IOSR Journal Of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 19, Issue 8 Ser. 1 (August. 2026), PP 15-20
www.Iosrjournals.Org

Impact Of Water Quality Parameters On White Leg Shrimp Growth And Production Under Bore Water In Winter Season, AndhraPradesh

Danya Babu Ravuru And Jagadish Naik Mude
Department Of Zoology AndAquaculture, Acharya Nagarjuna University, India-522510
Department Of Zoology AndAquaculture, Acharya Nagarjuna University, India-522510

Abstract:
The culture was conducted in three ponds, each sized 0.7, 0.7, and 0.4 hectares in Pucchakurthivaari palem, Andhrapradesh, and an intensive culture system was selected under bore water circumstances. Sy aqua seed was collected from Manjunaadha hatcheries; the L.vannamei seed was provided from the CAA-certified Ulavapaadu village in the Prakasam district, Andhrapradesh. The stocking densities of L.vannamei PL_{10} (post larvae) were calculated using three samples, each of which had 23, 37, and 28 species/m^2 and 59, 60, and 51% survival rates. The artificial diet was provided 4 times in a day with 35-39% protein. During the winter months of December through March, the water quality parameters were checked every fortnightly at 7 a.m. The final growth was 12.04, 17.24, and 18.18g; production was 1704, 1650, and 2127kg; feed was 2000, 2380, and 3150; and FCR was 1.17, 1.44, and 1.48 for Pond A1, Pond B1, and Pond C1/78, 85, and 90 days, respectively.
Keywords: *L.vannamei, salinity, dissolved oxygen, growth, productionand economic analysis*

Date of Submission: 24-07-2026 Date of Acceptance: 04-08-2026

I. Introduction

This tropical species, which is native to the Eastern Pacific coast from the Gulf of California in Mexico to Tumbes in northern Peru, is the most important penaeid shrimp species farmed worldwide (Pérez-Farfante and Kensley 1997: Alcivar-Warren *et al.,* 2007). It is a euryhaline species that can withstand a wide range of ambient salinity (0.5 to 40 ppt), according to Menz and Blake (1980) and Bray et al. (1994). The availability of superior shrimp seed was a major factor in the switch from tiger shrimp to *L.vannamei*. Post-larvae of wild-captured brood stock were produced in India in aquaculture dominated by tiger shrimp (Tandel.G. *al.,* 2017).

Because of its economic importance, the shrimp business has been regarded as one of the aquaculture systems with the quickest growth rates in recent decades. As aquaculture technology has developed, more attempts have been made to enhance the production of farmed shrimp. (Saadony.M.T.EL*et al.,* 2022). Given that the world's population is predicted to exceed 9.7 billion people by 2050, using more farmed aquatic food products rather as land-raised animal meat may reduce the amount of area needed to cultivate feed crops.

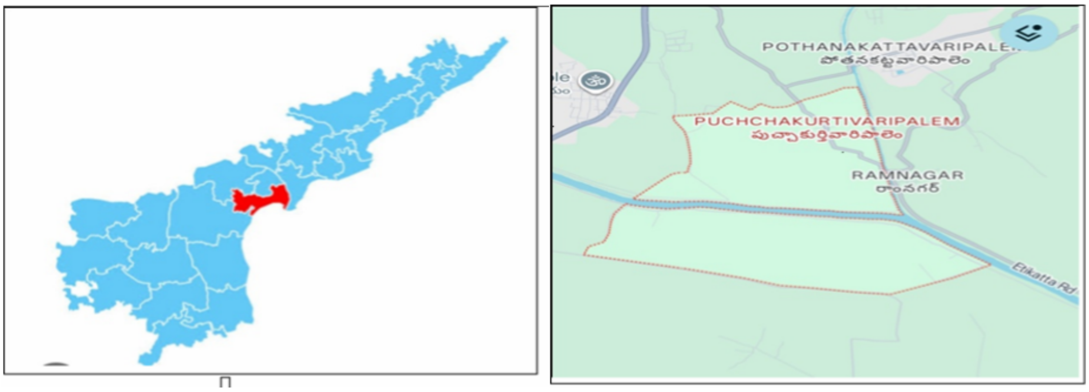
(Dong.S.L *et al.,* 2023). With an average annual growth rate of 6.7%, global aquaculture production doubled from 41.7 million tonnes in 2000 to 90.4 million tonnes in 2012 (Tacon and Metian, 2015). With a farm gate sale value of USD 263.6 billion, the worldwide business hit a record high of 114.5 million tons in live weight in 2018 (FAO, 2020). 9.4 million tonnes of crustaceans worth USD 69.3 billion were raised globally in 2018 (FAO, 2020). With 7.56% of global production, India is the second-largest producer of marine foods. Along the value chain, the industry employs over 50 million people, more than 28 million of whom work at the primary level. This industry has grown at an average annual rate of 7% during the last three years. (Swarna Pragathi, M. *et al.,* 2023).

