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Special Section

Boosting Fishermen's Income by Brackishwater Shrimp Culture

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Abstract

The shrimp farms in Ratnagiri and Sindhudurg districts are small-sized and isolated. Shri. Rajesh Popkar, ex-student of College of Fisheries has gained experience in shrimp farming after completion of graduation studies and further started his own enterprise. His gross income was around Rs. Ten lakh per hectare per crop. The Faculty of Fisheries had frequent visits to his farm with regard to disease surveillance project. The improvement in management practices according to suggestions related to lime application, application of prebiotic and probiotics, water quality analysis and management, sludge removal and partial harvesting has lead to enhancement of shrimp production and income.

Key words: Shrimp farming, pond management, probiotics, Doubling Farmers' Income, DFI.

Introduction

Shrimp culture is one of the most common and popular farming practices in the coastal areas. Shrimps are cultivated at various intensities either in ponds, PE-lined ponds with or without central drainage system and tanks (raceways), etc. In India, Coastal Aquaculture Authority (CAA) was established in the year 2005 to regulate the activities related to Coastal Aquaculture in coastal areas. The guidelines were issued by CAA for the farming of native black tiger shrimp, *Penaeus monodon*in in coastal areas of India (CAA 2014). The production increased to 2-2.5 tonnes ha^{-1} $crop^{-1}$ of 4-5 months through adoption of better management practices in improved traditional systems. Its production through brackishwater aquaculture peaked to 1,44,347 tonnes in the year 2006-07 (MPEDA 2017). However, because of outbreak of several viral diseases mainly WSSV, the production in subsequent years dropped and fluctuated. In the year 2009, CAA issued guidelines for farming of exotic white-leg shrimp, *Litopenaeus vannamei* (MoA DAHD 2009). This shrimp species was introduced because of several advantages like complition of life cycle in captivity, availability of Specific Pathogen Free (SPF) broodstock for production SPF seed, less aggressive in comparison to *P. monodon,*ability to grow at high densities (150 PL m^{-2}), availability of market for small size, high growth rate up to 20 g size (achieved in 100-120 days), requirement of relatively low protein diet, tolerance to wide range of salinity and temperature, high survival in hatchery and grow-out phase, high meat yield. Its SPF broodstock was imported from reputed production facilities, held in quarantine facility and supplied to approved Indian hatcheries for production and distribution of SPF seed to the registered farmers. The production of white-leg shrimp through aquaculture was merely 1,731 tonnes in the year 2009-10 which rose to 147,516.2 tonnes in the year 2012-13 and subsequently to 406,018 tonnes in the year 2015-16 (MPEDA 2017). Mandatory requirement of reservoir ponds and Effluent Treatment System (ETS) was more suitable for large farms. Considering the large number of farmers holding small farm size, amendment in the guidelines were done in the year 2015 which permitted its farming in small sized farms at low density (20 PL m^{-2}) with a reservoir pond in the farm with area less than 2 ha and ETS in the farm with area less than 5 ha as an optional condition (MoA DAHD 2015).

The suitable area for shrimp culture in Maharashtra is about 10,400 ha out of which, shrimp culture is undertaken only in 1,359 ha in the year 2015-16 (MPEDA 2017). The availability of suitable land for shrimp farming is less in Ratnagiri (505 ha) and Sindhudurg districts (1,268 ha) because of presence of narrow belt of coastal land. Most of farms developed are small in size and are isolated. There is no approved shrimp hatchery and shrimp feed

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mill located in the region. The coastal soils of these two districts are characterized with high porosity that leads to high water and energy requirements. Most of the soils in Ratnagiri and Sindhudurg districts are low in pH which need frequent applications of lime.Therefore, the cost of shrimp production is relatively high in this region.

The Faculty of Fisheries of Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli has promoted the farming of white-leg shrimp by imparting information on sustainable culture technology, guidelines of CAA, biosecurity measures and best management practices to the farmers in training programmes organized by the organizations like Marine Products Exports Development Authority (MPEDA) and Department of Fisheries and Government of Maharashtra. College of Fisheries is implementing a NFDB sponsored all India Co-ordinated Project named "National Surveillance Project on Aquatic Animal Diseases (NSPAAD)." Under this programme, fish and shrimp farmers of the region are made aware of various diseases and their preventive strategies through training programmes.

Technological intervention by DBSSKKV

Shri. Rajesh Popkar, Ex-student of College of Fisheries graduated in the year 1995 and started his career in shrimp farming by joining a private firm as a Technician. After getting experience for three years, he started shrimp farming on partnership basis at Khalchi Deoli, Malvan. Subsequently, in the year 2013-14, he started his own farm at Kochra with just three ponds covering a water spread area of 2.5 ha. The species cultivated here was black tiger shrimp, *Penaeus monodon.* During initial crops, the culture species was found to be infected with White Spot Syndrome Virus (WSSV) resulted in crop failures. As an alternative, the culture was shifted to species *Litopenaeus vannamei.* The post-larvae were stocked at the density of 20 PL m^{-2} and reared for duration of 110-120 days. At the end, average shrimp body weight was around 20 g with survival of 80% was achieved. The production ranged from 2800 to 3200 kg ha^{-1}. That time, average market price was ₹ 320 per kg for 50 count shrimps.

