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Effect of light and dark background color on the growth of Nile tilapia (*Oreochromis niloticus* L.) fingerlings reared in aquaria

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Abstract
This study on light and dark background color aimed to examine whether the background color could affect the growth performance of Nile tilapia fingerlings. Ninety (90) Nile tilapia fingerlings size-14 and nine aquaria were used in the study. The aquaria were covered with cellophane with white (treatment 1) and black (treatment 2) color and with no cellophane (as control). The fish were fed with pellet diets (30% crude protein) twice a day at 3% of their body weight, assessing their growth for four weeks. The results of the study showed that the aquaria with light background have the highest results in terms of weight gain (3.72g±2.59), average daily body weight gain (0.13g±0.09) and specific growth rate (3.11%±1.73) though statistical analysis showed no significance. The highest survival rate (33.33%) was observed in control, which is significant in treatment 2 and 3.

Keywords: Dark background, growth performance, light background, Nile tilapia

1. Introduction
Tilapia fish is one of the most important fish species in the fisheries world. It is the second most essential group of food fishes in the world after carps (FAO, 2008) [1]. Different factors may influence the growth performance of Tilapia like water contamination, ammonia, and temperature or feeding components and environmental color (Brännäs *et al*., 2001) [2]. Light intensity and background color can affect feed detection, feed conversion rate, and feeding success of cultured fish. Therefore, all these factors can affect fish growth and mortality (Jentoft *et al*., 2006) [3].
The effect of environmental color on animal physiology and behavior is a developing field. As in earlier studies, the ecological color showed both improvement and disruption of fish condition factor. Therefore, these studies support the initiation of investigations on this type of study for a better understanding of the factors affecting the fish health and condition factor (Elnwishy *et al*., 2012) [8]. The standard colors of the surrounding environment of fish are blue, green, or near-infrared (Levine and MacNichol, 1982) [5]. Very few studies have been conducted to understand the effects of background or light color on fish biology except for the change in fright reaction, color attractiveness, survival, and growth rate (Tamazouzt *et al*., 2000) [6]. The main objective of the study was to assess the influence of environmental color, utilizing white and black, of the hatchery production of Nile Tilapia fingerlings.

2. Materials and Method
2.1 Experimental Fish and Procedure
Ninety (90) Nile Tilapia fingerlings size 14 were obtained in the Freshwater Aquaculture Center. Nine aquaria measuring 60 x 30 x 60 cm was used as the culture facility of the experiment. The aquaria were covered with thick paper with white (treatment 1) and black (treatment 2) color, while transparent aquaria were used as control. The ninety Nile Tilapia fingerlings were randomly distributed in the aquaria. They were fed with pellet diets (30% crude protein) twice a day at 3% of their body weight (El-sayed, 2006).

2.2 Data Gathered
Each was subjected to growth assessment (Appendix Figure 2) at the end of the four-week culture period, following the parameters used to evaluate tilapia growth performance by De

Silva and Anderson (1995) [7]. The parameters that were used were:

Bodyweight (WG) = W1 – W0

Average Daily Body Weight Gain (ADG) = (W1 – W0)/ t

Specific Growth Rate (%day): SGR = (Ln W1 – Ln W0) x 100/ t

Feed Conversion Ratio (FCR) = Df / (W1 – W0)

Survival rate (%): SR = N1x100/N0

Where: W1 = Final wet weight (g)

W0 = Initial wet weight (g)

T = time interval in days

N1 = number of fish at the end

N0 = number of fish initially stoked

Df = dry feed intake (g)

At the end of the experiment, weight and number of surviving fish recorded.

2.3 Statistical Analysis

All data were expressed as mean±SE of three replicates of each treatment. Data were analyzed using one-way ANOVA, and when significant differences among treatments were found ($P<0.05$), the mean values were compared using the Least Significant Difference (LSD) test. All statistical analyses were performed using SPSS ver. 16.

3. Results and Discussion

3.1. Growth Performance of Nile Tilapia

The growth parameters considered in the study were body weight gain (WG), average daily weight gain (ADG), specific growth rate (SGR), feed conversion ratio (FCR) and survival rate. Table 1 presents the summary results of the growth performance of Nile Tilapia fed with 3% of their body weight of the commercial feed. No significant differences in their means were found among the growth parameters except for the survival rate.

Table 1: Summary of growth performance of Nile Tilapia under light and dark background

Growth Parameters	Treatments		
	Control (without background)	Light background (White)	Dark background (Black)
Initial Weight (g)	2.44 ± 0.45^a	2.30 ± 0.57^a	2.05 ± 0.40^a
Final Weight (g)	4.23 ± 1.56^a	6.01 ± 2.97^a	5.19 ± 2.48^a
Body Weight Gain (g)	1.79 ± 1.11^a	3.72 ± 2.59^a	3.14 ± 2.13^a
Average Daily Weight Gain (g)	0.06 ± 0.04^a	0.13 ± 0.09^a	0.11 ± 0.08^a
Specific Growth Rate (%)	1.86 ± 0.61^a	3.11 ± 1.73^a	2.99 ± 1.53^a
FCR	8.63 ± 2.70^a	5.75 ± 5.07^a	5.80 ± 5.65^a
Survival Rate (%)	33.33 ± 5.77^a	13.33 ± 5.77^b	10 ± 0.00^c

Note: Means±SD in rows with the same superscript are not significantly different at $p>0.05$.

