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Research Article

Basic Deviations of Water Quality Parameters of Shrimp (*L. vannamei*) Culture Ponds at Kongodu, Mogalipalem, and Gorripudi areas of East Godavari District, Andhra Pradesh, India

Sivakumar J[1], Harinath Reddy P[2], Surya Bhaskar Rao S[3]

[1]Assistant Technical Co-Ordinator, Fedora Sea Foods Pvt. Ltd, India; [2]Technical Co-Ordinator, Fedora Sea Foods Pvt. Ltd, India; [3]Lab Technician, Fedora Sea Foods Pvt. Ltd, India

ABSTRACT

Shrimp aquaculture principally *Litopenaeus vannamei* farming in India is developed into an expectant growth rate for the past decade. The intent of the search was to establish effective changes in water quality parameters in *L. vannamei* culture ponds. A total of nine water quality parameters such as Temperature, pH, Salinity, Dissolved Oxygen, Alkalinity, Hardness, carbonates, Bi-carbonates, and Ammonia were studied in 20 shrimp culture ponds (9 at Kongodu, 6 at Mogalipalem, and 5 at Gorripudi towns) of East Godavari district, Andhra Pradesh. The temperature was ranged from 26.2°C to 29.8°C in all ponds. The pH varied from 7.5 to 8.2. Dissolved oxygen varied from 4.4 to 8.6 mg/l. Minimum values of dissolved oxygen were recorded at Gorripudi village ponds and maximum in Mogalipalem. Low salinity (5 ppt) was observed in Kongodu ponds and high (8 ppt) in Mogalipalem ponds. The minimum (177.7 ppm) and maximum (316.8 ppm) alkalinity was observed in Kongodu ponds. The hardness ranged from 1305 ppm to 2445 ppm. The values of ammonia were 0.01 – 0.1 mg/l. The present study concluded that shrimp culture water parameters must vary even those ponds aren't geographically significant extended distance and as well as good water quality parameters supervision in all the *vannamei* culture ponds help the Better Management practices (BMPs) to produce healthy, good survival, growth, and production. The collective effect of these water parameters studied was in the optimal range for shrimp culture and will replicate the shrimp production.

Keywords: Salinity; Alkalinity; Ammonia; Mogalipalem; Shrimp

INTRODUCTION

Shrimp culture has been a quickly developing business industry with species expansion and among the various branches of aquaculture, shrimp culture has been a fast upward business industry which extended quickly over the world due to the quicker development rate of shrimps, broadening, least culture period, more fare worth and harvest turn taking into account the market request both in inside and send out market [1,2]. A decent water quality condition is basic for any aquaculture cultivating. Water quality influences the propagation, development, and endurance of sea-going living beings. The measures for good quality water appraisal rely upon the sort of creatures to be contemplated and are obviously settled by safe levels. The biological system of a shrimp pond is made out of soil and water; the fundamental components influencing shrimp creatures are utilized as water quality boundaries. Be that as it may, the negative impacts are diminished if ponds are checked and controlled enough; keeping up great water quality conditions [3].

In generally hypothetical and test reads for evaluating water quality, water quality boundaries are checked for recognizing outrageous negative circumstances zeroing in on basic estimations of these boundaries [4,5]. In particular, there are a few troubles in business shrimp ranches for estimating water quality boundaries like amazingly sweltering climate; numerous and enormous harvest regions, excessive costs of new advancements, and so on. Hence, in handy circumstances, the investigation is generally restricted to quantify a particular arrangement of boundaries, which are significant for the environment and moderately simple to gauge [6,7]. Accordingly, we found that in the vast majority of the works [4-8], dissolved oxygen, temperature, and salinity are observed every day; while, pH, alkali, nitrates and turbidity and additionally algae counts are dissected week by week. Compound examinations don't come into thought for water quality administration on a normal base and they are just observed by necessity [3]. Non-ionized Ammonia is described by its high harmfulness for living beings and it is legitimately identified with pH fixations; because of this

Correspondence to: Sivakumar J, Assistant Technical Co-Ordinator, Fedora Sea Foods Pvt. Ltd, India, Tel: 6300997802; E-mail: sivakumar.fedora2019@gmail.com

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conduct and the general straightforwardness for estimating pH through electronic sensors, pH is observed every day rather than week by week.

