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Research Article

SLOW GROWTH SYNDROME IN *LITOPENAEUS VANNAMEI*

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ABSTRACT

The present study describes slow growth of the shrimp, *Litopenaeus vannamei* and water quality parameters of shrimp ponds. Shrimp growth and water quality parameter of diseased and normal ponds were compared. The maximum length of diseased shrimp was 9.4 cm on 116th day of culture (DOC) which was less than normal shrimp length 14.6 cm on the same day. The maximum weight of diseased shrimp was 16.9 gm on 116th day of culture while normal shrimp was 27.2 gm on 116th day of culture. The pH of affected pond was ranged between 8.0 (38th DOC) and 8.9 (52nd DOC) of normal pond was ranged between 7.2 (31st DOC) and 7.7. (45nd and 81th DOC) The temperature of affected pond was ranged between 30.7°C (45th DOC) and 33.5°C (95th DOC). The temperature of normal pond was ranged between 28.6°C (38th DOC) and 30.6°C (95th DOC). The dissolve oxygen of affected pond was ranged between 3.9 mg/l (31st DOC) and 4.5 mg/l (52nd DOC). The dissolve oxygen of normal pond was ranged between 5.1 mg/l (31st and 38th DOC) and 5.9 mg/l (66th DOC). The salinity of affected pond was ranged between 33.2 ppt (31st and 66th DOC) and 36.8 ppt (102nd and 116th DOC) while in normal pond salinity was ranged between 29.6 ppt (31st DOC) - 33.6 ppt (102nd DOC).

Keywords: *L.vannamei*, slow growth, stress, water quality

INTRODUCTION

Aquaculture production has grown tremendously in the past years and is expected to continue during the next few years. Several shrimp species are being cultured in ponds, and one particular species that is gaining popularity in tropical countries is the Pacific white leg shrimp, *Litopenaeus vannamei*. This penaeid shrimp has fast growth rate, thus its culture period is significantly increased It is now evident that *L. vannamei* is farmed and established in several countries like East, Southeast and South Asia and is playing a major significant role in shrimp production [1]. Among all species of shrimp, *L. vannamei* 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 [2,3,4]. Within the order Decapoda (shrimp, lobsters and crabs), suborder Dendrobranchiata includes about 450 species of penaeid and sergestid shrimps that can grow up to 30 centimetres [5]. Due to the economic importance of penaeid shrimp worldwide, particularly in aquaculture, a great effort to understand the growth of Penaeid has been made in recent years. This includes studies on the influence of environmental factors such as temperature [6,7,8,9,10] and lunar cycles [11] on shrimp growth. Growth depends on sex, stage and environmental factors such as food quantity and quality, water temperature and salinity [12]. Thus, intensification of aquaculture is self-limiting, not only because of the high cost of formulated feed, but also for its poor utilization, which causes deterioration of the pond environment and poor growth, or generates even higher costs, because of the need to increase water exchange rates. This adds to the poor perception of aquaculture by the stakeholders, because it is perceived as an environmental threat [13].

MATERIAL AND METHODS

The normal and diseased shrimp ponds data were collected from culture ponds of Singarakonda, Andhra Pradesh. Area of both the pond 6000 m^2 and density was $40/m^2$. Among the ponds, two ponds were compared for the growth study. Cast net was used to collect the shrimp from the pond for the growth assessment. The shrimps were grossly examined for the incidence of disease if any. The collected shrimp's weight was measured by electronic weighing machine every week. The water quality parameters like salinity, pH, temperature, dissolved oxygen were measured every week using hand refractometer, pH pen, thermometer, and dissolved oxygen meter.

RESULT

The normal shrimp was glassy yellowish in colour while diseased shrimps were brownish colour (Figure 1). Higher pigmentation was observed in the diseased shrimps. The normal shrimp length was ranged between 12.2 and 14.6 cm while diseased shrimp length was ranged between 8.2 cm to 9.4 cm. The maximum weight of normal shrimp was 27.2 gm and the weight of diseased shrimp was 16.9 gm in on 116th day of culture (Figure 2). The minimum weight of normal shrimp 2.8 gm was observed on 31 day of culture while on the same day of culture diseased shrimp weight was 1.6 gm.

Physio-chemical parameter of normal pond was varied from diseased shrimp pond. pH of normal pond was ranged between 7.2 and 7.7 while diseased pond pH ranged between 8.0 and 8.9 (Figure 3). The temperature of normal pond was ranged between 28.6 °C and 30.6 °C while temperature in diseased pond was ranged between 30.7 °C and 33.5 °C (Figure 4). Dissolve oxygen of normal pond was ranged between 5.1 mg/l and 5.9 mg/l while in diseased pond it was ranged between 3.9 mg/l and 4.5 mg/l (Figure 5). The salinity of normal pond was ranged between 29.6 ppt and 33.6 ppt while diseased shrimp pond has salinity between 33.2 ppt and 36.8 ppt (Figure 6).

Figure 1: Gross observation of normal (open arrow) and diseased arrow (round head arrow).

