Dissipation behavior, residue dynamics, and dietary risk assessment of forchlorfenuron in postharvest kiwifruits during simulated cold chain logistics and store shelf life

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Abstract

Forchlorfenuron (CPPU) is often applied during the cultivation of kiwifruit to produce larger fruit. To address degradation patterns of CPPU during simulated cold chain logistics and simulated shelf life of the fruit after harvest, appropriate storage methods and safe consumption behavior can be investigated. In this study, an ultra-high-performance liquid chromatography-tandem mass spectrometry method was adopted to detect CPPU residues under different conditions. CPPU in kiwifruit stored at 6 °C had a half-life of 40.8–77.0 days. However, when kiwifruit was stored at 0 °C under simulated cold chain storage conditions, the half-life of CPPU was 63.0–115.5 days, implying that lower storage temperatures can reduce the degradation rate of CPPU. The residues of CPPU in kiwifruit pulp declined with time, and the reduction followed the first-order kinetics equation. More CPPU residues were present in the pulp of postharvest kiwifruit treated with exogenous ethylene than in the pulp of untreated kiwifruit. Thus, using exogenous ethylene for artificial ripening after harvest is not recommended. We determined that the appropriate cold chain storage temperature is 6 °C. It is recommended that the public select kiwifruit stored for at least 2 weeks. The estimated chronic and acute dietary risk quotients of CPPU are ≤ 0.79% and ≤ 0.11%, respectively. Therefore, it is highly unlikely that consumers will be poisoned by CPPU due to kiwifruit consumption. Our results provide scientific evidence regarding the adoption of appropriate kiwifruit storage methods and consumption behavior to enhance consumption safety.