



Til-Aqua International

Naturel Male Tilapia

Research and Development

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Salt tolerance of Til-Aqua Red NMT™ tilapia larvae

To investigate the salt tolerance of Til-Aqua Red NMT™ all-male tilapia larvae a short experiment is performed in which the salinity is increased in controlled steps up to 35 ‰. The salt tolerance of larvae is of particular interest for research purposes but also relevant to investigate the salt tolerance of Til-Aqua Red NMT™ tilapia for brackish/seawater fish farming. It is also of interest for treatment purposes against ecto-parasites .

Experimental design

For this experiment different groups of larvae are used (30 larvae for each test group). Discrimination is made between groups which are exposed to higher salinities in a “gradually” way and groups which are exposed in a direct way by transfer them “directly” out of freshwater into salt water at a certain salinity. The groups “gradually” and “directly” are subdivided into two age classes referred as “young” and “old”. This is done to investigate the effect of developmental stage on salt tolerance.

Larvae classified as “young” where between 7-10 days post fertilization (dpf) at the start of the experiment. These Larvae just started to build up their capacity to control their buoyancy and are still not capable of consuming food. Larvae classified as “old” where between the age of 16-22 dpf at the start of the experiment. These larvae are capable to control their buoyancy and to take up feed. Larvae used for the “direct” salt tolerance test were kept in a separate freshwater system with a salinity of 0.16 ‰. Larvae used for “direct” salt tolerance were only used once.

For this experiment a small recirculation system is used consisting of 4 Tanks of 97.6 liter and one settling tank of 208 liter. Total volume of the system is around 600 liter. Each tank is aerated by one large air stone and all the re-circulated water is treated by an UV-filter. Water was kept around 28 °C by an immersed central heater with thermostat. There was a 24 hours light regime.

Salinity was increased in 4 steps to a maximum level of 35 ‰. Prior to each increase of 9 ‰ salinity we dissolved ± 5387 grams of sea salt (Instant ocean) one day in advance. This was done by adding the salt in one of the 4 tanks which was disconnected from the main system at that moment. Salt was increased the next day by taking up this tank into the main circulation. With this method the new salinity level was reached in 3 to 4 hours time. During the experiment water quality was monitored and controlled.

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Results

Water Quality was monitored on a daily base. Oxygen levels were between 4.0 and 7.0 mg/l. Average temperature was 27.6 °C. Ammonium levels build up slightly starting from 0 mg/l till 3.0 mg/l at day 5. Nitrite levels increased from 0.0 till 1.25 mg/l at day 5. pH values were between 8 and 8.3 during the first 5 days.

Day / Date	Salinity ‰	Mortality group "gradually"		Mortality group "directly"	
		"Young"	"Old"	"Young"	"Old"
1 16/3/10	9	0	0	0	0
2 17/3/10	18	0	0	0	0
3 18/3/10	27	0	0	30 (100 %)	30 (100 %)
4 19/3/10	27	0	0	not tested	not tested
5 20/3/10	35	0	0	not tested	not tested
16 31/3/10	35	0	0	not tested	not tested

Table 1, Mortality rates at different salinity levels for two age groups (young and old) divided into two separate treatments (gradually and direct transfer). On day 1 the group "Young" is between 7-10 dpf /28°C and group "old" between 16-22 dpf/28°C. Mortality rates are based on groups of 30 larvae. Mortality rates are based on observations 20 hours after definite salinity level was reached.

During all the steps to increase salinity, larvae of the "Old" Groups (gradually and directly) showed a reduction in feed uptake. This was most clear for the groups which were transferred directly. During the first 5 days larvae of the "Young" groups were not at that developmental stage yet to take up food. Both the gradually adapted groups "old" and "young" were kept at a salinity of 35 ‰ after the 5th day. No mortality is observed between the 5th day and the last day of the experiment. food uptake gradually increased over time for the "old" group and larvae started eating at day 6.

Conclusion & Discussion

Til-Aqua Red NMT™ tilapia larvae in the two age classes of 7-10 and 16-22 days of post fertilization are capable to tolerate salinity levels up to 35 ‰ but only when adaptation to high salt levels is done gradually. Direct transfer to a salinity level of 27 ‰ is lethal for larvae in the age classes of 7-10 and 16-22 dpf. Larvae of both age classes can cope with a direct transfer to a salt level up to 18 ‰. Increase in salt level in steps of 9 ‰ induce a reduction in food uptake. This food uptake slowly picks up over time.