EFFECTS OF ENCLOSURE COLOUR ON GROWTH PERFORMANCE OF *Clarias gariepinus* FRY

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ABSTRACT

The effect of five enclosure colour on the production of *Clarias gariepinus* fry at post- yolk absorption stage were examined in the indoor hatchery during the first phase of exogenous feeding. A total of 3600 *C. gariepinus* fry (mean weight, 6.3 ± 0.00 mg) were stocked into 15, 56 litres capacity laboratory plastic bowls. Tank colours evaluated were black, blue, green, white and maroon. Frys were fed on zooplankton ad-libitum. Results indicated that tank colour had significant impact ($P<0.05$) on the weight of *C. gariepinus* fry. However, percentage survival was significantly higher ($P < 0.05$) in black (86.67 %) than in white and maroon (56.67% and 66.67 % respectively). Survival in the black tanks (86.67 %) was not significantly different ($P > 0.05$) than the blue and green tanks treatments but was significantly higher ($P > 0.05$) than the blue and green tanks treatments. Based on the results, it is obvious that the background enclosure colour has effects on the growth and survival of fry in the indoor rearing system. A general tendency of higher fry growth and survival in dark colour backgrounds was evident. This could have a significant financial impact on commercial fingerlings production of *C. gariepinus* as fish hatchery operators in Nigeria do not currently take into consideration the colour of tanks use for the rearing of fry in the indoor hatchery.

INTRODUCTION

Clarias gariepinus is one of the major catfish species whose seeds are produced in Nigeria. They are tolerant to low dissolved oxygen and other adverse aquatic conditions, tolerant to high density per unit water volume; water exchange and they are omnivorous. The fish can grow to large size (>10 kg) (Olaosebikan and Raji 1998). In spite of remarkable achievement reported on the rearing of *C. gariepinus,* the production of the fingerlings of this species is still far below the demand, this may be attributed to poor rearing methods in the indoor hatchery by the hatchery operators using different rearing culture vessels without taken the colour of the culture vessels into consideration. Numerous authors has established the effects of tank colour on larvae survival and growth of some species of commercial important (Abed Golam and Chaoshu 2005; Yasharian *et al.* 2005, Strand *et al.* 2007, Renato *et al.* 2005). Strand *et al.* (2007) studied the effects of tank colour and light intensity on feed intake, growth rate and energy expenditure of juvenile Eurasian perch, *Perca fluviatilis* and concluded that tank colour and light intensity has positive influence on the growth and development of perch. Abed Golam and Chaoshu (2005) compared the effects of tank colour on larvae survival and development of mud crab *Scylla serrata* (Forskal) and concluded that background colour affects larval survival and development. In view of dearth of information on the importance of tank colour on the growth performance of *C. gariepinus* fry in the indoor hatchery and the need to establish the fry culture requirements of this pecies in the indoor rearing system prompted this study with a view of recommending strategies to hatchery operators. The objective of this study was to examine the effect of culture vessels of different colour on the survival and growth of *C. gariepinus* fry.

MATERIALS AND METHODS

A total of 3600 hatchery – produced 3 day old *C. gariepinus* fry (mean wt., 6.3 ± 0.00 mg) by hormone induced breeding were obtained from the hatchery unit of the department of Fisheries and Aquaculture Technology fish farm and transferred to the Department of Fisheries and Aquaculture Technology laboratory for the experiment. Fry were counted numerically before transferring to the different rearing plastic bowls. The experimental fish were assigned to 15, 56 litres capacity laboratory plastic bowls (the fry density was based on the previous work on catfish fry by Faturoti and Adebayo 1993). Five enclosure colours were evaluated; black, blue, maroon, green and white. All enclosure colour treatments were replicated thrice. Water in the bowls were changed every day and supplied with fresh water from bore hole. Water in each plastic bowl was constantly aerated with Tecax air pump model AP-1500. Throughout the experimental period, the fry were fed to satiation on zooplankton (*Moina* spp.). All fish were weighed and counted every two days as described by Dada *et al.* (2003). The experiment lasted for 14 days being the normal fry rearing period practise in Nigeria. Dissolved oxygen, pH and Temperature followed the method described by Viveen *et al* (1986). Mean

weight gain was calculated using the approach of Pitcher and Hart (1982). Specific growth rate was obtained according to Brown (1957).

The values are recorded as mean ± standard deviation. The statistical significance of difference in the mean and standard deviation ($P < 0.05$) was analyzed by one-way ANOVA test comparison of each of the test groups and the control using the SPSS 15. Duncan's Multiple range was used to compare differences among individual means (Zar, 1996). Differences were considered significant at p levels < 0.05.

