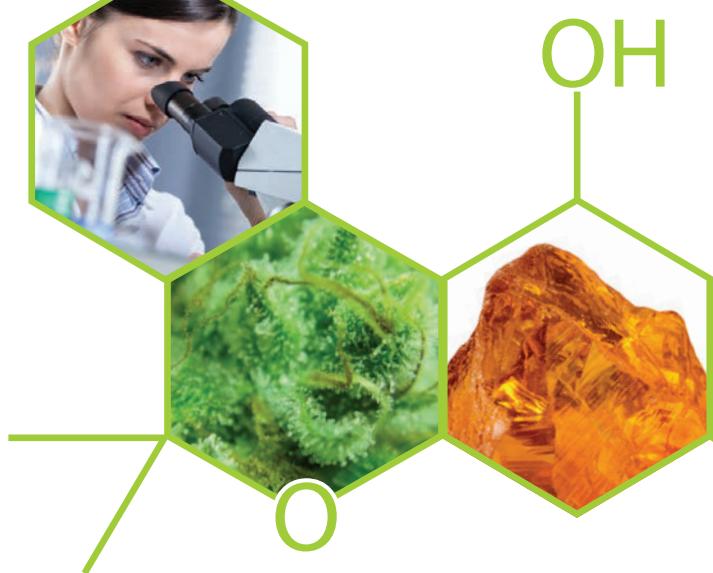




Medical Cannabis

Growing Analytical Solutions for Cannabis Testing

**INNOVATIVE PRODUCTS AND EXPERTISE
FOR ACCURATE AND RELIABLE RESULTS**



RESTEK®

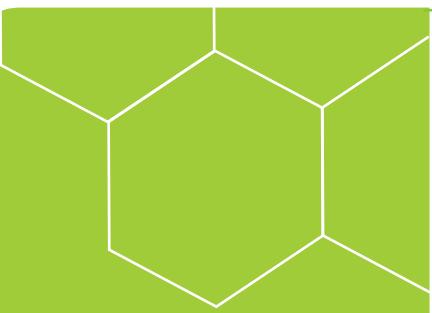
Pure Chromatography

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ECHnology Pty Ltd

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Restek has been helping cannabis labs establish innovative, cost-effective analytical solutions from the very beginning, and we will continue to help you manage your ever-changing analytical challenges every step of the way.

Technical Expertise &

By Breaking Boundaries in Our Industry, We Help You Succeed in Yours

We get it. Your market is quickly changing and you need a chromatography partner that understands that. Whether you are part of a well-established safety and potency lab or starting a new lab, Restek has the products and expertise you need for successful cannabis analyses. Being an employee-owned and independent chromatography company, every employee at Restek has a vested interest in your success. We design the best solutions for your lab, regardless of the instrumentation and techniques used. In this brochure, you will find innovative LC and GC products and methodologies designed to fit your toughest analytical problems.

We've been in your shoes. That's why we understand your challenges and focus on solving them. Using our expertise to develop innovative products that help chromatographers has always been, and continues to be, Restek's top priority. We strive to develop industry-leading technologies that fit the needs of today's analysts. When setting up a laboratory for cannabis testing, we realize that you need dependable products that deliver high quality data without considerable capital investment. We know you need to work with a company that understands the challenges of your market and supports you with tailored solutions and superior customer service.



Rxi® GC COLUMNS

Lower Costs With Rugged, Long-Lasting Rxi® Columns

The chemists at Restek have combined their analytical expertise and wide range of polymer chemistries to provide a solution for straightforward analysis of terpenes and residual solvents on a single Rxi® column platform, streamlining workflows for busy labs. Rxi® columns deliver more accurate, reliable results than any other fused silica column on the market. To ensure the highest level of performance, all Rxi® capillary columns for the cannabis industry are manufactured and individually tested to meet stringent requirements for exceptional inertness, low bleed, and unsurpassed column-to-column reproducibility.

Sky® GC INLET LINERS

**True Blue Performance—State-of-the-Art Deactivation
With a 100% Satisfaction Guarantee**



Whether you're determining cannabinoids, residual solvents, pesticides, or terpenes by GC, the inertness of your inlet is crucial for the success of your analyses. Sky® inlet liners from Restek use a comprehensive, state-of-the-art deactivation and are the only blue liners on the market—making them an easy-to-recognize solution to common inlet problems. The innovative deactivation used for Sky® liners results in exceptional inertness for a wide range of analyte chemistries. In addition to improved data quality, you'll benefit from fewer liner changes and less downtime for maintenance.



