Canna can: Ornamental eliminates pollutants from stormwater runoff

December 10 2009

This is a nutrient recirculation system planted with test plants including canna 'Australia' Credit: Photo courtesy of Yan Chen

Rapid population growth and urbanization have raised concerns over stormwater runoff contamination. Studies on watersheds indicate that excess nutrients, specifically nitrate-nitrogen and soluble reactive phosphorus are found in stormwater runoff in many new urban areas. These pollutants degrade water quality and have an impact on the downstream ecosystem by contributing to the growth and decomposition of oxygen-depleting microorganisms.

A research team recently used a nutrient recirculation system (NRS) to assess the ability of four ornamental and three wetland plant species to remove nitrogen and phosphorous from stormwater runoff. The study

showed that canna is a promising ornamental species for stormwater mitigation, and harvesting the aboveground biomass of canna can effectively remove nitrogen and phosphorous from the treatment system.

A variety of stormwater treatment technologies such as constructed wetlands and retention ponds have been developed in response to increasing regulatory pressures, but water quality issues are still found in many stormwater treatment structures. To meet increasingly rigorous EPA regulations, significant nitrogen and phosphorous reductions are necessary to improve water quality before it is discharged into the ecosystem from stormwater retention structures.

A relatively new technique using floating wetlands (also called "floating islands") for stormwater improvement has been tested in a wastewater treatment pond and a laboratory-scale constructed wetland; the results have suggested that the use of floating systems can increase mitigation capacity and provide efficient nitrogen and phosphorous removal in small treatment structures in urban areas. When ornamental plants are added to floating wetland systems, the benefits can be both aesthetic and environmental.

In a study published in a recent issue of the journal *HortScience*, a research team headed by Yan Chen of Louisiana State University's Hammond Research Station, analyzed the nutrient removal abilities of herbaceous perennial ornamentals (canna, iris, calla lily, and dwarf papyrus) compared with those of wetland plants (arrow arum, pickerelweed, and bulltongue arrowhead) in three experiments. The nutrient recirculation system (NRS) was filled with a nutrient solution with total nitrogen (N) and phosphorous (P) concentrations of 11.3 and 3.1 mg/liter, respectively, to simulate high levels of nutrient contaminations in stormwater.

The results showed that 'Australia' canna had the greatest water

consumption, total biomass production, and aboveground nitrogen and phosphorous content, followed by pickerelweed. 'Golden Fleece' iris had higher tissue nitrogen concentrations than canna, but much lower biomass production. Dwarf papyrus had similar total biomass as pickerelweed, but less shoot biomass. Nitrogen and phosphorous removed from the NRS units planted with canna (98.7% N and 91.8% P) were higher than those planted with iris and arrow arum (31.6% and 31.5% N, and 38.5% and 26.3% P, respectively). NRS units planted with dwarf papyrus had similar nutrient recovery rate as pickerelweed, but much less total N and P were removed as a result of less water consumption. The NRS units planted with calla lily had lower nutrient removal than canna and pickerelweed.

Results from the study suggest that ornamental canna has the potential to be used as mitigation plants in urban stormwater floating biofiltration treatment. Because canna is a perennial plant and allocates the majority of its biomass to shoots, it can be harvested regularly, offering consistent removal of biomass from the treatment system. Chen noted that more research needs to be done to evaluate factors that might affect its application, such as "nitrogen and phosphorous loading and hydraulic conditions, planting densities, poly culture, harvesting frequency, and growth maintenance techniques."

More information: The complete study and abstract are available on the ASHS HortScience electronic journal web site: hortsci.ashspublications.org/c … t/abstract/44/6/1704

Source: American Society for Horticultural Science

https://phys.org/news/2009-12-canna-ornamental-pollutants-stormwater-runoff.html