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Growth of cultured white Leg Shrimp *Litopenaeus Vannamei* (Boone, 1931) of brackish water culture system in summer season with artificial diet

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ABSTRACT

The Pacific white shrimp Litopenaeus vannamei (Boone, 1931) is an Ecological important tropical and euryhaline species. The shrimp used semi-intensive culture system and taken 3ponds each one 0.7 ha and stocking densities (post larvae) each one (3, 50,000) 500 species/m^2 for the study, survival was 86%, 88% and 90%. Crab fencing and bird netting was done before pumping water to prevent the auto entrants. In rainy seasons in month of March to August, the water quality parameters were measured fortnightly in a month at 7a.m. The artificial diet was provided 4times/day (6a.m; 11a.m; 4p.m and 9p.m) given made by Manamei feed pellets (Protein 35 and 34%). The production was 8337, 8932and 9450kg and FCR was1.78, 1.81 and 1.82 and mean growth was 27.7, 29.0 and 30.0g / 120, 123 and 126 days for P1, P2 and P3, respectively.

Key words: *L. vannamei*, salinity, dissolved oxygen, density, feed, growth and production

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INTRODUCTION

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 continue 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 right time (2008) the Coastal Aquaculture Authority of India (CAA) introduced a new species *(Litopenaeus vannamei*) in India. At the same time CAA is very keen in the bio security and approval for culture of *L.vannamei*. The white leg shrimp *Litopenaeus vannamei* is the most important penaeid shrimp species farmed world wide (Alcivar – Warren et al., 2007). Because of the high demand for shrimps in Japan, the United States and Europe, shrimp aquaculture has expanded rapidly in all around the world, especially in tropical areas, such as Southeast Asia and Latin America (Lombardi *et al*., 2006). Among all species of shrimp, *L. vannamei*, which represent over 90% of shrimp culture in the Western hemisphere, is the most commonly cultured shrimp in Central and South American countries, China, and Thailand (Frias–Espericueta *et al*., 2001; McGraw *et al*., 2002; Saoud *et al*., 2003;). India rank second next to china in shrimp production. India has the one of the longest line of 8118 km. The shrimp culture commercially the most important forming as much as 90 percent of the total landings. *L. vannamei*, are presently being grown in low-salinity inland waters experimentally and commercially in Alabama, Arizona, Florida, Indiana, Illinois and Texas (Samocha et al., 2002;). Andhra Pradesh has one of the longest coast line 972 km widely distributed in India. The species *L.vannamei* has the great significance to grow as fast of *Penaeus monodon* (Tiger Shrimp). The recent trends in shrimp culture shows a considerable increase of farming of *L. vannamei* replacing *P. monodon* culture. An increase in farmed shrimp production can be achieved by increasing stocking density but this requires an increase in feed input which may degrade water quality. The optimal stocking

density varies depending on the farm system and management practices. In India *L.vannamei* culture production of about 18247 MT from 2930 ha in 2010-11.

MATERIALS AND METHODS

The water taken from creek, stored in reservoir. The chlorination water pumped to all ponds by the PVC pipe (size 2½ inch). The pond shape is rectangular, the shrimp 15 days old post larvae *L.vannamei* at beginning the study. The shrimp culture selected at Chinaganjam Village, Prakasam District, and Andhra Pradesh. The (PL_{15}) of *L.vannamei* collected from BMR hatchery (Iscapalli village) situated approximately 20 km of Nellore, Andhra Pradesh. Cost of seed Rs. 50 paisa/species. Water depth maintained 8ft. The rainy season experiments the species *L.vannamei* post larvae (PL) stocking densities taken from three samples each one (3, 50000) 500 species/m^2 and survival were 86, 88 and 90% (3, 01,000; 3, 08000; 3, 15000), respectively. The P^H , temperature, salinity and DO ranges up to 7.2–8.7, 28.0–33.0^{0}C, 11.0–16.0 ppt and 3.5– 4.1ppm/day. The artificial diet was given made by Manamei feed (protein% 35 (Feed No. 1, 2, 3 and 3S) and 34(Feed No. 3M)).The methodology includes standard techniques to measure the water quality parameters. Feed conversion ratio (FCR) and Average daily growth (ADG) were calculated by the given formula below

FCR = Total weight of the harvested shrimps / Total feed used

ADG = Total weight gained by the shrimps / Total days of culture

Statistical Analysis

ANOVA analysis was applied to know the statistical significance between stocking densities and growth of the shrimp.

