



Effect Of Probiotics On Growth, Survival And Yield Of *Penaeus vannamei* (Boone, 1931) In Culture Ponds At Susaram Village, Srikakulam District, Andhra Pradesh

Chinnababu Sanapala^{1*}, P. Yedukondala Rao², Teja.G³

^{1*,2,3}Dept. of Marine Living Resources, Andhra University, Visakhapatnam, A.P., India.

ABSTRACT

The main objective of this study was to evaluate the growth, survival rate and yield of *Penaeus vannamei* during 120 days of culture period in two experimental ponds with same stocking densities i.e. 1,25,000 PL/ acre pond. Out of two ponds, one is probiotic treated pond and other is control pond. The Blanca, CP. Pvt. Ltd., shrimp feed was given as supplementary feed in both experimental ponds. The Probiotic, SUPER-PS, CP. Pvt. Ltd. was applied in treatment pond. The experiment was done in Winter Season at Susaram village, Srikakulam District, Andhra Pradesh. In the present study *Penaeus vannamei* yield observed after completion of the 120 days experimental period was 1562.2 kg/acre in control pond, whereas the highest yield 2246.4 kg/acre was reported in treatment pond. The survival rate 60% and 72% was noticed in control and treatment ponds respectively. The Specific Growth Rate observed in control pond was 4.535% , whereas in Treatment pond it was 4.654%. The lowest Average Daily Growth 0.17g/day was noticed in control pond, whereas the highest growth 0.20g/day was noticed in treatment pond. The lowest FCR 1:1.25 was reported in treatment pond and highest FCR 1:2.13 was noticed in control pond.

Key word: *Penaeus vannamei*, Growth, Survival, Yield, FCR, Probiotic -Super-PS, Blanca CP feed

INTRODUCTION

In the recent years aquaculture has a common practice throughout the World. During the last few years, white spot disease (WSD) has spread worldwide and caused large –scale mortalities and severe damage to shrimp culture, particularly in Asia leading to massive economic losses. Due to continuous outbreak of WSSV in of *P. monodon* culture leads to shattering of shrimp culture in India. So the farmers are seriously looking for alternative species for culture. At correct time the Coastal Aquaculture Authority of India (CAA) introduced a new shrimp species *Penaeus vannamei* in India. At the same time CAA is very keen in the biosecurity and approval for culture of *P. vannamei*.

Generally survival, growth and production of shrimp depend on the type of culture system, i.e., extensive, intensive and semi-intensive culture. Stocking rates in aquaculture are typically thousand folds greater than wild environments. In ponds usually high density exacerbates the problems with water quality and sediment deterioration. Water quality management become the limiting factor because of higher feeding rates and greater stocking densities in the intensive farming. The physico-chemical factors of the pond water and quality of supplementary feed as individual plays important role on the growth, survival and shrimp yield, which together determine the ultimate production. The ecosystem of the culture pond may also influence the production performance of shrimp culture (Subrahmanyam, 1973; Varghese *et al.*, 1975 & 1982 and Liao, 1977).

Many studies have an aim to increase the shrimp production through the stocking density, supplementary feeding, fertilization and combination of different species into culture system (Vargese *et al.*, 1975; Chakraborti *et al.*, 1985 and Krishna, 2006). *Penaeus vannamei* is one of the most intensive cultured shrimps all over the World (Perez Farfante and Kensley, 1997) because of the reduced risk of catastrophic disease and favorable environmental conditions (Boyd, 2002 and Zhu *et al.*, 2006). Several authors described about the growth in shrimp culture system based on stocking density (Cailout *et al.*, 1976 and Sedgwick, 1979) and some authors have reported in inverse relationship between growth and stocking density (Lee *et al.*, 1983). No proper research has yet been done on the effect of probiotic on growth, survival and yield of *P. vannamei* in culture ponds at Susaram village, Srikakulam District. Hence it was aimed to evaluate the effect of probiotic on growth, survival and yield of *P. vannamei* in the present study.

