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Effect of Different Stocking Density on Growth and Survival of Monosex Tilapia Cage Culture in Perumpallam Reservoir, Tamil Nadu

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***Abstract*:** The study was carried out to assess the effect of stocking density on the growth and survival of GIF Tilapia (*Oreochromis niloticus)* for a period of 90 days from June to August 2016 in the Perumpallam reservoir, Erode District, Tamil Nadu. Uniform size tilapia fingerlings with an average weight of 11 g were released in three different cages with the stocking density of 40 50 and 60 /m^3. Fishes were fed with a commercial floating pellet feed containing 28% protein to observe the growth of the tilapia in cages. The present study demonstrated that 40 fish/m^3 was the best stocking density in terms of growth, food conversion ratio, and survival for tilapia culture in the cage culture and the experiment revealed that the low stocking density in the cage showed better growth than the high stocking density.

***Keywords*:** GIF Tilapia, Growth, Survival, Stocking density, Cage culture and Perumpallam dam

Fish culture in cages are age-old practice and it was first described by Lafont and Saveun, in 1951 in Kampuchea and Japan. In the early years, the cages were utilized to culture the freshwater fishes. Due to the increase of the interest in aquaculture activities in the world the industry continuously growing more rapidly than all other animal food-producing sectors in many countries and growing with an average annual growth of 4.5% during 2011 to 2018. When compared with only 2% for capture fisheries production and 5% for aquaculture production in the world (FAO 2020). Cage culture is used widely in fish production in most parts of the world and tilapias are farmed in more than 85 countries, especially in countries like the Philippines, Japan, Malaysia, Vietnam, Taiwan, U.S.A., Norway Federal Republic Germany, and Britain (Pillay and Kutty 2005). It is widely cultured in many tropical and subtropical countries of the world. The tilapia fishes are suitable for the cages due to their rapid growth rates, high tolerance to adverse environmental conditions, efficient feed conversion, ease of spawning, resistance to disease, and good consumer acceptance. Presently the annual fish yield from small, medium and large reservoirs is 100, 75, and 50 kg/ha, suggesting substantial scope to enhance fish yield through wild capture and culture-based fisheries in these water bodies. Cage culture practices have numerous advantages over other culture systems. By integrating the cage culture system into the aquatic ecosystem, carrying capacity per unit area is optimized because the free flow of current brings in water and removes metabolic wastes, excess feed, and faecal matter. The growing popularity of tilapia among consumers and the ever-increasing need to improve food production, impose the need to seek production alternatives to culture tilapia. Hence, the present study was conducted to observe the effects of different stocking densities on the growth and survival of tilapia in cage culture and to analyse a suitable stocking density.

MATERIAL AND METHODS

Study area: The present study was carried out in the Perumpallam dam located in the Latitude 11.56' and Longitude 77.30' of Erode district in Tamil Nadu with a total water spread area of 60 ha and an average depth of 21 feet.

Fish species: The *Oreochromis niloticus* (GIF Tilapia) seeds 2.0g to 3.0cm in size of 20,000 number was procured from the Department of Fisheries, Krishnagiri. The seeds were transported to the Aliyar seed farm in oxygen-aided plastic tanks. The seeds were acclimated and stocked with 50x20m and 20x10m size cement tanks in the Aliyar seed rearing centre for raising fish seeds from fry to fingerlings. The Gift tilapia late fry were fed with Rice bran protein 10 % and groundnut oil cake protein 25-30% @ 10 % of the body weight.

Experimental setup (Growth-out cages): The rectangular cages made of HDPE, measuring 6x4x3m (72m^3) were installed at the Perumpallam dam. The cages net was enclosed with floats and sinkers supported with cement concrete blocks on each side to withstand the cages in the water. The concrete blocks weight 40kg were used as 50

blocks total of 2 tons were used for 3 cages. The experiment was carried out in three stocking densities (40, 50 and 60 fishes /m^3) having three floating HDPE cages. Gift tilapia fingerlings with a uniform size (11 g) were stocked.

