J Krishi Vigyan 2023, 11 (Supple) : 65-69 DOI : 10.5958/2349-4433.2023.00087.9

Effect of Live Feed (Artemia Nauplii) and Farm-Made Feed on Growth and Survival of Zebrafish, *Danio rerio* Fry

M Mohamed Faizullah* S S Santhoshkumar and S Archana
TNJFU- Dr.M.G.R Fisheries College and Research Institute, Thalainayeru

ABSTRACT

In the present study, the effect of live feed (Artemia Nauplii) and farm-made feed on the growth and survival of the Zebrafish, *Danio rario* fry was investigated. The mean value of water temperature, pH, dissolved oxygen, total alkalinity, ammonia (NH_3) nitrite (NO_2), and nitrate (NO_3) in live feed (Artemia Nauplii) in the experimental tank was observed as 28°C, 8.4, 4.5 mg/l, 140 mg/l, 0.02mg/l, 0.04 mg/ and 0.12 mg/l respectively. Whereas the farm-made feed tank registered the mean value of water temperature 28.5°C, pH 8.5, dissolved oxygen 4.0mg/l, Ammonia (NH_3) 0.09mg/l, Nitrite (NO_2) 0.06 mg/l. The specific growth rate was a maximum of 405.28 in the live feed tank than in the farm-made feed tank 351.88. The maximum SGR is 405.28. The highest survival 98% was achieved in the live feed experiment tank than in the farm-made feed tank

Key Words: Artemia, Farm made feed, Growth rate, Survival rate and Zebrafish fry

INTRODUCTION

Zebrafish, *Danio rerio* (Hamilton, 1822) is a small tropical freshwater cyprinid. The Zebrafish is omnivorous. Its natural diet consists primarily of zooplankton and insects, although phytoplankton, filamentous algae, spores, invertebrate eggs, detritus, sand, and mud have also been reported from gut content analysis (Spence *et al,* 2008). However, several studies reported that fish fed solely on formulated diets have poor percent survival and low growth rate (Finn and Kapoor, 2008) whereas other researchers insist that a combination of live food and formulated diets in the early stage may provide a higher growth rate and percent survival than live food (Puello-Cruz *et al,* 2010). In nature the early stages of fish and crustaceans feed on a broad spectrum of zoo and phytoplankton, providing a complete and balanced diet. The heterogeneous size distribution of wild zooplankton makes it suitable for all target species. Zooplankton has been widely used for rearing fish larval stages, and most studies indicated that the fry performed better when fed live zooplankton than dry artificial diets (Sivakumar, 2005). In aquaculture, an increasing demand exists for live zooplankton in spite of the availability of Artemia nauplii (Pagano *et al,* 2000). The Zooplankton forms ideal food usually in the larval stages of prawns and in the early larval stages of fishes (Murugan and Moorthy, 1990). Being a natural food of fish and prawn larvae, zooplankton collected from natural resources are used as a diet for the larvae of ornamental fish in many hatcheries (Altaff *et al,* 2002) Keeping this in view, the aim of the present study was to evaluate the effect of the live feed (Artemia) and farm-made feed on growth and Survival of Zebra Fish, *Danio rario* fry

MATERIALS AND METHODS

The present study was conducted in the Department of Aquaculture, Dr. MGR Fisheries College and Research Institute, Thalainayeru. The study was undertaken for a period of 25 days.

Experimental Fish

Four hundred numbers of zebrafish, (*Danio rerio*) were procured from a commercial ornamental fish farm at Thanjavur and transported with oxygen-

Corresponding Author's Email: faizullahmfsc@gmail.com

filled plastic bags. All the zebra fish fry were kept in the circular FRP tanks (600 litre capacity) with good aeration for 1hr to acclimatize the fish. No feeding was done for 24 hrs. Then the fish were released in the Live feed FRP tank and Farm made feed FRP tanks equally i.e. 100 Nos in each tank.

