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ORIGINAL ARTICLE

Effect of stocking density on the Growth performance of freshwater prawn *Macrobrachium dayanum* from Jammu

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ABSTRACT
An experimental trial was conducted to study the effect of varying stocking density on the growth and survival of freshwater prawn Macrobrachium dayanum. It was recorded that stocking density D_0 showed the highest final mean length (2.40±0.288 cm) followed by D2 (2.22±0.264 cm), D3 (2.11±0.264 cm) and least in D4 (2.02±0.264 cm). The final mean weight at the end of the trial period showed marked significant differences among different stocking densities. It was observed that the increasing stocking density resulted in a huge decrease in the mean weight of the post larvae. The stocking density D_0 showed the highest final mean weight (0.450±0.002g) followed by D_1 (0.416±0.001 g), D_2 (0.386±0.001g), D_3 (0.374±0.012g) and lowest in D_4 (0.360±0.001). Feed Conversion Ratio (FCR) was maximum and statistically significant (P<0.05) in case of D4 (0.315±0.02) and significantly lowest (P<0.05) in case of D0 (0.150±0.02). A comparative decline in feed conversion efficiency (FCE) was evident as a stocking density in the experimental sets was increased. The highest survival rate was found for D0 (91.56±1.17%) followed by D1 (84.88±1.74%), D2 (70.03±0.62 %), D3 (59.92±1.01%) and lowest in D4 (44.99±1.35%).
Keywords*: Stocking density, Percent Weight Gain (PWG), Feed Conversion Ratio(FCR), Feed Conversion Efficiency (FCE), Macrobrachium dayanum*

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INTRODUCTION

In intensive culture system high stocking densities are expected to generate increasing production. The fact however is that the carrying capacity of water body exercises the final control and act as a limiting factor, thereby, restricting the sustenance of life beyond a certain amount of biomass. Therefore, in order to obtain a production within minimum resources and maximum income it is necessary to determine the optimum stocking density. Several studies have been conducted to evaluate survival and growth rates of prawn stocked at different densities in the culture ponds with an aim to ascertain ideal stocking densities for obtaining maximum yields.

MATERIAL AND METHODS

The experiment to determine the different stocking densities was conducted in the laboratory, Department of Zoology, University of Jammu. After proper acclimatization of post larvae of *M. dayanum*, the length and weight of post larvae was recorded. The larvae were stocked in plastic troughs (0.35m x 0.4m depth). The troughs were marked as D_0, D_1, D_2, D_3 and D_4. The different stocking densities were:

D_0 - 5 prawns per trough
D_1 - 10 prawns per trough
D_2 - 15 prawns per trough
D_3 - 20 prawns per trough
D_4 - 25 prawns per trough

The water in trough was vigorously aerated by constant supply of air. About 1/3rd of water was changed in alternative days. Routine physicochemical parameters (dissolved oxygen, temperature and pH) and Growth parameters viz. Average Weight Gain (AWG), Percent Weight Gain (PWG), Feed Conversion

Ratio(FCR), Feed Conversion Efficiency (FCE), Specific Growth Rate (SGR) and Survival Rate (SR) were recorded using standard methods. In order to check the aggressive behavior and to prevent the cannibalism and aggressive behavior, small pebbles and PVC pipes were kept at the base of trough. The increase in weight and length of prawn was used as growth measures. The duration of experiment was 60 days. Feeding was maintained at the rate 5-8% body weight with 35% crude protein(Ideal feeding rates and crude protein levels predetermined under other experimental setup.