Product Innovation



Raptor™ LC COLUMNS

Maximize Analytical Performance and
Minimize Your Capital Investment



Raptor™ LC columns combine the speed of a superficially porous particle (SPP or “core-shell”) with the separation power of optimized USLC phase chemistry. These columns are ideal for cannabis testing because they quickly separate your target compounds, providing higher sample throughput. Raptor™ LC columns maximize your instrument performance so you won't need to buy expensive UHPLC equipment or extend your capital investment when the sample volume increases. Build a solid analytical foundation on any instrument with fast, rugged Raptor™ LC columns.

Q-sep® SAMPLE PREP SUPPLIES

Everything You Need for Fast, Simple Sample Prep



Cannabis products present a broad array of challenging matrices, from foods, to plant materials, to concentrates. For pesticides analysis, a fast, easy cleanup method is required to remove the matrix background for accurate, reliable results. Restek's versatile line of Q-sep™ QuEChERS extraction and cleanup salts allows for the development of quick, easy, and affordable sample preparation methods without capital investment in extraction equipment. The friendly experts at Restek are always willing to help with method development questions, too.

CERTIFIED REFERENCE MATERIALS (CRMs)

Get Results You can Trust With World-Class CRMs Produced in ISO-Accredited Labs

In order to achieve accurate results, samples must be quantified using certified reference materials. Restek has the widest offering of cannabinoid standards in the industry, and we are continually expanding our product line in order to meet the evolving needs of the cannabis industry. Restek's certified reference materials are manufactured and QC tested under our ISO Guide 34 and ISO/IEC 17025 accreditations, helping ensure confidence in results and compliance with changing regulations.