Experimental Setup

Four circular FRP tanks with a 600 litre/ tank capacity were used for the present study. The Experimental system consists of two FRP tanks that were used as Live feed (Artemia Nauplii), while another two FRP tanks were used as Farm made feed tanks. All four tanks were filled with Freshwater from a nearby bore well and labeled the experimental tanks. Each tank was stocked with 100 Nos. of zebra fish fry with good aeration and was given by air pump motor for 24 hrs during the experimental period.

Culture of Live feed (Artemia Nauplii)

Place a small quantity of Artemia dry cysts in a conical shape container filled with saline water ranging from 25 to 28ppt and provide continuous vigorous aeration for 24hrs. Decapsulation of the artemia cysts is essential for the disinfection of microbes, removal of the external layer, and improving the hatching efficiency. Take 2-5 g of hydrated artemia cysts and transfer them into a 500ml measuring beaker and add 15ml of decapsulating solution with 85 ml of seawater. When the cysts turn orange in colour, wash them with running freshwater & incubate them in seawater for 24 hr. After hatching of nauplii within 24 hrs, the airflow into the tank is turned off to let the tank settle for 10 minutes. The nauplii attracted by light get concentrated at the bottom and are harvested given the live feed twice a day

Preparation of Farm-made feed

Locally available ingredients such as Rice bran, Wheat bran, Fish meal, and Groundnut oil cake were used to prepare the (28% Crude Protein) farm-made feed. All the ingredients were grinded well to make a fine powder and a small amount of water was added to make a dough. Then the feed dough was placed in the steam cooker for 45 mins. The dough was cooled and dried at room temperature. After 24 hrs, store the feed in an airtight container.

Growth Parameters

Before stocking the zebrafish fry (*Danio rerio*), in Live feed diet tanks and Farm made feed diet tanks a sample of 20 nos of zebrafish fry was used to assess the total length in mm and average body weight in milligram. The Growth of zebrafish was assessed by measuring the length and weight of ten zebra fish fry from live feed (Artemia Nauplii) and farm-made feed experimental tanks by random sampling with scoop net during 1st, 10th, and 20th days of culture. From the pooled growth data of zebrafish length and weight gain, mean length and mean weight gain, and Specific Growth Rate (SGR) were assessed using the following formula.

Length gain (mm)=Final length-Initial length

weight gain=Final weight-Initial weight

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

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

Where,

Wt = Final mean wet weight

Ln = natural log

Wo = Initial mean wet weight

t = Duration of experiment

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

Water Quality Parameters

During the experimental period, water quality parameters such as temperature, dissolved oxygen, pH, and total alkalinity were recorded two times a day (morning and evening) in the culture systems. Water temperature was measured using a thermometer with an accuracy of 0.1^{o}C. The pH of the water was measured using the laboratory model

systronic pH meter. Modified/Winkler's titration method APHA14 was adopted to estimate the dissolved oxygen. Total alkalinity was determined as per the method described in APHA14. Ammonia (NH_3) nitrite (NO_2) nitrate (NO_3) and water hardness were assessed twice a week. Ammonia (NH_3) nitrite (NO_2) nitrate (NO_3) and water hardness were determined as per the standard methods APHA14.

RESULTS AND DISCUSSION

Water Quality Parameters

The water quality analysis was also performed over the experimental period of 20 days, and physico chemical water quality parameters were recorded in Table 1. The parameters such as temperature, dissolved oxygen, pH, alkalinity, hardness, Ammonia, Nitrite, Nitrate, etc. Water quality should be maintained at optimum levels for the normal development of zebrafish fry. The mean value of experimental Live feed (Artemia Nauplii) Experimental tanks water temperature (28°C), pH (8.4), Dissolved Oxygen (4.5 mg/l), Total alkalinity (140mg/l), Ammonia-NH_3, Nitrite NO_2 (0.02 mg/l) Nitrite-NO_3 (1.15 mg/l), and Water hardness (220 mg/l) was lower than farm-made feed experimental tanks (Table 1).