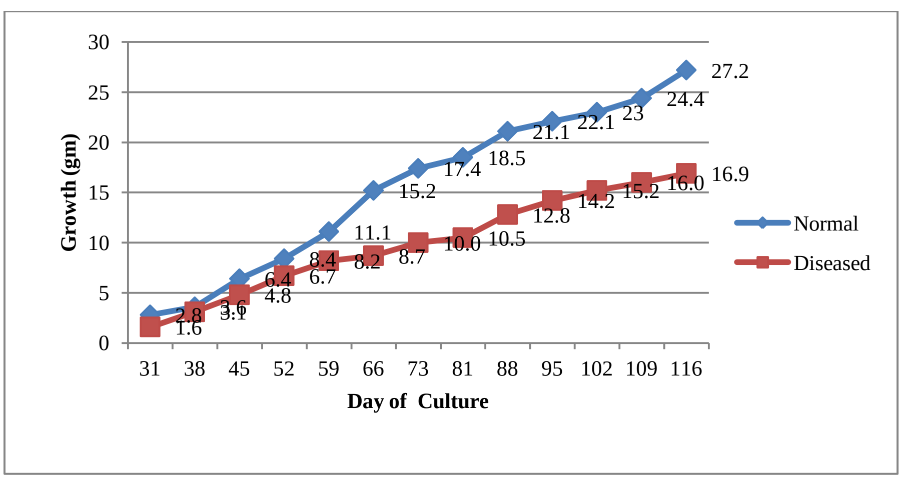

Figure 2: Growth of normal and diseased shrimp.

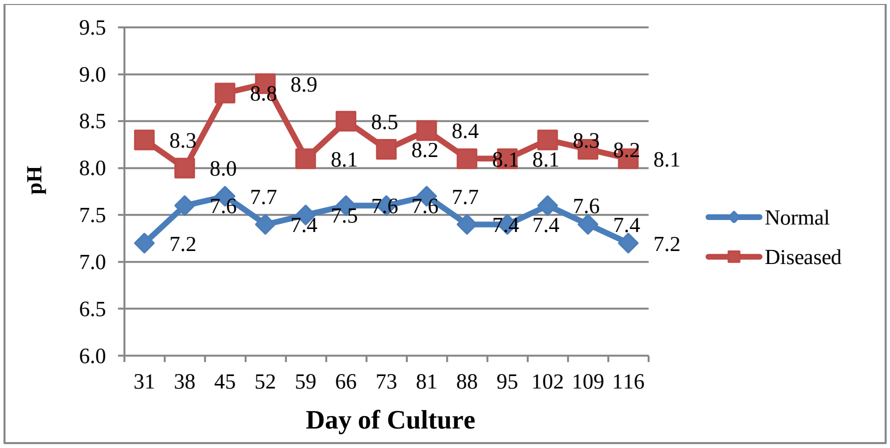

Figure 3: pH of normal and affected pond.

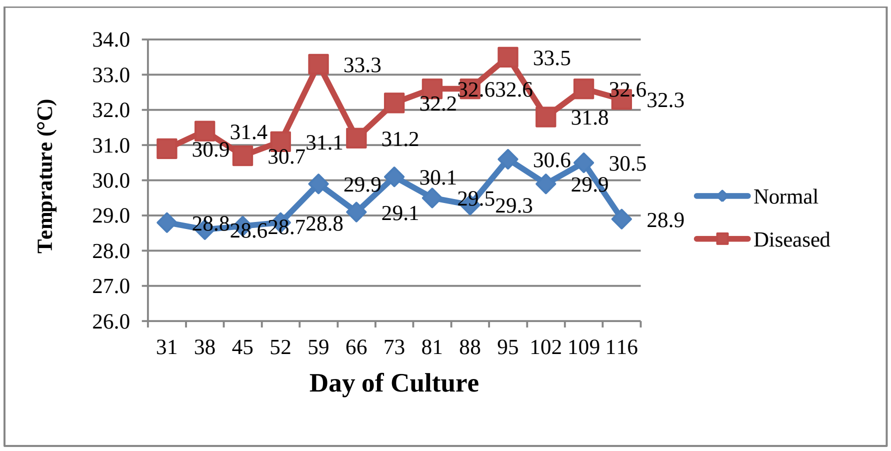

Figure 4: Temperature of normal and diseased pond.

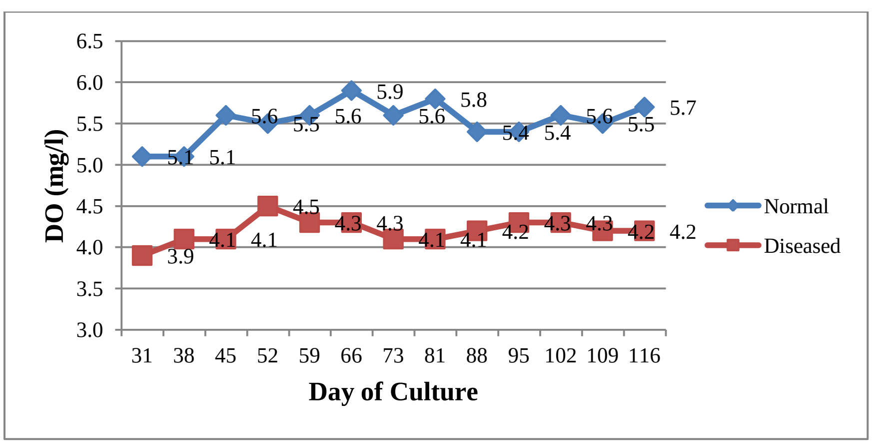

Figure 5: Dissolve oxygen of normal and affected pond.

