

Are resource recovery insects safe for feed and food? Assessing bioaccumulation and biotransformation of trace organic contaminants during organic waste bioconversion

Black soldier fly larvae (BSFL) digestion of low-value organic wastes is gaining traction as a resource recovery strategy to generate high-protein animal feed and other valuable products. BSFL are well known to efficiently digest diverse food waste substrates. Yet residual trace organic contaminants (TOrcs) in organic waste byproducts may bioaccumulate in insect tissues during waste digestion. We used a semi-quantitative suspect-screening approach to assess the bioaccumulation potential of diverse TOrcs in BSFL. Our analysis revealed bioaccumulation of several pesticides as well as hydrogen-substituted perfluoroalkyl carboxylic acids (H-PFCAs). Fortunately, the BSFL gut microbiome has also been shown to play a role in the biotransformation of some TOrcs. We are evaluating potential biotransformation of pesticides, mycotoxins and poly-fluoro-alkyl substances by insects using a suite of test substrates—including municipal organic waste and waste byproducts from beer, juice, and almond production. Our analysis provides insight into both the treatment potential of resource recovery insects and the resultant tissue contaminant profiles that evolve when organisms are exposed to complex mixtures of TOrcs.