

# PESTICIDES

## Analysis

*by GC/LC/Sample Prep*

- Versatile
- Reproducible
- Selective

 **phenomenex**<sup>®</sup>  
*breaking with tradition*<sup>SM</sup>



[www.phenomenex.com/food](http://www.phenomenex.com/food)

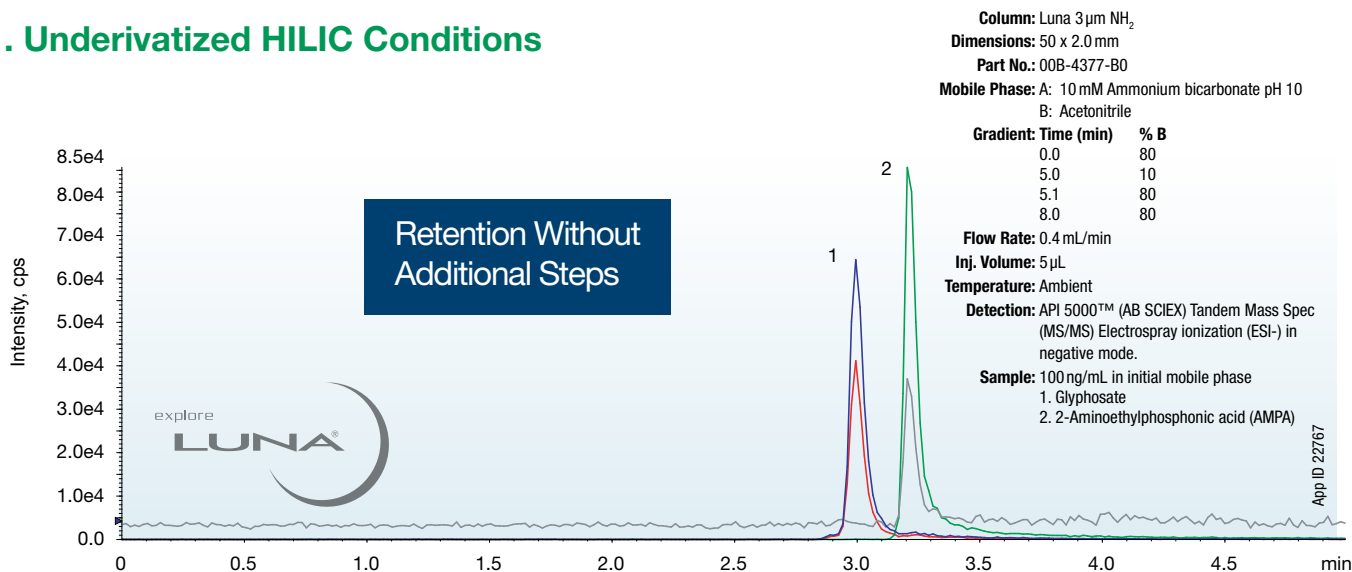


# Glyphosate and AMPA Analysis

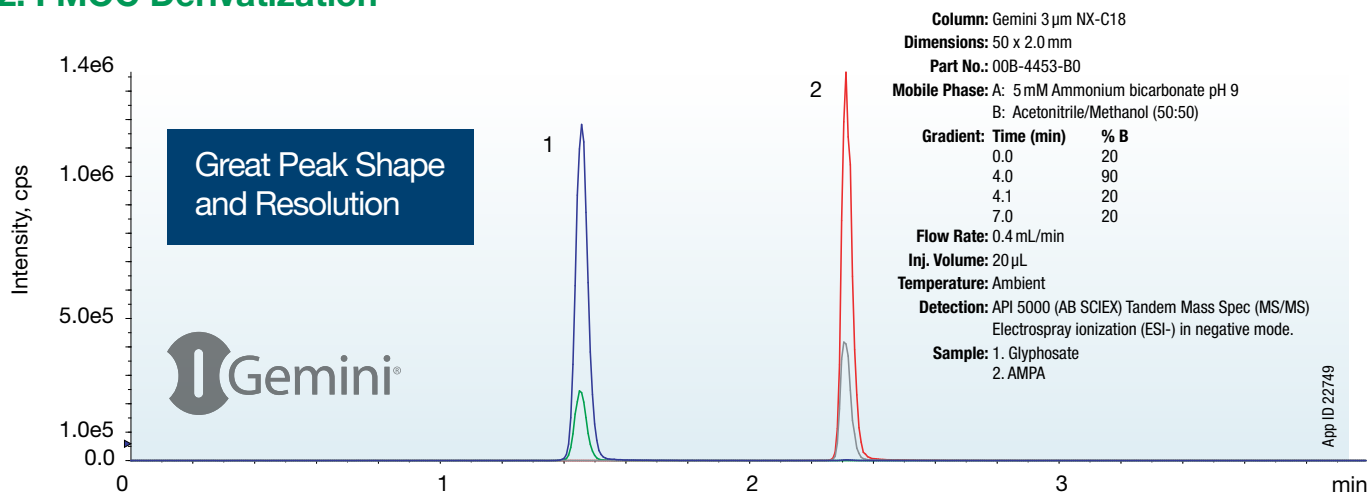
LC/MS/MS

Two options for improved retention and resolution

## 1. Underivatized HILIC Conditions



## 2. FMOc Derivatization



### Kinetex EVO C18 Core-Shell Columns are a Performance Upgrade to Gemini NX-C18 Columns

- Improved peak shape and efficiency
- Better resolution and analysis time
- Greater polar retention with 100% aqueous stability
- Robust methods from pH 1-12