Growth parameters

The Specific growth rate (SGR) of Zebrafish fry in the live feed experimental tank was from a minimum of 379.68 to 405.29 (Table 2). The Specific growth rate (SGR) of Zebra fish fry in the farm-made feed Experimental tank was from a minimum of 328.60 to 351.88 (Table3). Rani *et al* (2020) reported that a significant increase in weight (2.24±0.3 g) and length (2.09±0.4 cm) and high SGR was recorded in fry fed on planktons in contrast to those fed on supplementary feed. The present finding was almost coordinated with earlier studies on *Clarias batrachus* (Giri *et al,* 2002), *Pleteobagrus fulvidraco* (Wang *et al,* 2005). Fish larvae have been reported to prefer live feed over formulated artificial feed in various studies (Murugesan *et al*, 2010; Bakhtiyar *et al,* 2011). Kadhar *et al,* (2014) observed the effect of live feed on the survival and growth of fry of *Catla catla* and reported that fish fry fed with cyclopods showed significantly ($P< 0.001$) better growth (26.03 ± 1.88 mm, weight 61.07 ± 3.53mg) than those fed with artificial and mixed diets. Sivakumar (2005) observed that live feed has been widely used for nursery-rearing fish larval stages also indicating that the fry accomplished better when fed live zooplankton than formulated artificial feed.

Survival Rate

The survival rate of zebrafish fry in the live feed experimental tank was 99% and, in the farm-made feed experimental tank, it was 97%. Rani *et al* (2020) reported that Live feed proved to enhance the survival percentage of fry (95%) against

Table 1. The water quality parameters of the Live feed and Farm made feed experimental tanks

Water quality parameters	Live feed (Artemia Nauplii)			Farm made feed		
	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Water Temperature (°C)	26.5±1.24	27.0±1.35	28.0±1.47	26.5±65	27.5±1.23	28.5±1.65
Ph	8.0±0.02	8.3±0.02	8.4±0.02	8.2±0.04	8.4±0.28	8.5±0.06
Dissolved Oxygen (mg/l)	4.2±0.01	4.6±0.04	4.5±0.02	4.0±0.02	4.2±0.09	4.0±0.08
Total alkalinity (mg/l)	120±1.65	160±1.65	140±1.98	160±1.87	180±1.65	200±2.01
Water Hardness (mg/l)	140±1.78	180±1.98	220±2.45	160±1.98	200±2.04	240±2.65
Ammonia (NH_3) (mg/l)	0.02±0.01	0.04±0.01	0.02±0.01	0.06±0.01	0.08±0.01	0.09±0.01
Nitrite (NO_2) (mg/l)	0.01±0.01	0.06±0.01	0.04±0.01	0.04±0.01	0.07±0.01	0.06±0.01
Nitrate (NO_3) (mg/l)	0.08±0.01	0.14±0.01	0.12±0.01	0.06±0.01	0.08±0.02	0.10±0.01

Table 2. Length, weight and other growth parameters during zebrafish, live feed and Farm Made Feed experimental tanks

Live feed							
Days of culture	**Length (mm)**	**Weight (mg)**	**Length gain (mm)**	**Weight gain (mg)**	**Mean length gain (mm)**	**Mean weight gain (mg)**	**Specific growth rate**
1	10±0.16	10±0.78	--	--	--	--	--
10	14±0.28	50±2.05	4±0.02	40±1.24	3.8±0.08	36.5±1.65	379.68±3.45
20	16±0.47	70±1.45	2±0.01	20±1.08	1.7±0.02	18.4±1.47	405.28±3.87
Farm Made Feed							
1	10±0.02	10±0.01	--	--	--	--	--
10	14±0.12	30±1.24	4±0.01	20±0.04	3.5±0.02	28.4±1.24	328.60±3.45
20	16±0.68	40±1.87	2±0.01	10±0.02	1.8±0.01	38.7±1.87	351.88±3.87