RESULTS AND DISCUSSION

Summary of the result of the growth performance of *Clarias gariepinus* fry in the five enclosure coloured vessels is shown in Table 1. There was significant difference ($P<0.05$) in the mean weight gain obtained in black vessel when compared with the four other culture vessels. The highest mean weight gain was recorded in black enclosure coloured vessel followed by maroon, white, green and blue enclosure coloured vessels respectively. There were no significant difference in specific growth rate amongst the treatments ($P>0.05$). The best specific growth rate was obtained in black enclosure coloured vessel while the lowest specific growth rate was obtained in blue enclosure coloured vessel. The mean weight gain per day was also significantly different in black enclosure coloured vessel when compared with other culture vessels. Black enclosure coloured vessel had the highest mean weight gain while the lowest mean weight gain was obtained in blue enclosure coloured vessel.

Table 1: Growth performance of *Clarias gariepinus* fry reared in five different enclosure coloured Vessels.

Treatment	Initial wt.	Final wt.	Weight gain	ADG[1]	SGR[2]
(mg)	(mg)	(mg)	(mg/day)	(%.day−1)	
Black	6.3^{a}	28.0 ± 2.83^{a}	21.7 ± 2.82^{a}	1.55 ± 0.15^{a}	4.62 ± 0.31^{a}
Blue	6.3^{a}	14.5 ± 2.12^{b}	8.2 ± 2.12^{b}	0.58 ± 0.05^{b}	2.59 ± 0.45^{b}
Green	6.3^{a}	15.5 ± 0.71^{b}	9.2±0.71b	0.66 ± 0.10^{b}	2.79 ± 0.14^{b}
White	6.3^{a}	16.0 ± 1.41^{b}	9.7 ± 1.41^{b}	0.69 ± 0.20^{b}	2.89 ± 0.28^{b}
Maroon	6.3^{a}	19.0 ± 2.12^{c}	12.7 ± 2.13^{c}	0.91 ± 0.15^{c}	3.50 ± 0.33^{c}

[1]Average daily growth rate (g) = (final wt. − initial wt) / no. of days, [2]Specific growth rate (%. day $^{-1}$) = (ln final wt. − ln initial wt.) / no. of days × 100, Values in each row having different superscripts are significantly different ($P < 0.05$).

Table 2 shows the percent survival of fry reared in the five different enclosure coloured vessels. Black enclosure coloured vessel had the highest percentage survival while the lowest was obtained in the green enclosure coloured vessel. There was no significance difference in the percent survival in the five different coloured culture vessels ($P > 0.05$). The water quality parameters measured during the experimental period were within the desired range recommended for catfishes (Viveen *et al*, 1986) (Table 3). Abel Golam and Chaoshu (2005) reported that the background colour of the culture vessel affected larval culture success. Newly hatched larvae of mud crab (*Scylla serrata*) were reared in culture vessels of five colours, i.e. black, dark green, maroon, sky blue and white. The results at the end of experiment showed clear effects of background colour on larval survival. The percentage survival of fry reared in darker-coloured backgrounds (black vessels) was higher than the others. The best growth performance (28.0 mg) was attained in the fry stocked in the black enclosure coloured vessels while the lowest was obtained in the blue enclosure coloured vessel (14.5mg).

Hecht and Appelbaum, (1987) reported that good growth cannot only be attributed to the quality of the feed but also to the hatchery condition. Abel Golam and Chaoshu (2005) obtained highest growth and survival in newly hatched larvae of *Sycila serrata* reared in black vessels compared to the other vessels. This agrees with the result of this study where the best growth and survival of *C. gariepinus* fry was obtained in black culture vessels. The result of this study is a clear indication of the effects of enclosure or background colour on survival and growth performance of *Clarias gariepinus* fry. The result has shown that fry reared in black vessel has the best percentage survival and growth performance and this may be attributed to the habit of this fish species which prefer darken environment to where there is high intensity of light. This study indicated that background colour could be a key factor for the growth of *Clarias gariepinus* fry under indoor hatchery management.

Table 2: Percentage survival of *C. gariepinus* fry in five differently coloured vessels.

Days	black	blue	green	white	maroon
0	100	100	100	100	100
2	95.00	95.00	96.67	95.00	91.67
4	93.33	93.33	88.33	81.67	88.33
6	91.66	88.33	85.00	76.67	78.33
8	88.33	88.33	80.00	73.33	75.00
10	86.67	81.67	71.67	66.67	71.67
12	86.67	80.00	70.00	60.00	68.33
14	86.67	75.00	70.00	56.67	66.67
Total	728.33	661.67	610.01	701.66	640.00
Mean ±SD	91.04± 4.87	82.71± 11.85	76.25±15.55	87.71± 8.40	80.33± 12.05

n = 240, S.D. = Standard deviation

Table 3: Water quality readings from all treatments over 14 days during the study period

Days	Temperature (°C)	Dissolved oxygen (mg/l)	pH
2	25.3	7.5	6.5
4	26.4	8.4	7.6
6	27.5	8.6	8.4
8	26.5	9.3	8.2
10	28.4	10.2	8.4
12	27.6	10.4	8.2
14	28.2	10.2	8.4
mean	27.13	9.23	7.96
± SD	1.03	1.02	0.65

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