



## COMPARATIVE STUDY ON WATER QUALITY PARAMETER OF NORMAL AND WHITE FECES SYNDROME AFFECTED SHRIMP PONDS

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### ABSTRACT

In the present study is based on the water quality parameter of white feces affected pond. The water quality parameter such as temperature, salinity, pH and dissolved oxygen were periodically monitored. The diseased pond was compared with normal pond. In normal pond the maximum DO was 6 mg/l recorded in 2<sup>nd</sup> week of the culture where the minimum DO was 4.2 mg/l recorded in 10<sup>th</sup> week. In diseased pond the highest DO was 5.8 mg/l in 9<sup>th</sup> week where minimum DO 4.5 mg/l was recorded in 10<sup>th</sup> week. In normal pond the maximum pH was 8.5 recorded in 3<sup>rd</sup> week where minimum pH was 7.4 recorded in 11<sup>th</sup> week. In diseased pond the highest pH was 8.2 in 2<sup>nd</sup> week of culture where minimum pH 7.6 was recorded in 6<sup>th</sup> and 7<sup>th</sup> week. The maximum salinity in normal pond was 32 ppt in 3<sup>rd</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup> week of culture where minimum salinity was 30 ppt recorded in 2<sup>nd</sup>, 5<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup>, and 13<sup>th</sup> week. In diseased pond the highest salinity was 34 ppt in 7<sup>th</sup> week where minimum salinity 32 ppt was recorded in 18<sup>th</sup> week. In normal pond the maximum temperature was 33.2°C in 14<sup>th</sup> week where minimum temp 21.23°C was recorded in 5<sup>th</sup> week. In diseased pond the maximum temp was 32°C in 17<sup>th</sup> week where lowest temp 27°C was recorded in 9<sup>th</sup> week. In normal pond the maximum alkalinity was 120 in 4<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 17<sup>th</sup> week where minimum alkalinity 100 was recorded in 2<sup>nd</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 13<sup>th</sup>, 16<sup>th</sup> and 18<sup>th</sup> week. In diseased pond the maximum alkalinity was 120 in 3<sup>rd</sup>, 11<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup> week where minimum alkalinity 100 was recorded in 1<sup>st</sup>, 2<sup>nd</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup> week.

**Keywords:** *L. vannamei*, white feces disease, water quality, aquaculture

## INTRODUCTION

Aquaculture is one among the fastest growing food sectors in the world. Amongst the various branches of aquaculture, shrimp culture has expanded rapidly across the world because of faster growth rate of shrimps, short culture period, high export value and demand in the market. In 2006 the production reached 5 million tons.

Water qualities play a major role in the disease outbreak, and also caused economical losses to the farmers. The water quality parameter is necessary to prevent the environment stress and to keep the optimal condition for the shrimp growth. The metabolism of shrimp and organic substances from food and feces also cause quality poor in water and bottom of the pond. The present study about the water quality parameters of white feces disease infected pond.

In 2008 the Coastal Aquaculture Authority of India (CAA) introduced new species *Litopenaeus vannamei* in India. This *L.vannamei* play more significant role in shrimp aquaculture because of its fast growth rate. The vigorous development in shrimp aquaculture, leads to disease outbreak. The disease was first detected in low salinity water and in species *Penaeus monodon*. In 2010, due to increased stocking density, unusual high temperature and high feeding rates leads to increased organic matter levels it causes "white feces disease".

## MATERIALS AND METHODS

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 water quality parameters were recorded from culture ponds regularly. In pond water pH, DO & temperature readings were recorded in early morning (am) & late evening (pm). In normal pond the maximum pH was 8.5 ppt in 3<sup>rd</sup> week where minimum pH 7.1 ppt was recorded in 11<sup>th</sup> week of culture pond. In diseased pond the maximum pH was 8.2 ppt in 2<sup>nd</sup> week where minimum pH 7.6 ppt was recorded in 6<sup>th</sup> and 7<sup>th</sup> week of the culture pond of shrimp. In normal pond the maximum DO was 6mg/l in 2<sup>nd</sup> week where minimum DO 4.2mg/l was recorded in 10<sup>th</sup> week. In diseased pond the maximum DO was 5.8mg/l in 9<sup>th</sup> week where minimum DO 4.5mg/l was recorded in 10<sup>th</sup> week.

