SHORT COMMUNICATION

Reduction of Phosphorus Concentration from Artificial Wastewater in Constructed wetland

Ali Afrous1, Mohammad Yarian Kupaei2, Reza Jalilzadeh3, Ehsan Derikvand4 and Manish Kumar5
1. Department of Water Engineering, Dezful Branch, Islamic Azad University, Dezful, Iran.
2. Director of Integration and Balance, Ghazvin Regional water company, Ghazvin, Iran.
3. Department of Water and wastewater Engineering, Science and Research Branch, Islamic Azad University, Khouzestan, Iran
4. Department of Water Engineering, Shushtar Branch, Islamic Azad University, Shushtar, Iran.
5. Academy for Environment and Life Sciences, Agra.

ABSTRACT
In this paper, possible reduction of Phosphorus in artificial wastewater was studied at mesocosm scale for concentrations 10 mg/lit in three-time retention including 1.5, 3.5 and 7 days. In this research, Phragmites australis and Typha latifolia performance in constructed wetland were compared to a control system. Results showed that concentrations of PO4-P and TP in effluent of flow after 7 day reduced to average 56.7% and 45.6% respectively for three systems. Maximum removal efficiency was observed for system contains Phragmites australis by amount of 71.5% and 63.3% for PO4-P and TP concentrations in effluent.

Keywords: Wetland, Wastewater

INTRODUCTION
Releasing of excessive quantities of phosphorus to surface water bodies from sewage treatment works, municipal wastewater and agricultural runoff causes eutrophication, frequently resulting loss of water resources. Constructed wetland are cheap systems for treatment of many wastewater including industrial, municipal and agricultural runoff. In these occurs relying on plants and a combination of naturally occurring biological, chemical and physical processes to remove pollutants from the water. Phosphorus is one of important pollution in agricultural runoff that entire in water bodies and created eutrophication. Debing et al [1] to optimize poly-culture vegetation structure, Typha-Phragmites-Scirpus as three design treatments were planted in pilot-scale gravel-based subsurface wetlands to treat artificial sewage. The effect of macrophyte species on horizontal subsurface flow constructed wetlands efficiency were studied in ten units in a greenhouse experiment, in summer and winter for removal many pollutants such as TP and PO4-P by Ouellet-Plamondon et al [2]. In around of Dez river that located in agriculture region Dezful of Khouzestan, southwest in Iran, there are many aquatic plants such as Phragmites australis and Typha latifolia. However, due to intensive agricultural, annually large amounts of phosphorus in agricultural runoff into surface water sources. The aim of the present experiment was to reduce phosphorus concentrations in water entering the system is the constructed wetlands contain these aquatic plants.

METHODS AND MATERIALS
Experiments of research were conducted in mesocosm scale in the Agriculture Faculty of Islamic Azad University, Dezful, Iran. Latitude and longitude of area are 16°32 and 25°48 respectively and altitude is 137 m. Climate of this region is warm with Mediterranean rainfall regime. In present study, two systems contain planting of two species Phragmites australis and Typha latifolia and a system of control was considered. In all three systems, influent phosphorus concentration was 10 mg/lit. The constructed wetland system (planted media) was composed of a thick plastic placed in the context of a concrete channel with a small hole in the bottom of the outflow (drainage) flow sewers. Dimensions of bed were 5 m long, 0.5 and 0.4 m width and height that filled by river sand. For investigation the removal of TP and
PO4-P, three-time retention including 1.5, 3.5 and 7 days were selected and concentration of TP and PO4-P were measured in the effluent from the drainage system. The pollutant removal efficiency by dividing the difference between the inlet and outlet concentrations input concentration of each pollutant was calculated. Spectrophotometer was used for determination of phosphorus and results were analysis with SPSS V.15 software.

RESULTS AND DISCUSSION

The effect of system type on the removal efficiency

Figure 1 shows comparison of the effect of system type on the removal of TP and PO4-P. The results shows that different in average pollutant removal efficiency average in the system consists of growing two species aquatic plants compared to systems without plants (control) was significant at P≤0.05. The numbers in this figure, the mean of TP and PO4-P removal efficiencies for the three-time retention of each system is achieved. System containing the Phragmites australis species with amount 71.5% and 63.3% for PO4-P and TP concentrations (in retention time of 7 days) in effluent was better performance rather Typha latifolia system in removal efficiency, although not significant differences between the two systems averagely.

The effect of retention time on the removal efficiency

Figure 2 shows comparison of the effects of retention time on the removal of TP and PO4-P from studying artificial wastewater. Results showed that removal efficiency of TP and PO4-P between 3.5 and 7 days was observed significant difference in P≤0.05 of Duncan test. Maximum removal efficiency was observed for 7 days retention time with amount of 56.7% and 45.6% respectively about TP and PO4-P. Results of Arias et al [3] showed the use of river sand contain iron and aluminum oxides can be removal phosphorus concentration in constructed wetland system through chemical absorption by plants and the environment bed and precipitation. Other results indicate that prolonged periods of time will lead to increased nutrient removal from wastewater through the constructed wetland. Many studies have confirmed these results [4, 5], for example, [6] showed that reduction of nitrogen and phosphorus concentrations from effluent wastewater in constructed wetland with vertical surface flow is exponentially equation with retention time.

REFERENCES


How to cite this article