Grey Water Treatment with Constructed Wetlands for Backyard Crops Irrigation

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Water is a scarce resource and responsible for life on Earth. Nonetheless, the quality and quantity of this resource must be taken into account. Rural populations due to their remote geographic location, distance between houses and lack of economic resources, struggle to obtain improved water sources. Of the consumption of this liquid in a household, 60 to 70% is used in activities that produce grey water, such as showering and washing clothes, dishes and our hands, 25% is used in flushing toilets and the rest is used for cleaning, drinking, and preparing meals (Abdel-Kader, 2013). This water may be reused for backyard crop irrigation when properly treated against biological pollutants to avoid sanitary risks.

A constructed wetland is a confined biological system that replicates the water treatment mechanisms of natural wetlands. Worldwide they are used as a secondary wastewater treatment method, since they remove organic matter and reduce the nutrient and pathogen loads.

The University of Queretaro has implemented grey water treatment systems on campus and in rural communities since 2013. This research studies two grey water treatment systems located on the main campus of the University, as an attempt to improve such technologies. Each system consists of a grease trap, a stabilization pond, a constructed wetland and an irrigation system. Grey water is collected from sinks of two different bathrooms on campus.

During August-December 2015 these two systems underwent maintenance. One sample per month of each system's inflow and outflow liquid were collected and then analyzed. Results obtained indicated problems with how one of these systems was working, due to a malfunction of the irrigation system. After correcting the irrigation problem, the outflow analysis results of both constructed wetlands were similar and are reported in the next paragraph.

Analysis results indicated that the pH of the inflow was lower than the outflow, 7.49-7.92 against 8.02-8.24, respectively. The electrical conductivity remained unchanged throughout the treatment process, as well as the Total Suspended Solids (TSS), obtaining a maximum value of 0.075 mg/L. Chemical Oxygen Demand (COD) showed the greatest change, with inflow values above 500 mg/L to outflow values below 100 mg/L. Finally, we measured a 50 percent reduction of Total Coliforms (TC), with inflow values above 128 CFU/ml and outflow values below 86 CFU/ml.

Grey water treatment systems located at the University of Queretaro are a feasible solution; these systems need to be tested in the field in rural communities, to evaluate how they function and their resultant water quality.

References

Abdel-Kader, A.M. 2013. Studying the efficiency of grey water treatment by using rotating biological contactors system. J. King Saud Univ. – Engrg. Sci. 25(2): 89–95.

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