MATERIALS AND METHODS

The present study was undertaken at a shrimp farm at Susaram village, Srikakulam District, Andhra Pradesh, India during 02.10.2019 to 29.01.2020. The study was conducted in two experimental shrimp culture ponds. The cultured period goes to 120 days. The depth of the culture ponds was 1.5 m and the soil type was Loamy clay. The pond size is one acre each. Ponds were initially prepared by drying, tilting and liming to correct the pH of the soil. Inorganic fertilizers such as urea and triple superphosphate were applied to enrich the natural food organism in the water. Feed probiotics used was super -PS CP. Pvt. Ltd. (20 ml/Kg feed) in control pond. Supplementary feed Blanca, CP .Pvt. was used in both control and treatment ponds.

Bird fencing and crab fencing (netting) were constructed before pumping water to prevent the auto entrants. The filter bags were checked properly, which was fitted in the inlet and outlet pipe, then the pumping was done to the entire ponds. After filling, water kept stand for one day without any disturbance for sedimentation.

The *Penaeus vannamei* seeds (PL15), were acclimatized to a salinity level of 17 ppt. and confirmed negative for the white spot syndrome virus (WSSV) and Taura syndrome virus (TSV) by the polymerase chain reaction (PCR assay), were purchased from Sri kanakamatya shrimp hatchery Pvt Limited, Kalingapatnam. The seed were transported in oxygenated double-layered polythene bags with crushed ice packs between inner and outer covers of the bag to maintain optimum temperature in turn to keep less stress to the shrimps and the entire set up was 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 pond water was added slowly into the seed bag to adjust the salinity and pH. Subsequently the seeds were released slowly into the pond. The water quality parameters were measured by using standard Kits for salinity, pH, temperature, D.O., Total alkalinity, Nitrites and ammonia.

CP feed was given to stocked post larvae for four times daily at 6 am, 9 am, 2 pm and 8pm respectively. No water exchange was done throughout the culture period. Cast net sampling was done every seven days for monitoring shrimp health and growth. At each sampling, weights were recorded for growth increments. Average Daily Growth (ADG), Specific Growth Rate (SGR), and Feed Conversion ratio (FCR) were calculated from the sampling data. Final weight gain %, Survival rate %, Total yield (Kg) and Total feed (Kg) fed was recorded throughout the experiment period.

After harvesting the experimental ponds total yield, survival rate and total feed consumption were recorded and the following growth parameters were calculated for study the growth performance of *Penaeus vannamei*. Harvesting was done by drag netting and harvested shrimp were stored in ice boxer and transported to processing industry.

Methods used for calculation of Average daily growth (ADG), Survival rate (SR), Biomass (BM), specific growth rate (SGR), and Feed conversion ratio (FCR) were calculated by the following formulas:

The growth parameters were estimated by using the methods (Das et al., 2005)

$$ADG = \frac{\text{AVERAGE BODY WEIGHT}}{\text{DAYS OF CULTURE}}$$

$$\text{Survival Rate} = \frac{\text{NO OF SHRIMP PRESENT IN THE POND}}{\text{NO OF SHRIMP STOCKED IN THE POND}} \times 100$$

Specific Growth Rate (VinecntLugert et al., 2016)

$$SGR = \frac{\ln(WF) - \ln(WI)}{\text{TIME PERIOD}} \times 100$$

Feed Conversion Ratio (Aliyu-Paikoet.al. 2010)

$$FCR = \frac{\text{TOTAL FEED IS GIVEN}}{\text{TOTAL WET WEIGHT GAIN}}$$

BIOMASS = Total Weight of Harvested shrimp in Kg. s

RESULTS AND DISCUSSION

In the present study an attempt has been made to compare the performance of commercially available feed probiotics in the growth and survival of *P. vannamei*, in culture ponds. Feed probiotics help in the release of digestive enzymes in the gut of the animals which enhance the metabolism and feeding rate. The feed probiotics help in the domination of useful microbial gut flora in the alimentary canal of the animals. The gut probiotics are live microorganisms applied as feed supplement with the motto of improving the health of the shrimp as reported by Tannock (1997).

After completion of the experimental period of 120 days, the yield observed in control pond was 1562.2 kg/acre, whereas in experimental pond the yield obtained was 2246.4 kg/acre. The highest survival rate (72%) was observed in treatment pond when compared to the survival rate (60%) in control pond. Fairly highest Specific Growth Rate (4.654%) was observed in treatment pond, when compared to the control pond. Average Daily Growth of shrimp (0.20g/day) in treatment pond was higher than the Average Daily Growth of shrimp (0.12g/day) in control pond. The best Feed Conversion Ratio (1:1.25) was observed in treatment pond than the Feed Conversion Ratio (1:2.13) of control pond (Table1).

