

Supporting Information

Enhanced thread Spray Mass Spectrometry: A General Method for Direct Pesticide Analysis in Various Complex Matrices

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1. Thread Spray Apparatus Images: Microscopic images of the traditional thread spray apparatus and enhanced thread spray apparatus.

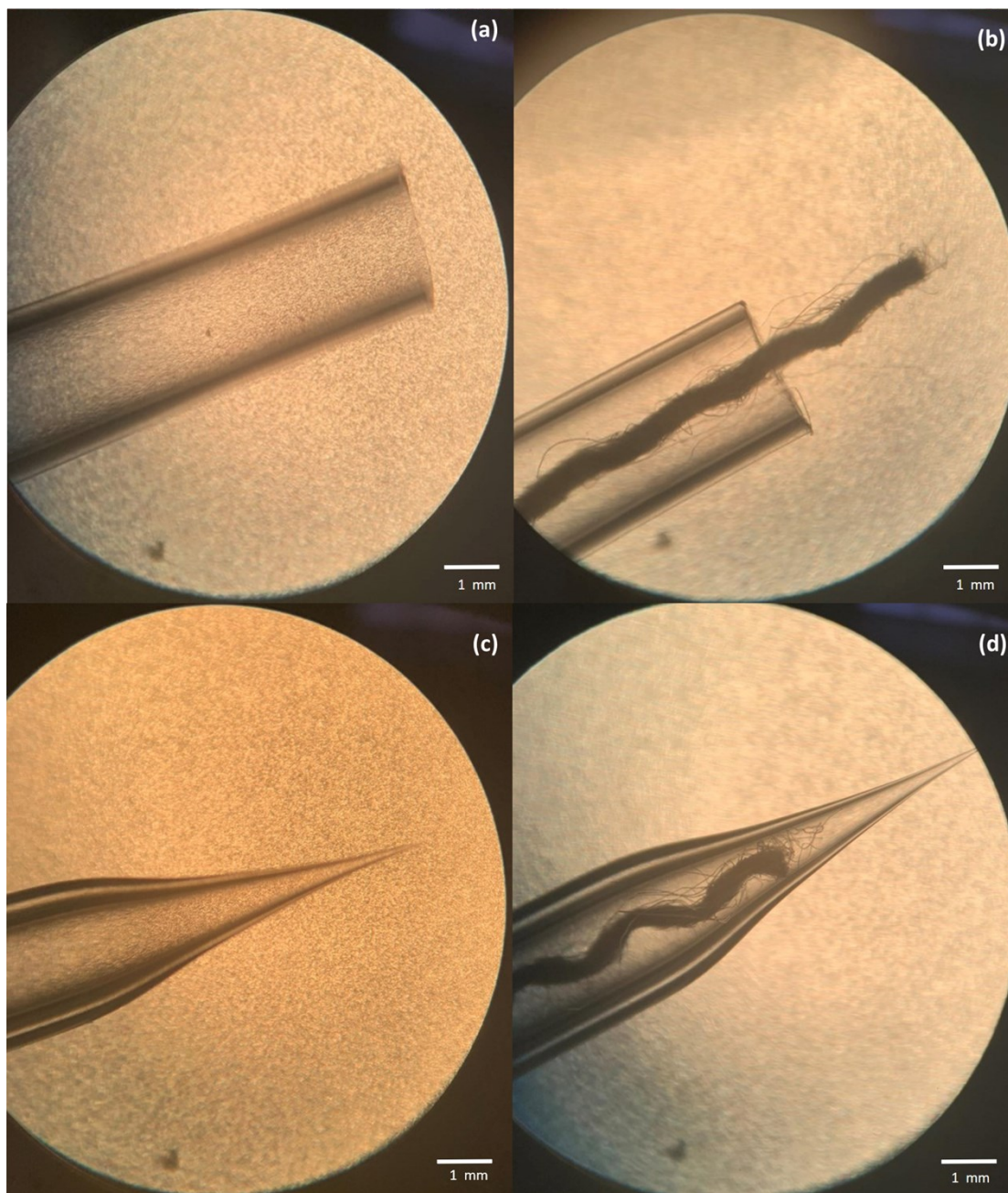


Figure S1. Microscope images of (a) conventional thread spray emitter, (b) conventional thread spray emitter with thread inserted, (c) enhanced thread spray emitter, and (d) enhanced thread spray emitter with thread inserted.

2. Atrazine (ATZ) Tandem Mass Spectrum: Tandem mass spectrometry (MS³) analysis of atrazine performed via enhanced thread spray MS.

