

Modeling of azo dye removal from textile wastewater using constructed wetlands:

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The removal of azo dye from synthetic textile wastewater was investigated using three Horizontal Sub-Surface Flow Constructed Wetlands (HSSFCWs) installed in parallel. The main objective was to model the removal mechanisms of azo dyes. This was achieved using STELLA RESEARCH® programme version 7.0.2 (2003). The results showed that the observed mean azo dye removals were 86.9% and 92.2% in the planted cells and it reached 78.2% in the unplanted cell. The observed mean Chemical Oxygen Demand (COD) removals were 39.9 and 48.9% in the planted cells and it reached 31.6% in the unplanted cell. The observed mean sulphate removals were 53.1 and 55.6% in the planted cells and only 47.3% in the unplanted cell. The observed mean removal efficiencies were calculated at 95% confidence interval. The reduction of sulphate signified the presence of sulphur reducing bacteria which consume sulphate and produces sulphide and subsequently sulphide reduces azo dye via chemical reaction. The COD reduction signified the reduction of azo dye intermediate products. The results from the model showed that the main processes for the azo dye removal were on average contributed by (27%) adsorption, (35%) biodegradation and (10%) chemical reduction, respectively. It is recommended that the scope of this research be further extended and broadened, and in particular through the treatment of real textile wastewater in a baffled HSSFCW planted with Phragmites. Furthermore, field data for the model calibration and validation should be based on measured azo dye concentrations and other environmental factors at relevant locations in the constructed wetland system.