RESULT AND DISCUSSION

An experimental trial was conducted to evaluate the effect of varying stocking densities on the growth and survival of post larvae of *Macrobrachium dayanum* with fixed feeding rate of 5-8% of wet body weight for a period of 60 days. The initial mean length of prawn larvae was 1.20±0.62 cm in D_0, D1, D2, D3 and D4 respectively. It was recorded that the stocking density D_0 showed the highest final mean length (2.40±0.288 cm) followed by D2 (2.22±0.264 cm), D3 (2.11±0.264 cm) and least in D4 (2.02±0.264 cm). The highest value of final mean length was found to be significantly different (P>0.05) from the rest of the values. The perusal of (Graph 1) shows the initial mean weight of post larvae as 0.300±0.001, 0.301±0.001, 0.300±0.001, 0.301±0.001and 0.303±0.001in D_0, D1, D2, D3and D4 respectively. The final mean weight at the end of the trial period showed marked significant differences (P>0.05) among different stocking densities. It was observed that the increasing stocking density resulted in a huge decrease in the mean weight of the post larvae. Several workers have also studied the effect of varying stocking densities [2, 6, 11, 12] and all of them arrived with the results altogether different from one another.

Presently, the stocking density D_0 showed the highest final mean weight (0.450±0.002g) followed by D_1 (0.416±0.001 g), D_2 (0.386±0.001g), D_3 (0.374±0.012g) and lowest in D_4 (0.360±0.001). Such observations were in agreement with the findings of various other investigators [18, 19, 6, 11] who also have recorded an inverse relationship of mean weight with the increasing stocking density. The statistical analysis indicated that the differences among the mean weight of prawns obtained from the stocking density D_0 D_1. D_2, D_3 and D_4 were quite significant (P< 0.05).

During the present course of study, the Average weight gain (AWG) were found to be maximum (Graph 2) for D_0 (0.150±0.002g) and lowest for D_4 (0.057±0.002g). The highest value of AWG was found to be significantly different (P<0.05) from the rest of the values. The values for D_3 (0.073±0.002g) and D_4 (0.057±0.002g) although showed significant decrease as compared to D_1 and D_2 (Graph 2) but did not vary significantly among themselves (P>0.05) Such results were in accordance with the findings of El-Sherif and Mervat [2], who reported the mean weight gain of *Macrobrachium rosenbergii* juveniles at the end of 90 days period to be 0.69, 0.64, 0.52 and 0.27g/prawn for the stocking density 50, 100, 150 and 200 prawns/m^2 respectively. Our results also coincide with the previous findings of other workers [2, 3, 17, 10, 15] who have also witnessed that the growth performance decrease with the increasing densities.

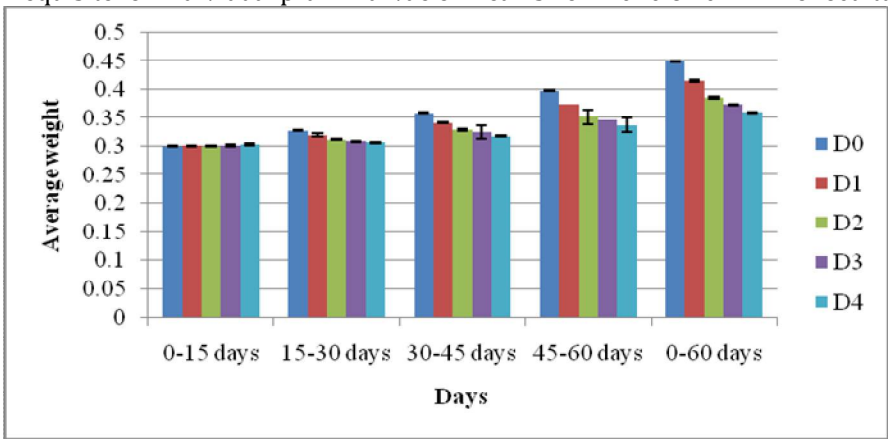
The percentage weight gain PWG (Graph 3) also followed the same trend as that of average weight gain and the highest value was found for D0(50.00±0.02%) followed by D_1 (38.20±0.02%), D_2 (32.33±0.02%), D3 (28.66±0.01%) and D4 (18.18±0.02) which was in accordance with the findings of El-Sherif, [2]; Haque *et al.* [3]; Langer *et al.* [6] and Paul *et al*. [12]. When analyzed statistically, D_0 was observed to be significantly different (P<0.05) from the rest of the values but D_1 and D_2 did not vary significantly from one another (P>0.05).

