

ABSTRACT

Acute Toxic Effects of Zinc, Copper and Ammonia to Tropical Freshwater Animals.

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Acute semi-static toxicity tests were conducted using zinc, copper and ammonia to five species of tropical freshwater animals, namely Hoplosternum littorale, Poecilia reticulata, Aequidens pulcher, Mytella guyanensis and Macrobrachium jelskii.

Median lethal concentrations and median lethal times were derived for each animal, from probit plots of mortality data. Threshold concentrations were also determined from toxicity curves.

Microscopic morphometry of gill sections taken from exposed animals were done, using a Weibel graticule, to make counts of the components of the secondary lamellar area. From these results the causes of death were derived.

The animals tested all showed differing sensitivities to the contaminants, with Hoplosternum

littorale being the least tolerant. The 96 Hr. LC 50 values derived for each contaminant, ranged from 0.16-1.0 mg un-ionised ammonia/L, 0.5-3.0 mg Zn/L and 0.01-4.5 mgCu/L. Poecilia reticulata showed the highest tolerance, for both ammonia and zinc (Threshold = 1.0 and 3.0 mg/L respectively).

With the application of a safety factor of 100 to these median lethal values, the allowable levels of the three contaminants, for effluent control, are 0.0016, 0.005 and 0.0001 mg/L for the most sensitive species, using ammonia, zinc and copper respectively. These values are in agreement with those derived by the U.S. Environmental Protection Agency (1975) and the European Inland Fisheries Advisory Commission (1973).

In most cases, except for Mytella guyanensis, death was primarily due to circulatory changes, as a result of increased lymphatic spaces in the secondary lamellar area. For the bivalve however, death was diagnosed as having occurred, from the increased inter-lamellar spaces. This effectively caused a reduction in the surface area for oxygen diffusion. In all cases, suffocation ensued.