

## Abstract

The objective of this study was to investigate application of forage crop for domestic wastewater treatment using vertical subsurface flow constructed wetland (VSF CW). Pangolar grass (*Digitaria decumbens*), Atratum grass (*Paspalum atratum*) and Buffalo grass (*Brachiaria mutica*) were planted in VSF CW. Efficiencies of these grass species for pollutant removal were evaluated. In addition, growth, nutrient accumulation rate, yield and nutritive value of each species were also examined at each harvest period.

This work gave promising result that the VSF CW fed with domestic wastewater at 20 cm/day or 100.6 l/day of HLR have potential for domestic wastewater treatment. Efficiency of the VSF CW for removal of COD, TSS, TKN, NH<sub>3</sub>N, NO<sub>x</sub>N and TP were 36.59-92.50, -325.00-100.00, 19.40-97.62, -378.95-97.84, -3,421.00-60.00 and -151.80-72.15 %, respectively. Atratum grass showed the highest efficiency for COD, TKN and NO<sub>x</sub>N removal and Buffalo grass showed the highest efficiency for TSS, TP and NH<sub>3</sub>N removal. However, statistical analysis showed that efficiency of each grass species for removal of all types of the pollutants was not significantly different at  $P \geq 0.05$ .

Nutrient accumulation rate of root of Pangolar grass, Atratum grass and Buffalo grass was 0.0032-0.0090, 0.0111-0.0172 and 0.0081-0.0139 g N/m<sup>2</sup>/d and 0.0031-0.0055, 0.0034-0.0135 and 0.0033-0.0062 g P/m<sup>2</sup>/d, respectively. The nutrient accumulation rate of root of each grass species was not significantly different at  $P \geq 0.05$ . For above ground part, average nutrient accumulation rate of Pangolar grass, Atratum grass and Buffalo grass was 0.0273-0.0285, 0.0410-0.0496 and 0.0238-0.0423 g N/m<sup>2</sup>/d, and 0.0146-0.0208, 0.0220-0.0326 and 0.0167-0.0216 g P/m<sup>2</sup>/d, respectively. There were significantly different between studied species at 1<sup>st</sup> and 2<sup>nd</sup> harvest for nitrogen accumulation rate, and 1<sup>st</sup> and 3<sup>rd</sup> harvest for phosphorus accumulation rate ( $P < 0.05$ ). Moreover, there were significantly different between harvest period for nitrogen accumulation rate of Buffalo grass and phosphorus accumulation rate of Pangolar grass ( $P < 0.05$ ).

Relative growth rate (RGR) of Pangolar grass, Atratum grass and Buffalo grass throughout experimental period was 0.096-0.154, 0.106-0.178 and 0.108-0.163 per day, respectively. There were not significantly difference between RGR of each studied species and RGR of each harvest period. Average dry yield of Pangolar grass, Atratum grass and Buffalo grass at 1<sup>st</sup> harvest was 372.2, 608.8 and 673.0 kg/rai, respectively. The average dry yield of those at 2<sup>nd</sup> and 3<sup>rd</sup> harvest was 388.9, 560.3 and 429.9 kg/rai, and 318.4, 965.5 and 602.0 kg/rai, respectively. DM, CP, CF and phosphorus of tissue of all studied species was 18.4-53.1, 1.66-5.09, 24.55-31.88 and 0.20-0.43 %, respectively. Most grass product contained DM, CP and CF less than normal level. However, phosphorus content appeared at high level.