A critical analysis of Graph 4 reveals that the Feed Conversion Ratio (FCR) is maximum and statistically significant (P<0.05) in case of D_4 (0.315±0.02) and significantly lowest (P<0.05) in case of D_0 (0.150±0.02). The values of D_2 (0.224±0.02) and D_3 (0.256±0.03) were not found to vary significantly from one another. Thus, statistically FCR followed the order as D_4>D_3>D_2>D_1>D_0. Perusal of figures (Graph 4)reveals that the feed conversion ratio (FCR) increases with increase in the density of prawns which stands in accordance with the findings of Zaki *et al.,* [19]) who studied the effect of stocking density of marine shrimp on the FCR. Wherein the values were 2.05, 2.20, 2.38, 2.62 and 2.77 corresponding to 3, 6, 9, 12 and 15 shrimps/m^2 respectively. Such results also coincide with the results found by Langer *et al*. [6].

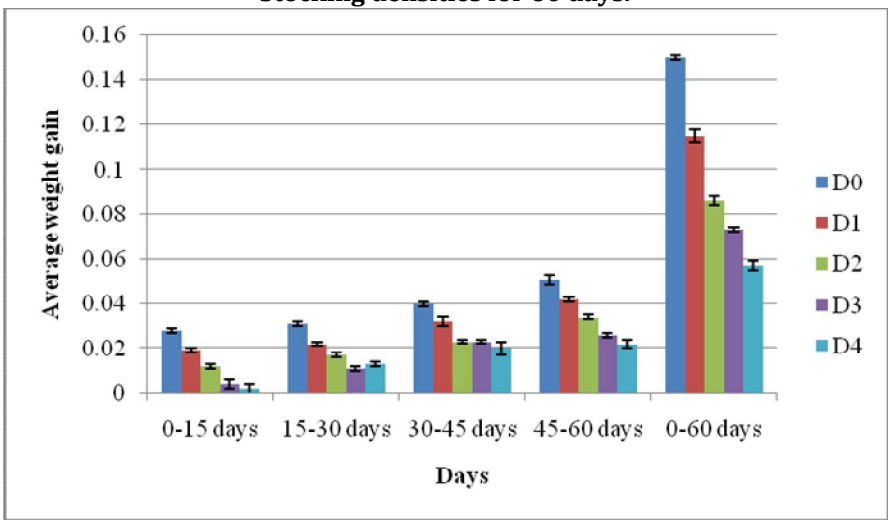
The FCE (Feed Conversion Efficiency) was inversely related to FCR and it is clearly evident from (Graph 5) that FCE records maximum value (6.666±0.02**)** for D_0 and is significantly different (P<0.05) from those recorded for D_4 (3.174±0.01). However, the values of FCE for D_1 (5.555±0.03) and D_2 (4.464±0.02) do not differ significantly from each other (P<0.05). Further, it is clearly evident that the increasing stocking density reduced the feed conversion efficiency (FCE). Such results are in accordance with the findings of Shrivastava *et al.* [15] and other workers who have worked under the similar conditions [12, 18, 11].

The values of Specific Growth Rate SGR (Graph 6) were also observed to be maximum for D_0 (0.801±0.01%) and lowest for D_4 (0.287±0.02%). The statistical analysis showed that the differences among the stocking densities with respect to specific growth rates of post larvae were significant ($P<0.05$) but the differences between stocking densities, D_1 (0.539±0.03) and D_2 (0.420±0.02) were not significant ($P>0.05$)Our results were in full agreement with the results of El-Sherif and Mervat [2], who found that the SGR value of prawn at the end of the trial period decreased (1.48, 1.47, 1.46 and 1.34%) in the order viz., 50, 100, 150 and 200 prawns/m^2 respectively. A similar trend has also been witnessed by several other workers [6, 15, 8].

