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RESEARCH ARTICLE

STUDY ON GROWTH PERFORMANCE OF *Litopenaeus vannamei* CULTURED IN BORE WELL AND BRACKISH WATER FED PONDS

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ABSTRACT

The present study is the report on the growth performance of *L. vannamei* in the bore well and brackish water fed ponds. Crab fencing and antibird netting were done before pumping water to prevent the disease and carries of White Spot Syndrome Virus (WSSV). The water quality parameters such as temperature, salinity, pH, dissolved oxygen and alkalinity were measured during the entire culture period. The Daily Growth Rate (DGR) was ranged between 0.05 and 0.38 g in the bore will fed pond and in the brackish water fed pond the DGR varied between 0.11 and 0.33 g. the maximum growth 27.33 g attained on 175th days of culture in the bore well fed pond and in the brackish water fed pond the maximum growth 31.44 g reached on 140th days of culture. From the present study it is concluded that the brackish water fed pond is suitable for *L. vannamei* culture when compare with bore well water fed pond.

INTRODUCTION

Aquaculture accounted for about 47 % of the world's fish food supply (FAO 2009). In 1996, *Litopenaeus vannamei* was introduced into Asia on a commercial scale. Total production of *L. vannamei* in Asia was approximately 3,16,000 mt in 2002. It is known that the *L. vannamei* is established in several countries in East, Southeast and South Asia and it is playing a significant role in shrimp aquaculture production. There are very limited research works done on the culture and growth performance of *L. vannamei* with different stocking densities and also the source waters like bore well waters in India. Growth is a parameter of obvious importance in fish and shrimp culture. It has been the topic of numerous studies and yet careful examination of the current scientific and technical literature shows that it is still poorly understood by many scientists and aqua culturists. Shrimp aquaculture in Asia facing many problems such as disease out-breaks, environmental degradation, stress, poor pond soil and water qualities and is highly correlated with poor management practices in the pond (Lightner and Kumula, 1993; Lightner, 1996; Subasinghe, 1997; Gopalakrishnan and Parida, 2005; Fegan, 2007; Gopalakrishnan *et al.*, 2008). Shrimp farming also facing criticism for its unsustainable practices, which include their water management and usage practices (Naylor *et al.*, 2000). Among these factors, the maintenance of good pond water quality is essential for optimum growth and survival and health of shrimp. Good water quality characterized by better water quality like dissolved oxygen, temperature, pH and salinity. Water quality plays an important role in shrimp culture. Since a decade, a few shrimp farmers of Andhra Pradesh, India have been using saline bore well water for shrimp culture, and they thought that they can avoid the disease outbreak of important disease like White Spot Syndrome Disease (WSSV). Hence the present investigation was undertaken to study the growth performance of the *L. vannamei* cultured in the bore well and brackish water fed ponds.

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MATERIALS AND METHODS

Two different type of ponds; one is brackish water fed pond, which located at Ongole, Andhra Pradesh, India (15° 19' N; 80° 05') and another pond filled with bore-well water located at (15°19' N; 80°04' E). The size of the both ponds were 0.6 ha were used for this study. Ponds were initially prepared by drying, tilting and liming. Inorganic fertilizers such as urea and triple superphosphate were applied to enrich the natural food organisms in the water. Crab fencing and anti bird netting was done before pumping water to prevent the disease carrier like crabs. The *L. vannamei* seeds were purchased from commercial *L. vannamei* hatchery; the seeds were acclimated to the respective ponds for 2 hr. after acclimatization the seeds were stocked in both ponds at the stocking density of 15/m^2.

The commercial pellet feeds were fed to post larvae (Feeding is based on the feed chart provided by M/S CP aquaculture (I) pvt ltd). After 30 days feeding is done 4 times a day and feed is adjusted based on check tray observation. Water exchange was not done during the entire culture period. The water quality parameters such as; Temperature, salinity, pH and dissolved oxygen were analyzed once in a day. From 35th Day of Culture (DOC) onwards cast net (sampling) was done every seven days for monitoring the shrimps weight gain and diseases if any during entire culture period.

