

Simultaneous removal of color, organic compounds and nutrients in azo dye-containing wastewater using up-flow constructed wetland

Abstract

Combination of aerobic and anaerobic processes in constructed wetlands can enhance the treatment performance in textile wastewater. This study assessed the treatment of azo dye Acid Orange 7 (AO7) and nutrients using five laboratory-scale up-flow constructed wetlands (UFCW) with and without supplementary aeration, and with different emergent plants. Supplementary aeration controlled the size of aerobic and anaerobic zones in the UFCW reactors as evidenced by the oxidation-reduction potential (ORP) and dissolved oxygen (DO) profile of the UFCW. The AO7 removal efficiency was above 95% in all UFCW reactors and most of the color was extensively removed in the anaerobic region of the UFCW beds. The intermediates produced through the breakage of azo bond were significantly reduced in the UFCW reactors with supplementary aeration. The results indicated the applicability of the UFCW reactors to the treatment of azo dye-containing wastewater. The removals of T-N and T-P were in the range of 60-67% and 26-37%, respectively, among the UFCW reactors. The COD and NH₄-N removals in the aerated reactors were about 86 and 96%, respectively. On the other hand, the COD and NH₄-N removals were in the range of 78-82% and 41-48%, respectively, in the non-aerated reactors. The supplementary aeration enhanced the removal efficiencies in organic matter, NH₄-N and aromatic amines in the UFCW reactors.

Keywords

Azo dye; Nutrients; Supplementary aeration; Up-flow constructed wetland; Wastewater treatment