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ROLE OF STOCKING DENSITIES ON GROWTH OF *Litopenaeus vannamei* IN LOW AND HIGH SALINE PONDS FROM WEST GODAVARI DISTRICT, ANDHRA PRADESH, INDIA

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ABSTRACT

The present study was aimed to establish the information on the growth rates of L. vannamei for one crop in ponds with low saline with low stocking, low saline with high stocking and high saline with low stocking, high saline with high stocking densities. The average values of pH, salinity, dissolved oxygen, ammonia and temperature in ponds with low saline and low stocking density were 8.26, 7, 5, 0.4 and 31.1 respectively. Whereas in ponds with low saline and high stocking density were 8.33, 6, 4.5, 0.7 and 31.1. Similarly, the average values of pH, salinity, dissolved oxygen, ammonia and temperature in ponds with high saline and low stocking density were 8.09, 17, 4.9, 0.46 and 31.0 respectively. Whereas in ponds with high saline and high stocking density were 8.3, 18, 4.8, 0.91 and 32.0. It is evident from the present results that, the stocking density has inverse proportion with the growth. Low stocking density favours the production. In contrary high stocking density leads to lower the production rate.

KEY WORDS

Stocking density, production, L. vannamei, salinity.

INTRODUCTION

Balakrishnan *et al.,* (2011) studied about the growth of cultured white leg shrimp *L. vannamei* in different stocking density from Bhimavaram, West Godavari district, Andhra Pradesh. Suriya *et al.,* (2016) reported about the stocking density, survival rate and growth performance of *Litopenaeus vannamei* in different cultured shrimp farms from Cuddalore District, Tamil Nadu. The optimal stocking density varies depending on the farm system and management practices. Stocking density range 1-3 shrimp/m^2 in extensive, 10-50 shrimp/m^2 in semi-intensive and up to 160 shrimp/m^2 in intensive farming systems. Stocking density is inversely proportional to shrimp growth. Therefore, production is optimized by using appropriate stocking density for each farm. The purpose of the present study is to estimate the growth rates of *L. vannamei* in low and high saline ponds with low and high stocking densities from West Godavari district, Andhra Pradesh, India.

MATERIAL AND METHODS

Experiments were conducted for the estimation of growth parameters in low and high saline ponds against low and high stocking densities. Ponds were initially prepared by drying, tilting (to remove the pests and predators and oxidize bottom soil) and liming to correct the pH of the soil. Enrich the natural food organisms in the water by following the Good Management Practices (GMPs).

The process of sampling to take the average body weight of the shrimps from the culture ponds is started from the 50 days of culture period and done till the harvesting of the ponds. The weekly growths in all the study ponds were recorded. The condition of the shrimp also observed during the sampling. The feeding is given

in the form of estimated feed as per the feeding chart and also according to the growth of the shrimps and the estimated survival rate.

Temperature of the water was measured in the field by using mercury thermometer with 0° to 100° C range and having a least count of 1°C. The pH was measured by using 'ELICO' pH meter. For dissolved oxygen, the water samples were collected in a BOD bottles and fixed on the spot and bottles were taken to the laboratory and analysed by Winkler's titration method. The salinity and ammonia were measured by adopting the procedure mentioned by Grosshoff *et al.,* (1999).

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

RESULTS

Growth vs Stocking Density

In West Godavari district, the average weekly growth ranged from 1.8 gms to 2 gms in low stocking ponds of low saline ponds in 1st crop and from 1.8 gms to 1.9 gms in high stocking ponds of low saline waters in 1st crop in the year 2018 (Table 1).

Table 1. Growth Vs Stocking Density in Low Saline Ponds of West Godavari District in 2018

DOC	1st crop	
	AWG in Low stocking	AWG in High stocking
50	1.98	1.9
57	2	1.85
64	2	1.86
71	1.9	1.88
78	1.84	1.82
85	1.88	1.8
92	1.8	1.8
99	1.84	1.8

Table 2. Water quality parameters of Low saline, Low stocking density ponds of West Godavari District in 1st crop during 2018

Parameter/ District	pH	Salinity (ppt)	D.O. (ppm)	Ammonia (ppm)	Temperature (^{0}C)	Density (no/m^2)
1st crop	8.26	7	5	0.4	31.1	25

In the 1st crop during 2018 in low saline low density ponds of West Godavari district the average pH, salinity, D.O, ammonia and temperatures observed were 8.26, 7ppt, 5ppm, 0.4 ppm and 31.1^{0}C respectively. Whereas the average weekly growth is 1.9gms at a stocking density of 25 pieces per square meter.