RESULTS AND DISCUSSION

Water qualitity parameters in the culture ponds were given in the (Figure 1 and 2). The temperatures in the brackish water and bore well fed ponds were ranged between 28.6 and 32.2 ^{o}C and 27.7 to 32.2 ^{o}C. When compare to the two ponds there is not much variation in temperature. Due to the summer season, the temperature was highly increased in the both ponds. The water temperature significantly inducing on the penaeid shrimp growth rather than salinity (Herke *et al.*, 1987; Staples and Heales, 1991; OBrien, 1994; Tsuzuki *et al.*, 2000). Van Wyk *et al.* (1999) reported slightly lower growth rates in white shrimp when water temperature is below 26 °C, and no growth rates when less than 22 °C. The salinity also in same trend in both ponds, it was varied from 20.3 to 38.8 ppt in bore well fed pond and 22 to 42.5 ppt in brackish water fed pond. The salinity plays a major role in the water quality parameter the *L. vannamei* though it is a uryhaline species it can tolerate the wide range of salinity between 2 and 45 ppt (Parker *et al.*, 1974 and Samocha *et al.*, 1998). Bray *et al.* (1994) reported maximal growth between 5-15 ppt and least growth was reported at 49 ppt.

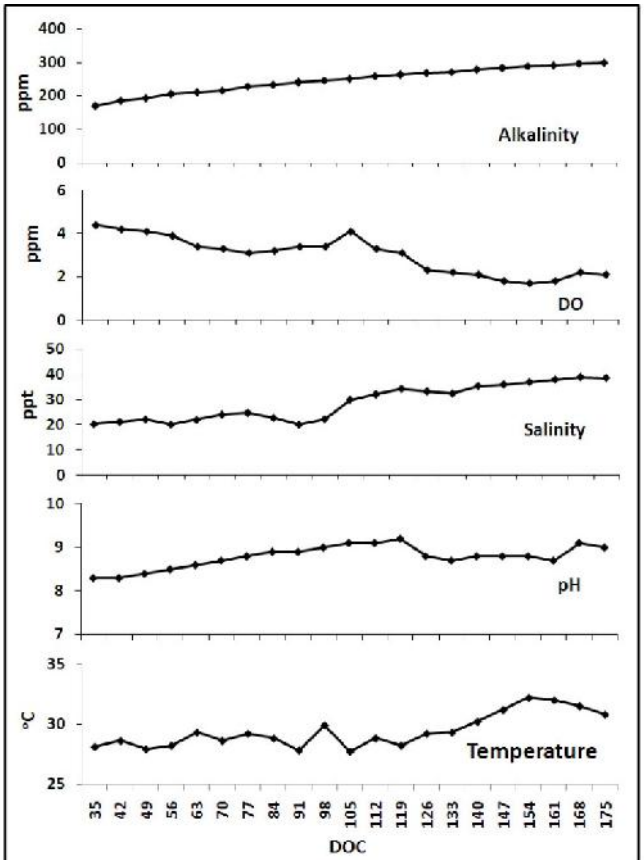

Figure 1. Water quality parameters of bore well water fed pond

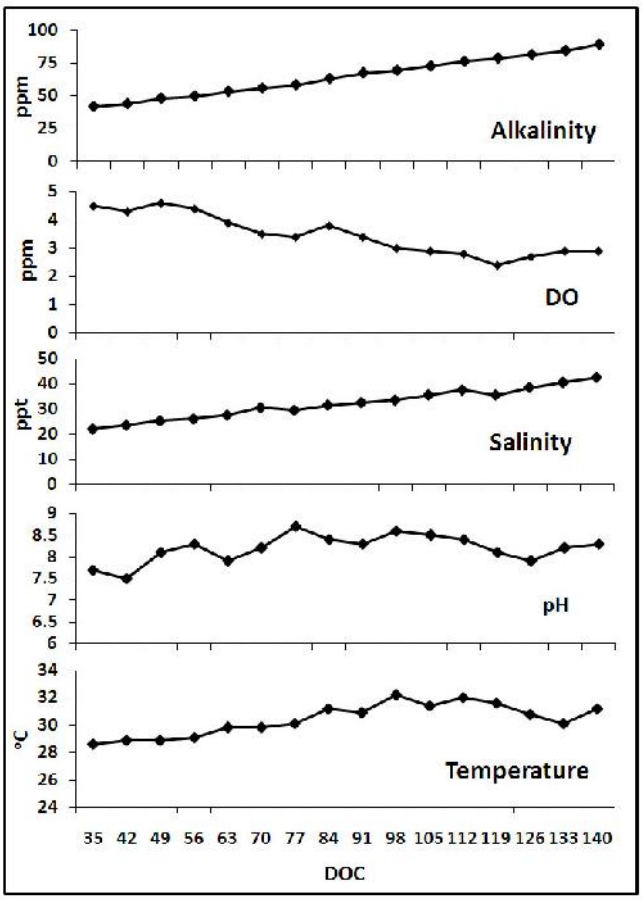

Figure 2. Water quality parameters of brackish water fed pond

The pH value of the both the ponds ranged between 8.3 and 9.2 in bore well pond and 7.5 to 8.7 in brackish water 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. Wang *et al.* (2004) reported that the pH 7.6 to 8.6 is favor for *L. vannamei* culture based on this, in the present study the pH 7.5 to 8.7 in brackish water pond is suitable for the culture of *L. vannamei* than the bore well fed pond. The lethal DO for *L. vannamei* is reported to be 0.2 ppm after 1 h of exposure (Perez-Rostro *et al.*, 2004) and about 1.0 ppm in culture pond conditions (Hopkins et al. 1991). In the present study the DO level varied from 2.4 to 4.6 ppm in brackish water fed pond and in bore well pond it was between 1.7 and 4.4 ppm were recorded. Alkalinity is the buffering capacity of water. It is calculated by amount of carbonates and bicarbonates. Alkalinity can affect the primary productivity and also the water pH. Gopalakrishnan *et al.