3.1.1. Body Weight Gain

The aquaria with light background yield the highest (3.72 g) while the lowest was observed in control (1.79 g). Analysis of variance shows no significance between the mean of the treatments.

3.1.2. Average Daily Weight Gain

The highest mean was observed in the aquaria with a light background with 0.13 g followed by the aquaria with a dark background with 0.11 g and lowest was observed in control with 0.06 g of average daily weight gain. Analysis of variance shows no significance between the mean of the treatments.

3.1.3. Specific Growth Rate

The specific growth rate (SGR) in all treatments ranged from 1.86%/day to 3.11%/day. Fingerlings that are reared in aquaria with light background had the highest SGR and while those reared in aquaria with no background had the lowest SGR. Analysis of variance shows no significance between the mean of the treatments for specific growth rate.

3.1.4. Feed Conversion Ratio

The mean of feed conversion ratio (FCR) of the three treatments ranged from 5.75 to 8.63. The highest FCR was found in control (5.75) and the lowest FCR was found in the aquaria with light background. Analysis of variance shows no significance between the mean of the treatments for FCR.

3.1.5. Survival Rate

The mean survival rate for the control was the highest with 33.33%, and the mean survival rate of the aquaria with the dark background was the lowest. Analysis of variance shows significance ($P>0.05$) between control and aquaria with a light background and between control and dark background while no significance was found between the means of aquaria with light background and aquaria with a dark background.

4. Discussion

In nature, light intensity and background color can affect feed detection, food conversion rate, and feeding success of cultured fish, thus influencing fish growth and mortality (Jentoft *et al*., 2006) [3]. In this study, the lowest survival rate was observed in the aquaria with a dark background (black). In the study of Sabri *et al*., 2012 [8], the darkness adapted fish showed less activity; this is mostly due to the absence of clear visibility. This results in wasting feed due to its less visibility resulting in the death of fish because of starving and yield to a very low survival rate compared to the background. Also, the removal of the dark effect induced stress and resulted in darker skin formation, mostly due to the sympathetic nervous system disturbance, which is probably affected by the light.

Lower growth rates were also observed in control and aquaria with a dark background. These lower growth rates may be attributed to a decrease in the contrast between food and aquarium walls in transparent and darker background. But there is a different case for marine fishes. Marine finfish prefer tanks with dark walls at larval stages (Naas *et al*., 1996) [9]. The weak contrast between the background and food may lead to diminished food consumption by fish and, consequently, to reduced fish growth.

5. Conclusion

In conclusion, aquaria with light background have the highest growth rate and good FCR that leads to better background color for growth. But, control has the highest survival rate.

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7. References

1. FAO. Fisheries and Aquaculture Information and Statistics Service, 2008
2. Brännäs E, Alanärä A, Magnhagen C. The social behavior of fish. In: Keeling, L.J., Gonyou, H.W. (Eds.), Social Behavior in Farm Animals. CABI publishing, New York, 2001, 275-304.
3. Jentoft S, Oxnevad S, Aastveit AH, Andersen O. Effects of tank wall color and up-welling water flow on growth and survival of Eurasian perch larvae (*Perca fluviatilis*). J. World Aquacult. Soc. 2006; 37:313-317.
4. Elnwishy N, Ahmed M, Elsherif M, Abd El-Hameed M. The effect of Diazinon on glutathionine and acetylecholinesterase in tilapia (*Oreochromis niloticus*). J. Agric. Sci. Soci. 2007; 3(2):52-54.
5. Levine JS, MacNichol JEF. Color vision in fish. Scient. Am. 1982; 216:108-117.
6. Tamazouzt L, Chatain B, Fontaine P. Tank wall color and light level affect growth and survival of Eurasian perch larvae (*Perca fluviatilis* L.). Aquacult., 2000; 182:85-90.
7. De Silva SS, Anderson T. Fish Nutrition in Aquaculture. Deakin University. Victoria, Australia. Chapman and Hall. 1995, 319.
8. Sabri DM, Elnwishy N, Nwonwu F. Effect of environmental color on the behavioral and physiological response of Nile Tilapia, *Oreochromis niloticus*. Global Journal of Science Frontier Research. Biological Sciences. 2012; 12(4) Version 1.0.1-11.
9. Naas KE, Huse I, Iglesias J. Illumination in first feeding tanks for marine fish larvae. Aquacult. Eng. 1996; 15:291-300.