

Treatment of swine wastewater with subsurface-flow constructed wetlands in Yucatán, Mexico: Influence of plant species and contact time

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Abstract

This study evaluates the capability of horizontal subsurface-flow constructed wetlands (SSF CWs) for treating pretreated swine wastewater as a function of contact time (CT) and type of macrophyte under the local conditions of Yucatán, Mexico. Experiments were conducted from July 2004 to November 2005 on a swine-fattening farm. The study had three stages: first, macrophytes were located and collected; second, plants were acclimatized; and third, a pilot plant with 6 wetlands was set up, operated and evaluated. The effectiveness of the wetlands was intensively tested over 2 periods (April and November 2005). The results indicate that treatment efficiency significantly improved with increased CT for most of the analysed contaminants. The highest removal rates were recorded at a CT of 3 d and ranged between 64 and 78% for total suspended solids, 52 and 78% for COD, 57 and 74% for BOD₅, 57 and 79% for total nitrogen, 63 and 75% for ammonium nitrogen, 70 and 81% for nitrate, 0 and 28% for total phosphorus and 3.3 and 4.2 log-units for total coliforms. Results also suggest that the macrophyte species used did not significantly differ on their contribution to overall treatment efficiency. However, vegetated beds slightly improved water quality when compared to unplanted systems. Horizontal SSF CWs are a suitable technology for treating swine wastewater under the local conditions of Yucatán. Contact time should be given special attention in the design of future full-scale facilities.

Keywords: reed beds, swine wastewater, contact time, plant species