II. Materials And Methods

The current investigation was carried out during the winter in coastal areas. The Pavani hatchery is situated in the Andhrapradesh district of Prakasam, in the hamlet of Kothapatnam. The shrimp culture was conducted from December to March using the Sy aqua seed that was used in the study. The rectangular ponds and the cultivation in bore water. Additionally, economic and cost-benefit analyses of the ponds' water quality characteristics, density, survival, growth, and production were carried out. The larvae are fed four times a day at 6 a.m., 10 a.m., 2 p.m., and 6 p.m. The pellet feed intended for starter, grower, and finisher was acquired for Rs. 84 per kilogram, and the artificial diet I feed (Protein 35–39%) cost 0.35 rupees per piece.

Study Duration: From 28/12/2025 to 27/03/2026

Study Location: Fig.1. Pucchakuthivaari palem village,Bapatla district, Andhrapradesh state



Procedure Methodology:
1. Selection of experimental ponds: Three earthen ponds, designated as **Pond A1, Pond B1, and Pond C1,** were selected for the experimental culture of *Litopenaeus vannamei*. The ponds were of similar size and prepared under identical management practices to ensure uniform experimental conditions.
2. Pond preparation: Before stocking, all ponds were drained, dried, and cleaned thoroughly. Pond bottoms were treated with lime as required, followed by filling with bore well water. Water quality parameters were adjusted to suitable levels before stocking.
3. Stocking of shrimp post-larvae: Healthy and disease-free *L. vannamei* post-larvae (PL) were acclimatized to pond water conditions and stocked in **Pond A1, Pond B1, and Pond C1** at the prescribed stocking density.
4. Feeding management: Shrimp in all three ponds were fed a commercial pelleted feed according to the recommended feeding schedule. Feed quantity was adjusted periodically based on shrimp biomass, feeding trays, and survival observations to optimize feed utilization.
5. Water quality parameters: Water quality was monitored regularly throughout the culture period. **pH** measured using a calibrated pH meter.**Salinity** measured using a refractometer. **Dissolved Oxygen (DO)** measured using a dissolved oxygen meter.All water quality observations from **Pond A1, Pond B1, and Pond C1** were systematically recorded and maintained throughout the experimental period.
6. Shrimp growth performance: Shrimp were sampled periodically to evaluate growth performance using the following parameters:Average Body Weight (ABW), Average Daily Growth (ADG), Survival Rate (SR) and Feed Conversion Ratio (FCR)
7. Production and economic analysis: At harvest, production parameters such as total biomass and yield were recorded. Economic indicators including production cost, gross income, net income, and benefit-cost ratio (BCR) were calculated to assess the profitability of each pond.