Applications

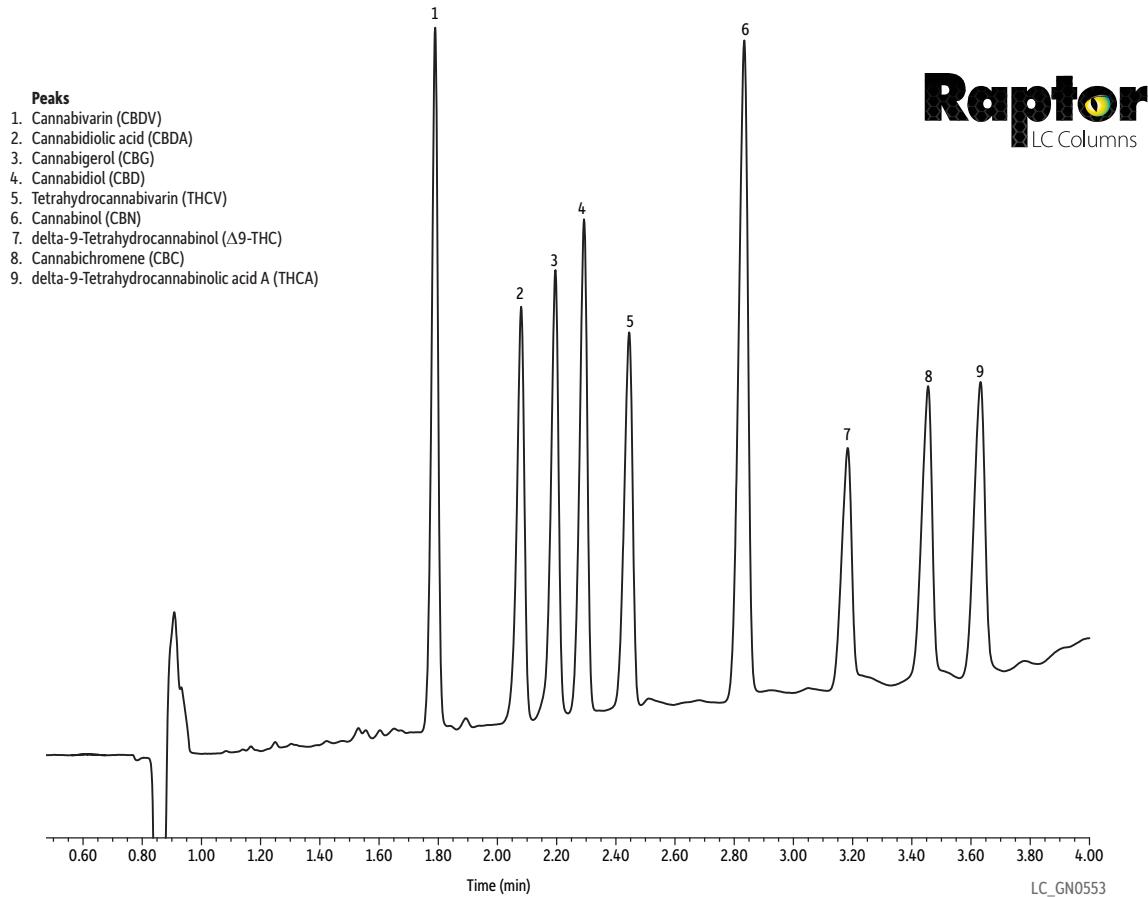
PRODUCT POTENCY TESTING

Our High-Throughput LC and GC Cannabinoids Methods Produce Results Quickly Without the Cost of New Equipment

When setting up a lab, often you just can't invest in the latest instrumentation, but you still need to get results fast. We understand that. That's why Restek has developed both LC and GC methods for cannabinoids that let you report potency results quickly. For LC, we created a fast analysis that can be performed on any LC instrument. By utilizing Raptor™ column technology, as shown in Figure 1, we developed a 3.7 minute analysis (7 minutes total cycle time) that is compatible with any HPLC instrument—so you get UHPLC speed on your existing equipment without the capital investment. Also, we specifically chose an easy-to-make mobile phase that can be directly

transferred to LC-MS, if you ever need to move to MS due to regulation changes. For labs using GC equipment, you can analyze cannabinoids in just minutes using an RxI®-35Sil MS column and the instrument conditions shown in Figure 2. We also offer a similar 35-type stationary phase on metal MXT® tubing for labs using SRI GC instruments. Why did we focus on fast cannabinoid analyses? Potency testing is the cornerstone of your lab. Building a fast method means your productivity increases and you can analyze more samples per day on the same instrument, delaying the need for expensive capital investments in new equipment.

Figure 1: Raptor™ LC columns give you fast analysis times for cannabinoids without the expense of UHPLC equipment.



