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ORIGINAL ARTICLE

PHYSICO-CHEMICAL PARAMETERS IN THE CULTURE POND OF BLACK TIGER SHRIMP, *Penaeus monodon* IN NAGAPATTINAM, TAMILNADU

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ABSTRACT

The present study is aimed to investigate the effect physic-chemical parameters in the two culture ponds of Black Tiger Shrimp, *Penaeus monodon* in Nagapattinam , Tamilnadu, India. In the present study, the pH, salinity and dissolved oxygen in the cultue pond Nagapattinam (Farm "A" Bluebay aqua farm phase -1)papakovil & Farm "B" (Bluebay aqua farm phase-2 karuvelankadai), Tamilnady. The monthly data were taken in sample collected from pond water. The present study shows that the level of physic-chemical parameters which maintained the growth Black Tiger Shrimp, Panaeus monodon in the culture ponds.

Keywords: Physico-chemical parameters, *Penaeus mopnodon*, Culture ponds

1.INDRODUCTION

Aquaculture is one of the important economic activities in many countries and offers number of opportunities to contribute to poverty alleviation, employment and community development, and reduction of over exploitation of natural resources and food security in tropical and sub-tropical regions (Ramanathan *et al*., 2005).Aquaculture production and trade in aquaculture products continues to grow at a fast pace, responding to increased global demand for fish, shrimp, mollusks and others aquatic products. In 2004, aquaculture production reached 224500 MT tones, with a farm gate value of 6600 crore. Developing countries dominate aquaculture production and trade, contributing over 80% of production and 50% to the value of internationally traded aquatic products. Aquaculture is making an increasingly significant contribution to the global seafood trade, as well as to domestic consumption, and will continue to grow due to stagnating wild capture fisheries supplies.

Probiotics principally inhibit the growth and decrease the pathogenicity of the pathogenic bacteria, enhance the nutrition of the aqua cultured animals, improve the water quality and decrease the use of antibiotics and other chemicals; thus decreasing environmental contamination by the residual antibiotics and chemicals. This benefit of probiotics will be long lasting, and the application of probiotics will become a major field in the development of aquaculture. Probiotics are welcome addition to the armament of disease prophylaxis in aqua-farms although the technology and science behind it is still very much in a developmental phase. It seems likely that the use of probiotics will gradually increase and that success of aquaculture in future may be synonymous with the success of probiotics, which, if validated through rigorous scientific investigation and used wisely, may prove to be a boon for the aquaculture industry. The usefulness of probiotic in maintaining water quality and thereby in enhancing growth rate is described. The probiotic usage minimizing the problems like such as,

- Poor water quality
- Bacterial infection
- PH
- Temperature
- Dissolved oxygen
- Alkalinity
- Ammonia
- Total heterotrophic bacteria

The use of probiotic in the culture of aquatic organisms is increasing with the demand for more environment-friendly aquaculture practices (Gomez-Gil *et al*., 2000; Irianto and Austin, 2002; Balca'zar, 2003).

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

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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.)

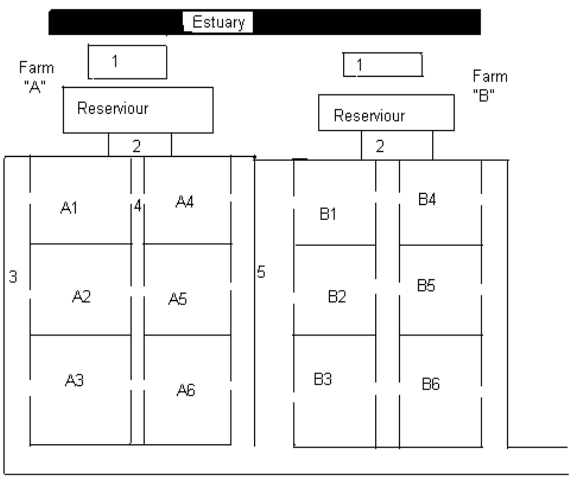
2.MATERIALS METHODS

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

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.2

F ig: 2 Farm layout-SITE LOCATED DIFFERENT AREA BUT SELECTED SAME STRUCUTRE



WATER QUALITY MANAGEMENT

The water quality parameters were recorded probiotic and nonprobiotic ponds regularly.

Salinity

The water salinity was measured by using a hand refractometer (Erma-Japan).

pH

The pH of the pond water was measured by using electronic pH pen manufactured by Hanna Instrumental Company, Japan.

Dissolved Oxygen

The dissolved oxygen was estimated by dissolved oxygen meter.

