

Evaluation Study on the Growth Performance of Four Local Strains of Nile Tilapia (*Oreochromis niloticus*) in Sudan

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Abstract

The study was conducted at the fish farm of the Department of Fish Sciences, Faculty of Agricultural Technology and Fish Sciences, Al-Neelain University. The purpose of the study is to compare the growth performance of different local strains of Nile tilapia (*Oreochromis niloticus*) to provide the necessary information for conducting research leading to genetic improvement of the locally farmed Nile tilapia. Fish fry used in the study were spawned by

brooders collected from, Jebel Aulia Dam Reservoir (White Nile strain **A**), Sennar Dam Reservoir (Sennar strain **B**), Lake Nubia (Halfa strain **C**) and khashm elgirba reservoir (Khashm elgirba strain **D**). The study was conducted for six weeks in twelve happas, each stocked with 30 fry in three replicates for each strain, averaging 5 g. Fish were fed by diet with a protein level of 35%. Statistical analysis showed Sennar strain was the best growth rate with a percent weight gain of 1529%, followed by white Nile strain with a percent weight gain of 1114%, followed by khashm elgirba strain with a percent weight gain of 993% and finally Halfa strain with a percent weight gain of 829%. Daily Growth Rate gain was 0.9g/day for sennar strain, followed by other strain with no significant (≥ 0.05). Food Conversion Ratios (FCR) were best in sennar and white Nile strain, survival rate with the same no significant (≥ 0.05) between treatments. Finally results indicated that there is significant (≤ 0.05) between treatments so sennar and white Nile strains is better than two strains in this study.

Keywords: Jebel Aulia Dam Reservoir, Sennar Dam Reservoir, Nubba Reservoir and khashm elgirba reservoir, Strain

1. Introduction

Nile tilapia is one of the most commercially important and widely used fish in the global aquaculture production particularly in tropical and subtropical areas (Gjedrem, 2005; El-Sayed, 2006). *Oreochromis niloticus* is by far the most important tilapia species and distributed throughout the world (Bentsen et al., 1998; Pillay and Kutty, 2005; El-Sayed, 2006). The importance of *Oreochromis niloticus* stems from its biological reasons accepting artificial feeds, ease of breeding in captivity, disease resistance, high fecundity; social reasons: good table food quality, good market price; and physical reasons: tolerant to a wide range of environmental conditions (El-Sayed, 2006; Ashagrie et al., 2008). Therefore, determination of different factors such as feed quality, stocking density and strain variations for cultured tilapia is essential to maximize its production, profitability and sustainability. Among these, selection of the best strains for efficient breeding program is crucial; not only to reach the production goal but also to reduce production cost, to improve disease resistance, utilization of feed resources and product quality (Gjedrem, 1997). Even though Ethiopian aquaculture practice is growing and seems promising, there are no breeding centres that produce genetically improved fish seeds for local fish farmers and thus, fish seeds are collected from the nearby lake or lakes. Moreover, there are no research reports on the growth performance of different *Oreochromis niloticus* strains in pond culture. Hence, the general objective of this study was therefore to compare the growth performance of different *Oreochromis niloticus* strains collected from various Sudanese freshwater lakes (such as Lake Sennar, Lake White Nile, Lake Halfa and Lake Khash elgirba).

2. Material and Methods

This recent study, was conducted for 90 days, in the period 15/6 - 15/9/2020 at the fish farm of the faculty of Agricultural Technology and Fish Sciences near the Jebel Aulia Reservoir. The seed of Nile tilapia (*Oreochromis niloticus*) used in the study was obtained from bloodstock collected from lake of Jebel Aulia reservoir (named after the White Nile strain **A**), Lake Sennar (named after the Sennar strain **B**), Lake Nubia (named in this study the Halfa strain **C**), and lake Khash elgirba named after the (Kash elgirba strain **D**) the, as part of a genetic improvement

project. Nile tilapia fish farmed in Sudan is implemented by the Department of Fish Sciences with funding from the Ministry of Higher Education and Scientific Research. Fry represented the first generation (F1) of these bloodstock under culture conditions.

The fish fry were transported from the cement farm ponds to the hatchery building, where they were acclimatized for five days to the hatching water in the fiberglass ponds. The initial weights were taken for each treatment separately, with similar weights. Then, it was transferred from the fiberglass basins to the experiment basin in two batches, at the rate of (90 fish) per treatment and a rate of (30 fish) per refined., treatment (A) to the White Nile strain, treatment (B) to the Sennar strain Treatment (C) was devoted to the Halfa strain and khashm elgerba strain (D). The experimental fish were fed with 35% protein (according to the producing company) of commercial pellets intended for the growing stage

In the first week, 6% of the fish's weight was fed per day, and then the food intake was adjusted in the second week based on the new weights of the fish. Dietary adjustments were continued that way until the end of the experiment. The daily diet was given in two doses, one in the morning at eight o'clock and the other in the afternoon at three o'clock. The ingredients of the diet according to the producing company are: ground nut meal, corn, sorghum, fish meal powder, a mixture of vitamins, mineral, amino acid, fish oil, methionine and calcium diphosphate. All fish were weighed in each replicate once a week to track growth and re-estimate the daily food intake needed for the following week. The weight gained, the percentage of weight gained, the daily growth rate, the rate of dietary transformation and the survival rate were calculated in the three treatments. Statistical analysis (ANOVA) was performed using SPSS software.