[www.phenomenex.com/EVO](http://www.phenomenex.com/EVO)



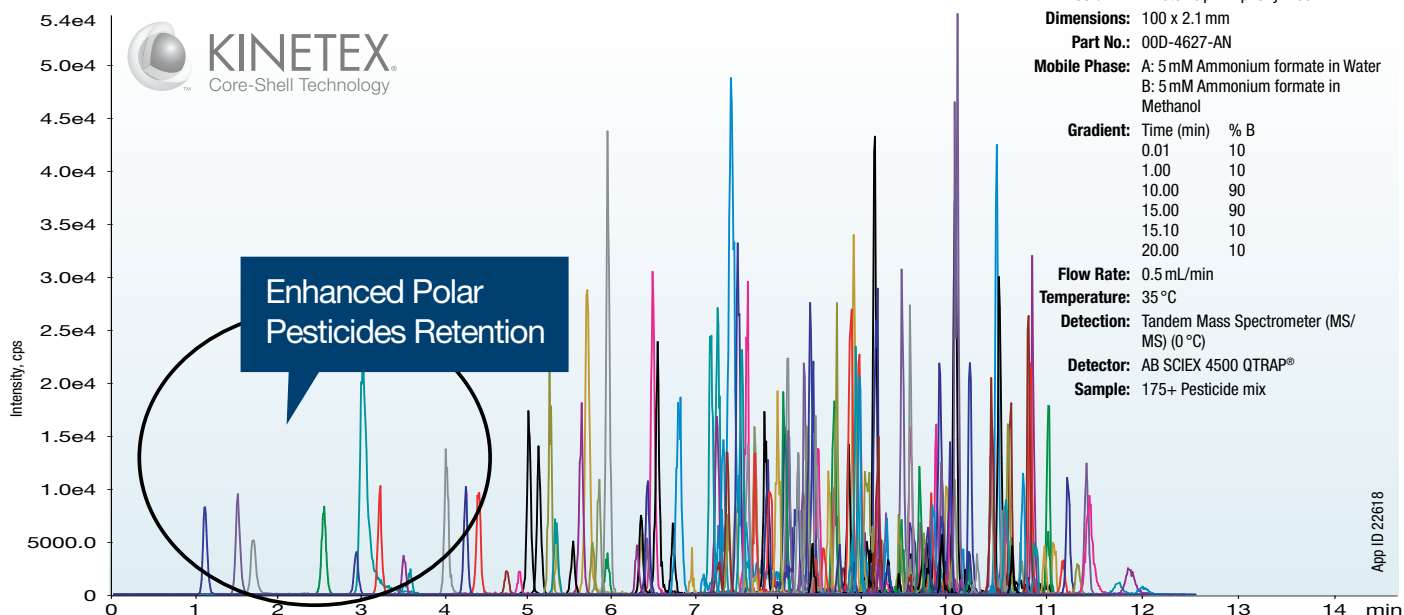
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# Comprehensive Pesticide Screening

