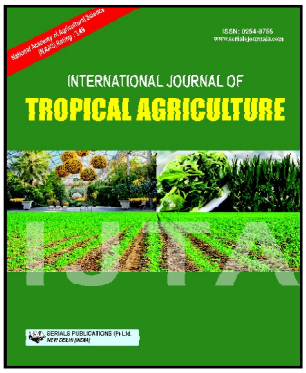

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Effect of different stocking densities on Growth performance of *Catla catla* fry reared in Harvested Rain water in cement tank

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Abstract: The study was undertaken with an objective to evaluate the effect of harvested rain water on growth and survival of *Catla catla* fry to fingerling reared in cement tank. In this Experiment the observations were taken on length gain, weight gain, specific growth rate and survival during the rearing period. Catla, fry of initial length length 21.64± 0.30 mm and average weight 77.14 ± 1.17 mg were reared at the stocking densities i.e. (T_1) 2 fry L^{-1}, (T_2) 4 fry L^{-1}, (T_3) 8 fry L^{-1}, and (T_4)12 fry $L^{-1}$for a period of 30 days in cement tanks (2 x 1 x 1m) filled with harvested rain water. Fry were fed Groundnut Oil Cake and rice bran at ratio (1:1) during this period, the fry was fed with live plankton 150, 180, 225 and 260 mg day^{-1} for first 15 days. Daily water exchange of 10-15% was done from each tank. The maximum average length gain (130.18 ± 3.94%), weight gain (1066.70 ± 3.31 %), specific growth rate (3.56 ± 0.004 %) and survival (91.32 ± 0.42 %) were recorded for spawn reared at density of 2 fry L^{-1} and statistical significantly (P<0.05) among the treatments. Growth and survival was decreased with increase in stocking densities. The growth of fry to fingerling was observed to be decrease with increase in the stocking density. During experiment, the observation on the water quality revealed that the dissolved oxygen value were decrease with increase in stocking density. Whereas, the value of ammonia-nitrogen, nitrite-nitrogen, and nitrate-nitrogen increased with the increase in the stocking density over the culture period. The present investigation indicated that harvested rain water showed the better growth and survival of *C. catla* fry to fingerling with stocking density of 2 fry L^{-1} reared for 30 days in cement tank.

Keywords: *Catla catla,* spawn, fry, aquaculture, harvested rain water, cement tank

INTRODUCTION

Aquaculture in India is almost synonymous to carp culture, since the latter alone contributes over 85% of the total aquaculture production of the country. It mainly involves Indian major carps such as Catla (*Catla catla*), rohu (*Labeo rohita*) and mrigal (*Cirrhinus*

mrigala) and exotic carps such as silver carp (*Hypophthalmichthys molitrix*), grass carp (*Ctenopharyngodon idella*) and common carp (*Cyprinus carpio*) (Ayyappan, 2011).

In Konkan region in Maharshtra state, land resources are limited. Prolonged monsoon season are in the konkan region. The Konkan region of Maharashtra falls under high rainfall zone, the pre-monsoon showers accounts for 25% of annual rainfall, while bulk of the rainfall (67%) occurs during June-September, which constitutes the monsoon season 3-4 months (Samuel and Satapathy 2008). The maximum rain water is drained and mixed in sea water. In this situation, it is necessary to make efforts for harvesting of rain water which can be used for production of freshwater fish seed. Limited information available on the direct use of harvested rain water for nursery rearing of fish fry to fingerling in cement tanks. However, no study has been found on the nursery rearing of freshwater fish fry to fingerling with harvested rain water in cement tank. The aim of the study was to develop technique for fingerling production of freshwater fish, *C. catla* using harvested rain water in cement tank.

MATERIALS AND METHODS

Study area

The experimental trials were conducted from June to October, 2011 at Wada Mirya finfish and shellfish hatchery of Marine Biological Research Station, (Dr. Balasaheb Sawant Konkan Agricultural University), Ratnagiri. MS, India.