Statistical analysis: The experimental data obtained from **Pond A1, Pond B1, and Pond C1** was analyzed using **One-way Analysis of Variance (ANOVA)** to determine significant differences among ponds. Differences were considered statistically significant at **$P < 0.05$.**

III. Results

Water quality parameters: The water quality indicators measured in ponds A1, B1, and C1 gradually changed. As the culture progressed, pH levels in all ponds gradually rose from almost neutral levels at the start (7.0–7.2) to somewhat alkaline conditions (up to 8.2). Salinity levels also displayed a continuous rise from 6 ppt to a high of 10–12 ppt, indicating regulated saline conditions favorable for shrimp growth. Between 5.0 and 5.6 ppm, which is within the ideal range for *Litopenaeus vannamei* culture, dissolved oxygen (DO) remained comparatively constant in all ponds.At the conclusion of the cultivation period, Ponds B1 and C1 had somewhat higher salinity and pH values than Pond A1. Pond C1 recorded the greatest DO (5.5 ppm), followed by Pond B1 (5.6 ppm at DOC 90), indicating superior aeration or primary productivity in these systems.

Growth performance: In contrast to Pond A1 (12.0 g), Pond B1 had superior growth performance with an average body weight of 17.24 g. Pond C1 showed the highest average body weight (18.18 g) but poorer survival (51%) compared to Pond B1 (60%).
Production performance: Pond C1 produced the most overall (2127 kg), followed by Pond A1 (1704 kg) and Pond B1 (1650 kg). Ponds used different amounts of feed; Pond A1 had the most efficient feed conversion ratio (FCR) of 1.17, followed by Pond B1 (1.44) and Pond C1 (1.48).

Economic analysis: Pond C1 made the most money (Rs. 90/kg), followed by Pond B1 (Rs. 75/kg), and Pond A1 (Rs. 25/kg).

Table 1: Water quality parameters (Pond A1)

DOC	P[H](ppm)	Salinity (ppt)	DO (ppm)
1	7.2±2	6.0±2	5.0
15	7.3±2	6.0±2	5.0
30	7.4±2	8.0±2	5.1
45	7.6±2	9.0±2	5.1
60	7.6±2	9.0±2	5.2
75	7.9±2	10.0±2	5.3

Fig 3: Water quality parameters (Pond A1)

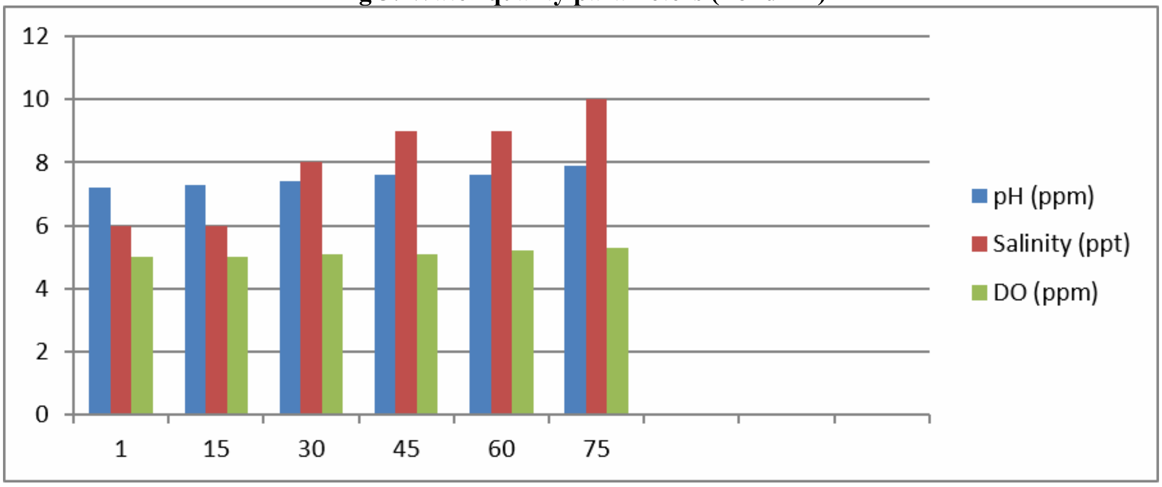


Table 2: Water quality parameters (Pond B1)

