EFFECT OF DENSITY ON GROWTH AND PRODUCTION OF
LITOPENAEUS VANNAMEI OF BRACKISH WATER CULTURE
SYSTEM IN SUMMER SEASON WITH ARTIFICIAL DIET IN
PRAKASAM DISTRICT, INDIA

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Abstract: The Pacific white shrimp Litopenaeus vannamei (Boone, 1931) is an Ecological important tropical
euryhaline species. The culture was conducted from three ponds each one of 0.7ha for the study. Semi
Intensive culture system was selected in Chinaganjam village, Prakasam District under Brackish water
conditions. Stocking densities of L.vannamei (post larvae) were taken from three samples, each one contains
(3, 50,000) 500 species/m² and its survival was 86%, 88% and 90%. In summer season in month of March to
August, the water quality parameters were measured fortnightly in a month at 7a.m. The production was
8337, 8932 and 9450kg/120, 123 and 126 days and FCR was 1.78, 1.81 and 1.82 for P1, P2 and P3,
respectively. The artificial diet was provided 4times/day with Manamei feed pellets (Protein 35 and
34%). The final growth was 27.7, 29.0 and 30.0g respectively.

Key words: L. vannamei, Temperature, Salinity, Density, Feed, Growth and Production

I. Introduction

Litopenaeus vannamei (Boone, 1931), is the most important penaeid shrimp species farmed worldwide (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 represents 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; Mc Graw et al., 2002; Saoud et al.,
2003). India ranks second next to china in shrimp production. India has the one of the longest coastal line of
8118 km. About 90percent of the total landings has commercially most importance for the shrimp culture all
over the world. Andhra Pradesh has the second longest coast line 972 km distributed in India. Prakasam District
has distributed 102 km coast line in Andhra Pradesh. The L.vannamei is growing much better than Penaeus
monodon. The recent trends in shrimp culture shows a considerable increase of farming of L. vannamei
replacing P. monodon culture. The optimal stocking density varies depending on the farm system and
management practices. In India the production of L.vannamei culture about 18247 (MT) from 2930 ha culture in
2010-11, the production of shrimp 48430.00 (MT).

II. Material and Methods

All ponds were pumped with creek water. The pond shape is rectangular. The post larvae (PL15) of L.vannamei
was 15 days old for beginning the study. The PL15 collected from BMR hatchery (Isacapalli village) situated
about 20 km of Nellore District in Andhra Pradesh. Cost of seed Rs. 50 paisa for each. Water depth maintained
8ft. In the summer season, L.vannamei (post larvae) stocking densities were taken for culture in three ponds,
each one contains (3, 50,000) 500 species/m² and also, survival was 86, 88 and 90% (3, 01,000; 3, 08000; 3,
15000), respectively. The temperature, salinity and DO ranges up to 33±2°C, 14±2ppt and 4.1ppm/day. The
artificial diet was given made by Manamei feed pellet (Protein% 35 (Feed No. 1, 2, 3 and 35) and Protein%
34(Feed No. 3M)). The methodology includes standard techniques to measure the water quality parameters.

III. Results

In the experiment the stocking density was influenced by the water quality parameters (see Table1) and also,
indicated the reduction of survival rate at higher densities. The species L.vannamei was well growup to 20 gm
body weight from 3.75g to 4.25g/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. More the feed is given; more the
Ammonia and H2S gas are released. When the electrical aerators and probiotics are used, the shrimp growth rate
was increased due to lack of Dissolved Oxygen (DO). The shrimp culture of the mean average weights of the
shrimp were 27.7, 29.0 and 30.0g (Tables 1, 2 and 3), survival were 86, 88 and 90%. The given feed 4662,
4932.3, 5181.6 kg/ 120, 123, 126 days; FCR was 1.78, 1.81 and 1.82 for P1, P2 and P3 (Table 1); production was 8337, 8932 and 9450 kg, respectively. Cost of the feed Rs.71.84/kg and Cost of the species at harvesting time Rs.400/kg.