RESULTS AND DISCUSSION

In the experiment the water quality parameters are presented (Table 1). The species *L.vannamei* well grow, the body weight increased 2.87–4.35g, 3.0–5.0g and 3.0–5.0g and ADG 0.23 (P1, P2 and P3)/15 days in Indian climate conditions, which is better than other countries. In the culture system the growth rate increased due to the artificial feed supplementation in the season. The oxygen consumption was higher in the large size groups than in the smaller shrimp. Given more feed to form the Ammonia and H_2S gas. When the electrical aerators and probiotics are used, the shrimp growth rate was increased due to lack of Dissolved Oxygen (DO). At the time of culture period observed shrimp mortality caused by vibrio disease. After 120, 123 and 126 days of pond culture, the mean average weights of the shrimp at harvest were 27.77, 29.00 and 30.00g (Table2, 3 and 4); survivals were 86, 88 and 90%; FCR was1.78, 1.81 and 1.82. The average production was 8337, 8932 and 9450kg/0.7ha P1, P2 and P3, respectively (Table 5).

Table 1: Average water quality parameters

Parameters	P1 range	P2 range	P3 range
P^H	7.2–8.0	7.8–8.5	7.8–8.7
Temperature (^{0}C)	28.0-30.0	29.0-31.0	29.0-33.0
Salinity (ppt)	11.0–13.0	12.0-14.5	12.0–16.0
DO (ppm)	3.5–3.8	3.7-4.0	3.7-4.1

Table 2: Fortnightly growth performance (g)

Pond	Days of culture (DOC)							
	15	30	45	60	75	90	105	120
P1	2.00	5.00	9.35	13.50	17.75	21.90	24.90	27.77

Table 3: Fortnightly growth performance (g)

Pond	Days of culture (DOC)							
	15	30	45	60	75	90	105	123
P2	2.00	5.35	9.00	14.00	19.50	23.00	26.00	29.00

Table 4: Fortnightly growth performance (g)

Pond	Days of culture (DOC)							
	15	30	45	60	75	90	105	126
P2	2.00	5.50	9.00	14.00	19.00	23.00	26.50	30.00

Table 5: Average Cost Analysis

Details	Pond 1	Pond 2	Pond 3
Area (ha)	0.7	0.7	0.7
Initial stocking (numbers)	3,50000	3,50000	3,50000
Density (numbers/m²)	500	500	500
Stocking Date	27/03/2013	27/03/2013	27/03/2013
PL stocking (days)	PL_{15}	PL_{15}	PL_{15}
Harvest Date	27/06/2013	30/06/2013	03/07/2013
Harvest size (g)	27.77	29.00	30.00
Count (numbers/kg)	47	45	44
Doc	120	123	126
Survival (%)	86	88	90
FCR	1.78	1.81	1.82
ADG (g)	0.23	0.23	0.23
Production (kg)	8337	8932	9450
Total feed (kg)	4662	4932.3	5181.6
Seed cost/kg shrimp	Rs 20.50	Rs 20.50	Rs 20.50
Feed cost/kg	Rs 71.84	Rs 71.84	Rs 71.84
Pond preparation cost/kg	Rs 5.00	Rs 5.00	Rs 5.00
Water treatment cost/ kg	Rs 6.00	Rs 6.50	Rs 7.00
Probiotic cost/ kg	Rs 4.00	Rs 4.50	Rs 5.00
Minerals cost /kg	Rs 3.00	Rs 3.40	Rs 4.00
Diesel cost/kg	Rs 7.00	Rs 7.50	Rs 8.00
Electricity cost/kg	Rs 20.00	Rs 20.50	Rs 21.00
Labour cost/kg	Rs 4.31	Rs 4.13	Rs 4.00
Other expenses (include maintenance & repair)/kg	40.00	40.50	41.00
production cost/kg of shrimp	Rs 400	Rs 430	Rs 460
Expenditure cost/kg Shrimp	Rs 181.65	Rs 186.37	Rs 187.34
Profit/kg	Rs 218.34	Rs 243.63	Rs 272.66
Total profit (Rs)	1820383.90	2176103.20	2576637.00

