

## Toxicity Depletion Rates of Water Lettuce (*Pistia stratiotes*) in an Aquaculture Effluent Hydroponic System

**Authors :** E. A. Kiridi, A. O. Ogunlela

**Abstract :** The control of ammonia build-up and its by-product is a limiting factor for a successful commercial aquaculture in a developing country like Nigeria. The technology for an advanced treatment of fish tank effluent is uneconomical to local fish farmers which have led to indiscriminate disposal of aquaculture wastewater, thereby increasing the concentrations of these nitrogenous compound and other contaminants in surface and groundwater above the permissible level. Phytoremediation using water lettuce could offer cheaper and sustainable alternative. On the first day of experimentation, approximately 100 g of water lettuce were replicated in four hydroponic units containing aquaculture effluents. The water quality parameters measured were concentration of ammonium&ndash;nitrogen ( $\text{NH}_4^+$ -N), nitrite-nitrogen ( $\text{NO}_2^-$ -N), nitrate-nitrogen ( $\text{NO}_3^-$ -N), and phosphate&ndash;phosphorus ( $\text{PO}_4^{3-}$ -P). Others were total suspended solids (TSS), pH, electrical conductivity (EC), and biomass value. At phytoremediation intervals of 7, 14, 21 and 28 days, the biomass recorded were 361.2 g, 498.7 g, 561.2 g, and 623.7 g. Water lettuce was able to reduce the pollutant concentration of all the selected parameter. The percentage reduction of pH ranged from 3.9% to 14.4%, EC from 49.8% to 96.2%, TDS from 50.4% to 96.2%, TSS from 38.3% to 81.7%,  $\text{NH}_4^+$ -N from 38.9% to 90.7%,  $\text{NO}_2^-$ -N from 0% to 74.9%,  $\text{NO}_3^-$ -N from 63.2% to 95.9% and  $\text{PO}_4^{3-}$ -P from 0% to 76.3%. At 95% confidence level, the analysis of variance shows that  $F(\text{critical})$  is less than  $F(\text{cal})$  and  $p < 0.05$ ; therefore, it can be concluded statistically that the inequality between the pre-treatment and post-treatment values are significant. This suggests the potency of water lettuce for remediation of aquaculture effluent.

**Keywords :** aquaculture effluent, nitrification, phytoremediation, water lettuce

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