Numerous scientists have dealt with the water quality boundaries in shrimp culture [9-14]. The current investigation is pointed toward surveying the deviations of the current water quality boundaries, for example, Temperature, pH, Salinity, Alkalinity, Hardness, Ammonia, and Dissolved Oxygen in fourteen shrimp culture ponds of topographically close separation towns of East Godavari region.

MATERIALS AND METHODS

For Water quality examination, five water samples were gathered from each Mogalipalem, Kongodu, and Gorripudi towns ponds and named M1, M2, M3, M4, M5; K1, K1, K2, K3, K4, K5 and G1, G2, G3, G4, G5 individually. The examination was led during 2019 September to till season closed. Geologically these three towns were remotely isolated; Kongodu and Gorripudi towns are relatively closer than the Mogalipalem. The separation among Mogalipalem and Gorripudi is 10 km. All the towns have a freshwater source and thus the shrimps have been developed at extremely low salinities. The surface water temperature of various shrimp ponds was recorded between mornings to mid-early afternoon with the assistance of a thermometer. Tests were gathered in independent reagent bottles and investigated at the research facility for various boundaries considered after the strategies for APHA, 2001 (American Public Health Association standard techniques for the assessment of water and wastewater, New York, USA in 2001 [15] with slight adjustments followed by Chakravarty et al. [1]. The dissolved oxygen was estimated by modified Wrinkler's method as described by Strickland et al. [16].

RESULTS AND DISCUSSION

To get optimal success rate, the culture mainly depends on the quality of the water. In the present study we have studied the water quality parameters of *L. vannamei* from Kongodu, Mogalipalem, Gorripadi towns for East Godavari in Andhra Pradesh. Water quality parameters such as temperature, pH, and salinity were presented in Figures 1-3. Whereas dissolved oxygen, hardness, carbonates, bi-carbonates, alkalinity and ammonia were presented in Table 1.

For any farm reared shrimp species the water temperature is one of the prominent environmental factors which have direct relation with the growth and production. According to Darwin et al. [9] the optimal temperature for the better growth of penaeid larvae ranged between 25.5°C to 28°C reported from the Prakasam District, Andhra Pradesh, India. Chakravarty et al. [1] suggested that, the temperature ranged between 26.5°C to 28.0°C was quiet suitable for the better development of *L. vannamei* larvae, this study reported from the culture ponds at Ramathirtham Village, Nellore district, Andhra Pradesh, India. In the present study the average temperature was ranged from 26.2°C to 29.8°C in all ponds. This reported temperature in the culture ponds of *L. vannamei* is well in agreement with the findings of Darwin et al. [9] and Charkavarty et al. [1].

The average temperature of all collected water samples is 28.2°C. The range of temperature in the three villages was from 24.1°C to 30.4°C. Among the three villages, Gorripudi has 29°C temperature