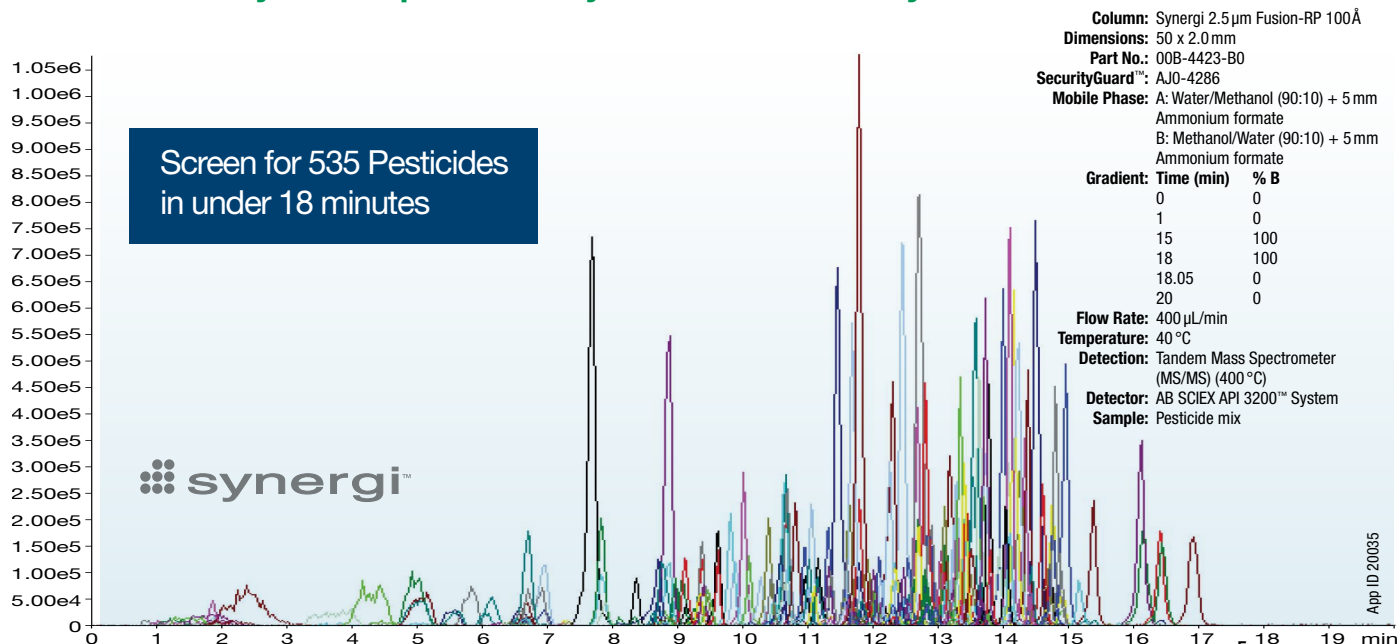
LC/MS/MS

Improved separation power as well as retention for a wide range of pesticides

## Improved Polar Selectivity on Core-Shell Technology Column



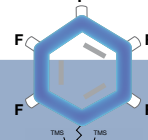
## Great Selectivity and Reproducibility on Traditional Fully Porous Column



### Kinetex F5

An Alternative Core-Shell Selectivity for All Pesticides Classes

Learn more at: [www.phenomenex.com/kinetex](http://www.phenomenex.com/kinetex)



# Neonicotinoid Pesticide Residues in Honey

QuEChERS and LC/MS/MS

A fast and simple approach for Neonicotinoid analysis from honey

**roQ**  
QuEChERS Kits



## Sample Preparation

### Extraction

1. Weigh 5.0 g (+/- 0.1 g) honey into 50 mL polypropylene centrifuge tube
2. Add 10 mL of water
3. Add 15 mL of 1.0% acetic acid in acetonitrile
4. Vortex sample for 30 seconds
5. Add 7.5 g of roQ QuEChERS AOAC extraction salts (p/n AH0-9043)
6. Shake vigorously for 1.0 minute then centrifuge for 1.0 minute

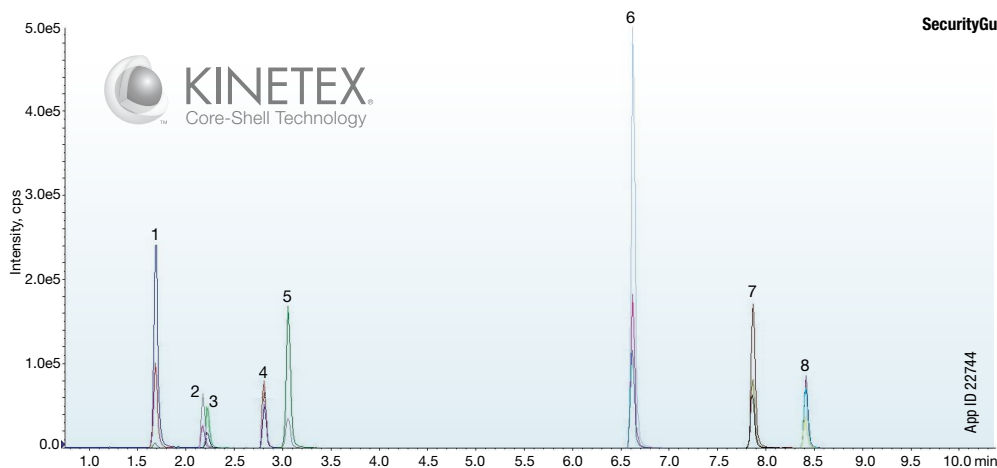
### Clean Up / dSPE

1. Transfer the 8 mL of supernatant from Step 6 of the extraction process into a 15 mL roQ QuEChERS dSPE tube containing 1200 mg  $MgSO_4$ , 400 mg PSA and 400 mg C18 (p/n KSO-8926)
2. Shake vigorously for 1.0 minute then centrifuge for 1.0 minute
3. Transfer 1 mL of supernatant to an autosampler vial for analysis

Quick and Easy  
Procedure

roQ QuEChERS Simplifies your Sample Preparation  
visit [www.phenomenex.com/roQ](http://www.phenomenex.com/roQ) for details.

