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***Research Article** (Open Access)*

THE ASSESSMENT OF WATER QUALITY PARAMETERS IN PACIFIC WHITE SHRIMP (*L. VANNAMEI*) CULTURE PONDS AT SELECTED VILLAGES OF KONADA AND CHIPPADA FROM VIZIANAGARAM DISTRICT OF ANDHRA PRADESH

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ABSTRACT
The present study was aimed to investigate the water quality parameters in *L. vannamei* culture ponds located at Konada and Chippada villages of Vizianagaram district in Andhra Pradesh. The water quality parameters were assessed for one crop (i.e. summer crop) in two different study stations during the year 2019. The physico-chemical parameters such as salinity, pH, dissolved oxygen, temperature, total ammonia, alkalinity and hardness were studied. It is evident from the present results that there is no marginal difference for the said parameters in selected study sites.

Keywords: *L. vannamei, Salinity, Temperature, pH*

INTRODUCTION
Kumar *et al.*, (2012) reported that, in commercial shrimp production China occupies the first place in the world. India has the capacity of 10.79 million tons of shrimp production next to China and occupies second place in the world (FAO, 2016). Darwin *et al.,* (2017) reported that *Litopenaeus vannamei* shrimp species is highly suitable for commercial production in Indian waters because of high growth rate, duration of culture and export value. Maintaining the good water quality parameters in shrimp culture ponds is very much important because, the quality parameters reflect on the growth and survival of shrimp species (Gupta *et al.*, 2001). Poor water quality management leads to various kinds of diseases related to stress and other physiogical activity of the any farmed organism. Hence the proper management in quality of water in culture ponds attains great importance in recent days (Tharavathy, 2014). In India Fisheries and Aquaculture sectors playing prominent role in the sea food production to meet the demands of local needs and also involved in the global export. The Global production of fisheries sector is about 6.3% in which India contributing 1.1% of the total GDP. The major shrimp farming states of Indian Nation are Gujarat, West Bengal, Maharashtra, Goa, Karnataka, Tamil Nadu, Kerala, Orissa and Andhra Pradesh (Bharathi *et al.,* 2017). In Andhra Pradesh there are 9 districts actively engaging in commercial shrimp production from Srikakulam to Nellore. The purpose of the present study to estimate the water quality parameters in shrimp farms which are located at Konada and Chippada from Vizianagaram district of Andhra Pradesh.

MATERIALS AND METHODS
Sample collection
The present study was carried out over a period of 120 days in summer season in the year 2019. Water samples were collected from five different ponds in Konada (K1, K2, K3, K4 and K5) and

Chippada (C1, C2, C3, C4 and C5) villages in Vizianagaram district of Andhra Pradesh. The water samples were collected during early hours between 8.00 a.m. to 9.00 a.m. by using sterile plastic jar of five liter capacity. 300 ml BOD bottles were used for the dissolved oxygen estimation. The water temperature and pH was recorded at the study sites using digital pH meter and standard mercury thermometer. Dissolved oxygen, total ammonia, alkalinity and hardness, was studied by following the standard methodology mentioned in American Public Health Association (APHA, 1992).

RESULTS AND DISCUSSION

Salinity

An important and significant factor in culture pond is salinity of the pond water. In coastal water ecosystem salinity is an important factor to control growth and survival of organisms. In culture ponds of shrimps higher salinity causes for slow growth in organism, but health of the shrimps will be improved, therefore they acquired high resistance to infections. At low salinities of pond water exoskeleton of the shrimp will be weaken and more susceptible to diseases. According to Samocha *et al.,* (1998) Salinity tolerance of 2-45 ppt was observed with *L. vannaemi* culture. An ideal salinity range for *P. monodon* was 10-35 ppt as recommended by Gunalan *et al.,* (2010). According to Laramore *et al.,* (2001) improved growth rates were observed when *L. vannamei* reared in 30 ppt for 18-40 days, while shrimp reared in 2 and 3 ppt no survival of *L. vannamei* was observed at less than 2 ppt salinity. In the present study the pond water salinity was found to be varied from 27.24 to 31.05 ppt throughout the study period in summer crop. The results were correlated with the studies conducted by Ponce-Palafox *et al.,* (1997) revealed that *L. vannamei* had better growth at higher salinity of 20 ppt at temperatures of 25^0C and 35^0C.