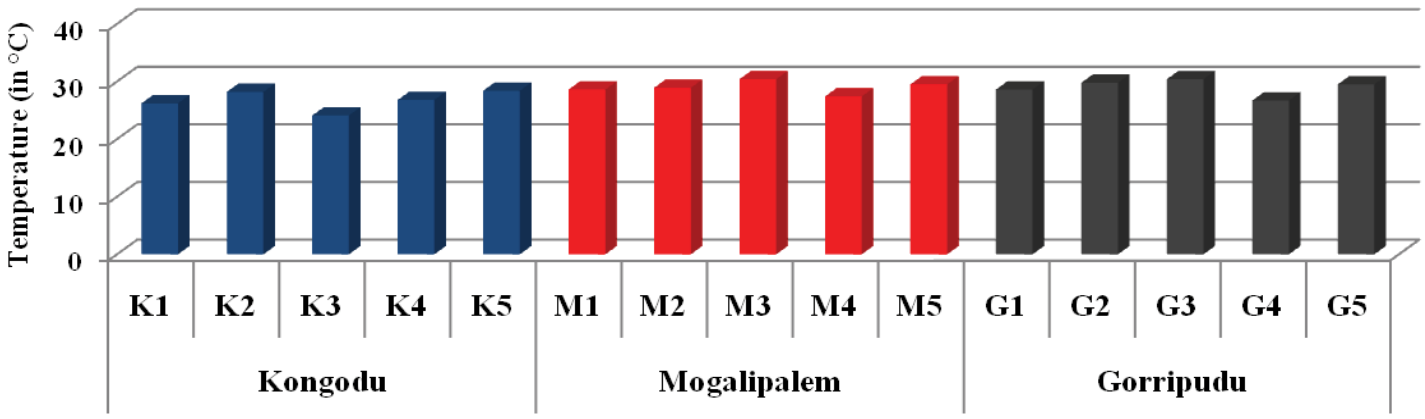

Figure 1: Variations of temperature at different ponds of three villages.

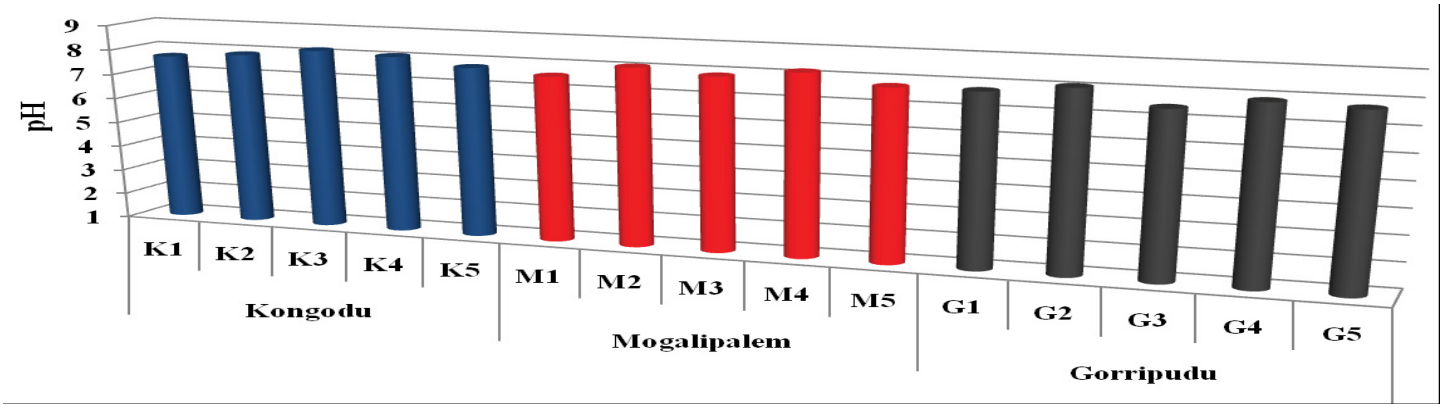

Figure 2: Dissimilarities of pH at different ponds of three villages.

