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Effect of water probiotic (Pro-W) on Litopenaeus vannamei culture ponds of Nellore, Andhra Pradesh, India

Nitya Jeevan Kumar P, Srideepu K, Hanuma Reddy M., Siva Reddy K.V.
Department of Marine Biology, Vikrama Simhapuri University, Nellore
Department of Marine Living Resources, College of Science and Technology, Andhra University, Visakhapatnam-530 003
jee1aqua@gmail.com
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ABSTRACT

The study was carried out for 120 days to evaluate the physico-chemical parameters of the *Litopenaeus vannamei* culture ponds by applying water probiotic (PRO-W). Two shrimp ponds were selected of which one is probiotic treated pond and second one is control pond. The major water quality parameters like salinity, dissolved oxygen; pH and total ammonia nitrogen were recorded by standard measurements. The present study results showed that the probiotic (PRO-W) plays a prominent role in maintain good water quality parameters throughout the culture period.

Keywords: PRO-W, Water probiotic, and *Litopenaeus vannamei*

1. Introduction

The application of probiotics in aquaculture has been widely used as a means of controlling disease, enhancing immune response, providing nutritional and enzymatic contributions to the digestion of the host, and improving water quality (Qi *et al.*, 2009). The physico-chemical properties of the rearing soil and water are crucial for the success of shrimp culture and the persistent infections could be actually due to poor water quality and low water exchange rates (Zokaeifar *et al.*, 2014). The susceptibility of cultured aquatic species to high concentrations nitrogenous compounds, such as ammonia, nitrite and nitrate, is generally species-specific but high concentrations of these compounds affect animals in aquaculture and likely cause high mortality. The application of gram-positive *Bacillus* species is generally more efficient than the application of gram-negative bacteria species for converting organic matter back to CO_2, which results in the conversion of greater percentage of organic carbon to bacterial biomass or slime (Verschure *et al.*, 2000).

The Bacillus species enrich the water quality by affecting the composition and abundance of waterborne microbial populations association with farmed species (Bandyopadhyay and Mohapatra, 2009) and also associated with improvement of water quality, reduction of pathogenic *Vibrios* in culture environment, enhancement of survival and growth rate, improved health status of juvenile *Penaeus monodon* (Dalmin *et al.*, 2001; Ngan and Phu, 2011).

Information on the efficiently of water probiotic (PRO-W) on water quality parameters of shrimp culture ponds is not adequate and the purpose to the present study was conducted to observe the effect of water probiotic PRO-W, on the physico-chemical parameters of the both control and experimental ponds of white leg shrimp *Litopenaeus vannamei.*

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2. Materials and Methods

The present study was undertaken at a shrimp farms in Nellore, Andhra Pradesh, India. The study was conducted in two shrimp culture ponds.

2.1 Pond Preparation

Initially the two culture ponds of the current study were allowed to dry and crack to promote the capacity of the hydrogen sulphide and to eradicate the fish eggs and other predators. Then the pond bottom was thoroughly ploughed at a depth of 35 cm to remove the obnoxious gases existing in the soil.

2.2 Monitoring water quality parameters

The water quality parameters like salinity, dissolved oxygen, pH and total ammonia nitrogen (TAN) were monitored regularly in control and probiotics treated ponds. The water salinity was measured by using a hand refractometer (Erma, Japan). The Dissolved oxygen was estimated by modified Winkler's method as described by Strickland and Parsons (1972).The pH of the pond water was measured by using electronic pH pen (Erma-Japan). Total ammonia nitrogen (TAN) of the pond water recorded by using ammonia test kit (Advance Pharma, Thailand).