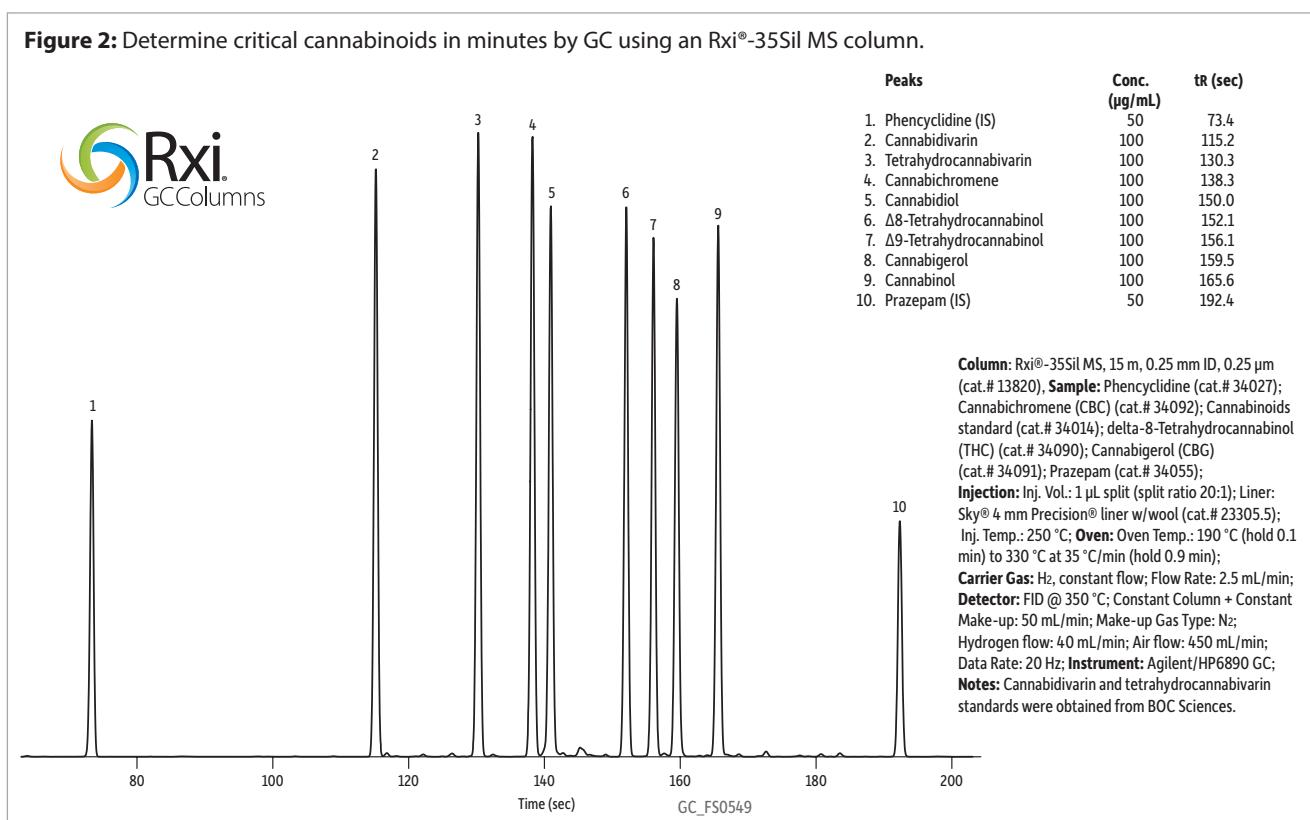
Column: Raptor™ ARC-18 (cat.# 9314A65), Dimensions: 150 mm x 4.6 mm ID, Particle Size: 2.7 μ m, Temp.: 50 °C; **Sample:** Cannabidiolic acid (cat.# 34094), Cannabigerol (cat.# 34091), Cannabidiol (cat.# 34011), Cannabinol (cat.# 34010), delta-9-Tetrahydrocannabinol (THC) (cat.# 34067), Cannabichromene (cat.# 34092), delta-9-Tetrahydrocannabinolic acid A (THCA) (cat.# 34093), Diluent: 50:50 Methanol:water, Conc.: 50 μ g/mL, Inj. Vol.: 5 μ L; **Mobile Phase:** A: 0.1% Formic acid in water, B: 0.1% Formic acid in acetonitrile; **Gradient (%B):** 0.00 min (75%), 4.00 min (100%), 4.01 min (75%), 7.00 min (75%); **Flow:** 1.5 mL/min; **Detector:** UV/Vis @ 220 nm; **Instrument:** HPLC

TECH TIP

Using syringe filters is an economical way to remove particulate matter that could clog your column. Visit www.restek.com/filters to access our solvent/syringe filter compatibility guide and quickly find the best filter for your method.



Figure 2: Determine critical cannabinoids in minutes by GC using an RxI®-35Sil MS column.



POTENCY TESTING PRODUCTS

Raptor™ ARC-18 LC Columns (USP L1)

Properties:

- Well-balanced retention profile.
- Sterically protected and acid-resistant to resist harsh, low-pH mobile phases.
- Ideal for use with sensitive detectors like mass spec.

Description	cat.#
2.7 µm Columns 150 mm, 4.6 mm ID	9314A65

For guard cartridges, visit our website at www.restek.com

Rxi®-35Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Provides superior separation for cannabinoids.
- Very low-bleed phase for GC-MS analysis.
- Extended temperature range: 50 °C to 340/360 °C.

Description	temp. limits	qty.	cat.#
15 m, 0.25 mm ID, 0.25 µm	50 to 340/360 °C	ea.	13820

Sky® 4.0 mm ID Precision® Inlet Liner w/Wool

For Agilent GCs equipped with split/splitless inlets

ID x OD x L	qty.	cat.#
Precision, Sky Technology, Borosilicate Glass with Quartz Wool 4.0 mm x 6.3 mm x 78.5 mm	ea.	23305.1
4.0 mm x 6.3 mm x 78.5 mm	5-pk.	23305.5
4.0 mm x 6.3 mm x 78.5 mm	25-pk.	23305.25

Patent pending

Medical Marijuana Singles

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Cannabichromene (CBC)	20675-51-8	PTM	1,000	34092
Cannabidiol (CBD)	13956-29-1	PTM	1,000	34011
Cannabidiolic Acid (CBDA)	1244-58-2	ACN	1,000	34094
Cannabigerol	25654-31-3	PTM	1,000	34091
Cannabinol (CBN)	521-35-7	PTM	1,000	34010
delta-8-Tetrahydrocannabinol (THC)	5957-75-5	PTM	1,000	34090
delta-9-Tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
delta-9-Tetrahydrocannabinolic acid A (THCA-A)	23978-85-0	PTM	1,000	34093
Tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
(±)11-nor-9-carboxy-Δ ⁹ -THC	104874-50-2	M	100	34068

