DETECTION OF FORCHLORFENURON IN GRAPES BY SURFACE-ENHANCED RAMAN SPECTROSCOPY AND HPLC

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ABSTRACT

Forchlorfenuron or CPPU (1-[2-chloro-4-pyridyl]-3-phenyl urea) is a synthetic cytokinin, approved by the US Environmental Protection Agency (EPA) in 2004 as a plant growth regulator (EPA 2004). Forchlorfenuron is used in grapes, raisins, kiwifruits, and melons together with auxins synergistically to improve fruit size and weight. Although there are few reports regarding the safety issue of forchlorfenuron except for its kidney toxicity based on a 2-year rat feeding study (EPA, 2004), excessive use of forchlorfenuron can cause exploding of fruits, contamination of the environment and negative long-term effects on human health. This study developed surface enhanced Raman spectroscopy (SERS) methods coupled with novel nanosubstrates and evaluate their performance in detection, characterization, and quantification of forchlorfenuron (CPPU) involved in fruits and vegetables especially from grapes for my project. HPLC was also used to verify and compare with SERS results. Partial least squares analysis (PLS) was used as a statistical method to analyze the SERS spectral data. Results showed that characteristic SERS spectra of various concentrations of forchlorfenuron (0.1 to 100 ppm) were acquired using gold nanosubstrates with the detection limit for forchlorfenuron by SERS is 3.14 ppm at 99.86% confidence interval, indicating SERS is a rapid and reliable method for detection of chemical contaminants in various food matrices and there is a great potential in using gold-coated nanosubstrates in SERS.