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Comparison of Controlled Nursery Rearing of Hybrid Tilapia Seeds in Different Culture System

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ABSTRACT

The experiment was conducted to find out the best nursery rearing system for hybrid tilapia young fry. Quality fingerlings in tilapia are very important for initial seed rearing. For this reason it is advisable for farmers to generate their own fingerlings if they cannot ascertain the quality of those from other sources. Poor fingerlings result in poor harvests. Developing a best nursery rearing system can meet the demand of fingerling required by farmers.

Nursery rearing of hybrid tilapia young fry (Red strain) was undertaken in two types of rearing systems for 21 days. Young fry of hybrid tilapia (0.12 ± 0.019 g ABW) were stocked in hapa at a stocking density of 0.87 fish/lit and in 5 aquarium tanks at a stocking density of 0.88 fish/lit. Crumble feed of 30% CP was given per day 7 times in 1st week and 6 times in 2ndweek and 5 times in 3rd week in both hapa and tank fishes.

The physico-chemical parameters of hapa and aquarium tank were taken every day. Do, pH, TDS, alkalinity and temperature were higher in hapa than tank water, ammonia is found higher (0.5-1 mg/lit) in aquarium tank system. After 21 days of trial, hapa stocked fishes had a weight gain of 3.48 g, while the fishes in aquarium tank had weight gain of 2.58 g.

The survival rate in hapa was 97% and in aquarium tank was 85%. The hapa rearing resulted in 74% more growth than in the glass aquarium tank. The final ABW of fishes reared in hapa was 3.6 g while that of aquarium tanks was 2.7 g. The body colour of the fishes in hapa was brighter than the tank of fishes.

INTRODUCTION

Tilapias are cichlids and native to Africa. They have originated from the tropical and subtropical parts of Africa but are now farmed throughout the world. Tilapia areshaped like snapper but can be identified by an interrupted lateral line, which is a characteristic of cichlid family. Tilapia group consists of three important genera, Oreochromis, Sarotherodon and Tilapia. Several characteristics distinguish these three genera, but the most important onerelates to reproductive behavior. Tilapia genus are commonly known as speckled tilapias and comprise about 42 species, while members of 37 species of Oreochromis are commonly known as blue tilapias and ten members of Sarotherodon are known as brush tooth tilapias [1]. Species of both Oreochromis and Sarotherodon are mouth brooders, eggs are fertilized in the nest but parents immediately pick up the eggs in their mouths and hold them during egg incubation. They continue to hold the fry in their mouths for several days after hatching. In Oreochromis species, only the females practice mouth brooding, while in Sarotherodon species either the male or both male and female are mouth brooders.

Tilapias are among the most important warm water fishes used for aquaculture production. They earned the title "the aquatic chicken" because of their fast-growing nature, ability to survive in poor water conditions, accepting a wide range of feeds, and breed easily in captivity. Among tilapia species, the Nile tilapia, Oreochromis niloticus and its hybrids, is the most important cultured fish species.

The Red tilapia hybrids, produced first time in Taiwan through the interspecific cross of O. mossambicus albino and O. Nilotic us are providing the 3rdgeneration of tilapias combining favored colors with other desirable features of tilapias. They are mutants and it was first produced in Taiwan during late 1960s. It was a cross between a mutant reddish-orange female Mozambique tilapia and a normal male Nile tilapiaand it has been called Taiwanese red tilapia. From the tilapia farmer's perspective, tilapia required three phase to reach marketable size i.e., hatching, rearing and grow out. Rearing, or grow-out, is the part of tilapia farming that picks up after the hatchery has raised them to fingerling size. At this stage, the tilapia farmer's goal is to raise the tilapia to harvest size quickly, economically, and in good health.

During rearing or nursery phase most required environment factor is clean water, oxygen, food, light and room to swim. Under this environment tilapia will stay healthy and grow fast. The art of tilapia farming is to understand each of these needs, and then find a way to provide them in sufficient quantities [2]. The problem is that each of these five needs comes with a myriad of potentially complicated questions, and solutions.

The present experiment was undertaken to know the impact of the rearing system on the growth and survival of young fry of red strain of Tilapia.

MATERIALS AND METHODS

Study location and period

The experiment was conducted at the "Thanjavur Centre for Sustainable Aquaculture''. While the hapa rearing was done in the freshwater tank in the Centre, the aquarium tank rearing was done in the indoor wet lab of the Centre.

