

Results and Discussion

Water parameters of different ponds in Abohar, Punjab are presented in table 1. The S1, S2 and so on represents the survey site 1, 2 and so on. The optimum range of salinity should lie between 5 to 25 ppt for proper shrimp farming. The salinity of different ponds surveyed lied between 13 to 18 ppt. Kasnir and Harlina (2014) recorded that the salinity in the coastal waters and river was 30.90 ± 4.01 and 17.95 ± 3.79 ppt. respectively. Others recommended that salinity of 5-35 ppt is suitable for shrimp farming and the salinity of 15-25ppt. is optimum for shrimp growth (Poernomo, 1992; Soewardi, 2007).

Carbonate and bicarbonate were found in range of 0-36 ppm and 88-158 ppm. Total alkalinity of the ponds ranged between 122 to 172 ppm which is in the optimum range of 100-200 ppm. Total hardness of the surveyed ponds was 3200-4620 ppm. Calcium harness for proper shrimp growth should be 400-2000 ppm.



Fig.1: Survey at sampling site



Fig. 2: Chemical water testing

The content of different minerals like Calcium, Magnesium, Potassium was also calculated in water samples. The results revealed that the Calcium content ranged between 392-600 ppm while the Magnesium content was estimated between 529 to 797 ppm. The ratio of Calcium to Magnesium content should lie between 1:3 to 1:4 which was found deviated in many ponds. The potassium content in various sampling sites ranged from 31.3 to 57.1 ppm. The pH in different ponds was in optimum range of 7.5 to 8.5 The pH measurement of river and coastal waters was 7.77 ± 0.42 and 8.06 ± 0.40 , respectively whereas pH of shrimp pond water ranged between 8.06-8.17 with the highest pH obtained at 12:00 noon and lowest at 3: 30 pm (Kasnir and Harlina, 2014).

Table 2: Mean and standard error of different water parameter measurements

Water parameters	Mean	S.E.
Salinity (ppt)	16.00	0.60
Carbonate (ppm)	17.80	4.15
Bicarbonate (ppm)	139.60	12.13
T. Alkalinity (ppm)	157.40	9.79
T. Hardness (ppm)	4,222.00	186.96
Ca Hardness (ppm)	1,316.00	62.38
Calcium (ppm)	526.40	24.95
Magnesium (ppm)	705.80	30.83
Potassium (ppm)	45.27	2.79
pH	8.16	0.04
C.D.	179.52	
SE(m)	63.79	
SE(d)	90.21	
C.V.	28.19	

Table 2 revealed that the mean of salinity (ppt), carbonate (ppm), bicarbonate (ppm), Total alkalinity (ppm), Total hardness (ppm), Calcium Hardness (ppm), Calcium (ppm), Magnesium (ppm), Potassium (ppm), pH (ppm) was 16, 17.80, 139.60, 157.40, 4222, 1316, 526.40, 705.80, 45.27, 8.16 respectively and the standard error recorded for these values was 0.60, 4.15, 12.13, 9.79, 186.96, 62.38, 24.95, 30.83, 2.79, 0.04 respectively. The critical difference found was 179.52.

Conclusion

Most of the water parameters of different ponds at survey sites were in adequate range which indicates a healthy shrimp production.

References

- APHA (American Public Health Association). (1998). *In: Clescert, L., Greenberg, A., Eaton, A. (Eds.), Standard Methods for the Examination of Water and Wastewater*. 20th edition. Washington, USA.
- CIBA. (2020). Impact of Corona Virus Disease (COVID-19) related lockdown on Shrimp aquaculture sector In India: Issues and way forward, 1-16 pp.
- De Grave, S., Pentcheff, N.D., Ahyong, S.T., Chan, T.Y., Crandall, K.A., Dworschak, P.C., Felder, D.L., Feldmann, R.M., Fransen, C.H.J.M., Goulding, L.Y.D., Lemaitre, R., Low, M.E.Y., Martin, J.W., Ng, P.K.L., Schweitzer, C.E., Tan, S.H., Tshudy, D. and Wetzer, R. (2009). A classification of living and fossil genera of decapod crustaceans. *Raffles Bulletin of Zoology*, 21, 1-109.
- FAO. (2019). FAO yearbook. In: Fishery and Aquaculture Statistics 2017.
- Kasnir, M. and Harlina, R. (2014). Water Quality Parameter Analysis for the Feasibility of Shrimp Culture in Takalar Regency, Indonesia. *J Aquac Res Development*, 5, 273. doi:10.4172/2155-9546.1000273
- Korenblum, E., von Der Weid, I., Santos, A.L.S., Rosado, A.S., Sebastián, G.V. and Coutinho, C.M.L.M. (2005). Production of antimicrobial substances by *Bacillus subtilis* LFE-1, *B. firmus* H2O-1 and *B. licheniformis* T6-5 isolated from an oil reservoir in Brazil. *J Appl Microbiol*, 98, 667-675.
- Poernomo, A. (1992). The selection of environment friendly shrimp pond. Centre for Research and development of fisheries, Jakarta.
- Pradhan, D and Flaherty, M. (2007). National initiatives, local effects: trade liberalization, shrimp aquaculture and coastal communities in Orissa, India. *Soc Nat Resour*, 21, 63-76. <https://doi.org/10.1080/08941920701655734>
- Soewardi, K. (2007). The continuous pond culture management. *Aquaculture*, 21, 32-41.