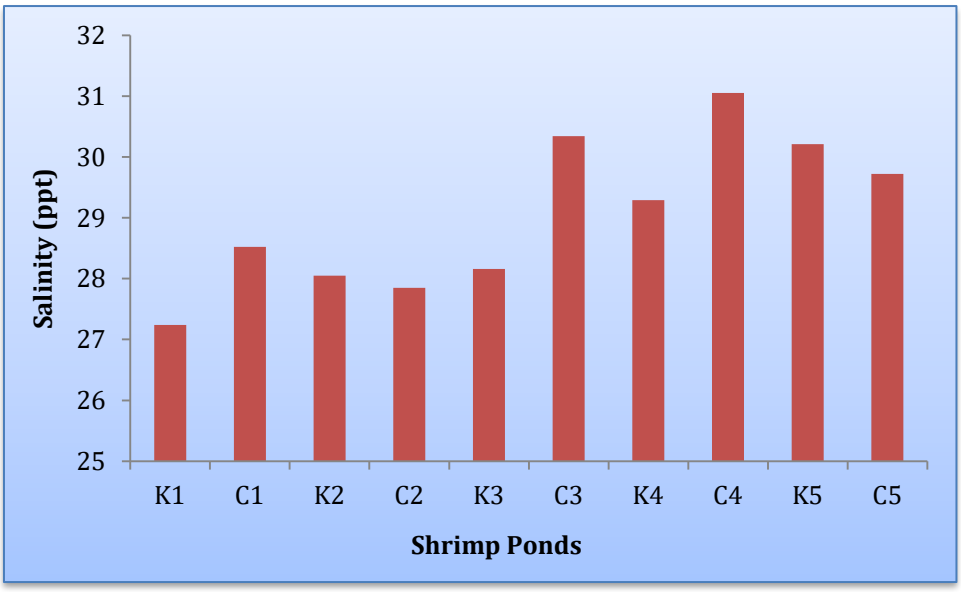

Figure 1: Salinity

pH

The pH play an important role in shrimp culture systems, since it influence on the growth, metabolism and other physiological process of the shrimp. In culture ponds pH of the pond water

effected by number of factors including pH of the pond bottom, biological activity in the pond, pH of the source of water, and inputs of the shrimps during culture. Boyd (2001) reported that when high pH values were recorded in the pond, water exchange is the better remedy to reduce the pH of the pond water. In *P. monodon* culture ponds, the suitable pH range of 7.5-8.5 was recommended by Ramakrishna Reddy (2000). Ramanathan *et al.,* (2005) gave information about the optimum range of pH is 6.8-8.7 for maximum growth and production in shrimp farming. According to Balakrishnan *et al.,* (2011) the percentage wise survival of 80-92% was observed in *L. vannamei* culture at a pH range of 7.9-9.1. In culture ponds of *P. monodon*, the pH of 3.7 is considered as minimum lethal pH at a water salinity of 32 ppt and 5.0 is the optimum pH as recommended by Allan and Maguire (1992). In the present study the pH concentration was found to be varied from 7.6 to 8.3 throughout the study period in summer crop. The study findings are well in agreement with the findings of Balakrishnan *et al.*, (2011).