3. Results

Statistical analysis showed Sennar strain was the best growth rate with a percent weight gain of 1529%, followed by white Nile strain with a percent weight gain of 1114%, followed by khashm elgerba strain with a percent weight gain of 993% and finally Halfa strain with a percent weight gain of 829%. Daily Growth Rate gain was 0.9g/day for sennar strain, followed by other strain with no significant (≥ 0.05). Food Conversion Ratios (FCR) were the same between treatment, survival rate with the same no significant (≥ 0.05) between treatments. finally results indicated that there is significant (≤ 0.05) between treatments so sennar and white Nile strains is better than two strains in this study table (1). Statistical analysis for Water quality parameters showed that there is no significant between treatments it was the same special temperature, PH and O₂ table (2).

Table 1. Growth performance of four local strains of Nile tilapia

Parameters	Treatments			
	White Nile strain A	Sennar strain B	Hallfa strain C	Khash elgerba strain D
Initial weight	5 ± 0.2^a	5.2 ± 0.5^a	4.8 ± 0.1^a	4.9 ± 0.2^a
Final weight	60.7 ± 1.2^b	86.6 ± 2.3^a	46 ± 3.6^{bc}	53.7 ± 6.7^{bc}
Weight gain	48.8 ± 0.1^b	81.3 ± 0.2^a	41.2 ± 0.2^{bc}	48.8 ± 0.1^{bc}
Weight gain%	114.6^b	1525^a	829^{bc}	993^{bc}
Daily growth rate	0.6 ± 0.1^b	0.9 ± 0.1^a	0.5 ± 0.2^b	0.5 ± 0.5^b
Feed conversion ratio	2.1 ± 0.9^a	1.8 ± 0.2^a	2.2 ± 0.5^a	2.2 ± 0.5^a
Survival%	93.3 ± 2.1^a	93 ± 1^a	93 ± 2^a	92.7 ± 1.5^a

The same letter indicates no significant difference between treatments

Table 2. Water quality parameters between treatments (m±sd)

Parameters	Treatments			
	White Nile strain A	Sennar strain B	Hallfa strain C	Khash elgerba strain D
Temperature	29 ± 0.1^a	29.3 ± 1.5^a	31 ± 1.5^a	28.7 ± 1.5^a
PH	6.9 ± 0.1^a	7.2 ± 0.2^a	7.6 ± 0.5^a	7.2 ± 0.2^a
O ₂ mg/l	7.5 ± 0.7^a	8.3 ± 0.6^a	7.8 ± 0.6^a	7.7 ± 0.9^a

The same letter indicates no significant difference between treatments

4. Discussion

Nile tilapia suffers from the genetic decline of cultured strains in many areas due to the overlapping of genes from other unwanted harmful tilapia species (Macaranas et al., 1986) and possibly also due to inbreeding. The expected genetic differences between different groups are reliable as a reliable means for the effective selection of ideal breeds that can be exploited in the development of fish farming (Eknath et al., 1993).

A number of studies conducted over the past few years have shown that there are significant differences in the relative performance of the culture of different groups and strains of tilapia in a wide range of different environments. In fishes - and especially tilapia - the isolated strains or groups are usually inaccurately classified according to their area of presence or origin and usually do not have distinctive features which may lead to great confusion (Mair, 2001). In a comprehensive study compare Eknath et al (1993) and Palada-de Vera and Eknath (1993) Growth rates of eight different strains of Nile tilapia were cultured in different culture environments. The strains included four African strains collected from Egypt, Ghana, Kenya and Senegal, and four cultured Asian strains known as the Israel, Singapore, Taiwan and Thailand strains, and they found that the performance of the African strains was similar or better than the performance of the Asian strains, and that the fastest growth achieved by the

Egyptian strain and the slowest growth Dynasty Ghana achieved it. They justified this difference by the effect of reproduction related to the nature of the genetic bloodline on the speed of growth.

In a comparison of eleven different strains of Nile tilapia collected from different African regions, Capili (1995) found that the Egyptian strain achieved the fastest growth rate while the growth of three Kenyan strains was relatively weak. Dan and Little (2000) evaluated the fry performance of three strains of indigo tilapia collected from Vietnam, the Philippines (GIFT) and Thailand. They found that the Philippines strain (GIFT) reached the largest size in both cages and ponds compared to the other two strains. To compare the growth of several strains of genetically improved Asian Nile tilapia and indigenous red tilapia strains in ponds and cages showed significant differences between the different strains in ponds with the superiority of the genetically improved cultivated Farmed Tilapia (GIFT) strain. Although the growth of Nile tilapia in cages followed the same approach, where GIFT strain showed the best growth, there were no significant differences between its strains. The red tilapia strains did not show significant differences in either ponds or cages

The different growth responses of Nile tilapia strains, especially in ponds (controlled conditions) are mainly due to genetic factors (variation in strains), while in cages (under uncontrolled conditions) it is generally observed that environmental conditions affected the survival rates and the growth of Asian Nile tilapia strains and Tilapia strains. the Red. In growing experiments on species and strains of tilapia, there is a change in the order of performance of different strains due to differences in environmental conditions, indicating great environmental genetic interactions in many cases (Dahilig, 1992; Elghobashy et al., 2000; Capili, 1995; Dahilig et al 1992., Maria et al 2010., Romana-Eguia and Doyle, 1992). But in Eknath et al (1993) the analysis of the performance of strains in different environments led to the conclusion that the relative importance of environmental genetic interactions is little compared to the effect of breed and sex differences The results of the current study show that there are differences in growth between the local strains used in the study, and this agree with many of the previous studies mentioned.

5. Recommendations

- 1- Sennar and white Nile strain is better to start programme of genetic improvement in Sudan
- 2- Conducting further studies on the strains used in the study under different
- 3- environmental and nutritional conditions to determine and confirm the actual growth capabilities of these strains in order to benefit from them in the genetic improvement programs for Nile tilapia fish.
- 4- An investigation of the growth potential of other local tilapia strains from distant regions along the Nile River, such as the lakes, Rossires and Meroe.

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