The maintenance of good water quality is essential for optimum health, survival and growth of shrimp. The shrimp at 20^0C were relatively inactive and exhibited low food consumption compared with at 35^0C. The shrimp maintained at 35^0C had the highest rate of food consumption Araneda *et al* .,2008) recorded the average growth rate of 0.38 g/wk in the 90 shrimp/m^2 and lowest in the 180 shrimp/m^2 (0.33 g/wk).Despite the variation observed, all value of the parameters meet the water quality requirements for shrimp production (Cawthorne, Beard, Devenport and Wickins1983; Allan and Maguire 1991; Garcia and Brune 1991; Prado-Estepa, Llobrera,Villaluz & Saldes 1993); early morning Dissolved oxygen concentration was between 3 and 5 $mg1^{-1}$; salinity was above 15 % during the first week of grow out pond, which is preferable for post larvae (PL). The initial lower temperatures would have reduced metabolism and diet intake of the shrimp (Lester and Pante 1992). The optimum feeding rate and frequency of presentation must, therefore, be determined for individual feeds and farms by carefully monitoring feed consumption, growth and feed efficiency over several growing seasons (Tacon, 1993). Many studies have illustrated that artificial substrates could increase shrimp growth and survival (Moss and Moss, 2004; Arnold *et al*., 2009). As *L.vannamei*, is a euryhaline species, and Bray et al., (1994) reported optimum growth in 5–15ppt salinity, and Huang, (1983) at 20 ppt. Zu et al .,(2004) the growth rate of *L.vannamei* at higher salinities of 50ppt and more, showed the possibility of commercial production. As one of key factors for culture shrimp, water quality not only affects the shrimp growth and survival rate, but also affects the accuracy of the experiment result (Chim *et al*., 2008). During the course of the attachment, a large number of shrimp could be assembled on the aquaria bottom from the artificial substrates (Zhang *et al*., 2010). Protein requirement has been defined by Guillaume (1997) as the minimum or the maximum amount of protein needed per animal per day. Protein requirements change with respect to changes in biotic factors (e.g. species, physiological state, size) and dietary characteristics (e.g. protein quality, energy: protein ratio). Abiotic factors such as temperature and salinity may also affect the protein requirement (Guillaume, 1997). The protein requirement of a given species is often based on the response (e.g. weight gain, feed efficiency, protein conversion efficiency) of the animal to varying levels of dietary protein under a given set of circumstances. "Vibro cheak" Probiotic is given to 3 ponds depending on biomass for control of Vibro disease.

Minerals are given to 3ponds depending on biomass for i.e. “Booster” for the development of the minerals in shrimp. “EDTA” 3kg/0.7ha for molting of the species. Opti oxygen controls the DO.

For each pond cost analysis was worked out. Production cost for 1kg shrimp (36, 34.48 and 33.33 counts) was calculated as Rs 400, 430 and 460. The feed cost were Rs 71.84/kg, followed by seed cost Rs 20.50/kg. The over all production were 8337, 8932 and 9450kg. Totally 4662, 4932.3, 5181.6kg feed was used. The average FCR were 1.78, 1.81 and 1.82, ABW were 27.77, 29.00 and 30.00g and average density was 500numbers/m². Profit /kg shrimp was Rs 218.34, 243.63and 272.66 and overall total profit was Rs1820383.90, 2176103.20 and 2576637/ P1, P2 and P3 for 120, 123 and 126 days (Table 5).

CONCLUSION

In the present study, it has been observed, temperature, salinity, dissolved oxygen, density and survival. ABW increases with less stocking density and vice versa. The shrimp *L.vannamei* culture is successful in brackish water environment and shrimp production and growth were increased with artificial Manamei feed when compared with control.

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