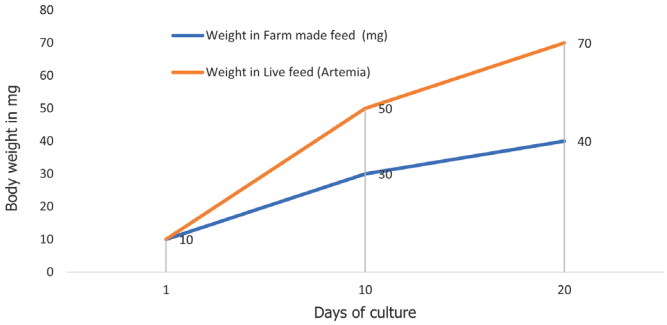

Figure 1. The Average body weight of Zerbrafish in Live feed (Artemia Nauplii) and Farm Made feed experimental tanks

artificial feed (91%). Giri *et al* (2002) reported that, the highest survival of Freshwater sharks, *Wallago attu* larvae fed on live zooplankton and dry feed compared to live zooplankton feed alone.

CONCLUSION

A major factor in the cultivation of the early stages of zebrafish fry is the availability of artemia live food organisms in sufficient quantity. Farm-made feed, also known as supplement feed, has been widely used in aquaculture because of its easy availability and low storage maintenance. The present study indicated a significant effect of live feed on the growth and survival of zebrafish fry as compared to farm-made feed. Thus, it can be concluded that live feed is better suited than farm-made feed for sustainable and economically viable fish culture.

REFERENCES

Altaff K, Raghunathan M B, Suresh Kumar R and Moorty S (2002). Harvest of zooplankton live food for ornamental fishes from natural ponds in north Chennai, Tamilnadu. *Indian Hydrobiol* 5:115-118.

APHA, (1998). A standard method for the examination of water and waste water APHA, AWWA, WPFC, 16Ed, New York.

Bakhtiyar Y, Langer S, Karlopia, S K and Ahmed I (2011). Growth, Survival, and proximate body composition of *Labeo rohita* larvae fed artificial food and natural food organisms under laboratory condition. *Int J Fisheries Aquac* **3**(6):114-117

Finn R N and Kapoor B G (2008*). Fish larval physiology*. Enfield: Science Publishers.

Giri S S, Sahoo S K, SHU B B, Sahu A K, Mohanty S N, Mohanty P K and Ayyapan S (2002). Larval survival and growth in *Wallago attu* (Bloch and Schneider): Effect of light, photoperiod and feeding regimes. *Aquac* **213**:157-161

Kadhar A, Kumar A, Ali J and Akbar J (2014). Studies on the survival and growth of fry of *Catla catla* (Hamilton, 1922) using live feed. *J Marine Biol* **1:** 7.

Murugan N and Moorthy RK (1990). Some trends in culture of Cladocera, in Proceedings of the 2nd Indian Fishery Symposium ,33-37.

Murugesan S, Sivasubramanian V and Altaff K (2010). Nutritional evaluation and culture of freshwater live food organisms on *Catla catla*. *J Algal Biomass Utilization*1(3):82-103.

Puello-Cruz A C, Velasco-Blanco G, Martínez-Rodríguez I E, Felix-Ramos E and Voltolina D (2010). Growth and survival of Siamese fighting, Betta splendens, larvae at

low salinity and with different diets. *J World Aquac Soc* **1**(5):823-828

Pagano M, Saint-Jean L, Arfi R, Bouvy M and Shep H. (2000). Population growth capacities and regulatory factors in monospecific cultures of the *cladocerans Moina micrura* and *Diaphanosoma excisum* and the copepod T. decipiens from Cote d'Ivoire (West Africa). *Aquat Living Resour* **13**(3):163-172.

Spence R (2008). *The behaviour and ecology of the zebrafish, Danio rerio*. PhD Thesis, University of Leiceste.

Sivakumar K (2005). *Freshwater fish and prawn larval rearing using indigenous live-feed* [Ph.D. thesis], University of Madras, Tamil Nadu, India.

Wang C, Xie S, Zheng K, Zhu X, Lie W, Yang Y and Liu J (2005). Effects of live food and formulated diets on survival, growth, and protein content of first-feeding larvae of *Plelteobagrus fulvidraco. J App. Ichthyol* **21**:210-214

Received on 22/8/2023 *Accepted on 2/10/2023*