Table 3. Water quality parameters of Low saline, High stocking Density ponds of West Godavari District in 1st crop during 2018

Parameter/ District	pH	Salinity (ppt)	D.O. (ppm)	Ammonia (ppm)	Temperature (^{0}C)	Density (no/m^2)
1st crop	8.33	6	4.5	0.7	31.1	40

In the 1st crop during 2018 in low saline high density ponds of West Godavari district the average pH, salinity, D.O, ammonia and temperatures observed were 8.33, 6ppt, 4.5ppm,0.7 ppm and 31.1^{0}C respectively. Whereas the average weekly growth is 1.84 gms at a stocking density of 40 pieces per square meter.

In West Godavari district, the average weekly growth ranged from 1.8 gms to 2 gms in low stocking ponds of high saline ponds in 1st crop and from 1.96 gms to 2.02 gms in high stocking ponds of high saline waters in 1st crop in the year 2018 (Table 4).

Table 4. Growth Vs Stocking Density in High Saline Ponds of West Godavari District in 2018

DOC	1st crop	
	AWG in Low stocking	AWG in High stocking
50	2.22	2.02
57	2.24	2.02
64	2.16	2.0
71	2.16	2.0
78	2.16	1.98
85	2.12	1.98
92	2.10	1.96
99	2.08	1.94

Table 5. Water quality parameters of High saline, Low stocking density ponds of West Godavari District in 1st crop during 2018

Parameter/ District	pH	Salinity (ppt)	D.O. (ppm)	Ammonia (ppm)	Temperature (^{0}C)	Density (no/m^2)
1st crop	8.09	17	4.9	0.46	31.0	25

In the 1st crop during 2018 in high saline low-density ponds of West Godavari district the average pH, salinity, D.O, ammonia and temperatures observed were 8.09, 17ppt, 4.9ppm,0.46 ppm and 31.0^{0}C respectively. Whereas the average weekly growth is 2.14 gms at a stocking density of 25 pieces per square meter.

Table 6. Water quality parameters of High saline, High stocking density ponds of West Godavari District in 1st crop during 2018

Parameter/ District	pH	Salinity (ppt)	D.O. (ppm)	Ammonia (ppm)	Temperature (^{0}C)	Density (no/m^2)
1st crop	8.3	18	4.8	0.91	32.0	40

In the 1st crop during 2018 in high saline high-density ponds of West Godavari district the average pH, salinity, D.O, ammonia and temperatures observed were 8.3, 18ppt, 4.8ppm,0.91 ppm and 32^{0}C respectively. Whereas the average weekly growth is 1.99 gms at a stocking density of 40 pieces per square meter.

DISCUSSION

The findings of the present study are clearly indicated that, the stocking densities have direct relation with the growth of the *L. vannamei.* Various workers have reported on the growth and survival of *L. vannamei* in different salinities and stocking densities (Balakrishnan *et al.,* 2011; Suriya *et al.,* 2016; Parvathi and Padmavathi, 2018). Water quality parameters play a significant role in any culture systems. Good water quality parameters include adequate levels of dissolved oxygen, temperature, salinity and pH. Unutilized feed, metabolic wastes, faecal matter will also create some disturbance in quality of the water. Hence the quality of the water in culture operations is very prominent (Chakravarty *et al.,* 2016; Darwin *et al.,* 2017).

In the present study various salinities were tested in ponds with low and high stocking densities. The salinity ranges for the present study fluctuated between 6-18ppt with respect to low and high saline ponds. However, the *L. vannamei* can tolerates the salinities of 2-45 ppt as reported by (Parker *et al.,* 1974; Samocha *et al.,* 1998). Similarly, the other water quality parameters like pH, temperature, D.O. and ammonia were recorded in low and high saline ponds against to various stocking densities. The average weekly growth parameters of *L. vannamei* were recorded against low saline and high saline ponds (Table 1, 4). The recorded growth values clearly indicated that, higher average weekly growth rate was noticed against low stocking densities and vice versa. Similar trends of results were reported in earlier studies by Suriya *et al.,* (2016) and Parvathi and Padmavathi, (2018).

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