IV. Discussion
The statistical analysis method was applied “ANOVA” test, comparison of the survival, production, growth rate and FCR in P1, P2, and P3. The maintenance of good water quality is essential for optimum health, survival and growth of shrimp. The present study was concluded that *L. vannamei* culture is successful in brackish water environments and the growth is directly related to stocking density. The shrimp was relatively inactive about 20°C and exhibited low food consumption comparatively at about 35°C. The shrimp maintained at 35°C 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/m² and lowest in the180 shrimp/m² (0.33 g/wk). Despite the growth variation observed, all values of the parameters meet the water quality requirements for shrimp production (Cawthorne, Beard, Devenport and Wikins, 1983; Allan and Maguire, 1991; Garcia and Brune, 1991; Lee and Wikins, 1992; Prado-Estepa, Llobrera, Villaluz and Saldes, 1993); early morning Dissolved Oxygen concentration was between 3.0 to 4.5 mg l⁻¹; salinity was about 14% 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), consequently slowing growth during the first week. The growth rate of *L. vannamei* at higher salinities of 50ppt and more, showed the possibility of commercial production. As Arnold et al., (2006) observed the lower wet weights at high stocking densities are reduced space and natural food source availability. Likewise, many studies illustrated that artificial substrates could increase shrimp growth and survival (Moss and Moss, 2004; Arnold et al., 2006; Arnold et al., 2009). It is noteworthy that optimum growth is between 3-14 ppt which is little less than Bray et al., observations (1994), but far more than Huang, (1983), Zu et al., (2004) observations. 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). 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 pond 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. Probiotics are provided to all three ponds depending on biomass i. e. “Sana” life for improving the pond bottom. “Back cheak” for controlling Bacteria. “Vibro cheak” for controlling of Vibro. “Detro care” for controlling dead matters. Burunt “lime to develop the water quality and Zooplankton. Minerals are provided to all three ponds depending on biomass i. e. “Booster” for the development of the minerals. EDTA 3 kg/0.7ha for moulding of the species, Burunt lime to enhance the water quality. Sugar 10 kg/0.7 ha for hardening the shell.”Mingrow” (not applicable around 15ppt) for replacing the deficiency of minerals. Bactericide for controlling of Black gill disease. “Bio curb” for decreasing of ammonia. “Gasonex” to lift of the gas (while it is black soil, it will be given after 70 days). Hydrogen peroxide (H₂O₂) for controlling of DO. Zeolite for bottom clears. Potash 25kg/0.7/ha for control the body gram of species. P1 the survival rate was decreased comparatively with P2, P3 and P1Food Conversion Ratio was low compared with P2, P3 (Table 1) and P3 the growth was increased in P1,P2(Table 2, 3 and 4). The mean feed and average growth were 66.1, 67.2 and 68.1 and 3.47, 3.62 and 3.75 for P1, P2 and P3 (Table 2, 3 and 4).

Table 1: Pond performance Details

<table>
<thead>
<tr>
<th>Pond Details</th>
<th>Area (ha)</th>
<th>DOC</th>
<th>Stocking date</th>
<th>PL stocking (days)</th>
<th>Density(m²) &amp; Initial stocking</th>
<th>Survival (%) &amp; Numbers</th>
<th>FCR</th>
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<td>0.7</td>
<td>120</td>
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<td>500=3,50,000</td>
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<td>P2</td>
<td>0.7</td>
<td>123</td>
<td>27/03/2013</td>
<td>PL₁₇</td>
<td>500=3,50,000</td>
<td>88=3,08000</td>
<td>1.81</td>
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<tr>
<td>P3</td>
<td>0.7</td>
<td>126</td>
<td>27/03/2013</td>
<td>PL₁₇</td>
<td>500=3,50,000</td>
<td>90=3,15000</td>
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Table 2: Pond 1 Water parameters & Growth performance (g) in summer season

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<th>DOC</th>
<th>Temperatur e (°C)</th>
<th>Salinity (ppt)</th>
<th>DO (ppm)</th>
<th>Giving feed (%)</th>
<th>Feeding/day (kg)</th>
<th>Total growth (gm)</th>
<th>AVG/ fortnightly (gm)</th>
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<td>12.5±2</td>
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<td>9.35</td>
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<td>33.0±2</td>
<td>14.0±2</td>
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<td>3.8</td>
<td>45.7</td>
<td>17.75</td>
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Table 3: Pond 2 Water parameters & Growth performance (g) in summer season

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<th>DO (ppm)</th>
<th>Giving feed (%)</th>
<th>Feeding/day (kg)</th>
<th>Total growth (gm)</th>
<th>AVG/fortnightly (gm)</th>
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<td>2.1</td>
<td>56.2</td>
<td>4.1</td>
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</tbody>
</table>

Mean 30.4±2 12.4±2 3.7 4.1 66.1 15.27 3.47
Total production=8337; Total feed=4662

Table 4: Pond 3 Water parameters & Growth performance (g) in summer season

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<th>Temperatur (°C)</th>
<th>Salinity (ppt)</th>
<th>DO (ppm)</th>
<th>Giving feed (%)</th>
<th>Feeding/day (kg)</th>
<th>Total growth (gm)</th>
<th>AVG/fortnightly (gm)</th>
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<td>4.1</td>
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</tr>
</tbody>
</table>

Mean 29.8±2 11.6±2 4.0 4.1 68.1 16.12
Total production=9450kg; Total feed=5181.6kg

Note: P=Pond, DOC=Days of Culture, PL=Post Larvae, FCR=Food Conversion Ratio and DO=Dissolved Oxygen, AVG=Average growth

V. Conclusion:
In the present study, it has been observed, Temperature, Salinity, Dissolved oxygen, Density and Survival have been observed and the shrimp Growth rate and Production were increased with artificial Manamei feed when compared with control.

References:

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