Rain water harvesting method

The rain water falling on the roof of the hatchery building was collected in cement tank through (U shaped) roof gutters attached to the edges of building roof (Sehgal 2008).The roof gutters were fitted to PVC pipe for collecting the harvested water in large cement storage tank**.** The bolting silk of 40 um mesh size bag were fitted to PVC pipe to filtered the harvested rain water**.** The total catchment area of the roof was 432 m^2. The first week of monsoon the roof was cleaned with rain water and then in second week of monsoon rain water were harvested and stored in three different rectangular cement tanks of total storage capacity 1, 50,000 l. As per the requirement of harvested rain water were taken into the experimental cement tank.

Stocking and Feeding

The healthy *C. catla* fry with average length 21.64± 0.30 mm and average weight 77.14 ± 1.17 mg were stocked at different stocking densities such as 2 fry $L^{-1}(T_1)$, 4 fry $L^{-1}(T_2)$, 8 fry $L^{-1}(T_3)$, and 12 fry $L^{-1}(T_4)$ fry per tank.

Fry fed by GOC and rice bran (1:1) at the rate of 20% of the body weight for 30 days. In addition to that fry was fed with150 mg day^{-1}, exogenous live plankton and zooplankton, (Sharma, 2003). The feed was given to the fry three times a day in equal proportion at 08.00 hrs, 13.00 hrs and 18.00 hrs.

Water parameters

Water quality parameter via. temperature, pH, dissolved oxygen (DO), alkalinity (bicarbonate and carbonate), hardness (calcium and magnesium) were measured on daily basis while analysis of other parameters like ammonia, nitrate and nitrite were done on weekly basis as per standard methods (Boyd, 1982).

Growth parameters

At initial and final of the experimental period, the fishes were counted from each replicate and their individual length and weight were recorded. Sampling was carried out at interval of 7 days to observe the growth of fishes. At the time of sampling, 75 numbers of fishes from each experimental tank were randomly collected for recording the length and weight of fishes. At the end of the experiment, the

survived fishes from each experimental tank were counted and calculated survival of the fishes. The average value of length and weight were recorded for each treatment of the experiment for analysis of growth parameters, such as length gain, weight gain, and specific growth rate (SGR) and survival (%) were calculated by using standard formulae (Sahu et al. 2007).

Statistical Analysis

The average length, weight, specific growth rate and survival of the fry of Catla for each replicate were calculated. Data obtained from the experiment for growth parameters and survival was analyzed by one way ANOVA. Differences were considered significant at an alpha level of 0.05, Student's Newman Keul multiple range tests.

RESULTS AND DISCUSSION

The rain water falling on the roof of the hatchery building was collected and stored in the large cement tanks with storage capacity 150000 lit. As per the requirement of harvested rain water were taken into the experimental cement tanks.

Water quality of harvested rain water

In the experiment of harvested rain water the dissolved oxygen, temperature, pH, calcium hardness, magnesium hardness, carbonate alkalinity, bicarbonate alkalinity, ammonia-nitrogen, nitrite-nitrogen, and nitrate-nitrogen value of ranged from 4.32-4.52 mg L^{-1}, 23.3-24.2^{0}C, 7.3-7.6, 14-15 mg L^{-1} as $CaCO_3$, 18.3-19.2 mg L^{-1}as $CaCO_3$, 16.15-16.8 mg L^{-1} as $CaCO_3$, 18.1-19 mg L^{-1} as $CaCO_3$, 0.003-0.058 mg L^{-1}, 0.002-0.005 mg L^{-1} and 0.20-0.47 mg L^{-1}, respectively.

The live mixed two group of phytoplankton viz Chlorophyta and Cyanophyta were dominant, while group of zooplankton viz Rotifera, Cladocera (*moina* and *daphnia*), Copepoda and Protozoa were dominated culture system.

