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MUSSEL CULTURE IN MALABAR PROSPECTS AND CONSTRAINTS

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NEW TRENDS IN FARMING MUSSELS AND EDIBLE OYSTER IN INDIA

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Introduction

The Central Marine Fisheries Research Institute (CMFRI) by setting up demonstration farms and conducting training programmes to fishers was able to popularize bivalve farming in Kerala State. Simultaneously, through interactions with the State government officials and members of local governing bodies, project proposals on oyster and mussel farming were recognized as financially viable schemes for rural development and self-employment. Since 1995, edible bivalves like the Indian backwater oyster, *Crassostrea madrasensis* and the green mussel, *Perna viridis* are farmed on a commercial scale in the estuaries of Kerala. Along the Malabar Coast, especially in the estuaries of Kozhikode, Malappuram and Kasaragod districts. Mussel farming (by rope culture from racks) is now a popular seasonal vocation through which about 500 to 800 tonnes of mussels are produced annually. Along central and south Kerala (Alappuzha and Kollam districts), edible oyster is more popular and in the Ashtamudi and Kayamkulam lakes, oyster culture is carried out by the rack and ren method by more than 150 farmers.

With the commercialization of edible bivalve farming, it was felt that refining the technology could help maximize the profit. The following objectives were made to upgrade and refine the technologies already developed.

- Increasing the profit margin in bivalve mariculture by reducing capital and recurring expenditures
- Potential for culturing brown (*Perna indica*) and parrot (light green colour mussel which could be a hybrid between brown and green mussel) mussel in the estuarine ecosystem
- Economical single oyster culture for supply to the live oyster trade
- Integrated culture of finfish in estuarine bivalve farms

Experiments to achieve the above objectives were carried out at the Institutes' farm in Ashtamudi Lake during 1997 to 2000 and the results are given in this article.

Increasing the profit in bivalve mariculture by reducing capital and recurring expenditures

The aim of this experiment was to reduce the capital investment on 12-18 mm nylon rope (a major capital investment) used for mussel seeding and the recurring expenditure on replacement of bamboo/ wooden poles used in the construction of racks in oyster and mussel farms. To meet these objectives experiments were designed to test the following.

- Efficiency of different low cost material for mussel seeding
- Reduction in labour during seeding
- Modification of grow out structures

Low-Cost Seeding Material

An experiment to study the efficiency of low cost materials that can be used instead of the expensive nylon rope was conducted using the following materials.

1. Imported mussel rope (Fuzzy™) with bristles having biodegradable cotton stocking (White-Gifted from Canada)
2. Imported mussel rope (Fuzzy™) with bristles having semi-degradable synthetic stocking (Grey-Gifted from Canada)
3. Flexible plastic strip of 5 cm width (commonly used in camp chairs and cots)
4. Control – 12 mm nylon rope

These were seeded uniformly at a stocking density 1 kg/m rope. The instantaneous relative growth rate of the green mussel *Perna viridis* in length and weight in different treatments was calculated. Besides, the fallout percentage in these treatments were also compared. The results indicated that the rate of growth in length and weight were highest (0.902 and 2.606 respectively) in control followed by fuzzy white rope. The fallout percentage of seeded mussel was lowest in the 12 mm nylon (39.38 %) and highest in the fuzzy white treatment (83.42 %). The production rates in each treatment were calculated after a culture period of 105 days. Highest production of 12.6 kg/m was obtained for nylon rope followed by plastic strip, 11.47 kg/m. This indicates that the control (12mm nylon) was the best performer in terms of growth rate, production and in terms of fallout percentage. However, when the costs of input materials (excluding imported materials) were compared, it was found that nylon rope is 12 times costlier than the plastic strip per meter of seeded length. Considering that the fallout percentage is also low (55.02 %) plastic strips can be used as a cost efficient seeding material in mussel culture and it can reduce the capital investment on nylon ropes very much.

Reduction in Labour Charges

Mussel seeding is labour intensive as it involves stitching and wrapping individual ropes with degradable cotton material. To reduce this, the degradable wrapping material (cotton mosquito net) was pre-stitched into tubes of 20 to 25 cm width and 1.25 m length. During seeding, the nylon rope was placed within the pre-stitched tube and filled with mussel seed. The ends were tied and these seeded ropes were suspended from the rack. This method resulted in halving the manpower for seeding from 8 to 4 man-days for seeding 100 ropes.

Cost Reduction in Rack Structure

The constant replacement of bamboo or casurina poles used for fabrication of grow out structure due to fouling and boring is the main recurring expenditure in bivalve farming using the rack method in estuaries. PVC poles of 2-inch diameter filled with concrete were used instead of bamboo poles in 1997. These have withstood 3 seasons without any fouling / boring or natural degradation. Though the capital investment in the first year is high, continuous replacement / maintenance work of farm owing to collapse of farm structure on account of natural calamities like strong wind or rain can be avoided.