* (2011) reported that the pond alkalinity above 150 ppm coupled with higher pH levels above 8.3 lead to the deposition of calcium on the exoskeleton. In the present study the alkalinity level were higher in the bore well fed pond and it varied between 169.7 and 299.3 ppm but lower level in the brackish water fed pond were 41.6 to 89.4 ppm. Similarly Gopalakrishnan *et al.* (2011) reported that the lower alkalinity 35.1 to 87.11 ppm is recorded in estuarine fed pond and higher alkalinity 197 to 321.33 ppm is in bore well fed pond. Daily Growth Rate (DGR) of *L. vannamei* in the bore well water fed pond ranged between 0.05 and 0.38 g. The maximum weight of the shrimp 27.33 g reached on 175th days of culture (Figure 3). Whereas in brackish fed pond, it was ranged between 0.11 and 0.33 g, the minimum DGR was recorded on 35th days of

culture and the maximum was on 63rd days of culture. The maximum weight of the shrimp was 31.44 g attained on 140th day (Figure 4). The shrimp weight was gradually increased and the DGR was uniform in the brackish water pond but in case of bore well fed pond the DGR was unstable. Gunalan *et al.* (2011) reported that the brackish water environment is more suitable for *L. vannamei* culture. Mineral deposition was noticed on the farm implements like aerators, PVC pipes, electric wires, concrete structures (like sluices) and on the shrimps too, when bore-well water used for culture pond (Gopalakrishnan *et al.*, 2008). Due to the mineral deposition on shrimp's shells become rough (rough shell disease) and stunted the growth of the shrimp (Chanratchakool, 2003) resulting in less survival rate and finally lead to poor production and productivity.

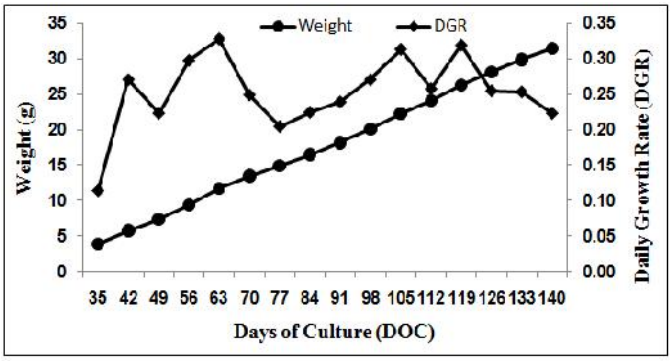

Figure 3. Variation of Daily Growth Rate (DGR) of *L. vannamei* in brackish water fed pond

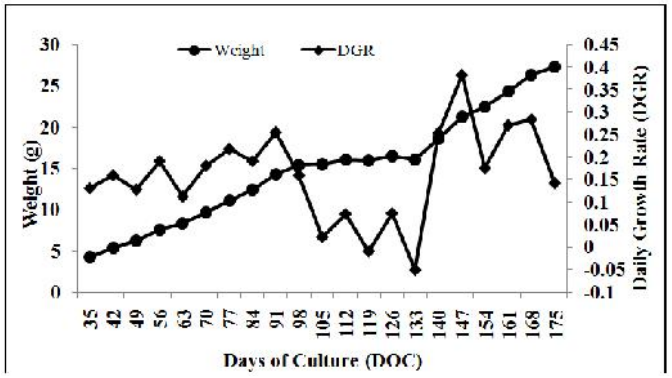

Figure 4. Variation of Daily Growth Rate (DGR) of *L. vannamei* in bore well water fed pond

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