Feeding schedule: The average initial body weight of fingerlings was 12g. The commercial floating pellet feeds were supplied daily at the rate of 5 % of the bodyweight of stocked fingerlings and the sampling was done regularly at an interval of 10 days to adjust daily feeding and monitor the growth and survival of animals in the cages. The fishes were fed twice daily; half of the ration was given in the early morning from 6.30 am to 7.00 am and another half in the evening around 5.00 pm to 5.30 pm.

Water quality parameters: The water quality parameters such as pH, temperature, and dissolved oxygen were recorded each day during the experimental period. Water temperature was measured using a thermometer with an accuracy of 0.1^{0}C. The pH of the water was measured using a pH meter, the dissolved oxygen using a DO meter, and total Ammonia-N, Nitrite-N, and Nitrate-N were analyzed twice a week using water quality kits.

Sampling and growth parameters: The fishes were sampled at 10 days intervals. For every sampling, 10 fishes were randomly sampled from each cage and the weight of the individuals was recorded to the nearest gram in the field weighing balance. After 90 days of the rearing period, growth data of gift tilapia length and weight gain, mean length and mean weight gain, and Specific Growth Rate (SGR) were pooled for further analysis.

Data analysis: Data collected during the experiment were analyzed by using the following formula to evaluate the fish growth.

1. Length gain (mm) = Final length – Initial length
2. Weight gain = Final weight – Initial weight

$$\text{Mean length (gain/day(mm)} = \frac{\text{Final length – Initial length}}{\text{Experimental duration (days)}}$$

$$\text{Mean weight (gain/day(g)} = \frac{\text{Final weight – Initial weight}}{\text{Experimental duration (days)}}$$

$$\text{Specific Growth Rate (\%)} = \frac{\text{Ln Wt – Ln Wo}}{t} \times 100$$

Where,

Wt = Final mean wet weight; Wo = Initial mean wet weight

t =Duration of experiment; Ln = Natural log

The result of the present study was analyzed statistically using MS Excel Office, 2019.

RESULTS AND DISCUSSION

Water quality parameters: The water quality parameters were within the acceptable range of fish culture and all of them were more or less similar without any abrupt changes in any parameters of the cages (Table 1). The water quality parameters like water temperature, pH, dissolved oxygen, total alkalinity, Ammonia-N, Nitrite-N, and Nitrate-N were within the suitable ranges for tilapia culture in cages (Rashid 2008, Swann 2009).

Growth parameters: The highest weight of 192.5g/individual was observed in the cage with the lowest stocking density cage (40 Nos/m^3) and was 164.5 and 130 g/ individual stocking density cage of 40 and 50 per m^3 (Fig. 1). The specific growth rate, food conversion ratio, and survival rate were 11.30%, 2.12 kg, and 98% in the stocking density cage of 40 and 50 /m^3 followed by 10.60%, 2.45 kg, and 96% in the T2 cage and 9.19%, 2.84kg and 95% in the T3 cage respectively (Table 2). The result indicates that the lowest stocking density has the highest rate of SGR, FCR, and survival rate than the highest stocking density cages ie., 50/m^3, 60/m^3, and which shows an inverse relationship between final weight, weight gain, and stocking density. The present experimental findings were supported by the earlier reports concerning the SGR of the experiment (Roy 2002, Carro-Anzallota and McGinty 2007, Gibtan et al 2008, Rashid 2008, Alam 2009). The survival rate of the fish was

Table 1. Various water quality parameters of the experimental cages

Water quality parameters	Value range
Water temperature ^{o}C	28-33
pH	7.6-8.4
Dissolved oxygen (mg/l)	3.6-4.4
Total alkalinity mg/l	90-120
Ammonia- N (mg/l)	0.05-0.10
Nitrite –N (mg/l)	0.03-0.50
Nitrate-N (mg/l)	0.05-1.45

