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ACCLIMATION AND TOLERANCE OF MARINE SABAKI TILAPIA, *OREOCHROMIS SPILURUS* (GÜNTHER) IN FRESH WATER

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Abstract: An experiment was conducted to acclimatize marine Sabaki tilapia, *Oreochromis spilurus* in fresh water for a period of 30 days in glass aquarium tanks (25 L). Mean fresh water tolerance and median lethality was tested by giving progressive decrease in salinity at 2, 4, 6, 8 and 10ppt/day from 40ppt (sea water) and each test was considered as treatment. Juveniles of uniform size (0.1g) were stocked (2/L) in each treatment tank prior to experiment and each test was duplicated and arranged in a completely randomized design (CRD). Median lethality (survival<50%) was high in 10 and 8ppt and low in 6 and 4ppt salinity reduction/day whereas, optimum tolerance was recorded in 2ppt reduction/day. Significant difference in median lethality was observed between 6, 8 and 10ppt however, it was not significant between 2 and 4ppt ($p<0.01$) salinity reduction/day. High survival and acclimation (90-100%) was achieved when salinity reduction was given at 2ppt/day for 20 days.

Key words: *Oreochromis spilurus*, Mean tolerance, Median lethality.

INTRODUCTION

Tilapias are naturally distributed in Africa and the Jordan Valley and were introduced to other places for aquaculture purposes. Tilapia species are basically fresh water; however, they are characterized by a large tolerance to salinity (Cnaani and Hulata, 2011). Such capacity to adapt salt water was modulated by environmental factors. They are euryhaline and are able to live and reproduce in salinities higher than 40 ppt (Villegas, 1990). Some species like *Tilapia guineensis, Sarotherodon melanotheron, T. zillii and O. mossambicus* can tolerate salinities from 0 to 120 ppt (Trewavas, 1982).

Tilapia possesses various characteristics which make them desirable species to culture in brackish water farms. It has been considered as the food fish of the 21st century and is popularly known as aquatic chicken (Villegas, 1990). There are species of tilapias with potential for brackish water farming. Sabaki tilapia, *Oreochromis spilurus* is a salt water adapted species grows and breeds well in sea water and found in the salt water bodies of Kenya, Egypt and Saudi Arabia. Though Sabaki tilapia is a marine candidate, no study has hither to been reported about the acclimation and tolerance of this species in fresh water. Therefore, a study was carried out to assess the acclimation and tolerance of Sabaki tilapia in fresh water.

MATERIALS AND METHODS

Experimental set up

The study was conducted in glass aquarium tanks at the wet lab of Dept. of Zoology, All Saints' college for a period of 30 days. Juveniles of tilapia were procured from Egypt and maintained them in Sea water (40ppt) tanks (Fig. 1). Mean salinity tolerance and median lethal salinity was tested by giving progressive decrease in salinity at 2, 4, 6, 8 and 10ppt/day from 40ppt (sea water) and each test was considered as treatment. Uniform size (0.1g) juveniles were stocked (2/L) in each treatment tank prior to experiment and each test was duplicated and arranged in a completely randomized design (CRD).

Fig. 1. Sabaki tilapia, *Oreochromis spilurus*

Mean fresh water tolerance (MFT) refers to the index of fresh water tolerance and is the average level where the fish dies in a certain salinity level (Villegas, 1990). The population of dead fish in each replicate was multiplied by their respective salinity. The products were summed together and averaged by the total number of experimental fish per replicate. The MFT of each replicate was determined using the formula MFT = (f1xs1 + f2 x s2 +...+ fN x sN)/N; (where f fish, s-salinity, N- number of individuals observed). Median Lethality (ML) is the level at which survival falls to 50%, during the conduct of fresh water tolerance test in a progressive decrease of salinity at 2, 4, 6, 8 and 10ppt/day from sea water salinity. The optimum freshwater tolerance (OST) was determined by equating the two linear regression functions (a1 + b1x = a2 + b2x). The intersection of the two regression lines was the break point value.

RESULTS

Details on median lethality are depicted in Fig. 2. Median lethality (survival<50%) was high in 10 and 8ppt reduction/day and low in 2 and 4ppt salinity reduction/day. Significant difference in median lethality was observed between 6, 8 and 10ppt however ($p<0.01$), it was not significant between 2 and 4ppt salinity reduction/day ($p<0.01$). Relationship between mean fresh water tolerence and salinity reduction is presented in Fig. 3. Significant relationship is observed between salinity reduction and fresh water tolerence. High survival and acclimation (90-100%) of *O. spilurus* was achieved in zero ppt (fresh water) when a salinity reduction at 2ppt/day was given for 20 days.

DISCUSSION

Results of the study show that Sabaki tilapia can tolerate and acclimate in fresh water when a gradual reduction (2ppt/day) of salinity was administered. Reports say that tilapia species are broadly euryhaline and tolerate a wide range of salinity and such ability to withstand salinity varies according to the species (Trewavas, 1982; Prunet and Bornancin, 1989). According to Villegas (1990), adaptability to salinity and fresh water can be modulated by several factors, i.e., environmental or endogenous. In a study on the ontogeny of salinity tolerance, indicated a close relationship with size, smaller fish adapting easier to higher salinities or fresh water bodies (Boeuf, and Payan, 2001). This may be true in the case of present study that the fish selected for acclima

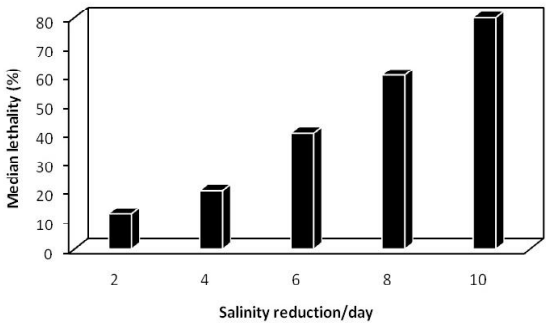

Fig. 2. Median lethality of fishes in different salinity reduction

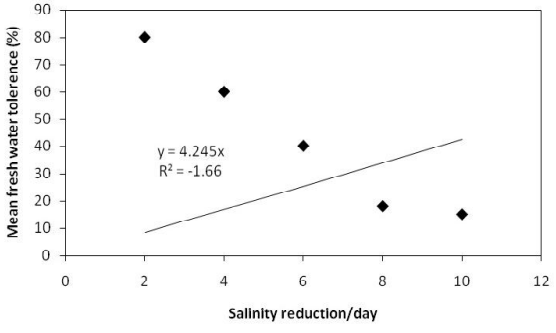

Fig. 3. Relationship between mean fresh water tolerence and salinity redution

tion was smaller in size. It was interesting to note that lethality rate of fish was increased in increase rate of salinity reduction/day being maximum in 10ppt reduction/day and minimum in 2ppt reduction/day. Based on this observation, it is suggested that the decrease in lethality in low salinity reduction was due to osmoregulatory efficiency of the fish. The results would certainly be of practical importance and more studies should be devoted to understand the physiology of such adaptability and acclimation of Sabaki tilapia.

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