

**ASSESSING THE FRESHWATER HABITAT HEALTHINESS USING
Lamellidens marginalis (FRESHWATER MUSSEL) – A CASE STUDY IN A
SELECTED URBAN TANK LOCATED IN ANURADHAPURA DISTRICT**

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Natural and anthropogenic disturbances contribute to the deterioration of water quality in aquatic ecosystems. Bioindicators such as mussels are particularly sensitive to changes in water quality, making them effective indicators of aquatic pollution. This study aimed to evaluate the environmental quality of an urban tank located in *Anuradhapura* district by integrating water quality parameters with lysosomal membrane stability (LMS), a biomarker of environmental stress in mussels. Freshwater mussels (*Lamellidens marginalis*) were collected from the wild and acclimatized under laboratory conditions for seven days. They (n=54) were placed within the tank at five pre-selected locations (L1-L5) for two months while a control group was maintained in the laboratory. Following the exposure, the LMS of haemocytes was assessed using the neutral red retention time (NRRT) method. Water quality analysis focused on parameters: pH, electrical conductivity (EC), total dissolved solids (TDS), available nitrates (NO₃⁻), phosphates (PO₄³⁻), biological oxygen demand (BOD), chemical oxygen demand (COD), and temperature. The water quality index indicated that nearly all sites had poor water quality, with site L3 classified as very poor. NRRT varied significantly among the locations, with the lowest retention time observed in site L3 (22.5±2.83 min) compared to the control. Significant negative correlations were found between NRRT and water quality parameters. Principal Component Analysis (PCA) revealed that EC, pH, temperature, available phosphate ion concentration, COD, and TDS were the primary drivers of water quality differences across the sites. The negative loading associated with NRRT suggests that NRRT decreases with the decline in water quality, reflecting an adverse impact on mussel lysosomal stability. In conclusion, this study indicates that LMS, measured through NRRT in the haemocytes of freshwater mussels, is an excellent biomarker for pollution in freshwater habitats.

Keywords: Bioindicators, Lysosomal membrane stability, Neutral red retention time