DOC	P[H](ppm)	Salinity (ppt)	DO (ppm)
1	7.0±2	6.0±2	5.0
15	7.2±2	6.0±2	5.0
30	7.3±2	8.0±2	5.1
45	7.5±2	9.0±2	5.3
60	7.7±2	9.0±2	5.3
75	7.9±2	10.0±2	5.4
90	8.2±2	12.0±2	5.6

Fig 4: Water quality parameters (Pond B1)

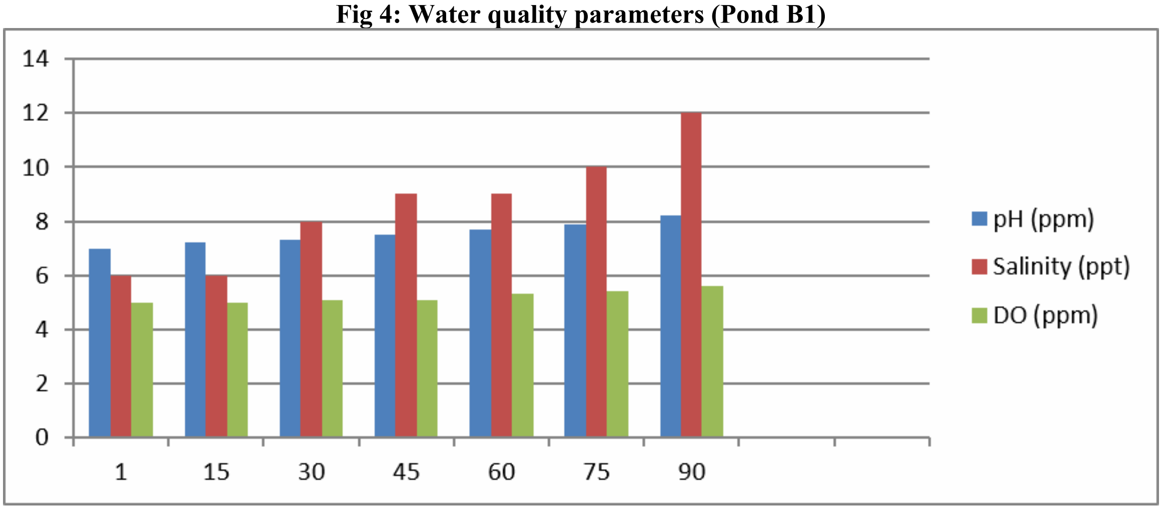


Table 3: Water quality parameters (Pond C1)

DOC	P[H](ppm)	Salinity (ppt)	DO (ppm)

1	7.1±2	6.0±2	5.0
15	7.1±2	6.0±2	5.1
30	7.2±2	8.0±2	5.1
45	7.4±2	8.0±2	5.2
60	7.6±2	9.5±2	5.2
75	7.8±2	10.0±2	5.4
85	8.1±2	11.0±2	5.5

Fig 5: Water quality parameters (Pond C1)

