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ABSTRACT



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IRRIGATING WITH WASTEWATER - RISKS OR ADVANTAGES? A PILOT-SCALE STUDY ON TOMATO (*SOLANUM LYCOPERSICUM* L.)

Michele Denora¹, Vincenzo Candido¹, Francesco De Mastro², Giuseppe Gatta³, Cristina De Ceglie⁴, Ruud P. Bartholomeus^{5,6}, Gennaro Brunetti², Michele Perniola¹

¹ *Dipartimento delle Culture Europee e del Mediterraneo, Università degli Studi della Basilicata, Via Lanera n.10 75100 Matera, Italia;*

² *Dipartimento di Scienze del Suolo, della Pianta e degli Alimenti, Università di Bari, Via Giovanni Amendola, 165/a, 70126 Bari, Italia*

³ *Dipartimento di Scienze Agrarie, Alimentari, Risorse Naturali e Ingegneria (DAFNE), Università di Foggia, 71122 Foggia, Italia;*

⁴ *Istituto di Ricerca sulle Acque del Consiglio Nazionale delle Ricerche (IRSA CNR), Viale F. De Blasio, 5 – 70132, Bari, Italia*

⁵ *KWR Water Research Institute, Nieuwegein, Netherlands*

⁶ *Soil Physics and Land Management, Wageningen University, Wageningen, The Netherlands*

Corresponding author: michele.denora@unibas.it

The reuse of treated wastewater has been identified as a pivotal strategy in semi-arid areas with water shortages or increased consumption. Nonetheless, the presence of emerging contaminants (ECs) such as pharmaceuticals and personal care products causes concern for human health and the environment. An experiment was conducted in Southern Italy to investigate the uptake phases, accumulation, and translocation processes of ECs in tomato (*Solanum lycopersicum* L. cv Taylor F1) production irrigated with treated wastewater. Moreover, the human and ecotoxicological impacts of chemicals was investigated. Tomato plants were grown in lysimetric weighing tanks (0.8 m³) during the period June-September 2021. The experiment involved three irrigation strategies: i) irrigation using conventional water ('FW'); ii) irrigation with treated wastewater additionally refined with the target contaminants in a dose comparable to the European average (TWWx1); iii) irrigation wastewater treated and refined with emerging contaminants in a triple dose (TWWx3). Considering the various balance items, the results showed a different behavior of ECs, and homogeneity between the 'TWWx1' and 'TWWx3' strategies. Specifically, in the 'TWWx3' strategy, Clarithromycin (antibiotic), Carbamazepine (anti-epileptic), Metoprolol (beta-blocker), Fluconazole, and Climbazole (antifungals) showed an interaction with the soil-plant system, most markedly for Carbamazepine and Fluconazole, which presented degradation percentages of 53% and 11% respectively, soil accumulation percentages of 39% and 70%, and plant accumulation percentages of 5%. The opposite behavior was found for Naproxen, Ketoprofen (anti-inflammatory), Sulfamethoxazole, Diclofenac, and Trimethoprim (antibiotics), the whose results showed degradation. This study showed a risk of active uptake of some ECs by the plant. In the period from June to September 2022, the study was repeated using the same methodology. The results from an agronomic point of view showed a

significant increase in yield in plants irrigated with wastewater ('TWWx1'; 'TWWx3'), compared to plants irrigated with conventional water ('FW'), which is attributable to a higher presence of nutrients in this water. Although partial, these results highlight benefits but also potential risks. Future studies will be indispensable to define guidelines for responsible water reuse.