

Optimizing Wastewater Quality for Safe Vegetable Irrigation

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Abstract

The reuse of wastewater comes with the risk of exposure to chemical contaminants and pathogens. Domestic wastewater mixed with industrial wastewater that has undergone some pretreatments were channelled through a sand filtration system before undergoing further treatment in a combination of storage tanks and shallow reservoirs imitating anaerobic reactors and algal-based maturation ponds respectively. Physico-chemical and biological parameters were monitored. Urine samples of farmers and consumers of irrigated vegetables were also analysed for glyphosate, amphetamine, paracetamol, tramadol and amitriptyline. Nutrient (nitrate, ammonia, phosphate) and metal (Cd, Pb, Zn, Cr, Fe) concentrations were within acceptable limits in final effluent. Tramadol, amphetamine and amitriptyline were negative in all samples. 60% of farmers and 16.7% of consumers however showed the presence of paracetamol in urine. 40% of farmers and 8.3% of consumers had concentrations of glyphosate above 1.7µg/L. The bacteriological quality of the reservoir effluent met the EU guidelines of <10 cfu/100mL. All the vegetables were of good quality showing *E. coli* concentrations of <1 log unit and devoid of intestinal parasites. The study underscores the effectiveness of the improvised combined wastewater storage systems as an effective option for urban and peri-urban farmers for ensuring the safe irrigation of vegetables.

Keywords

Emerging Contaminants, Combined Treatment Systems, Recalcitrant Organic Compounds, Sand Filtration, Shallow Reservoirs, Nutrient, Heavy Metals, Guidelines.