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Richard G Zytner

University of Guelph, Canada

Identifying treatment schemes for fruit and vegetable wash-water

The fresh-cut fruit and vegetable sector continues to expand as consumers are looking for fresh yet convenient ready-to-eat foods. The driving force behind this increase is the many health benefits that researchers continue to report for fruits and vegetables. Investigations have shown that the processing of fresh-cut fruits and vegetables generates about 5 liters of wastewater (wash-water) per kg of produce, whether it is fruit, leafy greens or root vegetables. This wash-water requires treatment prior to disposal or recycling. Generic water treatment units are too expensive for most small to medium sized operations, which require more affordable technologies. Even though there are a variety of treatment technologies available, the challenge for producers and regulators is that the selection of the appropriate treatment technology is difficult, and tools are needed to help make the decisions. Data for the research was collected by collecting samples from two different types of operation, washing and washing and processing. Various bench scale treatment processes where then tested, including settling, coagulation and flocculation with settling, centrifuge, dissolved air flotation, electrocoagulation, screening and hydrocyclone. The decisions tools developed decision matrices to summarize the removal effectiveness of the different treatments for typical wastewater parameters and serve as a reference tool in understanding wash-water treatment technologies and their effectiveness in treating various wash-waters. The data was then further analyzed to develop predictive correlations for raw wash-waters, followed by the development of models that identified which treatment process worked best for the type of wash-water being handled. Combining the decision matrices, correlations, and models also show the potential for water reuse. For example, wash-water high in suspended solids can be treated by electrocoagulation and settling. The tools provide information that growers, government and consultants can use in determining treatment options that were not previously available or studied in literature.

Recent Publications

1. Mundi G, Zytner R G and Warriner K (2017) Fruit and vegetable wash-water characterization, treatment feasibility study and decision matrices. Canadian Journal of Civil Engineering, doi.org/10.1139/cjce-2017-0214.
2. D Alharbi K K, Lau V, Liang C, Zytner R G and K Warriner (2017) Treatment of spent wash water derived from shredded lettuce processing using a combination of electrocoagulation and germicidal ultraviolet light. Food Quality and Safety, https://doi.org/10.1093/fqsafe/fyx012.
3. Moore A, Zytner R G and Chang S (2016) Potential water reuse for high strength fruit and vegetable processor wastewater with a membrane bioreactor (MBR). Water Environment Research, 88 (9):852-870.
4. Lam K, Zytner R G and Chang S (2015) Treatment of high strength vegetable processing wastewater with a sequencing batch reactor. Journal on Agricultural Engineering, 2(1):30-38.
5. Mundi G S and Zytner R G (2015) Effective solid removal technologies for wash-water treatment to allow water reuse in the fresh-cut fruit and vegetable industry. Journal of Agricultural Science and Technology A & B, doi: 10.17265/2161-6256/2015.06.003.

Biography

Richard G Zytner joined the School of Engineering, University of Guelph in 1991 after working in industry with Clayton Environmental Consultants. Since then he has taught both undergraduate and advanced graduate courses on water and wastewater treatment. His research interests have centered on soil remediation and wastewater treatment technologies. These projects have taken him several times to Germany on research leaves. Currently he is working on the fresh cut fruit and vegetable sector, with his research group looking at ways to treat both agri-food wash-water and wastewater, with the goal of reducing fresh water consumption. He has published and presented over 130 papers and is an Associate Editor with the *Canadian Journal of Civil Engineering.*

rzytner@uoguelph.ca

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