The temperature value in present study of harvested rain water ranged between 23.3-24.2^{0}C, which was found to be comparative with (Huang and Chiu, 1997); 23-30 ^{0}C, (El-Sayed, 2002); 24-30 ^{0}C, (Kumaraiah and Rao 2002); 28-32 ^{0}C, (Bombeo et al, 2002); 21-29.7 ^{0}C, (Szkudlarek and Zakes, 2002); 29-31 ^{0}C, Sahu et al (2007); 21 ± 0.3^{0}C, (Rahman et al, 2005); 27^{0}C, (Mohanty, 2004); 26.8-31.9^{0}C, (Rahman et al, 2009); 29.20-30.84 ^{0}C.

The pH ranged from 7.3-7.6 in harvested rain water. The poor growth performance at pH< 6.5 for cultured species (Miao, 1992) found that higher stocking density was accompanied by lower pH and suggested that low pH affects the growth and survival of fish. In the first experiment pH increased from acidic to alkaline in harvested rain water that was found to result in faster growth of *C. catla* fry to fingerling stage.

Dissolved oxygen varied range from 4.32-4.52 mg L^{-1} in harvested rain water. The value of dissolved oxygen were decreased with increased stocking density the results comparable with (Sharma and Chakrabarti, 2003) the similar result were found in glass aquaria with recirculatry system. The low dissolved oxygen results in water quality changes that play an important role in affecting growth and survival of fish (Miao, 1992).

The value of calcium hardness range from 14-15 mg L^{-1} in harvested rain water. In the experiment calcium hardness and magnesium hardness range18.3-19.2 mg L^{-1} in harvested rain water increased with the culture period and stocking density but was within the optimum range to better growth was recorded in the experimental period.

The value of carbonate alkalinity range from 16.15-16.80 mg L^{-1} in harvested rain water. In the experiment carbonate and bicarbonate18.1-19.0 mg L^{-1}in harvested rain water increased with the culture period and stocking density but was within the optimum range.

The value of Ammonia-Nitrogen (NH_3-N) range from 0.003-0.058 mg L^{-1} in harvested rain water. The increase in the level of ammonia with increase in stocking density was observed in the experiment. These increasing level of ammonia (NH_3-N) might be reduced with cleaning and increase water exchange at respective days for each density to obtained better production. The increased values of ammonia with the increase in the stocking density were reported by (Sharma and Chakrabarti, 1998, 2003; and Edward *et al.* 2010).

The value of Nitrite-Nitrogen (NO_2-N) range from 0.002-0.005 mg L^{-1}in harvested rain water. In the experiment Nitrite-Nitrogen (NO_2-N) and Nitrate-Nitrogen (NO_3-N) 0.20-0.47 mg L^{-1} in harvested rain water increased with the culture period and stocking density. The proper cleaning and the increase water exchange from this period onward for the respective density might improve the water quality and production. The increase value of nitrite with increase in the stocking density were reported by (Sharma and Chakrabarti, 1998, 2003; Rahman *et al.,* 2005). The results of the present study are in agreement with the results of the above mentioned studies.

Growth performance

The results of Length gain, Weight gain, specific growth rate and survival of *C. catla* fry stocked at four different densities, i.e. T_1 (2 fry L^{-1}), T_2 (4 fry L^{-1}), T_3 (8 fry L^{-1}), and T_4 (12 fry L^{-1}) in harvested rain water are presented in figure 1.