## LC/MS/MS



**Column:** Kinetex 2.6  $\mu$ m Biphenyl  
**Dimensions:** 50 x 2.1 mm  
**Part No.:** 00B-4622-AN  
**SecurityGuard ULTRA Cartridge:** AJ0-9209  
**Mobile Phase:** A: 0.1% Formic acid in Water  
B: 0.1% Formic acid in Acetonitrile  
**Gradient:**

| Time (min) | B (%) |
|------------|-------|
| 0.1        | 5     |
| 10.0       | 70    |
| 12.0       | 70    |
| 12.1       | 5     |
| 14.1       | 5     |

**Flow Rate:** 0.5 mL/min  
**Injection Volume:** 25  $\mu$ L  
**Temperature:** Ambient  
**Detection:** API 4500 QTRAP® (AB SCIEX)  
Tandem Mass Spec (MS/MS)  
**Sample:** 400 ng/g spiked in honey

1. Nitenpyram
2. Thiamethoxam
3. Clothianidin
4. Imidacloprid
5. Acetamiprid
6. Azoxystrobin
7. Coumaphos
8. Chlorpyrifos



# Pesticide Analysis in Spinach

QuEChERS with GC/MS and LC/MS/MS

An effective extraction and analysis of pesticides from spinach using GC/MS and LC/MS/MS

**roQ**  
QuEChERS Kits



## Sample Preparation

### Extraction

**AOAC 2007.01 Method**

6.0 g MgSO<sub>4</sub>, 1.5 g NaOAc

Part No.: **KS0-8911**

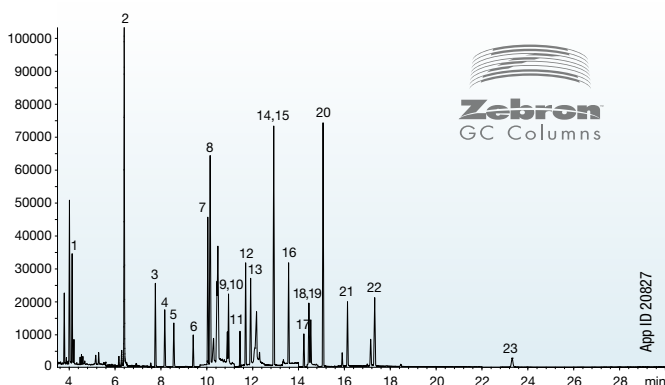
### Clean Up / dSPE

**roQ QuEChERS dSPE tube**

1200 mg MgSO<sub>4</sub>, 400 mg PSA, 400 mg GCB

Part No.: **KS0-8927**

## GC/MS



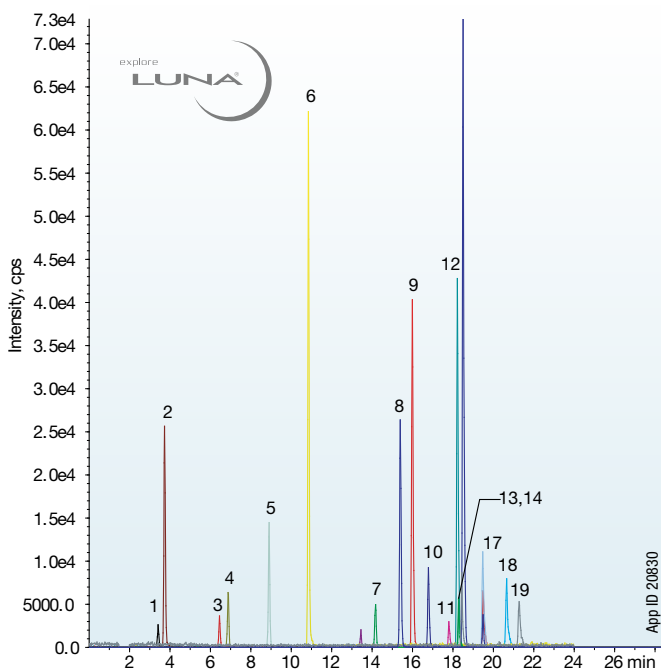
**Column:** Zebtron™ ZB-5MSi Guardian™  
**Dimensions:** 30 meter x 0.25 mm x 0.25 μm  
**Part No.:** 7HG-G018-11-GGA  
**Injection:** Splitless @ 250 °C, 2 μL  
**Carrier Gas:** Helium @ 1 mL/min (constant flow)  
**Oven Program:** 100 °C to 150 °C @ 25 °C/min to 280 °C @ 10 °C/min for 10 min then to 340 °C @ 25 °C/min for 5 min

**Detector:** MS @ 350 °C

**Sample:** Extract spiked at 200 ng/g

1. Dichlorvos
2. o-Phenylphenol
3. Trifluarlin
4. dG-α-HCH
5. Atrazine
6. Chlorothalonil
7. Chlorpyrifos-methyl
8. Carbaryl
9. d10-Parathion
10. Chlorpyrifos
11. Cyprodnil
12. Tolyfluand
13. Procymidone
14. o,p-DDD
15. Kresoxim-methyl
16. Ethion
17. Endosulfan Sulfate
18. Tebuconazole
19. TPP
20. Bifenthrin
21. L-Cyhalothrin
22. Permethrins
23. Azoxystrobin