Experimental design

The experiment was conducted in two experiment system (hapa and glass aquarium tank) with same ABW (0.12 ± 0.019 g) and same stocking density (0.88 fish/lit) for red tilapia young fry nursery rearing. Red tilapia spawn was stocked in hapa (1.5 mL × 1 mB × 1 mD) at a stocking density of 0.87 fish/lit and 5 glass aquarium tanks (each measuring 1.2 mL × 0.5 mB × 0.5 mD) at a stocking density of 0.88 fish/lit. Nylon screen hapa of No. 40 was used for red tilapia rearing in hapa system. The volume of the 5 aquarium tank was kept same with the volume of hapa that is 1 m^3.

Collection and Stocking of spawn:

Hybrid tilapia (red strain) spawn were collected from the "Krishnagiri Centre for Sustainable Aquaculture". During stocking sufficient care was taken for conditioning and acclimatizing the seeds to the water. The physico-chemical condition of the pond water and initial weight and lengthwere recorded.

Selection of feed

Commercial crumble feeds (M/s Growell) was selected for the present experiment. Selection of feeds size were done according to the mouth size of fry that is (0.6 mm).The proximate compositions of "Growell feed" are given in (Table 1). The feed was given to the fishes as per the advice of the feed manufacturer, which is given in (Table 2).

Table 1. Proximate composition of feed selected.

Feed size	Crude Protein % Min	Crude Fat % Min	Crude Fiber % Max
0.6 mm	30	0.6	3

Table 2. Feeding strategy adopted.

Culture period (days)	Size of supplied feed	Feeding frequency	Feeding rate (% ABW)
0-7	0.6 mm	7 time	10%
7-14	0.6 mm	6 time	10%
14-21	0.6 mm	5 time	10%

Recording of hydro biological parameters

Water temperature was recorded on the spot with the help of an ordinary thermometer graduated in centigrade scale (Thermometer 1100 cM dimple). Dissolve Oxygen of the pond water was recorded with the help of a dissolved oxygen meter (LMDO-50 DO model). pH was recorded with the of a pH meter (LMPH-12).Alkalinity was measured with titration method. TDS was recorded with the help of TDS meter. Ammonia was recorded with the help of double bean spectrophotometer (Model LT-2802). Nitrite and Nitrate were recorded with the help of double bean spectrophotometer (Model LT-2802).

STATISTIC ALANALYSIS

Data was entered into SPSS spreadsheet (version 20) for statistical inferences. All data were subjected to independent t-test analysis of means to check for significant differences between treatments using SPSS.

RESULT

Water quality parameters

The average mean values of water quality parameters during the experimental period are presented in (Table 3) (Figure 1).

Growth performance of the fishes

The growth performance of fish in different treatments were calculated and shown in (Table 4).

Table 3. Average (Mean ± SE) values of water quality parameters in two different treatments throughout the study period.

Water quality parameters	Hapa	Glass aquarium tank
Temperature (°c)	29.72 ± 0.24	27.45 ± 0.22
Dissolved oxygen (mg/l)	4.14 ± 0.04	3.23 ± 0.03
pH	7.65 ± 0.76	7.11 ± 0.71
Alkalinity (mg/l)	82.39 ± 8.2	54.31 ± 5.4
TDS (ppt)	0.37 ± 0.03	0.52 ± 0.05
Ammonia (mg/l)	0.25 ± 0.02	0.5 ± 0.05

Nitrite (mg/l)	-	0.25 ± 0.01
Nitrate (mg/l)	-	-

Figure 1. Comparison water quality parameters of hapa and glass aquarium tank system.

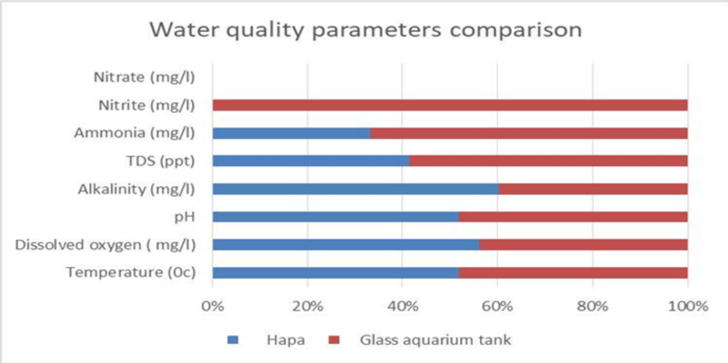

Table 4. Average (Mean ± SE) values of growth parameters of hybrid tilapia observed in different treatments throughout the study period.

