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ORIGINAL ARTICLE

CULTURE PRACTICE OF BLACK TIGER SHRIMP, PENAEUS MONODON (FABRICIUS, 1798) USING PROBIOTICS IN NAGAPATTINAM, TAMILNADU

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ABSTRACT

An investigation were made to observe the culture of Black Tiger Shrimp, *Penaeus Monodon* in the culture pond of Nagapattinam area, Tamilnadu. In the present study, the Penaeus monodon were cultured in the two farm located in the Nagapattinam area, Tamilnadu. The survival rate and growth rate were observed in the two pond. The present study showed that the growth rate of Penaeus monodon was more in the A section pond than B section pond.

Keywords: Survival rate, Growth rate, Penaeus mopnodon, Culture ponds

1.INDRODUCTION

With increasing volume of production, trade and consumption there is a concurrent and increasing demand for improved sustainability, social acceptability, and human health safety from the aquaculture sector. This is not only affecting the international trading environment and pressurizing producers to focus on production methods to address those issues, but also challenges producing countries to develop and implement adequate and appropriate polices and institutions that provide a conducive environment for responsible production and trade. To assist in achieving these objectives, the members of the Food and the Agriculture Organization of United Nations (FAO) in 1995 adopted the Code of Conduct for Responsible Fisheries, providing a framework for responsible development of aquaculture and fisheries.

Shrimp farming is one of the fastest growing sectors in many parts of the world and also one of the most controversial. Rapid expansion of shrimp farming has generated substantial income for many developing countries, as well as developed countries, but has been accompanied by rising concerns over environmental and social impacts of development. (FAO/NACA/UNEP/WB/WWF.2006.Farmed shrimp accounts for 55 percent of the shrimp produced globally. Most of the shrimp aquaculture occursinchina,followedby Thailand,Indonesia,India,Vietnam,Brazil,Equador and Bangladesh. WWF is committed to ensuring this valuable commodity is produced responsibility.international principles for Responsible Shrimp Farming. Network of aquaculture centers in Asia-Pacific (NACA). Bangkok, Thailand. 20 pp.)

Aquaculture has become one of the major industries earning more foreign exchange because of its excellent taste, universal appeal and high market and export value. India is rich in natural shrimp resources and nearly 52 species of shrimp are contributed in fishing (Swaminathan, 1980). Of these, 8 shrimp species are economically important and Successful culture is practiced for two species viz., *Penaeus monodon* and *P.indicus, Penaeus vannamei.* Instead of preventing and arresting the diseases, the unwanted and unwarranted usage of the chemicals damages the environment and develops antibiotics resistant bacteria (Karuna Sagar *et al*., 1996). In addition to resistance problems, it also impaired the growth of cultured species, posed a threat to human health and the environment at large by way of residual effects. Hence eco-friendly treatments came in to existence and among these, probiotic application came first as it is environmentally safe and cost effective also (Moriarty, 1997).

Probiotic shrimp culture in India today has developed into an improved farming system and is evolved day by day into a fine art of management. The last half a decade has proved adequately that the potential for shrimp production is quite good in India with its warm tropical climate, suitable soil, along the major estuaries and lagoons, suitable water availability and potential force of highly industrious farming community.

During the past 20 years, aquaculture industry has been growing tremendously, especially that of marine fish,

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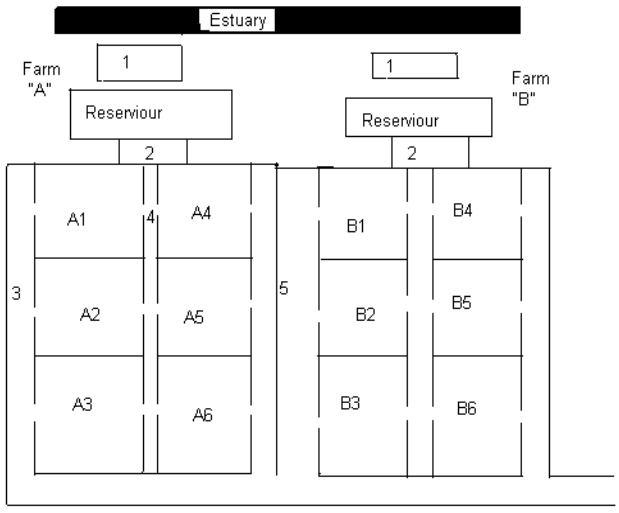
shrimps and bivalves. But, as with many other industries, this rapid growth has brought the problem of environmental pollution. Contamination of coastal waters due to aquaculture is posing serious concerns among law makers as well as scientists. The coastal environment has been seriously damaged, often resulting in disease outbreak. Recently, shrimp culture all over the world has been frequently affected by viral and bacterial disease inflicting huge loss. Pathogenic microorganisms implemented in these outbreaks were viruses, bacteria, rickettsia, mycoplasma, algae, fungi and protozoan parasites. For preventing and controlling diseases, antibiotics, pesticides and other chemicals were used possibly creating antibiotic resistant bacteria, persistence of pesticides and other toxic chemicals in aquatic environment and creating human health hazards. Thus, how best to improve the ecological environment of aquaculture has become a great focus in national and international area of aquaculture.

