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Effects of duration of aeration on the production of fry in indoor hatchery

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ABSTRACT: The effect of four duration of aeration on the production of *Heterobranchus bidorsalis* fry at Post-yolk absorbtion stage were examined during the first phase of exogenous feeding. The duration of aeration treatments were: no aeration (0 hours);aeration for 3 hours (0800 – 1100); aeration for 6 hours (0800 – 1400) and aeration for 12 hours (0800 – 2000). Average final weight of fish was significantly affected by duration of aeration. Relative to initial body weight, fry growth in non-aerated plastic tanks was lower in body weight (78.66mg) than that in aerated plastic tanks for 3, 6 or 12hours (83.40mg; 83.90mg and 99.59mg) ($P<0.05$). Fry production in 6 hours aerated plastic tanks was higher than 0, 3 and 12 hours. The survival rate increased with increasing duration of aeration up to 6 hours duration and then decreased as duration of aeration increased further, although survival was not significantly different among aeration treatments. Based on the results, an intermediate duration of aeration between 6 hours and 12 hours per day is ideal for adequate production of *Heterobranchus bidorsalis* fry in in-door hatchery.

Key words: *Heterobranchus bidorsalis*, Duration, Aeration, production.

Introduction

Heterobranchus bidorsalis is one of the major catfish species which seed can be produced and with potentials for culture in Nigeria. This is so for a number of reasons, such as hardiness of eggs and larvae and their capability of being reared under artificial condition. They are tolerant to low dissolved oxygen and other adverse aquatic conditions, tolerant to high density per unit of water volume, water exchange and they are omnivorous (Fagbenro, 1989). Aeration has been successfully used in in-door hatcheries to improve the growth and survival of fish larvae/fry (Piper et al., 1982).

High stocking density and feeding rates result in degradation of water quality through increased biochemical oxygen demand, decreased dissolved oxygen concentration, and increased in unionised ammonia concentration. Dissolved oxygen is the most important water quality parameter affecting fry growth and production in the indoor hatcheries. Aeration is applied continuously for 24 hours in/indoor hatchery/nursery tanks and this push up the production cost due to the high cost of electricity consumed.

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Because of paucity of information on the effect of timing and duration of aeration on the production of fry in the indoor hatchery in Nigeria, this study examines the effects of the timing and duration of aeration on *Heterobranchus bidorsalis* fry growth, production, survival and water quality in the indoor hatchery with a view of recommending strategies to hatchery operators.

Materials and Methods

The experimental fry was obtained by induced spawning with hormonal injection. A total of 800 *H. bidorsalis* fry (Mean weight, 5.60mg) were stocked into eight, 56 litres capacity laboratory plastic bowls (the fry density was based on the previous work on *H. bidorsalis* fry by Faturoti and Adebayo, 1993). Four aeration treatments were evaluated: zero aeration (0 hours); aeration for 3 hours (0800 – 1100); aeration for 6 hours (0800 – 1400) and aeration for 12 hours (0800 – 2000). All aeration treatments were replicated twice. Water in the bowls were changed everyday and supplied with fresh water from bore hole. Water in each bowl was constantly aerated with Tecax air pump model AP-1500.

Throughout the experimental period, the fry were fed to satiation on artemia. All fish were weighed and counted every two days. The experiment lasted for fifteen days.

Dissolved oxygen, pH and Temperature followed the method described by Boyd (1981). Mean weight gain was calculated using the approach of Pitcher and Hart (1982), specific growth rate was obtained according to Brown (1957).

Statistical Analysis

The data collected were subjected to one – way analysis of variance using the method of Steel and Torrie (1980) and the result verified with Duncan Multiple Range test (Duncans, 1955).

Results and Discussion

Summary of the result of the growth performance of *Heterobranchus bidorsalis* fry in the four treatments of different duration of aeration is shown in Table 1. There was a significant difference ($P<0.05$) in the mean weight gain obtained in all the treatments.

