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USING HYDRUS-2D MODEL TO EVALUATE WATER CONTENT IN VERTICAL DIRECTION FOR LETTUCE UNDER SUBSURFACE DRIP IRRIGATION

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Abstract

Produce can become contaminated with viral or bacterial pathogens in the irrigation water The contamination of romaine lettuce (*Lactuca sativa* L.) by irrigation water was assessed by modeling a subsurface drip irrigation (SDI) system with HYDRUS-2D. The model simulated the water movement in the soil to ensure that the soil surface does not become wet and consequently contaminated. An application efficiency of 95% for subsurface drip irrigation on Gila loam was used. The results obtained from this modeling study aim to prove that subsurface irrigation systems may effectively reduce the risk of contamination. HYDRUS 2D/3D simulations revealed that water would not wet the soil to a distance of 20 cm above the drip emitter in an SDI system. Thus, a dripline placed 20 cm below the surface should avoid soil surface wetting in this type of soil. This means that so long as the soil surface remains dry, subsurface irrigation has excellent potential to reduce health risks when microbial-contaminated water is used since the above-ground portion of the plant would never get in direct contact with the contaminated water. Hence, the simulations confirmed that by keeping the soil surface dry and understanding the water root-zone fluxes, crop contamination could be prevented with SDI while at the same time meeting the leafy greens water requirements.

Keywords: HYDRUS-2D, modeling, subsurface drip irrigation, contamination, lettuce.