India is a large country with great potential for aquaculture, but the application and development of the probiotics in Indian aquaculture is very meager when compared to other countries. In recent years, the diseases of shrimp hindered the development of shrimp culture. Based on the previous research results on probiotics suggest that the use of probiotic bacteria in aquaculture has tremendous scope and the study of the application of probiotics in aquaculture have a glorious future.

2.MATERILAS AND METHODS

DESCRIPTION OF THE STUDY AREA

Location of the farm {Farm "A" BLUEBAY AQUA FARM PHASE -1)PAPAKOVIL & Farm "B" (BLUEBAY AQUA FARM PHASE-2}KARUVELANKADAI



BLUEBAY AQUA FARM LAYOUT PHASE I & II; 1&2- pumphouse, 3&5 – drainage cannel, 4 – inlet cannel; A1,2,3,4,5,6 & B1,2,3,4,5,6 - .5 ha

The farms are located on the northern bank of KADUVAIYARU estuary in Nagapatinam. The farm is situated about 5 km away from Nagapattinam. The southern side of the farm is elevated to a height of 3.5 m from kaduvayaru estuary. The total area (farm "A") covered is 4.0 ha of which water spread is about 3.0 ha. Totally six pond is there, each culture pond size is .5 ha. One pond act as reservoir (1.0ha). Farm "B" also same like farm "A". The layout is given in fig.1

POND PREPARATION

Soil culture Initially all the ponds of the present study was allowed to dry and crack to increase the capacity of oxidation of hydrogen sulphide and to eliminate the fish eggs, crab larvae and other predators. Then pond bottom was scrapped 2 to 4 cm by using a tractor blade to avoid topsoil. Then the pond bottom was ploughed horizontally and vertically a depth of 30 cm to remove the obnoxious gases, oxygenate the bottom soil, discolouration of the black soil to remove the hydrogen sulphide odour and to increase the fertility. The soil pH was recorded in the ponds with the help of cone type pH meter. The average pH was calculated from the collected data and required amount of lime was applied to neutralize the acid soil condition and increases the availability of nutrient (Table 1).

Table 1. Details of the lime application.

Pond	Initial soil pH	Lime applied (kg/ha)	Corrected soil pH	Type of lime applied
A1	6.6	300	7.3	$Ca(OH)_2$
A2	6.5	400	7.4	$Ca(OH)_2$
A3	6.3	700	7.3	$Ca(OH)_2$
A4	6.5	400	7.2	$Ca(OH)_2$
A5	6.6	300	7.2	$Ca(OH)_2$
A6	6.8	200	7.1	$Ca(OH)_2$
pond	**Initial soil pH**	**Lime applied (kg/ha)**	**Corrected soil pH**	**Type of lime applied**
B1	6.6	500	7.5	$Ca(OH)_2$
B2	6.9	200	7.3	$Ca(OH)_2$
B3	6.2	700	7.4	$Ca(OH)_2$
B4	6.4	600	7.3	$Ca(OH)_2$
B5	6.8	350	7.3	$Ca(OH)_2$
B6	6.4	500	7.2	$Ca(OH)_2$

Water culture

Water culture is one of the important processes during the culture period. In deed, if the PLs are stocked in to a pond with poor algal populations, they will become stressed. That not only greatly reduces PL growth, but weakens the animals, making them much more prone to disease and subsequent death. For blooming, the pond is fertilized with inorganic or organic fertilizers.

Chlorination

The initial water levels in all ponds were maintained at 120 cm level (Twelve culture pond and two reservoir pond). After filling need one day for sedimentation. After sedimentation process speared the chlorine with water in the

pond every ever (dosage for 1 ha 1meter water level / 600 kg chlorine). After 72 hour completion, need to start the blooming process.