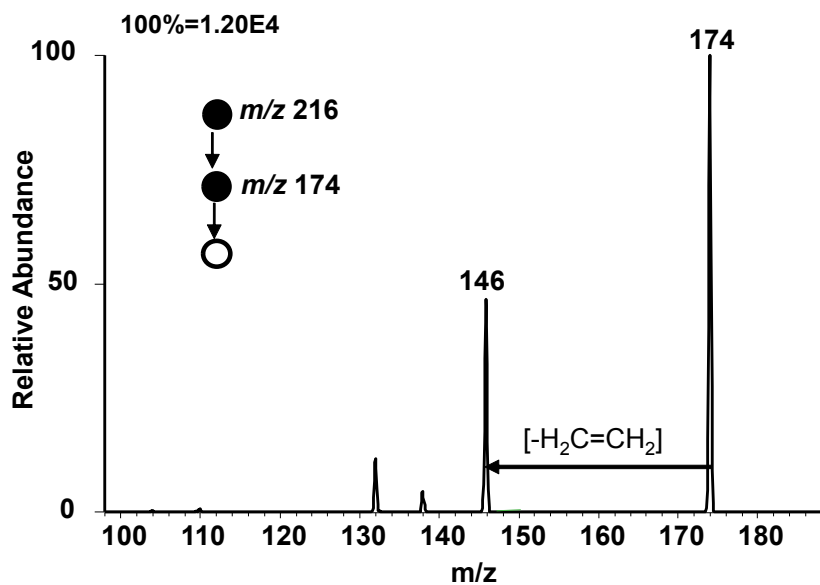


Figure S2. Tandem mass (MS³) spectrum for atrazine (ATZ) via enhanced thread spray. Spray voltage was 4 kV for enhanced thread spray experiments.

3. Glyphosate (GLYP) and Aminomethyl-phosphonic Acid (AMPA) Spectra: Comparative analysis of GLYP performed via traditional thread spray and the enhanced thread spray. Followed by AMPA analysis via enhanced thread spray MS.

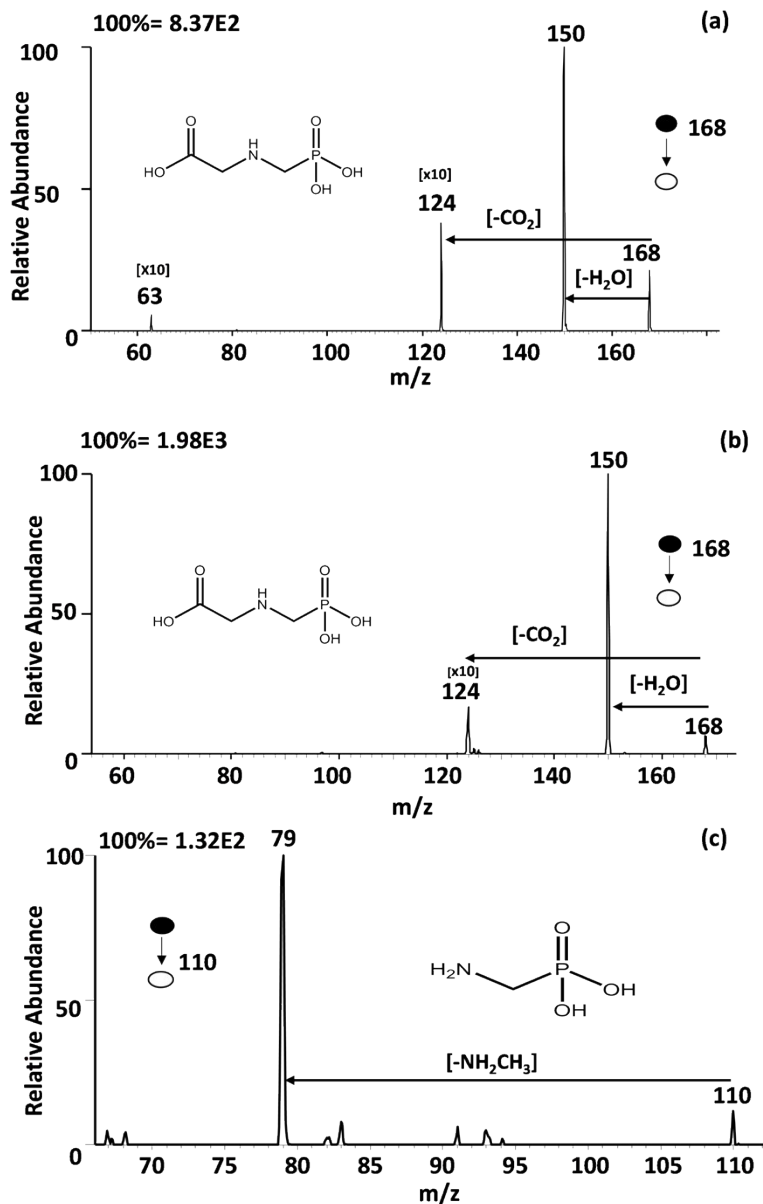


Figure S3. Tandem mass spectra for glyphosate using (a) traditional thread spray and (b) enhanced thread spray. Tandem mass spectrum of (c) aminomethyl-phosphonic acid, via enhanced thread spray. Spray voltage was 4 kV for both of the enhanced thread spray experiments.

4. Detection of Diphenylamine from Apples via Thread Spray MS: Diphenylamine, DPA, was first identified using enhanced thread spray MS. The detection of DPA on (store purchased organic and non-organic) apples was achieved by wetting thread with a MeOH:H₂O solution then wiping the fruit's surface with the thread for enhanced thread spray MS. In order to achieve targeted DPA identification within the

apple, a thread suspended on a needle was used to probe the core of the apple. Thread was pushed into the fruit, DPA residues were collected on threads followed by enhanced thread spray MS.