Economic Gains

Adopting these new refinements the additional gain as a percentage of total income in a farm of 0.0025 ha works out to be 18.33 indicating that these can be recommended to the users. The added costs on account of using the refinements was minimal considering the extra life of the PVC poles.

Potential for the Culture of Brown and Parrot Mussel in the Estuarine Ecosystem

Mussel seed resources survey by Appukuttan *et al.* (2001) along the Kerala coast indicated that brown and parrot mussel seed is available during the post monsoon period along southern regions of Kerala State. Hence to test the potential for mussel culture in the estuarine system about 15 ropes each were seeded with brown and parrot mussel and suspended from the same site. Their growth rates and fall out were compared. The low growth rate and high fall out percentage indicated that these two species are not suitable for culture in the estuarine ecosystem. This is because brown and parrot mussels are not tolerant to salinity variations, which are common in estuarine conditions.

Single Oyster Culture

The earlier method developed to grow single oysters was the rack and tray system (Nayar and Mahadevan, 1983) which proved to be expensive and hence the present system of rack and ren method was developed. By the rack and ren method the growth and shape of oysters is not uniform and individual oysters cannot be easily separated. The live oyster trade principally depends on production of single oysters with good shape and size. The main objective of this experiment was to grow large sized uniformly shaped oysters which can be marketed in live condition as a shell-on product which is highly priced compared to the assorted size oysters which can be marketed only as heat shucked and processed products.

The experiments which were carried out in the Ashtamudi Lake rack farm included fixing individual oyster spat on split bamboo poles, suspended flexible plastic strips (FPS), FPS attached to an aluminum frame and oyster spat stuck to knots of a stretched nylon net on a PVC frame. Oysters were stuck to FPS and nylon net knots using Fewikwik. Oysters of length 15 to 85 mm were collected from natural bed, declumped, cleaned, measured and fixed on to split bamboo pieces (5 cm width and 1.5 m length) using cement. To ensure proper fixing, iron nails were driven at intervals of 10 cm into the bamboo pole before placing cement. The oysters were placed on the cement and after 6 hours the bamboo strips with oysters were hung horizontally from the rack.

The oysters fixed with cement showed good growth and survival rate. The survival percentage after 35 days was 68%, loss due to detachment 20% and loss due to natural mortality 12%. After this initial mortality no further loss was observed. In the case of suspended FPS loss due to detachment was 100% during the first 35 days and in the case of FPS attached to aluminum frame and nylon net on PVC frame survival percentage was very poor after 60 days. This indicated that that use of synthetic instant adhesive is not suitable for sticking oyster spat. It was observed that small oyster (less than 65 mm) had an average growth rate of 8.5 mm/month while large sized oyster had only 3.07mm/month. Harvestable sizes could be reached within 5 months of culture.

Integrated Culture of Finfish in Bivalve Farms

To utilize the space in between the rack farm and as a means of improving the profit, integrated farming of finfish together with bivalves was attempted. Two nylon net cages (1.3 x 1.3 x 1.5 m, 1.5 cm mesh) were tied to the vertical poles in the rack farm and stocked with young ones of the pearl spot Etroplus suratensis, which is a favoured food fish of the region.

The mean seed size was 6.6 cm (6.8 g) and the stocking density was 22/m2. The fishes were fed with dried clam meat and pellet feed through a feeding tray at 5% of body weight. The growth observed is shown in Fig.3 and there was 100% survival. The average growth was estimated as 10.3 mm/ month, which is considerably more than that observed for this fish in pond culture (CIBA, 1995). The average production obtained was 1.6 kg/ m2 from an initial 0.15 kg/ m2 within less than 8 months.

Since pearl spot fetches a high price (Rs. 70/kg) in the local markets, it is clear that cage farming of quality food fishes in estuarine bivalve rack farms would form a significant source of additional income to farmers.

Conclusion

The experiments on technology refinement of edible bivalve farming have shown that the conventional method of farming can be made more profitable. The flexible plastic strip is cheaply available in the local markets and can be used as a seeding material. Similarly by using pre-stitched cotton tubes the expenditure on labour can be reduced. The grow-out structure itself can be made more durable by using PVC pole filled with concrete. These refinements are simple, and as the economic analysis shows will be beneficial to the farmer.

Though the technique for single oyster culture on split bamboo strips has been developed, the adoption level by the farmers will depend on the market demand for live oysters. There is a growing demand for live oysters in metropolitan cities like Bombay, where, an oyster restaurant has been recently established. Instant adhesives like FewiKwik cannot be recommended for sticking oyster spat to synthetic surfaces. The low survival rates of brown and parrot coloured mussel in the estuarine system clearly indicates their unsuitability as candidate species in areas other than open sea and bays with high salinity.

The high survival rates and growth of finfish in the cages erected in the space within the bivalve farms (racks) indicated the potential to develop the concept of integrated farming.

The present experiments and analysis of results clearly indicate that suitable modifications in the existing farming systems for bivalve production in the estuaries can definitely enhance the profit level of small-scale bivalve farmers.

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