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NITROGEN AND PHENOL REMOVAL IN GRAVEL- AND RAW RICE HUSK-BASED CONSTRUCTED WETLANDS

H.C. Tee, F.W.N. Tan and P.E. Lim

School of Chemical Sciences,
Universiti Sains Malaysia, 11800 USM Pulau Pinang, Malaysia

Abstract: *This study was conducted to investigate: (i) the removal of nitrogen and phenol in planted and unplanted constructed wetlands, (ii) the potential of raw rice husks to be used as an alternative media in constructed wetlands to treat phenol-containing wastewater and (iii) the effect of phenol on nitrogen removal. Four experimental-scale horizontal subsurface-flow constructed wetland units, two with pea gravel and the other two with mainly raw rice husks as wetland media, with one of which planted with cattails (Typha latifolia) were operated outdoors. The wetland units were fed with domestic wastewater spiked with 65.6 mg/L phenol for one month and then increased to 191.9 mg/L. The concentrations of ammoniacal nitrogen (AN), total Kjeldhal nitrogen (TKN), oxidized nitrogen (NOx-N) and phenol were monitored at the inlet, outlet and the intermediate point. The results show that the removal efficiencies of AN in planted gravel-based and rice husk-based wetland units were not affected even after 191.9 mg/L phenol was added for one month. In contrast, the removal efficiencies of AN in unplanted gravel-based and rice husk-based wetland units decreased from 64 to 43% and from 65 to 53%, respectively, after phenol was added. This indicated that wetland plants play an important role in nitrogen removal. The removal of phenol was nearly 100% for all wetland units indicating that raw rice husks have the potential to be used as an alternative media in constructed wetlands.*

Keywords: nitrogen and phenol removal, constructed wetlands

Abstrak: *Kajian ini dijalankan untuk meninjau: (i) penyingkiran nitrogen dan fenol dalam paya tiruan dengan dan tanpa tumbuhan, (ii) keupayaan sekam padi mentah untuk digunakan sebagai media ganti dalam paya tiruan untuk pengolahan air buangan yang mengandungi fenol dan (iii) kesan fenol terhadap penyingkiran nitrogen. Empat buah unit paya tiruan aliran sub-permukaan yang berskala eksperimen dioperasikan di luar. Dua daripadanya diisi dengan batu halus dan selebihnya disi dengan sekam padi. Sebuah unit bagi setiap jenis paya tiruan ditanam dengan tumbuhan cattail (Typha latifolia). Unit itu disalurkan dengan air buangan domestik yang berkepekatan fenol 65.6 mg/L selama satu bulan dan kemudian kepekatan fenol ditingkatkan kepada 191.9 mg/L. Kepekatan nitrogen ammonia (AN), jumlah nitrogen Kjeldhal (TKN), nitrogen teroksida (NOx-N) dan fenol dipantau di titik masuk, keluar dan perantaraan. Keputusan menunjukkan bahawa kecekapan penyingkiran AN dalam unit paya bermedia batu halus dan sekam padi yang mengandungi tumbuhan tidak dipengaruhi walaupun sebanyak 191.9 mg/L fenol telah ditambah selama satu bulan. Sebaliknya, kecekapan penyingkiran AN dalam kedua-dua jenis paya tiruan yang tidak mengandungi tumbuhan*