## LC/MS/MS



**Column:** Luna® 3 μm C18(2)  
**Dimensions:** 150 x 3.0 mm  
**Part No.:** 00F-4251-Y0  
**Mobile Phase:** A: 5 mM Formic acid in Water  
B: 5 mM Formic acid Methanol

| Gradient | Time (min) | % B |
|----------|------------|-----|
|          | 0.00       | 25  |
|          | 15.00      | 90  |
|          | 30.00      | 90  |
|          | 30.01      | 25  |
|          | 43.00      | 25  |

**Flow Rate:** 0.3 mL/min  
**Temperature:** 22 °C

**Detection:** API 4000™ Tandem Mass Spec (MS/MS) (ambient)

**Sample:** Extract spiked at 200 ng/g

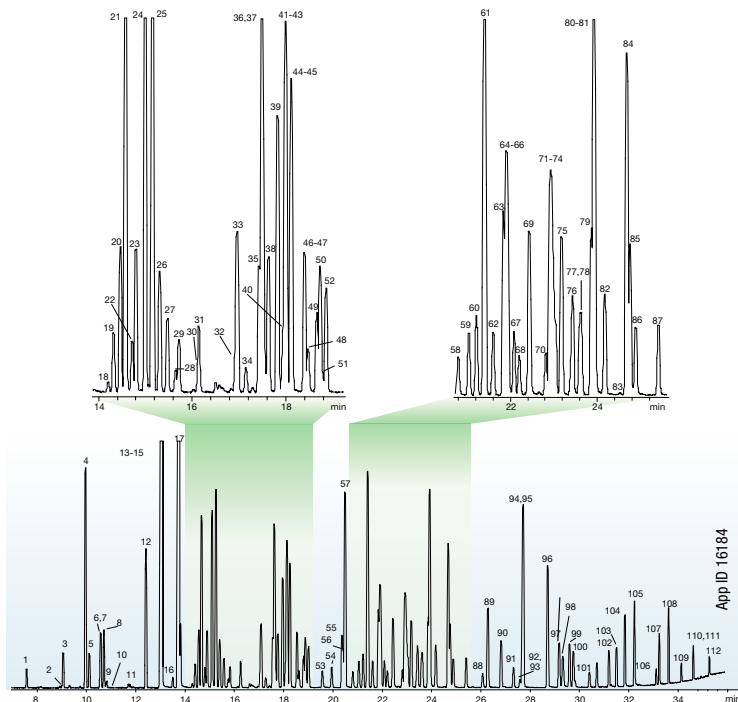
- |                  |                          |
|------------------|--------------------------|
| 1. Pymetrozine   | 11. Cyprodnil            |
| 2. Methamidophos | 12. d10-Parathionl       |
| 3. Thiabendazole | 13. Kresoxim- methyl     |
| 4. Methomyl      | 14. Tolyfluand           |
| 5. Imidacloprid  | 15. Triphenylphosphate   |
| 6. Imazail       | 16. Tebuconazole         |
| 7. Carbaryl      | 17. Chlorpyrifos- Methyl |
| 8. Atrazine      | 18. Ethion               |
| 9. Azoxystrobin  | 19. Chlorpyrifos         |
| 10. Linuron      |                          |

# Pesticides By Gas Chromatography

GC/MS and GC/ECD

Two Gas Chromatography phase selectivities for sensitive and accurate results for both detection methods

## Pesticide Screening by GC/MS

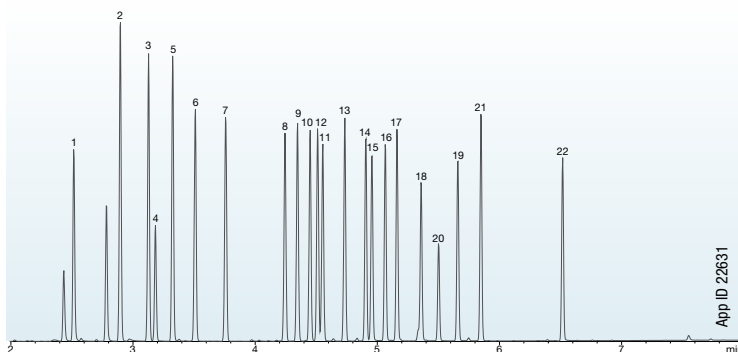


**Column:** Zebron MultiResidue™-1  
**Dimensions:** 30 meter x 0.25 mm x 0.25 µm  
**Part No.:** 7HG-G016-11  
**Injection:** Splitless @ 260 °C, 1 µL  
**Carrier Gas:** Helium @ 0.9 mL/min (constant flow)  
**Oven Program:** 80 °C to 0.5 min to 150 °C @ 10 °C/min  
to 240 °C @ 4 °C/min to 320 °C @ 15 °C/min for 3 min  
**Detector:** MSD @ 320 °C; 45-400 amu  
**Sample:** Analytes are 1 ppm in Dichloromethane  
View the full 112 compound list at [www.phenomenex.com](http://www.phenomenex.com)