The highest weight gain (99.59mg) was recorded in 12hours aeration treatment. This was followed by 6 hours aeration treatment (83.90mg) then 3 hours and 0 hours aeration treatments respectively.

The specific growth rates were also significantly different amongst treatment ($P<0.05$). 12 hours aeration had 19.19, 6 hours and 3 hours aeration had 18.01 while 0 hours aeration had the least specific growth rate of 17.62. The mean weight gain per day for fry in 12 hour aeration treatment was found to be highest with 6.27mg/day. This was followed by fry in 6 hours, 3 hours and 0 hours aeration with 5.22mg/day, 5.19mg/day and 4.87mg/day respectively.

Average weight of individual fish was significantly affected by the duration of aeration applied (Table 1). Relative to initial body weight, fry growth in unaerated plastic tanks was lower than in plastic tanks aerated for 3, 6 or 12 hours ($P<0.05$).

Dissolved oxygen concentration may affect fish growth by affecting appetite and food consumption or food utilization (Hepher, 1988).

Abdalla and Romaire (1996) demonstrated a direct relation between dissolved oxygen and average weight gain of channel catfish. Fry production in 6 hours aeration plastic tanks was higher than 0, 3 and 12 hours.

Table 2 shows the survival rate of fry in the plastic bowls. 6 hours aeration treatment had the highest survival (90.50%). 3 hours aeration had 90.0% survival, 0 hours aeration treatment had 87.0% while 12 hours aeration treatment had least survival of 86.0%.

The survival rate increased with increasing duration of aeration up to 6 hours duration and decreased at higher duration of aeration (table 2).

There was no significant (P>0.05) amongst aeration treatments. Although, there were variations in the percentage survival among treatments. 6 hours aeration treatment had the highest survival rate while 12 hours aeration duration had the lowest survival rate. Most mortalities occurred during the sampling periods.

The water quality parameters measured were within the desired range, temperature, 26.00 – 26.50°C, dissolved oxygen, 6.05 – 6.20mg/l, pH 7.20 – 7.50 recommended for catfishes by Viveen et al., (1986). Based on the results and foregoing it could be concluded that an intermediate duration of aeration between 6 hours and 12 hours per day is ideal for adequate production of *H. bidorsalis* fry in indoor hatchery.

Table 1: Growth performance of *Heterobranchus bidorsalis* larva/fry receiving aeration treatments in indoor hatchery. Treatments were: No aeration (0h), aeration from 1800-1100 (3 hours), aeration from 0800-1400 (6 hours) and aeration from 0800-2000 (12 hours).

Treatment	Initial mean final mean	Final mean weight (mg)	Mean wt. gain (mg)	Specific growth rate (% day)	Mean wt. gain/ day (mg/day)
0h	5.60[a]	78.66[b]	73.06[a]	17.62[a]	4.87[c]
3h	5.60[a]	83.40[a]	77.80[b]	18.01[b]	5.19[b]
6h	5.60[a]	83.90[a]	78.30[b]	18.01[b]	5.22[b]
12h	5.60[a]	99.59[c]	93.99[c]	19.19[c]	6.27[a]

Values within same column not having the same letter designation differ significantly (P<0.05).

Table 2: Survival rate of *Heterobranchus bidorsalis* fry receiving various aeration treatments.

Day	0h (%)	3h (%)	6h (%)	12h (%)	S.E.
0	100	100	100	100	0
2	100	100	100	100	0
4	97.50	97.50	97.50	96.50	0.43
6	96.50	94.00	96.50	96.00	1.03
8	95.00	94.00	94.00	94.00	1.24
10	94.00	91.50	93.00	92.50	0.90
12	94.00	91.50	93.00	92.50	0.90
14	87.00	90.00	90.50	86.00	1.92
Total	764.5	756.5	764.5	757.5	
X	95.56	94.56	95.56	94.69	
±	3.91	3.78	3.26	4.29	

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