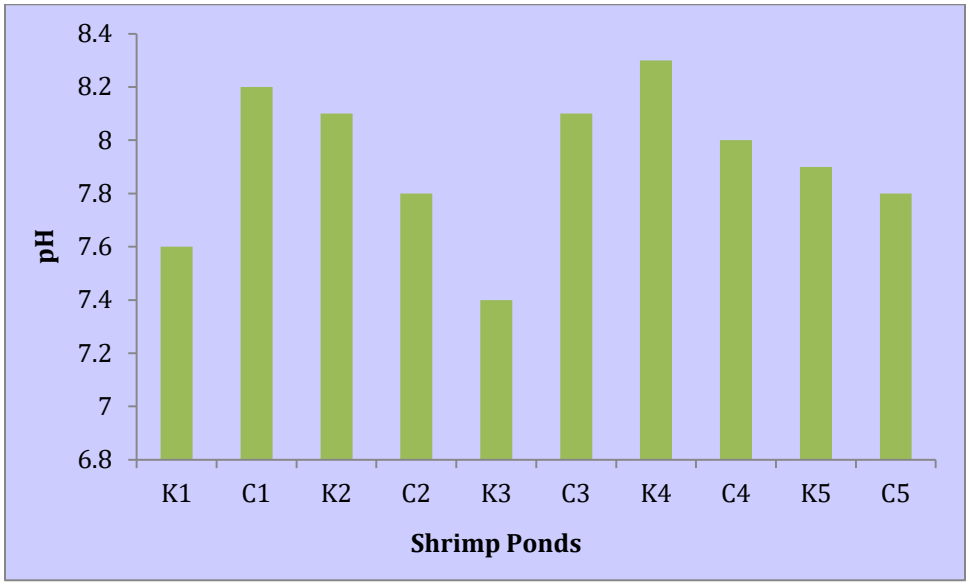

Figure 2: pH

Dissolved oxygen

Dissolved oxygen is an important environmental factor in any aquatic ecosystem and it plays a significant role on growth and production of shrimp in aquaculture ponds. It also influence on feeding and reproductive activity of the shrimp. Dissolved oxygen can affect the solubility of many nutrients. Low levels of the dissolved oxygen can damage the chemical equilibrium in pond ecosystem. According to Molluae (2000) oxygen demand can reduce the metabolic activity of shrimp, therefore growth and molting process will be retarded and eventually mortality occurs. In the present findings the recorded average values of dissolved oxygen are greater than 5.72 mg/lit. According to Flegel *et al.*, (1995) low dissolved oxygen condition can reduce the immune system and caused for the diseases and mortality of shrimp. In the present study the dissolved oxygen levels was found to be varied from 5.42-7.01 mg/lit throughout the study period in summer crop. The dissolved oxygen levels falls less than 4.0 and 5.0mg/lit growth of the penaeid shrimps will be effected (Egusa, 1961, Liao and Murai, 1986; Rosas *et al.,* 1997).

