

## Acute toxicity of cylindrospermopsin on zebrafish (*Danio rerio*) embryonic development

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Eutrophic conditions in freshwater bodies cause the formation of cyanobacterial blooms. Cylindrospermopsin (CYN) is a tricyclic alkaloid cytotoxin produced by cyanobacteria as a secondary metabolite. Exposure to elevated concentrations of CYN could cause liver and kidney damage in fish. The present study focused on the acute toxicity effects of CYN on zebrafish embryonic development. Zebrafish embryos were exposed to a concentration series of 0.1  $\mu\text{gL}^{-1}$ , 1.0  $\mu\text{gL}^{-1}$ , 2.5  $\mu\text{gL}^{-1}$ , 5.0  $\mu\text{gL}^{-1}$  and 7.5  $\mu\text{gL}^{-1}$  prepared using CYN standard solution and control (distilled water). After 1 hour of post-fertilization (hpf), 30 eggs per concentration were exposed and triplicated with three different batches. Hatching rate, hatching time, mortality rate and heart rate were recorded at every 24 hrs up to 96 hpf. The highest mortality rate was recorded as 13.3 % at 7.5  $\mu\text{gL}^{-1}$  concentration, whereas the lowest was 3.3 % at 0.1  $\mu\text{gL}^{-1}$ . Hatching time increased from  $55.2 \pm 2.04$  hpf to  $76.3 \pm 2.21$  hpf with increasing concentrations. In contrast, the control showed the lowest hatching time at  $53.7 \pm 2.16$  hpf with 0 % mortality. Heart rate decreased from  $124.7 \pm 2.45$  bpm to  $95.5 \pm 2.79$  bpm in high concentrations compared to the control of  $145.7 \pm 2.26$  bpm. Statistical analysis showed that CYN concentration and embryo survival have a negative correlation while hatching time has a positive correlation ( $p < 0.05$ ). Findings suggest that the impact of CYN on the embryonic development is influenced by the dosage as higher doses lead to greater vulnerability. This could potentially lead to a reduction in the zebrafish population especially when water bodies are hypereutrophic.

**Keywords:** Cyanotoxin, Cylindrospermopsin, Embryonic development, Zebrafish

**Acknowledgement:** Financial assistance from grant ASP/01/RE/SCI/2022/16, Centre for Water Quality and Algae Research, University of Sri Jayewardenepura is acknowledged

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