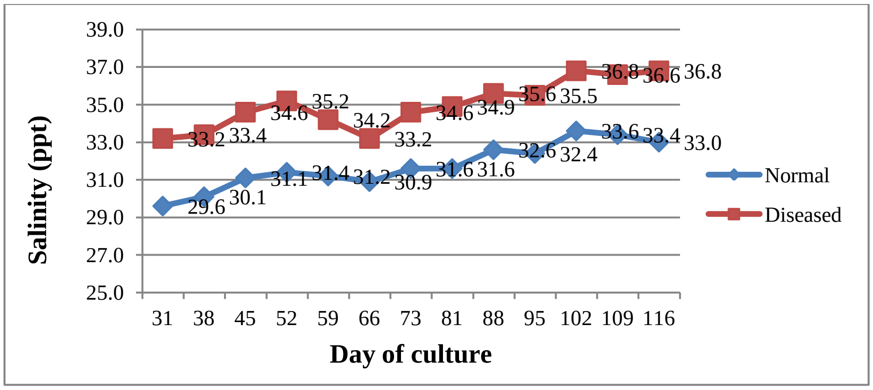

Figure 6: Salinity of normal and affected pond.

DISCUSSION

Slow growth syndrome one of severe disease which affect the *L. vannamei* production severely. The affected shrimp's body colour varied when compare to normal shrimps. The higher pigmentation of shrimp denotes stress and it may be caused by environmental parameter fluctuation in the shrimp pond and also the post larvae source. Sometimes the seeds may be produced from the domestic or pond raised brooders. In the present study, normal shrimp average body weight was 27.2 gm on the harvesting day (116 DOC) but diseased the shrimp average body weight was 16.9 gm on the same day. pH is one of the important environmental parameter which decides physiological process of shrimps. The optimum range of pH 6.8 to 8.7 for the shrimp in the pond environment for the optimal growth [14]. The maximum pH in normal pond 7.7 was observed on 45^{th} and 81^{st} day of culture and the lowest pH 7.2 was on 31^{st} day of culture. The maximum pH in the disease affected pond was 8.9 on 52^{nd} day of culture while the lowest pH 8.0 was observed on 38^{th} day of culture. Generally specific growth affected more by temperature and the growth rate increased over the temperature range of 20°C to 32°C. But in the present study the maximum temperature in the normal pond 30.6 °C was observed on 95^{th} day of culture while lowest temperature was 28.6 on 38^{th} day of culture. In affected shrimp pond the maximum temperature was 33.5 °C on 95^{th} day of culture while lowest temperature was 30.7 °C on 45 day of culture. Occurrence of low DO in coastal environments is accelerating, and its effects on fish and other aquatic organisms are of increasing concern [15]. In general, negative effects on growth and reproduction generally occur in fish at instantaneous DO concentrations less than 3–5 mg/l, and on survival at less than 2mg/l [16]. The culture environment dissolved oxygen concentration less than 2mg/l is termed as hypoxic and is considered ecologically detrimental [17]. In the present study, normal pond has maximum 5.9 mg/l dissolve oxygen on 66^{th} day of culture while lowest dissolve oxygen was 5.1 mg/l on 31^{st} and 38^{th} days respectively. The maximum dissolved oxygen in the affected pond was 4.5 mg/l on 52^{nd} day of culture while lowest dissolved oxygen was 3.9 mg/l on 31^{st} days of culture. *L. vannamei* tolerate wide range of salinities and made this species attractive for culture even at low salinities in several American countries [3] and also in

India. Penaeid shrimp culture in low-salinity environments has been practiced for several years in Asia [18]. *Litopenaeus vannamei*, can tolerate culture salinities as low as 1 ppt [19], and it has been attempted to raise it at even lower salinities [4] In present study, the maximum salinity in normal pond was 33.6 on the 102nd day of culture while lowest salinity was 29.6 on 31st day of culture. In the affected pond maximum salinity 36.8 ppt was observed on 102nd and 116th day of culture while lowest salinity was 33.2 ppt on the 31st and 66th day of culture.

CONCLUSION

Water quality is one of the most important factor in the shrimp culture. In the present study the water quality parameter like pH, salinity, and temperature were partially varied from the normal pond but the dissolve oxygen was very low in the disease affected pond which may the reason for the stress and slow growth of shrimp. But further experimental work for each water quality parameter is required to pin point the exact reason for the slow growth.

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