Parameters	Hapa	Glass aquarium tank
Initial weight (g)	0.12 ± 0.05	0.12 ± 0.04
Final weight (g)	3.6 ± 1.01	2.7 ± 1.07
Weight gain (g)	3.48 ± 0.53	2.58 ± 0.9
Length gain (Inch)	1.5 ± 0.6	1 ± 0.8
Average daily weight gain (g)	0.165 ± 0.5	0.122 ± 0.5
Specific growth rate (g)	5.93 ± 0.9	4.50 ± 0.8
Survival Rate (SR %)	97 ± 1.8	85 ± 1.5
Feed Conversion Ratio (FCR)	0.1 ± 0.3	1 ± 0.1

DISCUSSION

Highest weight gain (3.48 g) was found in hapa treatment compared to glass aquarium tank (2.58 g). The different in fry tilapia weight gain was due to natural productivity of the pond present in hapa system where in the glass aquarium tank natural food is completely absentonly depend on artificial feed and also hapa temperature found higher (28-31°c) than glass aquarium tank (24-28°c).Temperature is the principal factor affecting the rate of metabolic process. Therefore temperature was marked overall production of fish [3]. For 1°C rise of temperature metabolic rate of fish increase 10%. The water temperature of the ponds varied from 27.45 ± 0.22 to 29.72 ± 0.24°C during the study period which was within the range for suitable culture of fish water temperature in ponds of BAU, Campus Mymensingh and found to vary from 18.5 to 32.9°C, 22 to 32.2°C, 26 to 32.8°C and 26.3 to 30°C respectively. The highest survivability was recorded in hapa treatment (97%) and the lowest survivability was in glass aquarium tank (85%). The Survival rate was found to be positively influenced by good physico-chemical parameters in both the treatments. The effect of survivability might be due to the lower temperature and higher ammonia found in aquariumtank system. However it might be due to the mortality, competition for food and space in the culture environment. The mean pH values were slightly alkaline in all the treatments which indicate suitable range for tilapia culturewhich was 7.65 ± 0.76 in hapa and 7.11 ± 0.71 in tank, which ranges between 6.8 to 8.27. The FCR can serve, to a certain extent, as an indicator of the nutritional value of a feed, although it is also affected by the other factors such as environmental and physiological state of the fishes, availability of natural foods, amount of feed consumed etc. In the Food Conversion Ratio (FCR) was varied between 0.1 ± 0.3 in hapa treatment and 1 ± 0.1 in aquarium system. The lower FCR value might be due to the tilapia is known to be a predominantly omnivorous fish, consuming all types of food items. The fish might be efficiently utilized most of the formulated feed to convert it into the flesh and the present of natural food in pond hapa maybe the reason. Although, the irregularities in feeding as well as waste of feeds may also affect the FCR value [4]. Dissolved Oxygen (DO) of the hapa was found higher (3.87 to 6.8 mg/l) than glass aquarium tank (2.01 to 5.09 mg/l). The optimum level of dissolved oxygen concentration were found due to the clear weather in hapa system and where the rates of photosynthesis increased rapidly and recorded dissolved oxygen ranging from 2.0 to 7.4 and 2.29 to 10.36 mg/l. Similar observation have been reported by 4.62-5.75 mg/l; 4.10-6.20 mg/l and 5.1-8.7 mg/l is suitable for nursery rearing [5]. The lower level of dissolved oxygen were found in glass aquarium system these maybe due to low level of temperature and no regular water circulation which may have formed more decompose due to these tank may have used higher dissolved oxygen than hapa.

CONCLUSION

Rearing system and water quality parameters is an essential parameter during nursery rearing because it has direct effects on the growth and survival of young fish. During nursery period survival and growth play crucial role for future potential fish farming. From the experiment it was found water quality parameters has effect on survival and growth for young fry red tilapia. The better growth and survival of young fry red tilapia was found in hapa rearing system due to all water quality parameters was found within suitable range where poor survival and growth was seen in glass aquarium tank. In aquarium glass tank system all water quality parameters wasn't found within optimal range where Do (3.23 mg/l), ammonia (0.5 mg/l), alkalinity (54.31 mg/l) was found lesser than suitable range and ammonia (0.5 mg/l), TDS (0.52 ppt) was found higher. This study concludes that for red tilapia young fry hapa rearing system is more effective and has potential for nursery farming than rearing in the glass aquarium. The findings may help in some extent, to a farmer for choosing the tilapia fry rearing system effectively in different rearing systems.

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