

Chronic exposure of iron on growth performance, survival and histological alterations of Guppy (*Poecilia reticulata*)

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Abstract

The present study was designed to evaluate the chronic exposure of iron (Fe) on the growth, haematological and histological parameters of the Guppy (*Poecilia reticulata*). This experiment was conducted with four iron concentrations (3 ppm: Fe-3, 5 ppm: Fe-5, 10 ppm: Fe-10 and 20 ppm: Fe-20) and the control which does not contain added iron. The lowest concentration of iron is based on the maximum tolerance limit for the discharge of industrial wastewater into inland surface waters (3 ppm) which has been recommended by the Board of Investment (BOI) of Sri Lanka. Fifteen male fish with an initial mean weight of 0.20 ± 0.04 g were randomly assigned in triplicated treatments and the experiment lasted for 45 days. Daily food consumption and survival of the experimental fish were recorded and weight measurements of fish were taken fortnightly. At the end of the experiment, growth performances and feed utilization efficiencies were assessed by using percentage specific growth rate (%SGR), percentage average daily gain (%ADG) and feed conversion ratio (FCR). Red blood cell count (RBC), blood smears and histological variations of gill tissues of the experimental fish were also examined at the end of the experiment. Mean body weight was not affected by the treatments. There were no structural alterations observed in blood smears of fish in different treatments. The lowest FCR (1.35 ± 0.07) was observed in Fe-3 while the highest %ADG and %SGR both were observed in the control (4.30 ± 1.21 and 2.37 ± 0.44). Significantly ($p < 0.05$) the highest survival rate (100%) was observed in control followed by Fe-3 ($86.7 \pm 2.6\%$), Fe-5 ($82.0 \pm 2.5\%$), Fe-10 ($73.3 \pm 1.4\%$) and Fe-20 ($10.0 \pm 0.7\%$). Among tested treatments, the highest RBC was reported in the control and Fe-3 ($1.83 \pm 0.30 \times 10^6/\text{mm}^3$ and $1.92 \pm 0.49 \times 10^6/\text{mm}^3$ respectively) followed by Fe-5 ($1.22 \pm 0.31 \times 10^6/\text{mm}^3$), Fe-10 ($0.99 \pm 0.21 \times 10^6/\text{mm}^3$) and Fe-20 ($0.61 \pm 0.13 \times 10^6/\text{mm}^3$). Histological sections of the gill tissues showed that secondary lamellae were arranged without proper order and were visualized as broken or eroded, fused and misshaped filaments in the high Fe levels. However, these alterations were not observed in the Fe-3. The results of this study revealed that there is a significant effect of the chronic exposure of iron on the growth performance, red blood cell counts and histological status of the gills of the guppy at the concentrations greater than the BOI recommended level (3 ppm).

Keywords: Gill histology, Growth, Iron exposure, *Poecilia reticulata*, Red blood cell count

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