Blooming

The organic fertilizers such as rice bran; groundnut oil cake, dry cow dung and yeast were soaked overnight and applied the extract to the all ponds (Table 2). The same procedure was continued for three days. After three days the water colour turned to light green. Then water level was maintained to 120 cm of the ponds and added urea and super phosphate to improve the primary production. Fertilization enhanced the optimal algal bloom in the ponds and the transparency in the ponds ranged from 33 to 36 cm. During the culture period four types of lime was used to maintain the pH and algal bloom (Table 3). During the water culture chain dragging was done daily before stocking of seeds.

Table 2. Details of fertilizer dosage

Fertilizer	Dosage (Kg/ha)
Organic fertilizer	
Rice bran +Groun nut oil cake+Dry cow dung +Yeast+Mixed with 200 liter water and soak over night	10+8+10+200g
Inorganic fertilizer	
Urea + Super phosphate	7 + 5

Table 3. Types of lime used during culture.

Types of Lime	Chemical formula
Calcium carbonate	$CaCO_3$ (Agricultural lime)
Calcium magnesium carbonate	Ca Mg $(CO_3)_2$ (Dolomite)
Calcium oxide	CaO
Calcium hydroxide	Ca $(OH)_2$

STOCKING

The *P. monodon* (PL16 pass the PCR test and stress test) seeds were purchased from Tropical hatchery, Marakkanam and were transported in oxygenated double-layered polythene bags with crushed ice

Packs between inner and outer covers of the bag and packed in a carton. The seeds were brought to the farm site and bags were kept in the pond water for some time to adjust the temperature. Then the pond water was added slowly into the seed bag to adjust the salinity and pH. Subsequently the seeds were released slowly in to the ponds. The stocking density per pond was 10/m^2 (50,000 PLs / pond).

Application of probiotics

Farm**"A"** Ponds (A1, A2, A3, A4, A5, A6) were treated with water, soil & feed probiotics (BC-PLUS– water ,PRO-GOLD – soil, manufactured byAqua Solution Company-Puducheery). For Farm**"B"** ponds (B1, B2, B3, B4, B5, B6,) the culture was carried out without the application of probiotic (Table 4 & 5). For water quality management 1.0 kg BC-Plus mixes with 200liter water (4 hour fermentation process aerating through aquarium aerator was applied). It was broadcasted throughout the pond during morning hours in an interval of 15 days (Probiotic application after 50 th doc 10 days once).For bottom soil quality management 1 Kg Pro-gold probiotic was mixed in 50 kg of dry sand and it was broadcasted throughout the pond during morning hours in an interval of 15 days (Probiotic application after 50th DOC 10 days once). For shrimp health and proper moulting, gut probiotic was given through mixing with feed {(Gut Act) manufactured by Salem Microbes Pvt Ltd.

Statistical treatment

To know the significance between the parameters of probiotics treated and control pond's' test was applied.

3.RESULTS

Survival rate

Survival rate of both the sections ("A&B" farm ponds) which was applied with probiotic was higher than that of with out probiotic ponds. At the end of culture period the survival rate of farm "A" ponds with probiotic dosage was 96.34% and without probiotic farm "B" ponds was 73.2% (Fig. 2).

Growth rate

Maximum growth was observed in the "A" section ponds treated with probiotic during each sampling interval and by the end of the experiment. Average weight gained for the shrimps that were supplied with probiotic ("A" section) was approximately 25% greater than that of the "B" section ponds. (Fig. 3)

Fig. 2 Survival rate of P.monodon treated with probiotic and with out probiotic

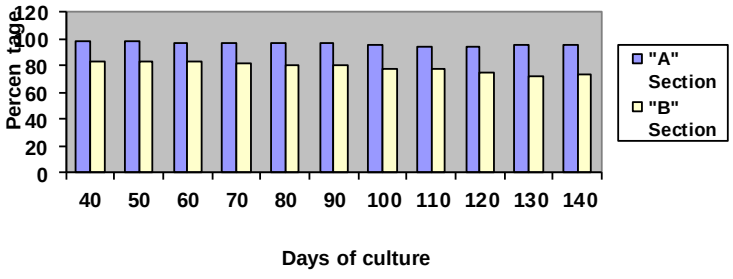
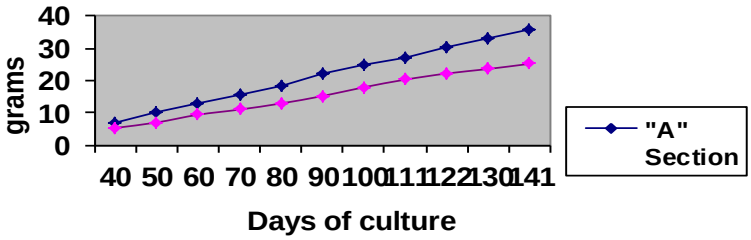