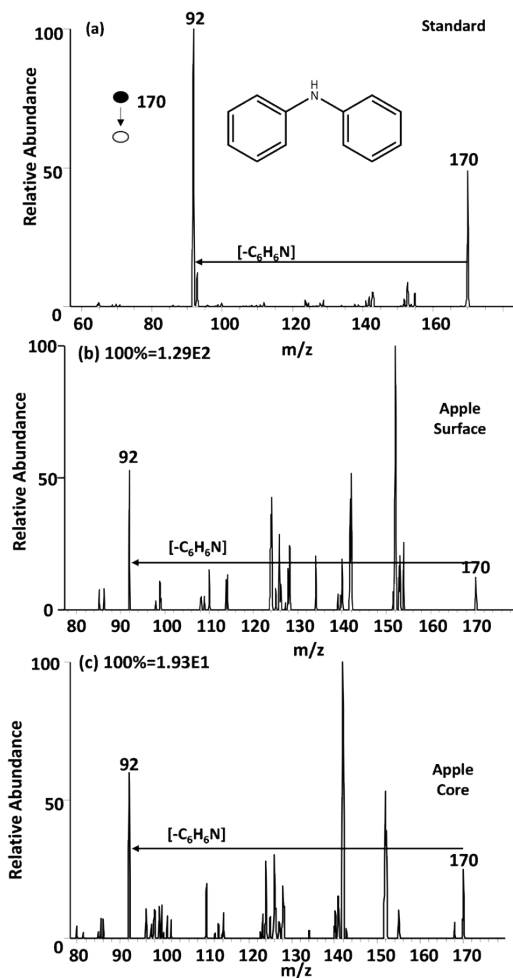


Figure S4. MS² spectrum of diphenylamine, m/z 170 showing fragment at m/z 92 using enhanced thread spray of (a) 1 µg/mL of DPA in MeOH (b) apple peel and (c) apple core with enhanced thread spray using the wiping method. Spray voltage was 4 kV.

5. Detection of Thiabendazole from Oranges via Enhanced thread Spray MS:

Thiabendazole, TBZ, was first identified using enhanced thread spray MS. The detection of TBZ on (store purchased organic and non-organic) oranges was achieved by wetting thread with a MeOH:H₂O solution then wiping the fruit's surface with the thread for enhanced thread spray MS. In order to achieve targeted TBZ identification within the oranges, a thread suspended on a needle was used to probe the pulp of

the orange. Thread was pushed into the fruit, TBZ residues were collected on threads followed by enhanced thread spray MS.

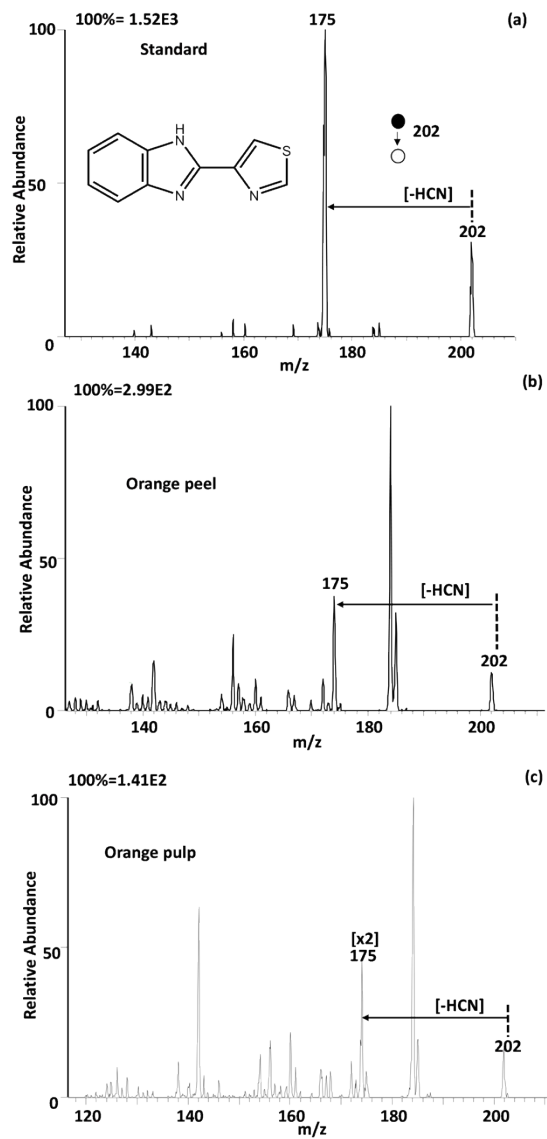


Figure S5. Tandem mass spectra in positive ion mode of thiabendazole, TBZ, obtained from (a) 50 µg/mL of TBZ in MeOH:H₂O (9:1, v/v) (b) orange peel and (c) pulp. Spray voltage was 4 kV.