M = methanol; PTM = purge-and-trap grade methanol; ACN = acetonitrile

Cannabinoids Standard (3 components)

Cannabidiol (13956-29-1)

Cannabinol (521-35-7)

delta-9-Tetrahydrocannabinol (Δ⁹-THC) (1972-08-3)

1,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 34014 (ea.)

Quantity discounts not available.

Phencyclidine

Phencyclidine (956-90-1)

1,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 34027 (ea.)

Prazepam

Prazepam (2955-38-6)

1,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 34055 (ea.)



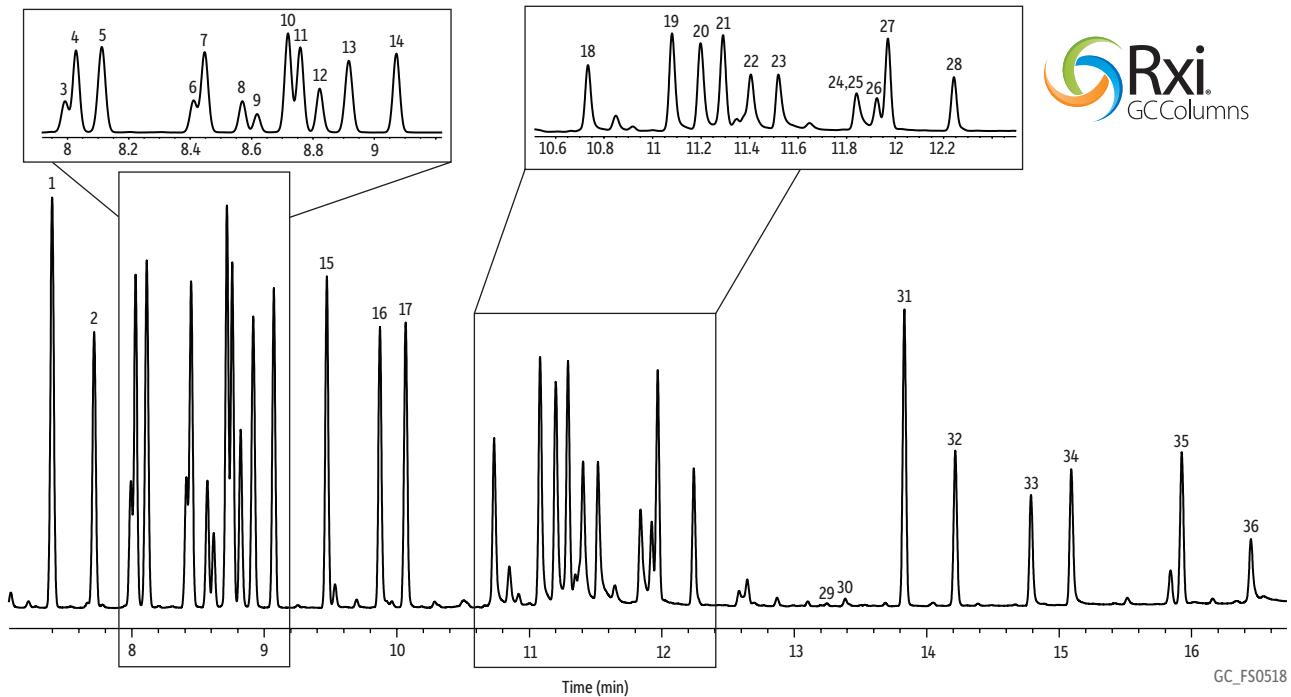
TERPENE PROFILING

Reduce Capital Investments—Analyze Terpenes by GC on the Same Setup Used for Residual Solvents

Cannabis has a complex terpene profile, which is theorized to increase its therapeutic effects. Terpene profiling is used for both product quality testing and strain identification. These complex and sometimes problematic compounds are challenging to analyze, but the experts at Restek have developed

GC methodology for terpene profiling that fits easily into required laboratory workflows. To keep things simple, the GC terpene profile analysis in Figure 3 can be performed on the same instrument and column that we recommend for residual solvent testing (see page 8).