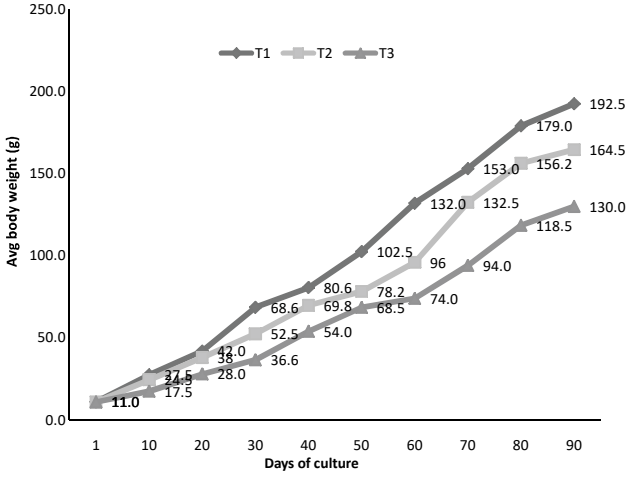

Fig. 1. Average bodyweight of GIF tilapia in different cages

Table 2. Growth parameters of Gift tilapia in three stocking densities

Treatment	Initial wt (g)	Final wt (g)	Final wt gain (g)	SGR (%)	FCR	Survival rate (%)
T1 (40/m^3)	11.0±1.73	192.5±1.45	13.5±0.06	11.30±0.39	2.12±0.08	98±1.08
T2 (50/m^3)	11.0±1.08	164.5±1.27	11.5±0.02	10.60±0.08	2.45±0.04	96±1.47
T3 (60/m^3)	11.0±1.26	130.0±0.90	8.30±0.01	9.19±0.01	2.84±0.02	95±1.35

the major problem in the cage culture and which has achieved the highest in the low stocking cage (T1). The present study revealed that the survival of the individual and stocking density is always expressed with an inverse relationship (Hasan 2007, Rashid 2008).

CONCLUSION

The present investigation, indicate that low stocking density provided the better growth rate and survival of GIF Tilapia production in cages and hence to increase the aquaculture fish production from natural reservoirs.

REFERENCES

Alam MN 2009. *Effect of stocking density on the growth and survival of mono-sex male tilapia (Oreochromis niloticus) fry (GIFT strain) in hapa*. MS Thesis. Department of Aquaculture, BAU, Mymensingh, pp. 40.

Carro-Anzalotta AE and McGinty AS 2007. Effects of stocking density on growth of Tilapia nilotica cultured in cages in ponds. *Journal of World Aquaculture Society* **17**: 52-57.

FAO 2020. The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome

Gibtan A, Getahun A and Mengistou A S 2008. Effect of stocking density on the growth performance and yield of Nile tilapia [*Oreochromis niloticus* (L.1758)] in a cage culture system in Lake Kuriftu, Ethiopia. *Aquaculture Research* **39**: 1450-1460.

Hasan SJ 2007. *Effects of stocking density on growth and production of GIFT tilapia* (*Oreochromis niloticus*). MS Thesis. Department of Aquaculture, BAU, Mymensingh, pp. 54

Rashid MH 2008. *Effect of stocking density on the growth, survival, and production of mono-sex GIFT tilapia (Oreochromis niloticus) reared in a recirculatory system in cisterns*. MS Thesis. Department of Aquaculture, BAU, Mymensingh, pp. 68.

Roy R 2002. *Effect of stocking density on the growth and survival of GIFT tilapia fed on a formulated die*t. MS Thesis. Department of Aquaculture, BAU, Mymensingh,pp. 63.

Pillay TVR and Kutty MN 2005. *Aquaculture: Principles and Practices*, Second Edition. Blackwell Publishing Ltd, Oxford, England, pp. 624.

Swann L 1997. *A fish farmer's guide to understanding water quality.* Department of animal science, Illinois-Indiana Sea Grant Program, Purdue university, pp 1-8.

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