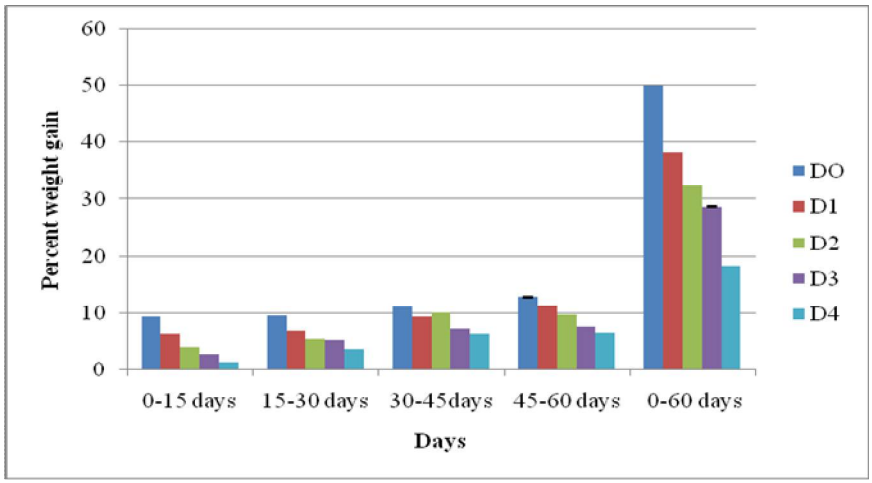
During the present study, it was observed that the survival rate of prawns during the trial period declined as the stocking density increased. The highest survival rate in Graph 7 was found for D_0 (91.56±1.17%) followed by D_1 (84.88±1.74 %), D_2 (70.03±0.62%), D_3 (59.92±1.01%) and lowest in D_4 (44.99±1.35). When analyzed statistically, it was found that the highest value for D_1 was significantly different ($P<0.05$) from other experimental sets but the values for D_2 and D_3 were not found to differ significantly among themselves ($P>0.05$). Reduced survival at high density is probably due to cannibalism process which is a very common phenomenon prevailing in crustaceans (Rouse et al. 1991 and Jones, 1995). Our results are also in accordance with the results reported earlier by Daniels *et al.* [1], Marques *et al.* [9], Marlina and Panjaitan [8]. Kotiya and Vadher [5] observed the survival percent as 95.1, 90.9, 89.9, 85.2, 81.6 % in *L. vannamei* at stocking density 30, 40, 50, 60, 70 and 80 p/m^2 respectively. On the contrary some workers [16, 9, 11] highlighted that the increasing stocking density had no significant effect on survival rate. Lopez-Uriostuegui *et al.* [7] recorded that the overall prawn production increased with increasing density and varied from 1,307.2 kg/ha at a density of 6 prawns/m^3 to 2,013.3 kg/ha at a density of 24 prawn/m3. Since D_0 (5 prawn/m^2) produced better overall performance in terms of mean growth, FCR, FCE, percent survival rate, percent weight gain, therefore an optimum space of 0.2m^2 is the recommended density to be a minimum requisite for individual prawn larvae of mean size 1.20±0.62 cm in monoculture condition.



