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Wastewater reuse in a closed hydroponic system: An emerging solution for a sustainable agriculture

Today, agriculture remains the largest key driver of economic development, accounting for approximately 75% of the available freshwater resources. Increasing rainfall variability and extreme weather events have amplified the pressing pressure on alternative water resources, including rainwater, industrial recycled water and reclaimed wastewater, as a prominent way to meet with different water needs. It was estimated that greater than 700 million of consumers would depend primarily on the vegetables grown from these untreated or partially treated wastewater, while the health risks involved in the production chains have not been well defined. These polluting trace elements at the concentrations exceeding the physiological demand of food crops are expected to administer toxic effects to the plants but might be subjected to the bioaccumulation in food crops by entering into the food chains, to induce a large-scale dietary hazard in the major organs of the human body. In parallel to the urbanization and new city development, urban cultivation system, also known as a hydroponic system, is now seen as a viable solution to the limited land area suitable for agriculture and a more rational use of water resources, to provide better opportunities for a sustainable food supply in both developed and developing countries. It offers the ability to reuse water and nutrients, ease of environmental variability control, higher production yield and successive prevention of soil-borne diseases and pests. In this work, the application of nutrient film technique for selected food crop models cultivation under a controlled environment, for the investigation of different toxic heavy metal pollutants on the food crops quality and yield has been attempted. Priority attention has been focused into the feasibility of a hydroponic system for food crops cultivation, the impact of wastewater irrigation practice on the macroscopic symptoms, photosynthetic pigmentation, biochemical and physiological profiles, oxidative stress defense machinery of food crops, the accumulation and translocations of water pollutants and the associated health risks on different food crops species. This research presents a meaningful insight into the interruption of wastewater irrigation practice and its possible future health risk estimates for the reliable protection of human health and natural ecosystems and the building of a sustainable future.

Biography

Foo Keng Yuen is a lecturer and researcher of River Engineering and Urban Drainage Research Centre, Universiti Sains Malaysia. His research interests are environmental engineering, waste utilization, water treatment technology, catalysis, food security and toxicology and environmental health. He has a Web of Science Hirsch index of 35. He has authored more than 100 publications in reputed international, high-impact and proceeding journals and book chapters, with the total citations of exceeding 5,000 times. He serves as the Editor, Editorial Board Members, Scientific Adviser, Technical Committee, Review Committee, Keynote and Invited Speakers in several international scientific journals, conferences and research seminars.

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