Statistical treatment

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

3. RESULTS

Monthly wise details of Water quality parameters in the culture ponds there tabulated in Table 1.

pH

The pH was recorded during the culture period from May to Sep 2008. The average pH was between 7.5 to 8.2 (Table. 1)

Salinity

For the shake of interpretation the average values of all the ponds in 'A' and 'B' are pooled up separately. The salinity was recorded maximum (35ppt) in the month of May and minimum(15 ppt) was during August (Table. 1)

Dissolved oxygen

The dissolved oxygen was recorded maximum (4.2 ppm) during the month of May and minimum (3.0 ppm) was during September (Table. 1)

Table 1. Water quality parameters in the culture ponds

Parameters	Farm“A”	Farm“B”
Salinity	15 – 35	15 - 35
pH	7.5 - 8.0	8.1 - 8.5
Dissolved oxygen (ppm)	3.9 - 4.2	3.0 – 4.1

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.

The present study was undertaken to ascertain the efficiency of probiotic (Bc Plus- Pro Gold – Gut Act- GI) on the growth and survival of the most important cultivable shrimp species, *P.monodon*, in addition to its influence on important water quality parameters. Important water quality parameters monitored during the study were, temperature, salinity, Oxygen, pH, and ammonia levels. The volumes of water behave like a buffer, which prevents weather fluctuations from influencing the environment in which shrimp lives. The ideal water depth is between 0.8 to 1.5 m depending upon the stage of culture. It is recommended that a minimum depth of 1m should be maintained at operational level. In the present study 100 cm water level was maintained in all ponds throughout the culture period. When a pond is ready for operation, the optimum stocking density of seeds in a pond determined in accordance with the production capacity of the pond and the culture system, which included the soil and water quality, food availability and seasonal variations, target production and farmers experience (Gunalan, 2006). The stocking density between 10-20PLs/m^2 is ideal for successful shrimp farms (Ramanathan, 2005; Gunalan 2006). In the present study the seeds were stocked at the stocking density of 10/ m^2 in all ponds.

The maintenance of good water quality is essential for optimum growth and survival of shrimps. The levels of physical, chemical and biological parameters control the quality of pond waters. The level of metabolites in pond water can have an adverse effect on the growth. Good water quality is characterized by adequate oxygen and limited level of metabolites. Excess feed, faecal matter and metabolites will exert tremendous influence on the water quality of the shrimp ponds. Hence critical water quality parameters are to be monitored carefully as adverse conditions may be disastrous effect on the growing shrimps (Ramanathan, 2005; Soundrapandian and Gunalan, 2008).

Salinity is important parameters to control growth and survival of shrimps. Eventhough *P. monodon* is euryhaline animals it is comfortable when exposed to optimum salinity. At high salinity the shrimps will grow slowly but they are healthy and resistance to diseases. If the salinity is low the shell will be weak and prone to diseases. The salinity of the present study was maintained 15-35 ppt in all ponds (Table 7). Muthu (1980), Gunalan (2006) and Karthikeyan (1994) recommended a salinity range of 10-35 ppt was ideal for *P. monodon* culture. Chen (1980) opined that salinity ranges of 15-20 ppt are optimal for culture of *P.monodon*. There are few reports (Shivappa and Hambry, 1997; Ramakrishna Reddy, 2000; Collins and Russel, 2003; soundrapandian and Gunalan, 2008), which stated that *P. monodon* adapted quite well in freshwater conditions also because of its wide range of salinity tolerance.

pH is one of the vital environmental characteristics, which decides the survival, and growth of shrimp under culture; it also affects the metabolism and other physiological process of shrimps. The optimum range of pH 6.8 to 8.7 should be maintained for maximum growth and production (Ramanathan *et al*., 2005). In the present study pH was ranging between 7.5 to 8.2 for the farm "A" ponds as well as farm "B" ponds. Ramakrishnareddy, 2000; Gunalan, 2006; Soundrapandian and Gunalan, 2008; was recommended pH of 7.5 to 8.5 for *P.monodon* culture. The pH of pond water is influenced by many factors, including pH of source waters and acidity of bottom soil and shrimp culture inputs and biological activity. The most common cause of low pH in water is acidic bottom soil, liming can be used to reduce soil acidity. In most common cause of high pH is high rate of photosynthesis by dense phytoplankton blooms. When pH is high water exchange will be better choice (Boyd, 2001).

Dissolved oxygen plays an important role on growth and production through its direct effect on feed consumption and maturation. Oxygen affects the solubility and availability of many nutrients. Low levels of dissolved oxygen can cause damages in oxidation state of substances from the oxidized to the reduced form. Lack of dissolved oxygen can be directly harmful to shrimps and cause a substantial increase in the level of toxic metabolites. Low-level of oxygen tension hampers metabolic performances in shrimp and can reduce growth and moulting and cause mortality (Gilles Le Molluae, 2001). The dissolved oxygen in all the culture ponds in the present study was ranging between 3.0 to 4.2 ppm (Table, 1).

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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