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# USE OF LOW PRESSURE GC-MS WITH TOF TO ROUTINELY ANALYZE 150 PESTICIDE RESIDUES IN <10 MIN PER FOOD SAMPLE

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The “quick, easy, cheap, effective, rugged, and safe” (QuEChERS) approach to pesticide residue analysis in foods enables high sample throughput sample preparation in monitoring labs. The QuEChERS method has been validated for >450 pesticide residues in dozens of food commodities and has been implemented in countless labs worldwide. Compared to older methods, QuEChERS streamlines sample preparation through sample size reduction to 10-15 g, uses a 1:1 sample:solvent ratio, involves shaking for extraction in a single tube, entails salt-out partitioning, and dispersive solid-phase extraction cleanup. Using pre-homogenized samples, commercial QuEChERS products, and pre-labeled vials, a chemist can prepare a final extract in approximately 5 min per individual sample and a batch of 20 samples in just over 30 min.

With such a fast sample preparation method for such a wide scope of pesticides, greater need is placed on faster chromatographic analytical methods. Sample turnaround time within 8 hrs for hundreds of LC- and GC-amenable pesticides with <10 ng/g limits of quantitation plus MS(-MS) identification would meet an important need for import/export purposes of perishable foods. Same day analysis in regulatory labs can better meet consumer and industry demands, and private monitoring labs can obtain a competitive advantage and/or charge a premium for such a service.

For thermally labile and relatively polar pesticides, the use of ultra-performance liquid chromatography - tandem mass spectrometry (UPLC-MS/MS) has become a reliable tool to achieve 10 min analysis for >100 LC-amenable pesticides in a single run. UPLC-MS/MS achieves 2-3 times the sample throughput of previous LC-MS/MS methods for a similar number of pesticides. However, GC-MS(/MS) has not yet met the challenge to analyze >100 GC-amenable pesticides for implementation in routine monitoring labs. Typical GC-MS analyses for pesticides are >30 min per sample, and sequences are commonly run overnight.

In this work, we used rapid low-pressure (LP) GC-MS on a time-of-flight (TOF) instrument with large-volume injection to quantify and identify 150 pesticides in a 10 min analysis time in >180 lettuce, orange, strawberry, potato, and tomato samples spiked at different levels. Sample throughput, analytical figures of merit, identification aspects, and instrument ruggedness were assessed, which show acceptable performance for routine use of this approach. LP-GC/MS-MS using a modern triple quadrupole instrument can also achieve rugged and rapid analysis as in UPLC-MS/MS. An assessment and comparison of TOF and MS/MS coupled with LP-GC will be presented for the quantitation and identification of the pesticides in 130 blind test samples using QuEChERS for extraction of fruits and vegetables.