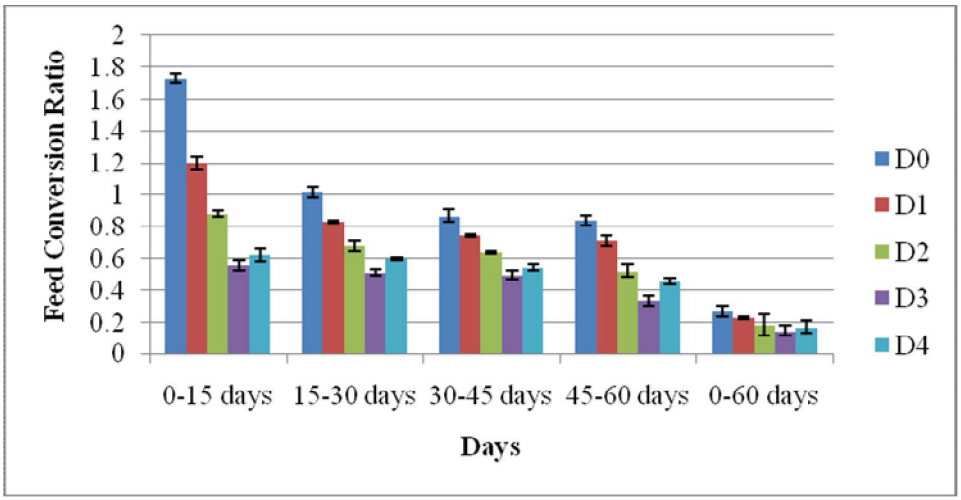
Graph 1: showing growth in weight (g) of post larvae of *Macrobrachium dayanum* at different Stocking densities for 60 days.



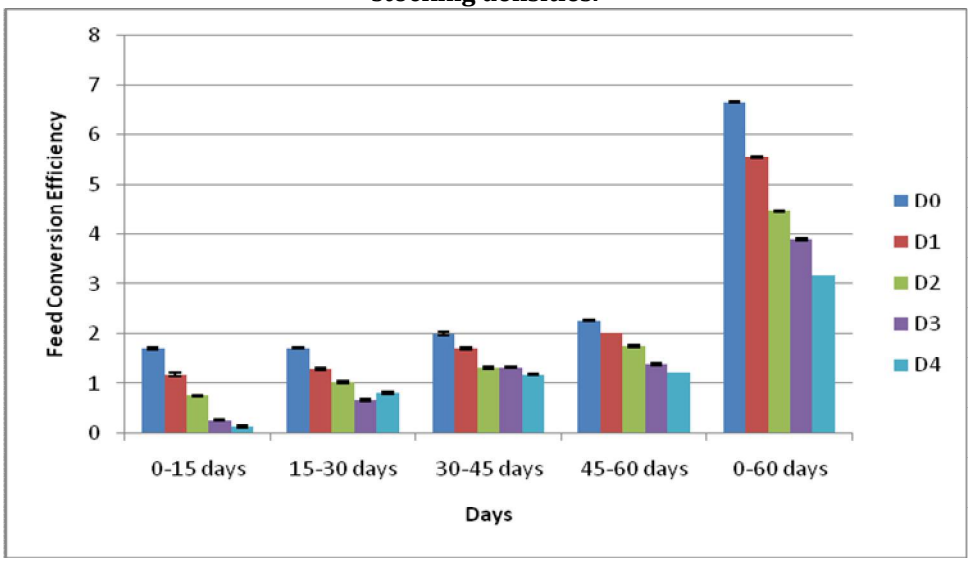
Graph 2: showing Average Weight Gain (AWG) by post larvae of *Macrobrachium dayanum* at different stocking densit



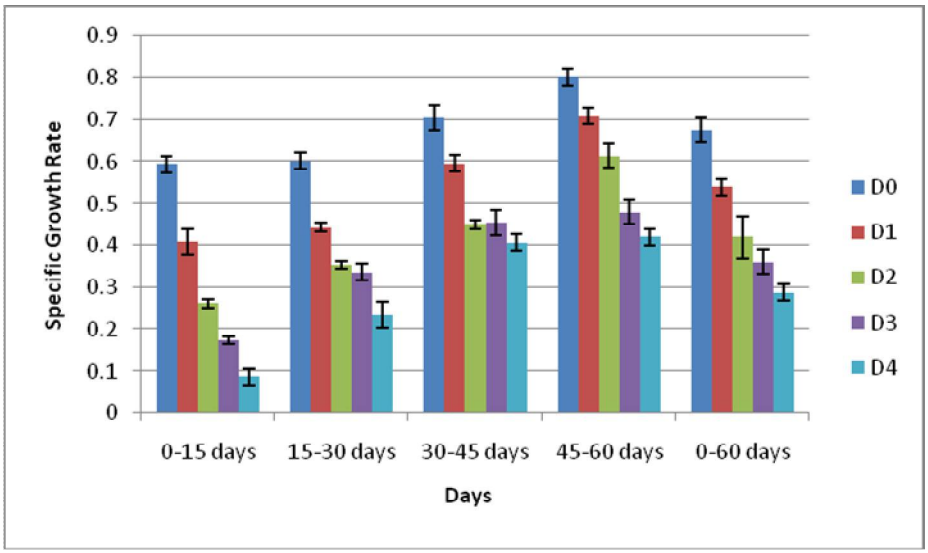
Graph 3: Percent Weight Gain (PWG) by post larvae of *Macrobrachium dayanum* at different stocking density.