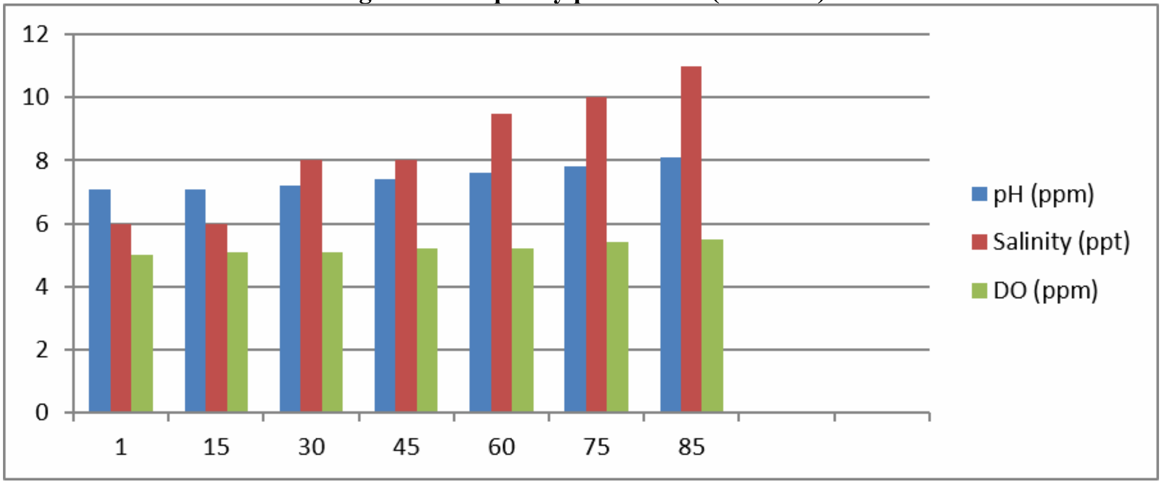


Table 4: Economic analysis of *L.vannamei*culture in winter season

Details	Pond A1	Pond B1	Pond C1
WSA (ha)	0.7	0.7	0.4
Stocking date	28/12/2025	28/12/2025	28/12/2025
Harvest date	15/03/2026	22/03/2026	27/03/2026
DOC	78	85	90
Stocking density/m²	23	37	28
Seed cost/piece (Rs)	0.35	0.35	0.35
Survival Rate (%)	59	60	51
Harvest size (Count)	83	58	55
ABW (Grams)	12.0	17.24	18.18
Total feed (Kg)	2000	2380	3150
Feed price/kg (Rs)	84	84	84
Total production (Kg)	1704	1650	2127
Production price/kg (Rs)	235	285	310
Expenditure cost/Rs/Kg	210	210	220
Profit/kg (Rs)	25	75	90
FCR	1.17	1.44	1.48

IV. Discussion

Water quality parameters: Water quality parameters such as pH, salinity, and dissolved oxygen remained within optimal limits throughout the culture period. ANOVA results indicated **showed significant variation ($p < 0.05$).**The stable pH (7.0–8.2) confirms that environmental conditions were uniform across treatments, minimizing their influence on growth variation. Similar findings were reported by **Brandão, dos Reis, and Krummenauer (2024),** who observed that stable water quality ensures consistent shrimp performance in biofloc systems.The significant variation in salinity observed in this study is consistent with seasonal concentration effects reported by **Suneetha, Padmavathi, and Chatla (2024),** where ANOVA showed significant differences in water quality parameters under varying culture conditions. However, since salinity remained within the tolerance range of *L. vannamei*, it did not adversely affect growth.

Growth performance:Average Body Weight (ABW): Significant ($p < 0.05$), Feed Conversion Ratio (FCR): Significant ($p < 0.05$). The significantly higher ABW in Pond C1 (18.18 g) demonstrates that **stocking density and culture duration strongly influence growth performance.** This agrees with findings by **Khanjani (2025),** who reported that shrimp cultured at different stocking densities showed significant variation in growth and physiological responses.
Similarly, **Araujo, Nguyen, and Davis (2025)** reported that growth performance and nutrient utilization in *L.vannamei* are significantly affected by feeding and culture conditions. According to Danya Babu et al., (2014), in winter season the final growth was 26.5, 27.0 and 27.5g for P1, P2 and P3/95, 98 and 101 days. FCR

differences were also statistically significant, with Pond A1 showing the lowest FCR (1.17), indicating better feed efficiency under lower stocking density. This supports the findings of **Ferrando-Juan *et al.*, (2026),** who demonstrated that feed management and stocking conditions significantly influence feed utilization efficiency.Survival rate did not show significant variation, suggesting that **under stable environmental conditions, stocking density has limited statistical impact on survival,** a result also supported by **Krummenauer *et al.*, (2024).**

