

ABSTRACT

The practices of using untreated wastewater in the agricultural irrigation leads in the bioaccumulation of antibiotics in vegetables and other crops. Exposure to the bio accumulated antibiotics poses serious health risks to the ecosystem and humans ultimately. The prevalence of two types of fluoroquinolones, molecules and their bioaccumulation in five crops (*Daucus carota* L., *Pisum sativum* L., *Raphanus raphanistrum* L., *Lactuca sativa* L., *Spinacia oleracea* L.) and associated human health risks and their biodegradation were investigated. The main objectives are: Evaluation of antibiotics uptake, translocation, accumulation and assessment of physico-chemical changes in different parts of vegetables and related human health risks, isolation and screening of antibiotic resistant bacteria from contaminated soils and wastewater sample, bioremediation of antibiotics using microbial isolates and evaluation of phytotoxic effects of antibiotics on seed germination. The first part of this study deals with the uptake, transfer, accumulation, BCF and TF of antibiotics in the plants from antibiotic amended soil. The final transfer and distribution of each type of Levofloxacin (LEV) and Ciprofloxacin (CIP) in the edible portions of the experimental vegetable crops were: leaves > shoots > roots for both antibiotics. Risk quotient of both LEV and CIP in current study is found to be posing medium risk to human health due to the discharge of untreated wastewater into the fields, therefore it poses potential risks to human health. Second part of study dealt with the biodegradation of LEV and CIP. For this experiment collection of wastewater samples from different drains were obtained, labelled and stored. In the first phase 45 LEV and CIP microbial strains were isolated from wastewater samples. These isolates were identified through 16SrRNA sequencing. Isolates N6 and M16 showed 100% homology to *Escherichia* sp. whereas isolates N23 and M4 showed 100% homology to *Enterococcus* sp. Isolates potential for biodegradation were examined in liquid media. Maximum degradation was obtained under optimum conditions of concentration, temperature, pH and inoculum densities for both antibiotics. *Escherichia* sp. degraded 78% (LEV) and 90% (CIP) at 37°C and 6.5pH with inoculum density of 108 CFU/ml. *Enterococcus* sp. degraded 98% (LEV) and 100% (CIP) at 40°C and 6.5pH with inoculum density of 108 CFU/ml. It was observed that CIP degradation is more rapid than LEV. Kinetic study of biodegradation of both strains showed that, they have potential to degrade LEV and CIP. The third part of study was to compare the accumulation and seedling growth in antibiotic laden water and antibiotic with bacterial consortium in a seed germination experiment on all selected crops. Different antibiotic concentrations of 0.1, 1, 10, 100 and 500mg/L with and without bacterial consortium were used to evaluate seed germination in the laboratory. The results showed a significant phytotoxic reduction in the crop seeds grown in antibiotic with bacteria water in terms of germination percentage (GP), germination index (GI), stress tolerance indexes (STIs), seedling vigour index (SVI) and phytotoxicity index (PI). Phytotoxicity and accumulation of LEV and CIP was evaluated which showed significant result showed reduction in inhibitory effect and phytotoxicity when measured with different parameters. The results also established the worth of the bacterial consortium to be used for the removal of antibiotics before irrigation. Bioremediation is a cost-effective and an ecofriendly alternative for the degradation of antibiotics before going into filed irrigation.