Fig. 1 Length gain, Weight gain, specific growth rate and survival of *C. catla* fry in harvested rain water

The maximum average length gain of 130.18 ± 3.94% were observed in T_1 Whereas T_4 showed the minimum average length gain of 79.83 ± 2.65%. The maximum average weight gain of 1066.70 ± 3.31 % were observed in T_1. Whereas T_4 showed the average weight gain of 507.61 ± 9.77%. The maximum specific growth rate of 3.56 ± 0.004% was observed in T_1 Whereas T_4 showed the minimum specific growth of 2.62 ± 0.023%. The maximum survival of 91.32 ± 0.42% were observed in T_1 Whereas T_4 showed the minimum survival of 59.94

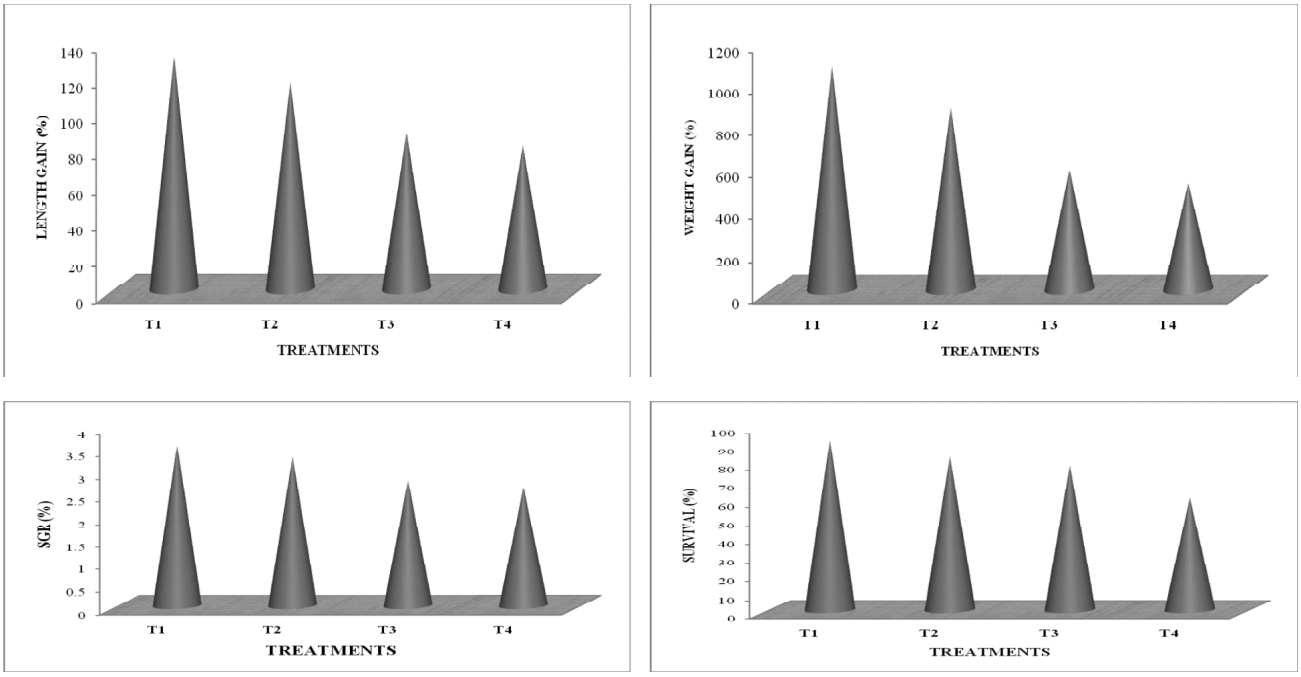

Figure 1: Length gain, Weight gain, specific growth rate and survival of *C. catla* fry in harvested rain water

± 0.09%. The average length gain, average weight gain, specific growth rate and survival showed significant differences with T_1 (2 fry L^{-1}), as compared to), T_2 (4 fry L^{-1}), T_3 (8 fry L^{-1}), and T_4 (12 fry L^{-1}).

CONCLUSION

The stocking density of fry of *C. catla* at the rate of 2 no l^{-1} achieved better growth and survival in harvested rain water in cement tank. There was no significantly changes occurred on water quality parameters. The water quality parameters were with optimum range during experiment. It is concluded that, the harvested rain water would be the low cost alternative for production of freshwater fish seed for sustainable development of small scale freshwater fish farming.

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