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Evaluating the Impact on Water PH on Glyphosate Acute Toxicity Using the Zebrafish (*Danio rerio*) Embryos**Naleefa, M.N.¹, Imanthi, K.P.A.², Manage, P.M.^{2*}**¹*Faculty of Medical and Health Sciences, Business Management School (BMS), Colombo 03, Sri Lanka*²*Center of Water Quality and Algae Research, Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka***pathmalal@sjp.ac.lk***Abstract**

Glyphosate (GLY) is the most widely used herbicide in the world to control weeds. Widespread use of GLY potentially causes health risks to both human and aquatic organisms. GLY can be toxic under different pH, which alters the fish physiology by causing oxidative stress, inflammation, and mitochondrial dysfunction. The present study aimed to assess the acute toxicity of the GLY under acidic, basic and neutral pH using zebrafish embryos focusing on the mortality rate, hatching rate, morphological deformities, and heart rates. Zebrafish is a model organism who depicts the rapid development of embryos, optical transparency, external fertilization and has 70% genetic similarity to humans. Zebrafish embryos were exposed to combination of pH series (5,6,7,8 and, 9) and commercial glyphosate (Anu 71). The pH solutions were prepared using NaOH and HCl, then 0.7 mgL⁻¹ GLY was added into each. Distilled water was used as the control. Twenty embryos were exposed to each solution after 2 hours post fertilization (hpf) and triplicated. Observation was recorded at 24 hour interval, up to 96 hpf. After 1 hour, the mortality of the embryos in GLY at pH 5 was 83.3±0.58%, and within 24 hrs it was 100%. The Mortality rate of embryos in pH 6 was 50.0±1.15% after 1 hr and reached to 100% at 96 hr. GLY at pH 8 and 9 showed delayed embryonic development and recorded 100% mortality after 96 hr. The mortality rate of embryos in pH 7 was 18.2±0.58%, and it was 82.3±0.58% at 96 hr. Yolk sack oedema was observed in more than 30% of the exposed larvae. The hatching rate of the embryos were 18.2±1.74% in pH 7 and the heart rate was 120±10 bpm. No fatalities were reported in the control solution, the hatching rate was 100% and heart rate were 140±4. According to the results, glyphosate toxicity was highly influenced by pH fluctuations as low pH caused acute mortalities and high pH caused delayed growth. Yolk sack oedema represents internal fluid accumulation caused by organ disruption. This can affect embryonic survival in the natural environment and can cause long-term diversity loss in water bodies. Implications regarding the usage and discharge of glyphosate around natural eco-systems have to be critically monitored to overcome this issue in future.

Keywords: *Glyphosate, Hatching rate, Mortality rate, pH, Zebrafish embryos*