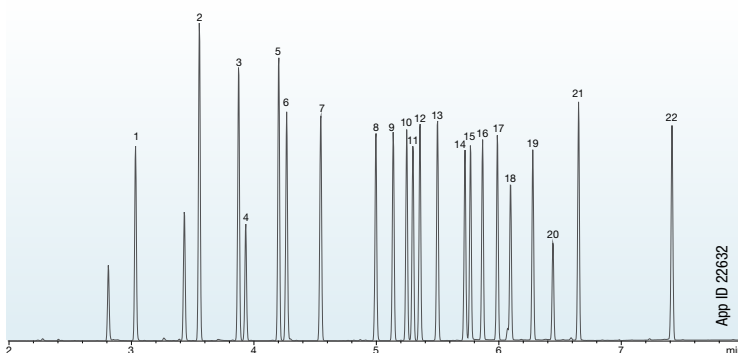
For more details on Pesticides by GC  
visit [www.phenomenex.com/GCfood](http://www.phenomenex.com/GCfood)

## Chlorinated Pesticides, Herbicides, and Organohalides by GC/ECD

ZB-CLPesticides-1



ZB-CLPesticides-2



**Column:** Zebron ZB-CLPesticides-1  
Zebron ZB-CLPesticides-2  
**Dimensions:** 30 meter x 0.32 mm x 0.32 µm  
30 meter x 0.32 mm x 0.25 µm  
**Part No.:** 7HM-G028-51  
7HM-G029-11  
**Injection:** Splitless @ 250 °C, 1 µL  
**Carrier Gas:** Helium @ 3.9 mL/min (constant flow)  
**Oven Program:** 120 °C to 200 °C @ 45 °C/min to 230 °C @  
15 °C/min to 330 °C @ 30 °C/min for 2 min  
**Detector:** ECD @ 330 °C  
**Sample:** Performed using a 5 m Z-Guard™ column and Y-Connector  
Analytes are 250 ppb in Hexane  
1. 2,4,5,6-Tetrachloro-m-xylene\*  
2. α-BHC  
3. γ-BHC  
4. β-BHC  
5. δ-BHC  
6. Heptachlor  
7. Aldrin  
8. Heptachlor epoxide (isomer B)  
9. trans-Chlordane  
10. cis-Chlordane  
11. Endosulfan I  
12. 4,4'-DDE  
13. Dieldrin  
14. Endrin  
15. 4,4'-DDD  
16. Endosulfan II  
17. 4,4'-DDT  
18. Endrin aldehyde  
19. Endosulfan sulfate  
20. Methoxychlor  
21. Endrin ketone  
22. Decachlorobiphenyl\*  
\* surrogate standard

# Ordering Information

## Kinetex®

Get the most out of every HPLC/UHPLC analysis. Kinetex Core-Shell Technology produces increased efficiencies over traditional fully porous columns, yielding remarkable chromatographic resolution, higher peak capacities, and greater sensitivity.

| 5 µm Analytical Columns (mm) |             |             |             |             | SecurityGuard™ ULTRA Cartridges† |
|------------------------------|-------------|-------------|-------------|-------------|----------------------------------|
| Phases                       | 50 x 4.6    | 100 x 4.6   | 150 x 4.6   | 250 x 4.6   | 3/pk                             |
| Biphenyl                     | 00B-4627-E0 | 00D-4627-E0 | 00F-4627-E0 | 00G-4627-E0 | AJO-9207                         |

for 4.6 mm ID

| 2.6 µm Minibore Columns (mm) |             |             |             |             | SecurityGuard ULTRA Cartridges† |
|------------------------------|-------------|-------------|-------------|-------------|---------------------------------|
| Phases                       | 30 x 2.1    | 50 x 2.1    | 100 x 2.1   | 150 x 2.1   | 3/pk                            |
| Biphenyl                     | 00A-4622-AN | 00B-4622-AN | 00D-4622-AN | 00F-4622-AN | AJO-9209                        |

for 2.1 mm ID

## Gemini®

Rugged reversed phase HPLC columns that offer extended lifetime at extreme pH conditions and excellent stability for reproducible, high efficiency separations.

| 3 µm Analytical Columns (mm) |             |             |             |             | SecurityGuard Cartridges (mm) |
|------------------------------|-------------|-------------|-------------|-------------|-------------------------------|
| Phases                       | 50 x 4.6    | 100 x 4.6   | 150 x 4.6   | 250 x 4.6   | 4 x 3.0*                      |
|                              |             |             |             |             | /10pk                         |
| NX-C18                       | 00B-4453-E0 | 00D-4453-E0 | 00F-4453-E0 | 00G-4453-E0 | AJO-8368                      |

for ID: 3.2-8.0 mm

| 3 µm Microbore, Minibore and MidBore™ Bore Columns (mm) |             |             |             |             |             |             |             |             | SecurityGuard Cartridges (mm) |
|---|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------------|
| Phases  | 20 x 2.0    | 30 x 2.0    | 50 x 2.0    | 100 x 2.0   | 150 x 2.0   | 50 x 3.0    | 100 x 3.0   | 150 x 3.0   | 4 x 2.0*                      |
|   |             |             |             |             |             |             |             |             | /10pk                         |
| NX-C18  | 00M-4453-B0 | 00A-4453-B0 | 00B-4453-B0 | 00D-4453-B0 | 00F-4453-B0 | 00B-4453-Y0 | 00D-4453-Y0 | 00F-4453-Y0 | AJO-8367                      |

for ID: 2.0-3.0 mm

## Luna®

One of the world's leading HPLC columns.