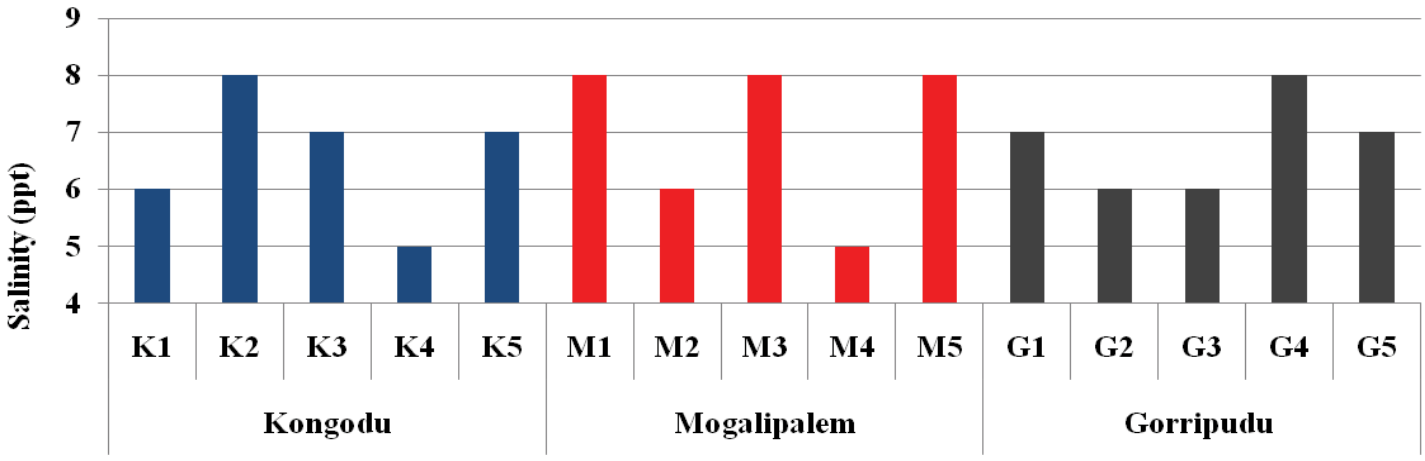

Figure 3: Differences of salinity at different ponds of three villages.

Table 1: Water quality parameters in selected shrimp ponds from Kongodu, Mogalipalem, and Gorripudi Villages of East Godavari in Andhra Pradesh, during winter crop (Sep-Dec 2019).

Variables	Kongodu (Ponds)					Mogalipalem (Ponds)					Gorripudu (Ponds)				
	K1	K2	K3	K4	K5	M1	M2	M3	M4	M5	G1	G2	G3	G4	G5
DO (ppm)	7.2	4.6	8.6	5.8	7.5	8.4	8.8	6.5	7.1	8.2	4.5	4.7	5.6	7.1	6.9
Hardness (ppm)	1860	2056	1920	1762	1554	2445	2015	2036	2185	1745	1305	1623	1405	1580	1659
Carbonates (ppm)	14	15.7	11.6	21.8	19.5	20.8	20.6	18.3	16.4	18	12.5	20.6	18.7	16	14.9
Bi-Carbonates (ppm)	285	162	178	295	206	220	218	190	259	188	264	277	210	215	289
Alkalinity (ppm)	299	177.7	189.6	316.8	225.5	240.8	238.6	208.3	275.4	206	276.5	297.6	228.7	231	303.9
Ammonia (mg/l)	0.01	0.04	0.1	0.05	0.02	0.04	0.03	0.04	0.1	0.03	0.05	0.09	0.06	0.06	0.07

which is high compared to Kongodu (26.74°C) and Mogalipalem (28.9°C) but the highest individual temperatures were recorded at Mogalipalem (Figure 1). The pH of three villages was ranged from 7.6 to 8.2, and the average was reached to 7.8 (Figure 2). Figure 2 explains that the Kongodu and Mogalipalem village ponds have almost similar pH (7.9) and Gorripudi ponds have slightly decreased pH (7.8). The most common cause of high pH is a high rate of photosynthesis by dense phytoplankton blooms. The pH in the shrimp culture ponds is affected by the water alkalinity, pond soil pH, lime applications, and phytoplankton bloom activity.

In general the contemplated tests have 6.8 ppt of normal Salinity, and ranged from 5 to 8 ppt (Figure 3). Among the three contemplated territories, Mogalipalem town ponds have 7 ppt Salinity which is high contrasted with Gorripudi (6.8 ppt) and Kogodu (6.6 ppt). Be that as it may, individually, high salinity was found in Mogalipalem ponds (Figure 3). In high Salinity, the shrimps will develop gradually yet they are healthy, active, and impervious to diseases. Dissolved Oxygen assumes a significant function in development and creation through its immediate impact on feed utilization and development.