Fig. 3 Average bogy weight of P.monodon treated with probiotic and with out probiotic



4.DISCUSSION

There has been a considerable increase in the culture of brackish water shrimps due to its taste, market demand both in national and international markets. In order to overcome the serious problems in shrimp culture, sustainable shrimp farming is the need of the hour. Ideal pond size for shrimp culture was 1 or less than 1 ha (Ramanathan *et al*., 2005). In the present investigation also 12 ponds were used for shrimp culture and each pond size was 0.5 ha. Eventhough shrimps are bottom dwelling organisms, the depth and volume of water in a pond has certain physical and biological consequences.

Shrimp aquaculture production in much of the world is depressed by disease, particularly caused by luminous *Vibrio* and/or viruses. Antibiotics, which have been used in large quantities, are in many cases ineffective, or result in increases in virulence of pathogens and, furthermore, are cause for concern in promoting transfer of antibiotic resistance to human pathogens. Probiotic technology provides a solution to these problems. The microbial species composition in hatchery tanks or large aquaculture ponds can be changed by adding selected bacterial species to displace deleterious normal bacteria. Virulence of luminous of Vibrio species can be controlled in this manner. Abundance of luminous Vibrio strains decreased in ponds and tanks where specially selected, probiotic strains of Bacillus species were added. A farm on Negros, in the Philippines, which had been devastated by luminous Vibrio disease while using heavy doses of antibiotic in feed, achieved survival of 80-100% of shrimp in all ponds treated with probiotics (Moriarty, 1998).

Ruangpan and Kitao (1991) reported in their study that the high abundance of luminescent Vibrio is consistent with occurrence of disease and poor or zero harvest results. *V. harveyi*, a pathogen of *P. monodon* that causes severe losses (Baticados *et al*., 1990). The farm, which used the Superbiotic probiotic bacteria, had either a very low abundance or a complete absence of luminous Vibrio in pond water and very good harvest result. This consistent and high productivity occurred, even though the proportion of luminescent Vibrio in the pond water was high in the sea water source, and the abundance of total green colony in the pond water was higher than in the water source. Furthermore, luminescent Vibrio were completely absent at all stages of grow out from the pond sediment in the presence of the Bc Plus *Bacillius* species. Shrimp were healthier in ponds with Bc Plus ProGold GutAct and GI.
The probiotic treated (Farm "A") ponds in the present study had either a very low abundance or a completed absence of luminous and very good survival was achieved. This result is comparable with the study of Dalmin et al. (2001). Colonization of the gastrointestinal tract of animals by probiotics is only after birth, and before the definitive installation of a very competitive indigenous micribita.

After this installation, only the addition of doses of probiotic provokes its artificial and temporary dominance. In mature animals, the population of probiotic organisms in the gastrointestinal tract shows a sharp decrease (Fuller, 1992). Application of microbial supplement in the probiotic ponds hindered the growth of Vibrio spp, like *V. alginolyticus* and V. harveyi because of the colonization of the beneficial microbes like *Bacillus sp., Pseudomonas sp., lactobacillus sp,* and *Saccharomuces sp,* in the shrimp gut. Since the shrimp in the farm "B" ponds were dominated with green colony, which caused Vibriosis can be attributed as the reason for low survival in the farm "B" ponds when compared with the farm "A" ponds. This was evident from the presence of higher load of green colony, in the water and sediment of without probiotic ponds than in the probiotic used ponds. The occurrence of green colony in the farm "B" ponds was concluded by presence of luminescence in the nighttime and occurrence of dead animals in the check tray. In the present study white gut disease was reported in farm "B" ponds, which ultimately leads fungal diseases, naturally animal's activities slowed down and become sluggishness finally leads to fungal disease. The white gut and fungal disease are not observed in probiotic treated (farm "A") ponds.

The general conclusion obtained from the present study is that probiotics plays a vital role in enhancing the growth, survival and disease resistance of the animal by maintaining good water quality parameters throughout the culture period. It is clear from the microbial load data that green colony is dominant in the farm "B" (with out probiotic) ponds. Besides green colony, the shrimps in the farm "B" ponds also affected by black gill, white gut and fungal diseases.

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