2.3. Dosage of Probiotic

The dosage of probiotic (PRO-W) was applied @ 200gm/hectare and the depth of the pond water 1 meter was maintained throughout the culture period

3. Results and discussion

Table1: Water quality parameters of the culture ponds

	Salinity (Avg±SD)		pH (Avg±SD)		Dissolved oxygen (Avg±SD)		Total ammonia Nitrogen (TAN) (Avg±SD)	
Sampling (In days)	Treated	Control	Treated	Control	Treated	Control	Treated	Control
15	13±0.12	13±1.3	8.1±0.3	8.2±0.3	6.2±1.2	5.3±0.3	0.43±0.1	2.1±0.1
30	14±0.15	14.5±0.13	8.5±0.1	8.7±0.2	5.9±1.2	4.2±1.2	0.32±0.1	2.5±0.4
45	14±1.2	14±1.3	8.4±.03	8.8±.02	4.8±1.3	4.1±1.2	0.41±0.2	2.7±0.2
60	15±1.4	15±1.2	8.2±0.2	8.5±0.3	5.9±1.2	4.5±1.2	0.53±0.4	2.4±0.4
75	17±0.13	17±0.13	8.3±0.4	8.1±0.5	6.5±0.4	5.1±1.2	0.58±0.2	2.5±0.5
90	18±0.13	18±0.13	8.5±0.3	8.5±0.5	5.9±0.1	4.6±1.7	0.61±0.1	2.1±0.3
105	20±1.2	20±0.2	8.7±0.1	8.6±0.1	6.2±0.3	5.3±1.7	0.65±0.2	2.6±0.2
120	22±2.1	22±0.1	8.1±0.2	8.2±0.3	5.7±0.5	5.1±1.2	0.71±0.1	2.3±0.1

SD: Standard deviation

The maintenance of good water quality is essential for optimum growth and survival of shrimps. Good water quality characterized by adequate dissolved oxygen, temperature, pH and salinity. Excess feed, faecal matter and metabolites will exert tremendous influence on the water quality of the shrimp farm (Soundarapandian and Gunalan, 2008). In the present study salinity was ranged between 13-22 ppt and 13-22 ppt in probiotic treated and control ponds respectively. However, the American white shrimp, *Litopenaeus vannamei*, is widely cultured in Central and South America (Wen-Young Tseng, 1998) and tolerates the salinities of 2-45 ppt (Parker *et al.,* 1974; Samocha *et al.,* 1998). Muthu (1980), Soundarapandian and Gunalan (2008) and Karthikeyan (1994) recommended a salinity range of 10-35 ppt was ideal for *Penaeus monodon* culture.

pH is one of the important environmental parameter which decides 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 ranged between 8.1 to 8.8 for the treated and control ponds. The pH of pond water is influenced by many factors, including pH of source water, acidity of bottom soil and shrimp culture inputs and biological activity. According to the studies of Wang *et al.,* (2004) the recommended range of pH for *Litopenaeus vannamei* culture is 7.6 to 8.6.

Dissolved 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 reduced form. In the present study dissolved oxygen was found 4.8-6.2 ppm and 4.1-5.3 in probiotics and control ponds respectively. Low levels of dissolve oxygen tension hampers metabolic performances in shrimp and can be reduce growth and moulting and cause mortality (Gilles, 2001). Soundarapandian *et al.,* (2010) found 3.2 to 4.2 ppm dissolved oxygen.

Ammonia is the principal and end product of protein catabolism of organisms and it is excreted through gills. It is also formed by decay of organic matter. Under anaerobic condition, sulphate is also reduced to ammonia. In the present study total ammonia nitrogen was 0.32-0.71 and 2.1-2.7 in probiotics treated and control ponds respectively. At farm level ammonia level should be less than one ppm (Soundarapandian *et al.,* 2010). The preset results were similar to the findings of earlier workers (Hossain *et al.,* 2013 and Soundarapandian *et al.,* 2010). Thus maintaining the ammonia level probiotics helps in maintaining good water quality and there by keeps the shrimps disease free.

4. Conclusion

The general conclusion drawn from the present investigation is that the probiotic (PRO-W) plays a significant role in maintaining the water quality parameters of the culture ponds throughout the study period.

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