Abstract

Constructed wetlands (CW) or artificial wetlands (AW) represent a feasible option for the problems confronted by emerging economies countries, such as Mexico, from the technical and economical point of view, because they are integrated wastewater treatment systems in which through physical, chemical, and biological processes, pollutants can be efficiently removed from wastewaters allowing its use for agricultural and/or industrial purposes. In this research experiments were carried out using reactors at laboratory scale to evaluate the role played by plants (Phragmites australis) in its first stage of growth in pollutants removal measured as soluble chemical oxygen demand CODsoluble and electrical conductivity (EC). Two reactors were built using 25 liters plastic containers, with 12.5 L working volume (one with a 1.5 cm height plant, RA1 and a second one as a control, RA2, unplanted), packed with volcanic slag (tezontle). The reactors received illumination during 16 h a day using fluorescent tube lamps with natural light characteristics. Both reactors were kept flooded to minimize the effect of convective oxygen transfer through air sucking. Synthetic wastewater was daily prepared by dissolving sucrose, (NH4)2SO4, and Na3PO4 rendering an approximate concentration of 450 mg/L CODsoluble. Hydraulic residence time (HRT) in both reactors was 1.8 d. Samples of wastewaters at the inlet and outlet as well at 2, 10, and 30 cm depth from the water level were taken, and the CODsoluble and EC were determined using the standard methodology and commercial electrodes respectively. Results obtained, when the hydrophyte has approximately 50 cm height, indicate that the plant had a marked beneficial role (RA1) with removal rates of 54 and 9.3%, for CODsoluble and EC, respectively, compared with the control reactor (RA2) (38.1 and 4.4%, respectively). Data analyses indicated that these differences were statistically significant (P<0.05). Values for CODsoluble and EC diminish as depth increases having the highest removal at 10 cm where the plant root system is located indicating the importance of the plant presence for the pollutants removal phenomena.

Keywords

Pollutants removal, chemical oxygen demand, electric conductivity, artificial wetlands, constructed wetlands