Evaluation of the different filter media in vertical flow stormwater wetland

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ABSTRACT

The performance of four different types of filter media, namely woodchip, pot gravel, synthetic fiber, and volcanic stone employed as the main media in a set of column vertical flow stormwater wetlands were evaluated in this study. The evaluation parameters were treatment performance, adsorption capacity, porosity, filtration type, plant growth, substance release, cost, and construction. For pollutant removal, all the media showed efficient reduction of total suspended solids (more than 80%). Similarly, all were efficient in organics removal except for woodchip but it had the highest total nitrogen removal efficiency for 40%. Total phosphorous removal was high in synthetic fiber and pot gravel (75 and 65%, respectively) but it was poor in volcanic stone. Pot gravel showed the highest adsorption capacity followed by volcanic stone but their disposal cost may be a burden. Although synthetic fiber has the highest porosity, it was thought to be capable of only surface filtration due to its small pore size while the others were expected to be capable of in-depth filtration. In terms of cost, woodchip was the cheapest followed by pot gravel and volcanic stone, while synthetic fiber was the most expensive. Finally, in terms of construction, all the media are advisable for use except for volcanic stone due to its high loading that can increase construction cost and due to difficult management during construction as well as replacement.

Keywords: Media; Stormwater; Vertical flow wetland

1. Introduction

Vertical flow (VF) wetlands, as a type of constructed wetlands, are used worldwide for removing pollutants from wastewater or stormwater runoff due to their mechanical simplicity, low operational and maintenance requirements in comparison to conventional water treatment technologies. The most important consideration in the design of this type of wetland is the filter media, which is closely related to the pollutant removal, wetland running time, and construction cost.

A great number of previous studies have focused mainly on the treatment performance of wetland*Corresponding author.

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