimen was recorded on 1994 and kept for 2 days in the aquaria filled with pond water for conditioning. After 2 days, mussels were transferred in a tray from aquaria and washed in 40% alcohol. Sands and stones were placed at the end of a hypodermic injection needle and inserted them into the epithelial layer at the right side and middle position of the mantle by opening the valve of the mussels with the help of knife and sharpended bamboo pegs. With the help of knife, the valve was first made open and a bamboo peg was inserted to keep the gap wide open. The gap of about 0.5 cm

to 1 cm was made open between the shells. Sands and stones were pushed in a proper position by passing a platinum wire through the hole of the needle. Fish eyeball and beads of pearl nucleus were placed into the proper place with the help of forceps.

Pearl production

After insertion of the foreign particles, mussels were than transferred to the cages placed at the experimental pond. Fifty mussels were kept in each cage with two replication for each different nuclei used. Besides inserted mussels, uninserted mussels were also kept in the cages at same density and replication. Mortality rate were recorded at every four months of intervals. Mussels were finally harvested from the cages after 12 months of the experiment and transferred to the laboratory. Mussels were killed to observe the conditions of pearl development.

To determine the survival rate of mussels, every individual of each cage was counted for the number of alive mussel. Any mussel having its valve open or having the smell of decomposition was treated as a dead one. On the following sampling date every alive individual in each cage was again counted for the number of alive mussel in the same way. Sampling was done at every four months of intervals. The survival rate of each cage in each sampling was expressed in percentage and was calculated using the following formula:

$$S = n/N \times 100$$

Where, S is the survival rate (%) for each sampling, n is the number survived for each sampling, N is the initial number stocking. Finally, at the close of the experiment, the entire stock of mussels of each cage was collected and survival rates (%) were computed from the initial and final data.

To determine the growth rate of mussels, 5 mussels were collected from each cage and the average increase in length and weight of each individual was computed. The growth rate of mussels of each sampling at each cage was expressed in percent and was calculated by using the following formula :

$$G = I/L \times 100$$

Where, G is the growth rate (%/day), I is the increase in shell length (cm) or weight (g), and L is the initial shell length (cm) or weight (g).

Results and discussion

Survival rate

Highest survival rate of 80% was recorded for nuclei uninserted mussel. Among the inserted mussel the survival rates of 72%, 71%, 67% and 50% were recorded for the insertion of stone, fish eyeball, sand and beads of pearl nucleus, respectively (Table 1).

Lower survival in the nuclei inserted mussel than the uninserted mussel might be due to physiological injury or other environmental stress during experimental period.

Begum *et al.* (1990) and Hossain (1983) found similar survival for the nucleus inserted mussel in case of *L. marginalis*. Alagarswami and Qasim (1974) and Bautil and Boulle (1992) also found similar result for *Pinctada fucata* and *P. margaritifera*.

Table 1. Survival rate of mussels with and without insertion of nucleus

Inserted foreign particles	Initial stockin g	After 4 months Survival rate (%)	After 8 months Survival rate (%)	Final survival S = n/Nx 100 (%)
Sand	50	80	73	67
Stone	50	84	78	72
Fish eyeball	50	82	76	71
Artificial pearl	50	59	54	50
Without nucleus	50	93	86	80

Growth rate

Highest average growth rate of nuclei uninserted mussel was recorded 0.06%/day. Mussels with sand, stone, fish eyeball and artificial pearl resulted average growth rateof 0.05%/day, 0.05%/day, 0.03%/day and 0.04%, respectively (Table 2).

Table 2. Growth rate (in weight) of mussels with and without insertion of nucleus

Inserted foreign particles	Average weight of the mussels		Increase in weight (g)	Average growth (g/day)
	Initial weight (g)	Final weight (g)		
Sand	110.4	132.3	21.9	0.05%
Stone	108.8	128.5	19.7	0.05%
Fish eyeball	114.6	128.5	13.9	0.03%
Artificial pearl	112.4	128.8	16.4	0.04%
Without nucleus	110.2	135.5	25.3	0.06%

Growth rate of nuclei uninserted mussels was recorded highest might be due to without disturbance of mussels however growth rate of nuclei inserted mussel might be hampered for physiological stress, operational injury and hazards. Chellam (1988) and Amin (1977) found the similar results in their experiments in case of *Pinctada fucata* and *Corbicula japonica* respectively.

Pearl production

Mussels which were inserted artificial pearl did not produce any pearl due to ejection of all nuclei. However other mussels which were inserted sand, stone and fish eyeball produced pearl. The pearl production was recorded highest (72%) in case of stone and lowest (67%) in case of sand (Table 3).

Table 3. Survival rate of mussels and pearl production rate using different foreign particles as nucleus

Foreign particles use as nucleus	No of survived mussel	Total no. of pearl	Pearl production rate (%)
Sand	67	67	67
Stone	72	72	72
Fish eyeball	71	71	71
Artificial pearl	50	-	-

Pearl production was highest in case of stone nuclei, might be due to its acceptability by the mussels. Alagarswami (1974) and Hossain (1983) reported the more or less similar results in their experiment in case of *Pinctada fucata* and *L. marginalis*, respectively.

References

Ahmed, M., 1968. Frequency and location of seed pearls in freshwater mussels of East Pakistan (*Lamellidens*). *Pakistan Biology and Agricultural Science*, **11**(2): 11-14.

Alagarswami, K., 1974. Development of cultured pearls in India. *Current Science*, **43**(7): 205-207.

Alagarswami, K. and S.Z. Qasim, 1974. What are pearls and how are these produced? *Sea Food Export J.*, **6**(1): 1-10.

Alam, A.B.M.T., 1994. Mukta Chash: Somridhir Nutan Diganta. Krishi Kotha, Krishi Kotha Service, Dhaka, **54**(8): 254-256.

Amin, M.R., 1987. Ecological studies on the edible clam, *Corbicula japonica* Prime in lake Hinuma. Ph.D Thesis. Department of Fisheries, The University of Tokyo, Japan. 263 pp.

Bautil, B. and D. Boulle, 1992. Result of SFA preliminary experiments on artificial spat collection of the black pearl oyster *Pinctada margaritifera*. Technical report, Seychelles-fish. Auth. Victoria-Seychelles SFA, **20**: 35 pp

Begum, M., M. Ismail, S. Ali, Z. Islam, and R.N. Paggatipunan, 1990. Studies of pearl culture in freshwater mussel, *Lamellidens marginalis* (Lamarck). *Bangladesh J. Zool.*, **18**(2): 223-227.

Chellam, A., 1988 Growth and biometric relationship of pearl oyster *Pinctada fucata* (Gould). *Indian J. Fish.*, **35**(1): 1-6.

Hossain, S.M.Z., 1983. Studies on the pearl culture and food and feeding habits of freshwater clams (*Lamellidens marginalis*). M.Sc. Thesis. Department of Aquaculture and Management, Bangladesh Agricultural University, Mymensingh. 56pp.

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