The growth, survival and yield of the shrimps in probiotic treated pond showed better performance during the study period. Management of good water quality is also very much essential for optimal growth and survival of shrimps as reported by Soundarapandian *et al.*, (2010). The results of the present study clearly demonstrated that the maximum growth and survival of the shrimps was due to the beneficial effects of probiotic administration through the feed. Rengpipat *et al.*, (2000) have described about the effects of probiotics and immune stimulants in *P. monodon* shrimp culture and observed an increased immunity and showed resistance against to *Vibrio harveyi*.

Table.1: Growth performance of vannamei shrimp in experimental ponds during the study period

Culture Details	Control Pond	Treatment pond
Area	One Acre	One Acre
Initial Stocking (Numbers)	125000	125000
Stocking date	2.10.2019	2.10.2019
Post larva Stocking(days)	PL15	PL15
Harvest date	29.1.2020	29.1.2020
Culture Period	120	120
Initial Weight (g)	0.09	0.09
Harvest size(g)	20.83	24.00
Count (numbers/Kg)	48	42
Shrimp harvest(Kg)	1562.2	2246.4
Survival percentage	60	72
Total feed Used(Kg)	3333.3	2825
FCR	2.13	1.25
ADG	0.17	0.20
SGR	4.535	4.654
Feed company	CP	CP
Aeration	5 Fans 2HP	5 FANS 2HP

Table 2. Water quality parameters of experimental ponds during the study period

Ponds	Control Pond	Treatment Pond
Temperature (°C)	29	28
Salinity (ppt)	7.5	8.4
pH	8.5	7.5
DO (ppm)	4.8	6.0
Total alkalinity (ppm)	184	188
Nitrite – N (ppm)	0.11	0.09
Ammonia– N (ppm)	0.09	0.05

The physico-chemical parameters of water play crucial role in the culture systems. Maintenance of water quality is essential for optimum growth and survival rate of shrimp. The water quality parameters during the study period were presented in Table 2. The optimal water quality parameters were recorded in treatment pond when compared the control pond due to the application of Probiotic. Excess feed, fecal matter and metabolites will exert tremendous influence on the water quality of shrimp farm (Soundarapandian and Gunalan, 2008). In the present study the salinity was maintained in between 7.5 and 8.4 ppt in experimental ponds. However, the shrimp tolerates the salinities of even 2.45ppt (Parker *et al.*, 1974). Several works have reported good growth and survival of *P.vannamei* in brackish water salinity rangse from 10-30ppt (Karthikeyan, 1994 and Gunalan *et al.*, 2010). Sowers and Tommasso (2006) observed the higher growth in low salinity (2ppt) water than in seawater. Wang *et al.*, (2004) reported that the favorable pH range of 7.5-8.7 for *P.vannamei*. The pH of pond water is influenced by many factors, including the source of water, acidity of bottom soil and shrimp culture inputs and biological activity. The level of dissolved oxygen in pond water depends in the balance of autotrophic and heterotrophic production and cloudy weather also influenced dissolved oxygen concentration. The DO reported in the present study ranges from 4.8 to 6.0 ppm. Several workers have reported on the Survival and growth of *P.vannamei* in different salinities, pH and DO (Wyban *et al.*, 1988; Samochaet *et al.*, 1993, 1999; Araneda, 2008, Neal *et al.*, 2010, Karuppasamy *et al.*, 2013 and Gautam *et al.*, 2014). Temperature can affect shrimp growth directly controlled by food consumption and nutrients availability in the food. During the experimental period the temperature was recorded between 28 and 29°C. The cultured shrimp grows best in a temperature ranges from 24 to 32°C (Fast and Lannan, 1992). Temperature has pervasive controlling effect on growth (Das and Saksena, 2001).

CONCLUSION

The present study clearly indicated that the application of probiotics increase the feed efficiency and growth of *P. vannamei*. The present study suggested to expansion of vannamei culture in this area by implementation of strict procedure of bio-security.

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