| 3 µm Minibore Columns (mm) |             |             |             |             | SecurityGuard Cartridges (mm) |
|----------------------------|-------------|-------------|-------------|-------------|-------------------------------|
| Phases                     | 30 x 2.0    | 50 x 2.0    | 100 x 2.0   | 150 x 2.0   | 4 x 2.0                       |
|                            |             |             |             |             | /10pk                         |
| NH <sub>2</sub>            | 00A-4377-B0 | 00B-4377-B0 | 00D-4377-B0 | 00F-4377-B0 | AJO-4301                      |
| C18(2)                     | 00A-4251-B0 | 00B-4251-B0 | 00D-4251-B0 | 00F-4251-B0 | AJO-4286                      |

for ID: 2.0-3.0 mm

| 3 µm MidBore and Analytical Columns (mm) |             |             |             |             |             | SecurityGuard Cartridges (mm) |          |
|--|-------------|-------------|-------------|-------------|-------------|-------------------------------|----------|
| Phases                                   | 50 x 3.0    | 150 x 3.0   | 50 x 4.6    | 100 x 4.6   | 150 x 4.6   | 4 x 2.0                       | 4 x 3.0  |
|  |             |             |             |             |             | /10pk                         | /10pk    |
| NH <sub>2</sub>                          | 00B-4377-Y0 | 00F-4377-Y0 | 00B-4377-E0 | 00D-4377-E0 | 00F-4377-E0 | AJO-4301                      | AJO-4302 |
| C18(2)                                   | 00B-4251-Y0 | 00F-4251-Y0 | 00B-4251-E0 | 00D-4251-E0 | 00F-4251-E0 | AJO-4286                      | AJO-4287 |

for ID: 2.0-3.0 mm    3.2-8.0 mm

## Synergi™

Whether your pesticides are hydrophobic or polar, Synergi Fusion-RP columns provide you with a full range of selectivity, ensuring separation of the most challenging and complex mixtures.

| Synergi 2.5 µm High Speed Technology (HST) Columns (mm) |             |             |             |             |             |             |
|---|-------------|-------------|-------------|-------------|-------------|-------------|
| Phases  | 30 x 2.0    | 50 x 2.0    | 100 x 2.0   | 50 x 3.0    | 100 x 3.0   | 50 x 4.6    |
| Fusion-RP   | 00A-4423-B0 | 00B-4423-B0 | 00D-4423-B0 | 00B-4423-Y0 | 00D-4423-Y0 | 00B-4423-E0 |

## Zebon™ GC Columns

Zebon GC columns are engineered by expert Phenomenex GC scientist that created J&W technologies.

### ZB-CLPesticides-1

| ID (mm)         | df (µm) | Temperature Limits (°C) | Part No.    | Price |
|-----------------|---------|-------------------------|-------------|-------|
| <b>30-Meter</b> |         |                         |             |       |
| 0.25            | 0.25    | 40 to 320/340           | 7HG-G028-11 |       |
| 0.32            | 0.32    | 40 to 320/340           | 7HM-G028-51 |       |
| 0.32            | 0.50    | 40 to 320/340           | 7HM-G028-17 |       |
| 0.53            | 0.50    | 40 to 320/340           | 7HK-G028-17 |       |

### ZB-CLPesticides-2

| ID (mm)         | df (µm) | Temperature Limits (°C) | Part No.    | Price |
|-----------------|---------|-------------------------|-------------|-------|
| <b>30-Meter</b> |         |                         |             |       |
| 0.25            | 0.20    | 40 to 320/340           | 7HG-G029-10 |       |
| 0.32            | 0.25    | 40 to 320/340           | 7HM-G029-11 |       |
| 0.32            | 0.50    | 40 to 320/340           | 7HM-G029-17 |       |
| 0.53            | 0.42    | 40 to 320/340           | 7HK-G029-16 |       |

Available in convenient kits online.

Part numbers, phases, and dimensions are a limited representation of complete HPLC, GC, and Sample Preparation selections available. Please visit [www.phenomenex.com/food](http://www.phenomenex.com/food) for more options.

### ZB-MultiResidue™ -1

| ID (mm)         | df (µm) | Temperature Limits (°C) | Part No.    | Price |
|-----------------|---------|-------------------------|-------------|-------|
| <b>30-Meter</b> |         |                         |             |       |
| 0.25            | 0.25    | -60 to 320/340          | 7HG-G016-11 |       |
| 0.32            | 0.25    | -60 to 320/340          | 7HM-G016-11 |       |
| 0.32            | 0.50    | -60 to 320/340          | 7HM-G016-17 |       |
| 0.53            | 0.50    | -60 to 320/340          | 7HK-G016-17 |       |

### ZB-MultiResidue-2

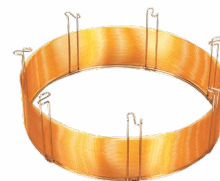
| ID (mm)         | df (µm) | Temperature Limits (°C) | Part No.    | Price |
|-----------------|---------|-------------------------|-------------|-------|
| <b>30-Meter</b> |         |                         |             |       |
| 0.25            | 0.20    | -60 to 320/340          | 7HG-G017-10 |       |
| 0.32            | 0.25    | -60 to 320/340          | 7HM-G017-11 |       |
| 0.53            | 0.50    | -60 to 320/340          | 7HK-G017-17 |       |

Available in convenient kits online.