Then the team of NSPAAD project visited his farm for surveillance work. The team members interacted with him and understood the limitations and problems faced by him. One of the problems told by him was with regard to low pH. The team members suggested him to apply lime on inside slopes of pond dykes before commencement of rain (Boyd and Daniels 1994). This helped to neutralize the acidic rainwater entering the pond and thereby minimized the reduction in pH. The other problem discussed was slow development of plankton bloom during phase of pond preparation. It was emphasised to use fermented slurry made out of rice bran, jaggery and yeast. It was also suggested to use soil and water probiotics to decompose organic waste rapidly and to release the nutrients in pond water (Gatesoupe 1999; Verschuere *et al.* 2000). As a post-stocking management, it was suggested to observe and record pH, DO and salinity on daily basis and suggested to apply lime as per the need to maintain pond water pH (Fig 1a). Use of water testing kits to estimate approximate concentration of ammonia was advised. In order to maintain better pond bottom environment, a measure of periodic removal of sludge was discussed (CIBA 2001). It was suggested to have central drainage system or use of sludge pump to remove pond bottom sludge. Adoption of the concept of shrimp toilet was also discussed to minimize high nutrient loading in to the environment and for further utility of nutrient rich sludge as fertilizer. Use of mechanical feeders in the ponds was also suggested to improve feed efficiency (Fig 1b).

Fig 1. Shrimp farming in brackishwater ponds in Konkan: (a) Uses of aerators to maintain DO levels; (b) Check tray evaluation of feeding performance; (c) Harvesting at the end of culture duration.

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Table 1. Management practice and yield of shrimp farm in the years 2013-14 and 2015-16.

Particulars	Year	
	2013-14	2015-16
Total number of ponds	03	11
Water spread area (ha)	2.5	7.5
Stocking density (PL m^{-2})	20	35
Use of advanced management practices	Minimal	• Application of lime on the slopes of dykes before rain • Use of fermented slurry of rice bran, jaggery and yeast to develop algal bloom • Use of probiotics • Screening of seed for presence of pathogens • Regular water quality analysis • Removal of sludge • Adoption of the concept of shrimp toilet
Culture duration (days)	110-120	130-135
Survival (%)	80	80
Average body weight (g)	20	25
Yield (t ha^{-1})	3.2	6.0 (60 count = 1.5 tonne, 50 count = 1.5 tonne and 40 count = 3.0 tonne)
Count (number of shrimps kg^{-1})	50	60 (95 DOC), 50 (115 DOC) and 40 (at the end)
Market price realized (₹ kg^{-1})	320.00	290.00 (60 count) 320.00 (50 count) 360.00 (40 count)
Income (₹ Per ha)	10,24,000.00	19,95,000.00

Partial harvesting of shrimps from day 95 onwards was suggested to implement and to reduce the biomass and expenditure on feed towards the end of culture period. The NSPAAD team regularly collected shrimp samples for screening for presence of various viral diseases. The results of these tests were communicated to him after analysis. This helped him to assure about presence or absence of selected viral pathogens on shrimps.

Success Story

Over a period of two years, with his own experience and by gaining knowledge from other farmers, technicians and College of Fisheries Ratnagiri, Shri. Rajesh Popkar generated enough confidence to manage and harvest good crop yield on a sustainable basis. In the year 2015-2016, he expanded farming activity to 11 ponds with a total water spread area of 7.5 ha. In order to increase total yield, a stocking density was also increased up to 35 PL m^{-2}. The shrimps were also grown for a longer duration (130-140 days) in order to achieve a higher size and lower count (Fig. 1c). The comparison in the management aspects and yield of shrimp crops of the year 2013-14 and 2015-16 is given in Table 1.

Conclusion

The gross income of Mr. Rajesh Popkar has been found to be elevated considerably with adoption of better management practices in shrimp farming.

Way Forward

The shrimp farming in the region can be made more sustainable by employing bio-secured, minimal water exchange culture systems like Biofloc system. However, pilot scale trials are needed to be undertaken at suitable private farms. The major limitations for adoption of such systems are the requirement of continuous power supply, availability of suitable ponds and trained technicians /

farmers.

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References

Boyd C. E. and Daniels H. V. 1994. Liming and fertilization of brackishwater shrimp ponds. J. Appl. Aquaculture, 2:221-234.

CAA 2014.Compedium of Act, Rules, Guidelines, Regulation and other Notifications (updated up to March 2014), pages 244 P. 244.

CIBA special publication number 13. 2001. Soil and water quality management in brackishwater aquaculture.

Gatesoupe F. J. 1999. The use of probiotics in aquaculture. Aquaculture, 180:147-165.

MoA DAHD 2009.Coastal Aquaculture Authority (Amendment) Rules, 10-15.

MoA DAHD 2015.Coastal Aquaculture Authority (Amendment) Rules, .1-4.

MPEDA 2017.State-wise details of shrimp and scampi production. www.mpeda.gov.in/MPEDA/cms.php?id=eWVhcil3aXnILXNwZWNpZXMtd2LzZS1zdGFOZS13aXNL# (accessed 07.11.17).

Verschuere L., Rombaut G., Sorgeloos P. and Verstraete W., 2000. Probiotic bacteria as biological control agents in aquaculture. Microb. mol. Bio. Rev., 64:655-671.

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