Productionperformance: Total production differed significantly among ponds ($p < 0.05$), with Pond C1 recording the highest yield (2127 kg).According to Mude JN, Ravuru DB (2015), in winter season the production was 3200, 3318 and 3459 kg for P1, P2 and P3/ 95, 98 and 101 days. Furthermore, studies by Krummenauer*et al.,* (2024) confirmed that improved growth under optimized conditions leads to significantly higher production in shrimp culture systems.

Economicanalysis:Profit per kg: Significant ($p < 0.05$. Pond C1 achieved the highest profit (Rs90/kg), which was statistically significantcompared to other ponds. This indicates that**profitability is strongly influenced by shrimp size and market price rather than production cost alone.**This observation is consistent with **Chowdula (2024),** who reported that economic returns in shrimp farming in Andhra Pradesh depend significantly on production efficiency and harvest size.Additionally, **Marimuthu, Puvaneswari, and Lakshmanan (2024)**highlighted that improved growth performance directly enhances profitability in shrimp farming systems.**Overall Growth parameters (ABW, FCR), production, and profit showed significant differences ($p < 0.05$).**

These findings confirm that **stocking density and culture duration are the primary factors influencing shrimp farming success,** rather than environmental variation.Moderate stocking density combined with longer culture duration (Pond C1) resulted in:Higher growth (ABW), higher production, and higher profit. Even though survival was lower, it did not significantly affect overall performance, emphasizing that **final biomass and harvest size are more critical than survival alone.**This conclusion is strongly supported by recent global research trends, where optimizing growth conditions rather than maximizing stocking density leads to better economic and production outcomes.

V. Conclusion

The study demonstrates that water quality parameters the ANOVA-based analysis such as pH, salinity, and dissolved oxygen play a crucial role in determining shrimp survival, growth, and overall production. The use of artificial feed in bore shrimp culture proved effective in achieving good feed conversion efficiency. Among the ponds studied, Pond C1 showed the best performance with higher growth, survival, production, and profitability. Seasonal variation also influenced the results, with improved growth and yield observed during the winter season due to favorable environmental conditions and better market prices.

References

[1]. Alcivar-Warren AD, Meehan-Meola S, Won Park, Xu Z, Delaney M, Zuniga G, (2007) Shrimp Map: A Low-Density, Microsatellite-Based Linkage Map OfThePacific White Leg Shrimp, *Litopenaeus vannamei*: Identification Of Sex-Linked Markers In Linkage Group 4. Journal Of Shellfish Research 26(4): 1259–1277, Http://Dx.Doi.Org/10.2983/0730-8000(2007) 26[1259: SALMLM] 2.0.CO; 2.

[2]. Araujo, A. N., Nguyen, K., Strebel, L., Corby, T., Rhodes, M. A., Beck, B. H., ... &Davis, D. A. (2025). Effect Of Protein Intake On Growth And Nutrient Retention Of Pacific White Shrimp *(Litopenaeus vannamei*) In A Green Water Recirculating Aquaculture System. Aquaculture Nutrition, 2025(1), 4942439.

[3]. Brandão, H., Dos Reis, W. G., Krummenauer, D., & Wasielesky Jr, W. (2024). Growth Performance Of *Litopenaeus vannamei* Under Biofloc System Using Denitrified Seawater. Aquaculture International, 32(3), 3129-3145.

[4]. Bray W.A., Lawrence, A.L., Leung-Trujillo, J.R., (1994). The Effect Of Salinity On Growth And Survival OfPenaeus Vannamei, With Observations OnThe Interaction OfIHHN Virus And Salinity. Aquaculture 122, 133–146.