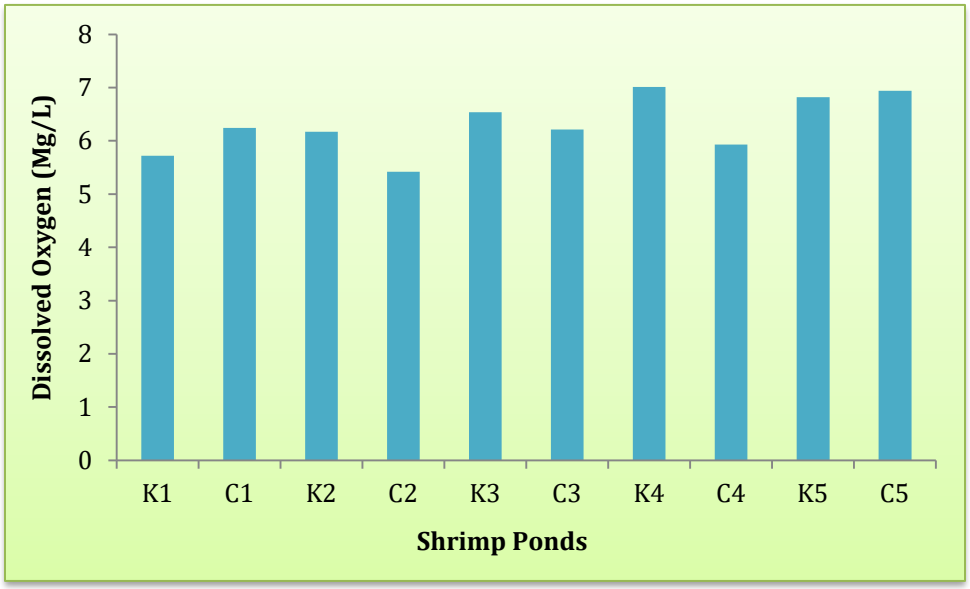

Figure 3: Dissolved Oxygen

Temperature

In shrimp culture system temperature is the main important environmental factor, it influence the metabolism, consumption of oxygen, growth, molting and survival of the shrimps. Generally any sudden change in temperature effect the immune system of the shrimp. Ramanathan *et al.*, (2005) suggested about the temperature range in the culture system of tiger shrimp that, the optimum temperature range of 28-50^{0}C promotes the optimum growth rates in shrimps. In the present investigation the observed temperatures in summer crop of the study period ranged from 26.47-31.12^{0}C. These results were correlated with the similar findings observed by Pushparajan and Soundarapandian, (2010) for the temperature of 25-35^{0}C and they suggested that cloudy weather is responsible for the low temperatures of 25^{0}C. At low temperatures shrimps are not active and do not feed well and when the temperature reached to less than 15^{0}C they undergo with stress conditions. In another study conducted by Hennig and Adreatta (1998) the highest survival rates of *L. vannamei* and *P. paulensis* were at temperatures of 20-30^{0}C. Another important study conducted by O'Brien (1994) on the growth rates of juveniles of *P. esculentus* at 30^{0}C was higher than temperature of 20^{0}C. Therefore higher temperatures enhance the molting frequency and larval growth, but survival rates of penaeid shrimps will be reduced as the accumulation of low quantity of proteins in body tissues of the organism (Staples and Heales, 1991; O'Brien, 1994; Parado-Estepa, 1998).

Total Ammonia

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 un-ionized form as reported by Boyd (1982). Jiang *et al.*, (1999) 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 (0.16 to 0.31 ppm and correlated with similar studies of Boyd and Zimmerman, (2000). Bhatnagar *et al.*, (2004) recommended that the

desirable ammonia concentration for shrimp culture was considered as 0.01-0.05 ppm. In polyculture systems of *L. vannamei* and milkfish *Chanos chanos* the desirable ammonia concentration of 0.013-0.14 was observed by Jaspe *et al.*, (2011). In the present study a marginal increase in ammonia concentrations were observed throughout the culture period as ranged from 0.16 to 0.31 ppm.

