**Abstract No: BO-17**

# Acute toxicity of formaldehyde on the ornamental fish, *Cyprinus carpio* (koi carp) fingerlings

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The ornamental fish trade is a multibillion-dollar sector that involves more than 125 countries, including Sri Lanka. Formalin, 37% formaldehyde, is widely used in the ornamental fish industry as a prophylactic measure or therapeutic purposes. It is usually used to treat ectoparasites that reside on the body surface or gills of fish, and it is also used as a fungicide for fish eggs. Chemotherapeutic agent usage has been criticized because the indiscriminate usage of chemicals like formalin may cause severe risks to both fish and human health and the environment. The toxicity of chemicals to fish must be decided prior to using any chemical to fish as a therapeutic agent for their diseases. A 96 h acute toxicity test was conducted to determine the median lethal concentration ($LC_{50}$) of formalin on *Cyprinus carpio* (Cyprinidae) fingerlings. Experimental fish were exposed to a static bath in 4 L glass aquaria with formalin concentrations of 50, 55, 60, 65 and 70 mg $L^{-1}$. Seven fingerlings were added to each tank for the acute toxicity test, and glass aquaria were continuously aerated during the test. The control experiment was conducted using de-chlorinated tap water. All five treatments and the control experiment were triplicated. During formalin exposure, fish behavior was observed. The Number of fish deaths was recorded in each concentration separately and probit analysis was conducted to determine the 96-h $LC_{50}$ value of formalin. Fish behavior changes were investigated during the acute toxicity test. Fish were aggregated near the aeration, erratic swimming with fast movement, fast opercula beating, and fast opening and closing of the mouth, excess mucus production, opercula beating frequency reduction, slow swimming and jumping-like behavior were observed until the beginning of the first death. Mucus accumulation on the body surfaces and gill filament was recorded on dead fish. The gills of the dead fish were damaged and toxicity symptoms were observed. The 70 mg $L^{-1}$ concentration was the lethal concentration for *C. carpio* fingerlings in less than 24 h. The $LC_{50}$ value of formalin on *C. carpio* fingerlings at 95% confidence level was 55 mg $L^{-1}$ for 96 h. It was concluded that acute exposure to formaldehyde causes lethal toxic effects on *C. carpio* fingerlings. Formalin must be used with due care and management in aquaculture practices.

**Keywords:** Formalin; $LC_{50}$, Therapeutic agents, Ornamental fish

**Acknowledgment**
This work was supported by The Faculty of Science, University of Kelaniya.