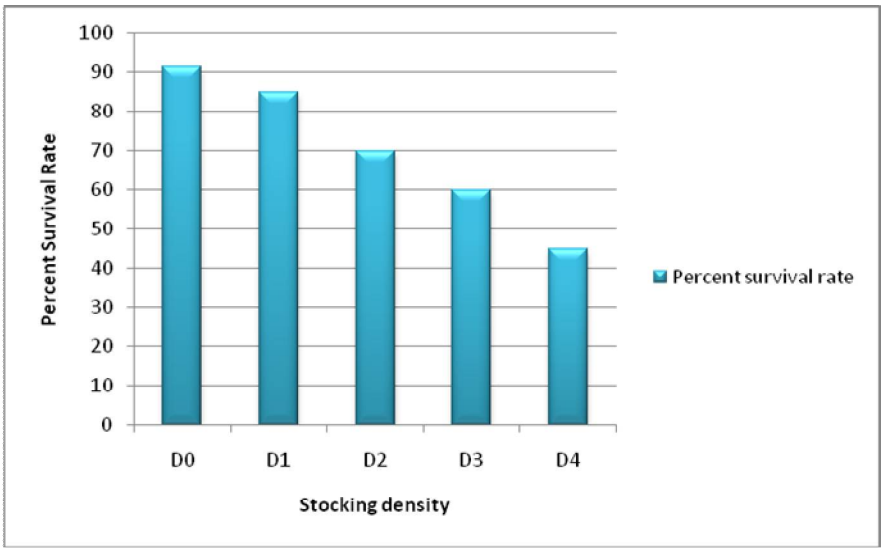
Graph 4: Feed Conversion Ratio (FCR) by post larvae of *Macrobrachium dayanum* at different stocking densities.



Graph 5: Feed conversion efficiency (FCE) by post larvae of *Macrobrachium dayanum* at different stocking densities.



Graph 6: Showing Specific Growth Rate by post larvae of *Macrobrachium dayanum* at different stocking density.



Graph 7: showing Percent survival rate at varying stocking density of post larvae of *Macrobrachium dayanum*

REFERENCES

1. Daniels WH, D'Abramo LR, Fondren and Durant MD (1995). Effects of stocking density and feed on pond production characteristics and revenue of harvested freshwater prawns *Macrobrachium rosenbergii* stocked as size graded juveniles. J. World Aquacult. 26(1): 38-47.
2. El-Sherif MS (2001). Studies on growth performance of prawn *M. rosenbergii* as affected by type of feeding and stocking density. Journal of Agricultural Sciences. 26: 4141-4149.
3. Haque MM, Narejo NR, Salam MA, Rahmatullah SM, Islam MA (2003) Determination of optimum stocking density of *Macrobrachium rosenbergii* in carp polyculture in earthen pond. Pakistan Journal of Biological Sciences.16:898–901.
4. Jones, CM (1995). Production of juvenile red claw crayfish, *Cherax quadricarinatus* (Decapoda: Parastacidae). Managed pond production trials. Aquaculture. 138:247-255.
5. Kotiya AS and Vadher KH (2021) Effect of different stocking density on growth and survival of *Litopenaeus vannamei* (Boone, 1931) in summer crop in province of Gujarat State, India. J. Exp. Zool. India. 24: 261- 275.
6. Langer S, Karlopia SK, Bakhtiyar Y (2011) Effect of different stocking densities on the growth and survival of freshwater prawn, *Macrobrachium rosenbergii* under laboratory conditions in Jammu. International Journal of Fisheries and Aquaculture Sciences.1(1):19–25.
7. Lopez-Uriostegui F, Jesus T, Ponce-Palafox, JL, Figueroa, MA, Mandujano B, Garcia-Ulloa M, Gomez SC, Vargasmachuca and Hector M(2014) Effect of Stocking Density on Growth and Survival of the Prawn *Macrobrachium tenellum* Cultured in a Cage-Pond System. North American Journal of Aquaculture. 76(2): 164-169.