\* SecurityGuard Analytical Cartridges require holder, Part No.: KJO-4282

† SecurityGuard ULTRA Cartridges require holder, Part No.: KJO-9000





# QuEChERS Ordering Information

## roQ™ Extraction Kits

Extraction kits contain fifty easy-pour salt packets and fifty 50 mL stand-alone centrifuge tubes

| Description  | Unit  | Part No.  |
|--|-------|-----------|
| <b>AOAC 2007.01 Method Extraction Kits</b>                   |       |           |
| 6.0 g MgSO <sub>4</sub> , 1.5 g NaOAc                        | 50/pk | KSO-8911* |
| <b>EN 15662 Method Extraction Kits</b>                       |       |           |
| 4.0 g MgSO <sub>4</sub> , 1.0 g NaCl, 1.0 g SCTD, 0.5 g SCDS | 50/pk | KSO-8909* |
| <b>Original Non-buffered Method Extraction Kits</b>          |       |           |
| 4.0 g MgSO <sub>4</sub> , 1.0 g NaCl                         | 50/pk | KSO-8910  |
| 6.0 g MgSO <sub>4</sub> , 1.5 g NaCl                         | 50/pk | KSO-8912  |

\*AOAC and EN Extraction Kits also available in traditional non-collared 50 mL centrifuge tubes, Part No.: KSO-8911-NC and KSO-8909-NC

## roQ dSPE Kits

dSPE kits contain pre-weighed sorbents/salts inside 2 mL or 15 mL centrifuge tubes

| Description   | Unit   | Part No. |
|---|--------|----------|
| <b>2 mL dSPE Kits</b>   |        |          |
| 150 mg MgSO <sub>4</sub> , 25 mg PSA, 25 mg C18E                | 100/pk | KSO-8913 |
| 150 mg MgSO <sub>4</sub> , 25 mg PSA, 2.5 mg GCB                | 100/pk | KSO-8914 |
| 150 mg MgSO <sub>4</sub> , 25 mg PSA, 7.5 mg GCB                | 100/pk | KSO-8915 |
| 150 mg MgSO <sub>4</sub> , 25 mg PSA                            | 100/pk | KSO-8916 |
| 150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg C18E, 50 mg GCB     | 100/pk | KSO-8917 |
| 150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg C18E                | 100/pk | KSO-8918 |
| 150 mg MgSO <sub>4</sub> , 50 mg PSA, 50 mg GCB                 | 100/pk | KSO-8919 |
| 150 mg MgSO <sub>4</sub> , 50 mg PSA                            | 100/pk | KSO-8920 |
| <b>15 mL dSPE Kits</b>  |        |          |
| 900 mg MgSO <sub>4</sub> , 150 mg PSA, 150 mg C18E              | 50/pk  | KSO-8921 |
| 900 mg MgSO <sub>4</sub> , 150 mg PSA, 15 mg GCB                | 50/pk  | KSO-8922 |
| 900 mg MgSO <sub>4</sub> , 150 mg PSA, 45 mg GCB                | 50/pk  | KSO-8923 |
| 900 mg MgSO <sub>4</sub> , 150 mg PSA                           | 50/pk  | KSO-8924 |
| 1200 mg MgSO <sub>4</sub> , 400 mg PSA, 400 mg C18E, 400 mg GCB | 50/pk  | KSO-8925 |
| 1200 mg MgSO <sub>4</sub> , 400 mg PSA, 400 mg C18E             | 50/pk  | KSO-8926 |
| 1200 mg MgSO <sub>4</sub> , 400 mg PSA, 400 mg GCB              | 50/pk  | KSO-8927 |
| 1200 mg MgSO <sub>4</sub> , 400 mg PSA                          | 50/pk  | KSO-8928 |



# guarantee

If Phenomenex products in this guide do not provide at least an equivalent separation as compared to other products of the same phase and dimensions, send in comparative data within 45 days for a FULL REFUND.



# Access the Latest Food Testing Resources



[www.phenomenex.com/Food](http://www.phenomenex.com/Food)

- Applications
- Technical Notes
- Online Method Development Tools
- On-Demand Webinars
- News and Events

# Pesticides Analysis

by GC/LC/Sample Prep

• Versatile

• Reproducible

• Selective

#### Australia

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CAUTION: this patent only applies to the analytical-sized guard cartridge holder, and does not apply to SemiPrep, PREP or ULTRA holders, or to any cartridges.