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PFAS uptake in lettuce and tomato plants grown in a contaminated area: A field experiment in Northern Italy

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Poly- and perfluoroalkyl substances (PFAS) are a group of more than 4700 artificial aliphatic molecules, which are widely used by industry owing to their unique physico-chemical properties. PFAS are resistant to chemical and biological degradation, thus they are persistent and mobile in the environment. PFAS polluted soils and waters are secondary sources for plants, that accumulate them in different amounts depending on the chain length, functional group and PFAS source. Contaminated fruits and vegetables from polluted areas may represent a significant PFAS source for humans, and their accumulation into agrifood can increase risks for health. PFAS toxic effects on human health have been widely reported, therefore, it is important to evaluate their bioaccumulation in different plant species cropped in polluted areas. While information is available on plant uptake in hydroponic studies or pot experiments, information from field trials conducted in real polluted agricultural areas is scant. Here, we report the results from a field trial set up in Creazzo (Vicenza, North-East Italy), where soil and water are polluted by several PFAS compounds. Plants of lettuce and different varieties of tomato, grafted or ungrafted, were grown and PFAS accumulation was quantified by LC-MS/MS analysis. Only PFBA was detected in lettuce leaves, whilst other PFAS were present at trace-level amounts. Concerning tomato, PFBA, PFBS, PFHxA, PFHpA and PFOA were accumulated into leaves, whereas fruits accumulated mainly PFBA, PFPeA and PFHxA. In most cases, the ungrafted variety contained less PFAS compared to the grafted ones. Generally, a decreasing trend in the PFAS concentrations in fruits dependent on the increasing height of the plant trusses was observed. Results in terms of PFAS uptake and accumulation in plant tissues by the studied crops and implications for human health risks are discussed.