8. Marlina, E and Panjaitan, I (2020) IOP Conf. Series: Earth and Environmental Science 537 (012048):1-5
9. Marques HLA, Lombardi JV and Boock MV (2000). Stocking densities for nursery phase culture of the freshwater prawn *M. rosenbergii* in cages. Aquaculture. 187: 613-623.
10. Nabil F, Hakim A, Desoki A, Azab A, Hasan, Y, Allam and Ahmed GA (2013). Effect of stocking density and probiotic dietary supplementation on growth performance, feed conversion and survival of postlarvae of the freshwater prawn *Macrobrachium rosenbergii*. Egypt. J. Aquat. Biol. and Fish.17(1):81-90.
11. Negrini C, Castro CS, Guimaraes AT, Frozza A, Kracizy R, Ballester EL (2017) Stocking density for freshwater prawn *Macrobrachium rosenbergii* (Decapoda, Palaemonidae) in biofloc system. Latin American Journal of Aquatic Research. 45: 891–899
12. Paul P, Rahman A, Hossain MM, Islam S, Mondal S and Haq M (2016). Effect of stocking density on the growth and production of freshwater prawn *Macrobrachium rosenbergii*. Int. J. Fish. Aquac. Sci. 6: 77-86.
13. Rouse, DB, Naggar, GOE and Mulla, MA (2007). Effects of stocking size and density of tilapia on *Macrobrachium rosenbergii* in polyculture. World mariculture society. 18:57-60pp.
14. Sherif-El MS and Mervat AM (2009). Effect of rearing systems Mono and Poly-Culture on the Performance of Freshwater Prawn *M.rosenbergii* Juveniles. Journal of Fisheries and Aquatic Science. 1-12.
15. Shrivastava V, Chadha NK, Koya MD, Lakra WS, Banerjee PS and Remya S (2017) Effect of Stocking Density on Growth and Survival of *Fenneropenaeus merguiensis* (de Man, 1888) Post Larvae. Int. J. Curr. Microbiol. App. Sci. 6: 1779-1789.
16. Smith TIJ and Sandifer PA (1979). Development and potential of nursery systems in the farming of Malaysian prawns, *Macrobrachium rosenbergii*. Proceedings of the World Mariculture Society. 10:364-384.
17. Sookying D, Silva FS, Allen, DD and Hanson TR (2011). Effects of stocking density on the performance of Pacific white shrimp *Litopenaeus vannamei* cultured under pond and outdoor tank conditions using a high soybean meal diet. Aquaculture. 319: 232–239.
18. Tantu AG, Salam S, Ishak M (2020) Vaname Shrimp Cultivation (*Litopenaeus vannamei*) on High Stocking Densities in Controlled Ponds. 11(583): 1-6
19. Zaki MA, Nour AA, Rahim MM and Srour TM (2004). Effect of stocking on survival, growth performance, feed utilization and production of marine shrimp *Penaeus semisulcatus* in earthen ponds. Egyptian Journal of Aquatic Research. 30(B): 429-442.