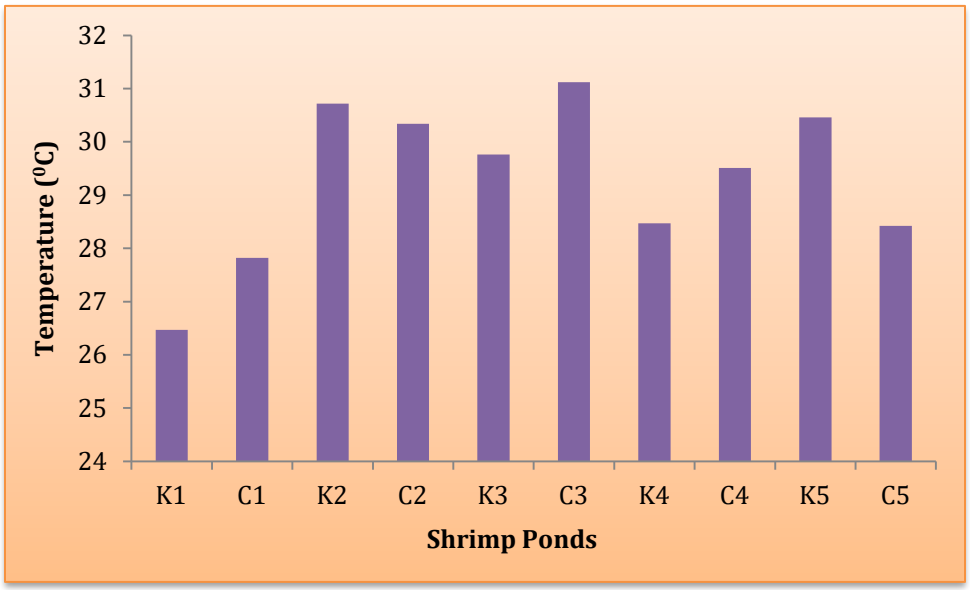

Figure 4: Temperature

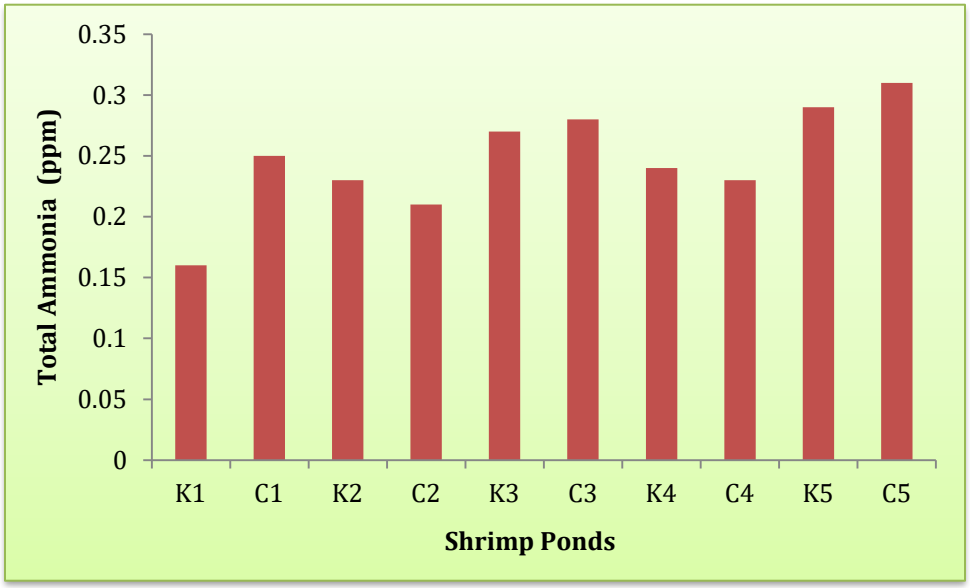

Figure 5: Total Ammonia

Alkalinity

Boyd (1998) was provided information about the increase of total alkalinity in pond water upto 150mg/lit through the natural fertilization of pond. In a study conducted by Mathew (1975) the alkalinity more than 40 mg/lit is found to be hard water characteristics, this helps to maintain the pH value of alkaline condition. According to Hutchinson (1957) main cause of alkalinity in pond

water due to bicarbonates are act as chief components at a pH range of 7 to 9. Welch (1952) and Yaron (1964) stated that alkalinity of aquatic environment is partly depends on water present in it. In the present study the total alkalinity found to be varied from 132.7-177.8 mg/lit in summer crop of the study period.