The maximum temperature was 33.21°C in 14<sup>th</sup> week where minimum temperature 21.23°C was recorded in 5<sup>th</sup> week in the normal pond. In diseased pond the maximum temperature was 32°C in 17<sup>th</sup> week where minimum temperature 27°C was recorded in 9<sup>th</sup> week. The salinity of the normal pond the maximum

was 32ppt in 3<sup>rd</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup> week of culture pond, where minimum salinity 30ppt was recorded in 2<sup>nd</sup>, 5<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup>, and 13<sup>th</sup> week. In diseased pond the maximum salinity was 34ppt in 7<sup>th</sup> week where minimum salinity 32ppt was recorded in 18<sup>th</sup> week.

In normal pond the maximum alkalinity was 120 in 4<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 17<sup>th</sup> week of culture shrimp pond, where minimum salinity 100 was recorded in 2<sup>nd</sup>,3<sup>rd</sup>,5<sup>th</sup>,7<sup>th</sup>,8<sup>th</sup>,9<sup>th</sup>,13<sup>th</sup>,16<sup>th</sup> and 18<sup>th</sup> week. In diseased pond the maximum alkalinity was 120 in 3<sup>rd</sup>, 11<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup> week where minimum alkalinity 100 was recorded in 1<sup>st</sup>,2<sup>nd</sup>,8<sup>th</sup>,9<sup>th</sup>,12<sup>th</sup>,13<sup>th</sup> and 14<sup>th</sup> week.

**Table 1**

**Normal Pond**

Week	pH		TEMP		DO		SALINITY	ALKALINITY
	AM	PM	AM	PM	AM	PM		
1	8.0	8.2	26.22	29.32	6	7.5	31	110
2	8.0	8.4	24.38	27.45	5.9	8.0	30	100
3	7.8	8.5	27.56	30.56	5.8	7.2	32	100
4	7.7	8.2	25.45	28.65	6.0	7.0	31	120
5	7.6	8.0	21.23	24.23	6.0	7.2	30	100
6	7.5	7.8	24.32	27.54	5.4	6.8	31	110
7	7.2	7.5	29.45	32.12	5.0	6.5	31	100
8	7.2	7.4	27.54	30.26	4.8	6.5	31	100
9	7.3	7.4	28.46	31.49	4.5	6.3	30	100
10	7.4	7.5	26.32	30.23	4.2	6.0	32	120
11	7.4	7.3	22.25	26.23	4.6	6.5	31	120
12	7.3	7.5	25.84	28.45	4.9	6.7	30	110
13	7.3	7.6	26.45	29.36	5.1	7.1	30	100

14	7.5	7.7	28.75	33.21	5.4	7.6	31	110
15	7.4	7.8	27.12	31.25	4.8	6.4	32	110
16	8	8.3	25.65	29.24	4.6	6.1	32	100
17	7.7	7.9	23.45	27.26	5.0	7.3	31	120
18	7.9	8.0	28.46	32.35	4.9	6.1	31	100

**Table 2****Diseased Pond**

Week	pH		TEMP		DO		SALINITY	ALKALINITY
	AM	PM	AM	PM	AM	PM		
1	8.01	8.18	28.22	31.34	5.38	7.55	32	100
2	8.1	8.2	28.88	31.37	5.18	6.92	31	100
3	8.01	8.12	29.01	32.08	5.27	7.6	32	120
4	7.87	7.95	28.14	30.11	5.37	7.47	32	100
5	7.8	7.84	29.08	31.82	5.35	7.2	31	110
6	7.6	7.8	28.45	31.52	5.3	7.2	32	100
7	7.6	7.8	28.8	31.97	5.27	8.45	32	120
8	7.72	7.91	28.72	30.94	5.25	7.6	33	100
9	7.71	7.93	27.42	30.2	5.52	9.64	31	100
10	7.7	7.95	28.04	30.88	4.95	9.7	34	120
11	7.77	8	29.21	31.77	4.95	11.25	32	110
12	7.72	8	29.68	31.97	4.92	10.48	31	100

13	7.68	7.8	29.4	32.15	5.15	7.45	32	100
14	7.65	7.8	29.72	32.4	4.81	9.31	32	100
15	7.71	7.9	29.55	31.87	4.85	8.15	32	110
16	7.74	7.9	29.77	32.51	4.78	9.15	33	120
17	7.8	8.02	29.8	32.61	4.71	8.7	31	100
18	7.76	7.9	29.96	31.96	5.1	8.23	32	100