[5]. Chowdula, S. (2024). A Socio-Economic Analysis On Shrimp Culture *(Litopenaeus vannamei)* In Godavari Districts OfAndhra Pradesh, India. Archives Of Current Research International, 24(12), 10-9734.

[6]. Dong, S. L., Tian, X. L., Gao, Q. F., &Dong, Y. W. (Eds.). (2023). Aquaculture Ecology. Springer

[7]. Danya Babu Ravuru and Jagadish Naik Mude (2014). American International Journal Of Research In Formal, Applied & Natural Sciences, 6(2), March-May 2014, Pp. 126-129

[8]. FAO. 2020. Mekouar, M. A. Food AndAgriculture Organization OfTheUnited Nations (FAO). Yearbook Of International Environmental Law, 31(1), 326-340.

[9]. Ferrando-Juan, S., Gómez-Aguilera, J., Martínez-Llorens, S., Tomás-Vidal, A., Rodilla, M., Jover-Cerdá, M.,& Peñaranda, D. S. (2026). Optimization Of Protein Requirements And Feed Restriction In *Penaeus vannamei* (Boone, 1931) Biofloc Culture. Aquaculture International, 34(2), 65.

[10]. Khanjani, M. H. (2025). The Effect Of Different Levels Of Settleable Solids On Water Quality And Performance Of Pacific White Shrimp (Penaeus Vannamei). Journal Of Oceanography, 16(61), 55-66.

[11]. Menz, A., Blake, B.F., 1980. Experiments On The Growth Of *Penaeus vannamei* Boone. J. Exp. Biol. Ecol. 48, 99–111.

[12]. Marimuthu, S., Puvaneswari, S., &Lakshmanan, R. (2024). Effect Of Biofloc Technology Enriches The Growth Of *Litopenaeus vannamei* (Boone, 1931). Applied Biochemistry And Biotechnology, 196(7), 3860-3890.

[13]. Mude JN, Ravuru DB (2015) Growth OfCultured White Leg Shrimp *Litopenaeus vannamei* (Boone, 1931) Of Brackish Water Culture System In Winter Season With Artificial Diet. J Aquac Res Development 6: 304. Doi:10.4172/21559546.1000304

[14]. Perez Farfante, I. S. A. B. E. L., Kensley, B., &Ryan, M. K. (1997). Penaeoid And Sergestoid Shrimps And Prawns OfThe World: Keys And Diagnoses ForThe Families And Genera. MémoiresDu Muséum National d'Histoire Naturelle. Série A, Zoologie.Paris.

[15]. Saadony-EI, M. T., Saad, A. M., Soliman, S. M., Salem, H. M., Desoky, E. S. M., Babalghith, A. O.,&Abu Qamar, S. F. (2022). Role Of Nanoparticles In Enhancing Crop Tolerance To Abiotic Stress: A Comprehensive Review. Frontiers In Plant Science, 13, 946717.

[16]. Swarna Pragathi, M., Anitha, M., Sreenivasulu, G., & Jayaraju, N. (2023). Sustainable Aquaculture And Economic Development In Coastal Areas: The Case OfAndhra Pradesh, India. In Coasts, Estuaries AndLakes: Implications ForSustainable Development (Pp. 393-404). Cham: Springer International Publishing.

[17]. Suneetha, K., Padmavathi, P., & Chatla, D. (2024). Hatchery Performance OfPacific White Shrimp, *Penaeus vannamei* In Biofloc Technology By Using Different Carbon Sources. Blue Biotechnology, 1(1), 13.

[18]. Tandel, G. M., John, K. R., George, M. R., &Jeyaseelan, M. P. (2017). Current Status Of Viral Diseases InIndian Shrimp Aquaculture. Acta Virol, 61(2), 131-137.

[19]. Tacon, A. G., &Metian, M. (2015). Feed Matters: Satisfying The Feed Demand Of Aquaculture. Reviews In Fisheries Science &Aquaculture, 23(1), 1-10.