Dissolved oxygen influences the dissolvability and accessibility of numerous supplements in the pond water. Low degree of Dissolved Oxygen can cause harms in the oxidation condition of substances from the oxidized to the diminished structure absence of disintegrated oxygen can be straightforwardly destructive to shrimps and cause a significant increment inside the degree of hepatotoxic metabolic exhibitions in shrimp and can scale back development and shedding and cause pressure its prompts mortality. A normal of 6.7 ppm of DO was seen in totally examined regions. The DO was gone from 4.5 ppm (G1) to 8.8 ppm (M2). The Kongodo town structures have 6.7 ppm DO, Mogalipalem town ponds have 7.8 ppm DO and Gorripudi town ponds have 5.7 ppm DO (Table 1).

At the point when estimated the Total Hardness of three districts ponds, it was ranged from 1305 ppm (G1) to 2445 ppm (M1). A moderately 1810 ppm of Hardness was recorded from all ponds (Table 1). The Mogalipalem town ponds have 2085.2 ppm of high Hardness, contrasted with Kongodu ponds (1830.4 ppm) and Gorripudi ponds (1514.4 ppm). All the examined ponds of three towns have 17.29 ppm of normal Carbonates, 230.4 ppm of normal Bi-Carbonates, and 247.69 ppm of Alkalinity (Table 1). Exclusively Gorripudi has 267.54 ppm of normal alkalinity which is high contrasted with Kongodu ponds (241.7 ppm) and Mogalipalem ponds (233.82 ppm). In the present study high alkalinity of 316.8 ppm (K4) and low alkalinity of 177.7 ppm (K2) reported from the same station i.e., Kongodu town and the values were presented in Table 1. The examined smelling salts boundary subtleties resemble; the normal of all ponds is 0.052 mg/l (Table 1). The least and most elevated alkali was seen in Kongodu ponds (K1 @ 0.01 mg/l and K3 @ 0.1 mg/l). Among the three towns, Gorripudi has 0.06 mg/l of normal high smelling salts contrasted with Kongodu (0.05 mg/l) and Mogalipalem (0.048 mg/l).

The total ammonia concentration in water comprises in two forms i.e., unionized ammonia and ionized ammonia. The unionized fraction is more toxic to shrimp or fish. The amount of total ammonia in this form depends upon the pH and temperature of the water, as general rule the higher the pH and temperature, the higher percentage of the total ammonia is occurs in the toxic unionized form as reported by Boyd et al. [17] and Jiang et al. [18] observed the safe level of ammonia in *L. vannamei* culture was of 2.6 mg/lit. In the present investigation the total ammonia concentrations were within the normal limits (0.01 ppm to 0.09 ppm and correlated with similar studies of Boyd et al. [19].

CONCLUSION

An adequate flexibly of good nature of water is fundamental to any aquaculture cultivation. The measures for good quality water differ with the sort of organisms and are set up by safe levels, i.e., physical and chemical properties of water which have immaterial antagonistic consequences for shrimp development and endurance. The elements prevailing the organization of pool water square measure shifted and incorporate physical, chemical, and biological processes. To keep water properties within safe levels, one must understand those processes so that the elements inhibiting prawn growth and survival can be detected and their impact minimized. The aims of water management are to provide high-quality water and minimize water quality fluctuations. The aspiring of water exchange is to change the water so that water quality does not change abruptly. A combination of inorganic fertilization, aeration, water exchange, and waste removal and application of water probiotics once in a week can be most efficient in managing water quality. So the current investigation has served to farmers and analysts for their future examinations to improve the development and profitability of shrimps. The examination presumes that despite the fact that a similar area implies which were particularly aren't so long, the upkeep of ideal water and soil quality boundaries in all the *L. vannamei* culture organizations helps the environmentally agreeable acts of shrimp aquaculture in India.

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