## DISCUSSION

The present study based on the water quality parameter of the *L. vannamei* culture pond which is affected by the white feces disease. Survival of shrimp and optimum growth are maintained by the water quality. The better water quality is essential for good shrimp production, several parameters were monitored daily and many were present within optimal ranges for the shrimp production [13, 11]. The temperatures play an important role in shrimp culture [10]. Optimal temperature has been reported between 27–33°C. In the present study normal pond the maximum temperature was 33.2°C in 14<sup>th</sup> week where minimum temp 21.23°C was recorded in 5<sup>th</sup> week. In diseased pond the maximum temp was 32°C in 17<sup>th</sup> week where lowest temp 27°C was recorded in 9<sup>th</sup> week. The temperature variation affects the shrimp growth and makes the shrimp stressful.

In the present study the pH value was ranging 7.6 - 8.0 in the morning and 7.7 -8.2 in the evening. The pH of the pond was influenced by many factors, including biological activity and organic waste. Wang et al., 2004 and Gunalan et al., 2011 recommended the favorable pH range of 7.6-8.6 for *L. vannamei* [6]. The 73<sup>th</sup> DOC of the shrimp's pond observed with white gut and also white feces observed in the check tray as well as corner of the ponds. Nyan Taw (2010) reported white feces problem during the period of *L.vannamei* culture. Chalor Limsuwan (2010) says the disease was first detected in *P. monodon* cultivated in low salinity waters (3-5‰), but it was later spread throughout Thailand entire shrimp production area. In case of DO the optimal is between 3-5 ppm and lower levels may result in mortality [5]. Lee and Wickens, Garcia and Bruna 1992, demonstrated that the DO level was varied between 2.2 and 4.6 ml/l, almost optimum for *L. vannamei* culture [9]. It is a euryhaline animal can tolerate the wide range of salinity from 2 to 45 ppt. In this study normal pond the maximum DO was 6 mg/l in 2<sup>nd</sup> week where minimum DO 4.2 mg/l was recorded in 10<sup>th</sup> week. In diseased pond the maximum DO was 5.8 mg/l in 9<sup>th</sup> week where minimum DO 4.5 mg/l was recorded in 10<sup>th</sup> week. Salinity tolerance is dependent on the strain of shrimp [8, 6]. Saoud *et al* 2003, reported that the *L. vannamei* can be acclimated to fresh water like, low-salinity well waters [14]. Cawthorne *et al* 1983 reported that single salt solutions (NaCl) were not suitable for shrimp culture at any salinity

although in seawater [3]. The ions most important in osmoregulation are chloride and sodium [11,2]. In Normal ponds the highest salinity was 32 in 3<sup>rd</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 16<sup>th</sup> week where lowest salinity 30 was recorded in 2<sup>nd</sup>, 5<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup>, and 13<sup>th</sup> week. In diseased pond the highest salinity was 34 in 7<sup>th</sup> week where lowest salinity 32 was recorded in 18<sup>th</sup> week. The present study concluded those poor water quality parameters that enhance the disease white feces disease. Alkalinity is the amount of carbonate, bicarbonate, and hydroxide contained in the water. Alkalinity becomes an important key in the water because of its ability to sustain the pH level and low alkalinity in water is poorly buffered against pH change [1]. In this study the maximum alkalinity of normal pond was 120 in 4<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup>, and 17<sup>th</sup> week of culture shrimp pond, where minimum salinity 100 was recorded in 2<sup>nd</sup>, 3<sup>rd</sup>, 5<sup>th</sup>, 7<sup>th</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 13<sup>th</sup>, 16<sup>th</sup> and 18<sup>th</sup> week. In diseased pond the maximum alkalinity was 120 in 3<sup>rd</sup>, 11<sup>th</sup>, 15<sup>th</sup>, and 16<sup>th</sup> week where minimum alkalinity 100 was recorded in 1<sup>st</sup>, 2<sup>nd</sup>, 8<sup>th</sup>, 9<sup>th</sup>, 12<sup>th</sup>, 13<sup>th</sup> and 14<sup>th</sup> week.

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