

Transformation of the pharmaceutical carbamazepine by crops

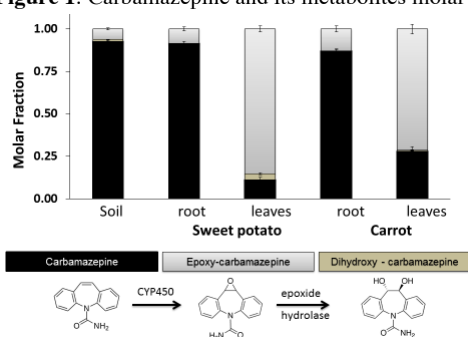
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Objective

Pharmaceuticals detected in treated wastewater are introduced into the agricultural environment. Thus, their uptake and metabolism by plants are of increasing concern. The research aimed to identify the uptake, translocation and metabolism of carbamazepine (CBZ) in crops under agricultural conditions. Root crops, carrot and sweet potato were grown in lysimeters. Tomato, cucumber and lettuce were grown in a greenhouse. All crops were irrigated with high-quality treated wastewater.

Figure 1: Carbamazepine and its metabolites molar fractions.



Discussion of results

Two metabolites of CBZ were identified and quantified, 10,11-epoxycarbamazepine (EP-CBZ) and 10,11-dihydroxycarbamazepine (DiOH-CBZ). In root crops, the parent compound was dominant in the soil and roots. However, in the leaves the concentrations of EP-CBZ were significantly higher than that of CBZ, indicating in-plant metabolism (Figure 1). In tomatoes and cucumbers, CBZ concentrations were higher than that of the metabolites. Among the metabolites EP-CBZ was the dominant in leaves while DiOH-CBZ was the dominant in the fruit. These are the first studies [1,2] to quantify transformation products of CBZ in plant organs and to demonstrate that their concentrations could be equal to or several times higher than those of the parent compound.

[1] Malchi et al. (2014) *Environ. Sci. Technol.* **48**, 9325-93

[2] Goldstein et al. (2014) *Environ. Sci. Technol.* **48**, 5593-00