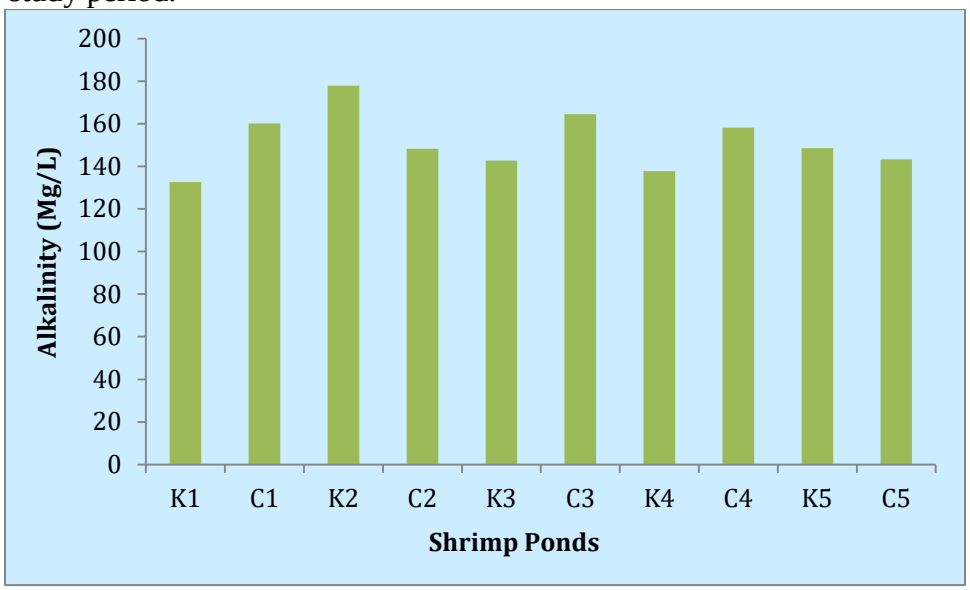

Figure 6: Alkalinity

Total Hardness

Suresh and Gunalan (2019) recorded hardness values in two different crops. The summer crop values were ranged from 5179 to 5742. The winter crop values were ranged from 3120 to 6840. Mishra *et al.,* (2008) recorded the average value of total hardness ranges from 1136.16 to 2,954.4 mg/L in aquaculture ponds whereas the average value of total hardness in river water was 1,769.42 mg/L. In the present investigation the observed hardness values in summer crop of the study period ranged from 1058 to 1804.

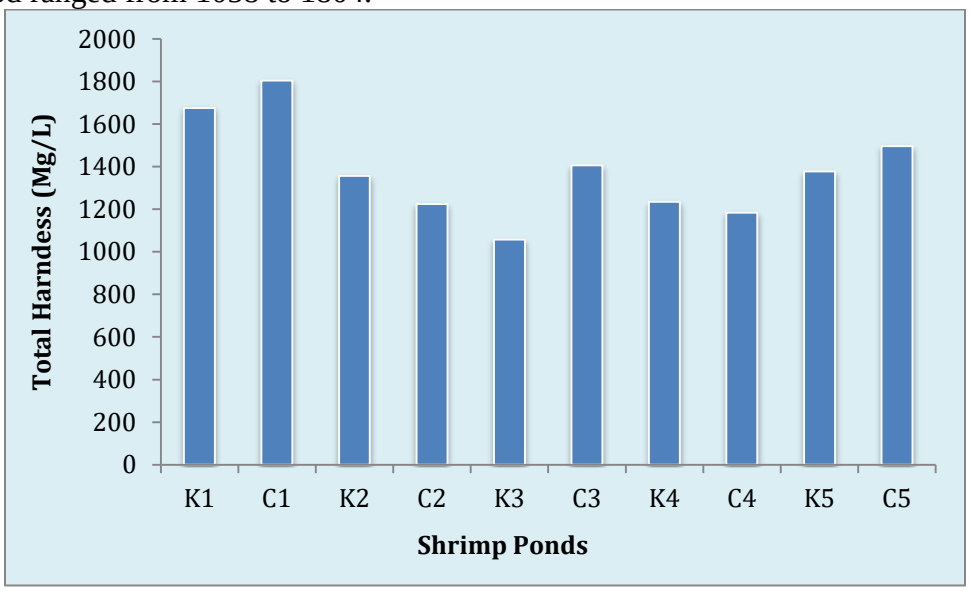

Figure 7: Total Hardness

Conclusion

The study was made to compare the water quality parameters in two different villages of Vizianagaram district, Andhra Pradesh India. It is evident from the present results that there is no marginal difference for the said parameters in selected study sites.

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