Figure 3: Comprehensive terpene analysis by headspace GC-FID can be done on the same instrument and GC column as residual solvents analysis, which simplifies setup and improves lab productivity.



Peaks	t _R (min)
1. α -Pinene	7.39
2. Camphene	7.71
3. β -Myrcene	7.98
4. Sabinene	8.02
5. β -Pinene	8.11
6. α -Phellandrene	8.4
7. δ 3-Carene	8.44
8. α -Terpinene	8.57
9. Ocimene	8.61
10. Limonene	8.71
11. p -Cymene	8.75
12. β -Ocimene	8.82
13. Eucalyptol	8.91
14. γ -Terpinene	9.06
15. Terpinolene	9.47
16. Linalool	9.87
17. Fenchone	10.06
18. Isopulegol	10.73
19. dl-Menthol	11.08
20. Bornol	11.19
21. α -Terpineol	11.29
22. Dihydrocarveol	11.40
23. Citronellol	11.51
24. Geraniol	11.82
25. 2-Piperidinone	11.88
26. Citral 1	11.92
27. Pulegone	11.97
28. Citral 2	12.24
29. Citral 3	13.19
30. Citral 4	13.43
31. β -caryophyllene	13.83
32. α -Humulene	14.21
33. Nerolidol 1	14.78
34. Nerolidol 2	15.08
35. Caryophyllene oxide	15.92
36. α -Bisabolol	16.43

Column: RxI® -624Sil MS, 30 m, 0.25 mm ID, 1.40 μ m (cat.# 13868); **Sample:** Terpenes mix; Diluent: Isopropyl alcohol; Conc.: 200 ng/ μ L (0.02% wt/vol). The sample was prepared by placing 10 μ L into the headspace vial.; **Injection:** headspace-loop split (split ratio 10:1); Liner: Sky® 0.0 mm ID straight inlet liner (cat.# 23333.1); **Headspace-Loop:** Inj. Port Temp.: 250 °C; Instrument: Tekmar HT-3; Inj. Time: 1.0 min; Transfer Line Temp.: 160 °C; Valve Oven Temp.: 160 °C; Needle Temp.: 140 °C; Sample Temp.: 140 °C; Sample Equil. Time: 30.0 min; Vial Pressure: 20 psi; Loop Pressure: 15 psi; **Oven:** Oven Temp.: 60 °C (hold 0.10 min) to 300 °C at 12.50 °C/min (hold 3.0 min); **Carrier Gas:** He, constant flow; Linear Velocity: 33 cm/sec; **Detector:** FID @ 320 °C; Make-up Gas Flow Rate: 45 mL/min; Make-up Gas Type: N₂; Hydrogen flow: 40 mL/min; Air flow: 450 mL/min; Data Rate: 20 Hz; **Instrument** Agilent/HP6890 GC

TECH TIP

For full method details on headspace GC analysis of terpenes, visit www.restek.com/cannabis_terpenes



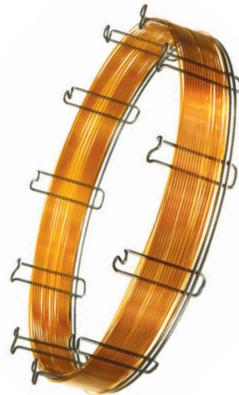
TERPENE TESTING PRODUCTS

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

Description	temp. limits	qty.	cat.#
30 m, 0.25 mm ID, 1.40 µm	-20 to 300/320 °C	ea.	13868



Sky® 1.0 mm ID Straight Inlet Liner

for Agilent GCs equipped with split/splitless inlets

RESTEK

ID x OD x L	qty.	cat.#
Straight, Sky Technology, Borosilicate Glass		
1.0 mm x 6.3 mm x 78.5 mm	ea.	23333.1
1.0 mm x 6.3 mm x 78.5 mm	5-pk.	23333.5
1.0 mm x 6.3 mm x 78.5 mm	25-pk.	23333.25

* 100% SATISFACTION GUARANTEE: If your Sky® inlet liner does not perform to your expectations for any reason, simply contact Restek® Technical Service or your local Restek® representative and provide a sample chromatogram showing the problem. If our GC experts are not able to quickly and completely resolve the issue to your satisfaction, you will be given an account credit or replacement product (same cat.#) along with instructions for returning any unopened product. (Do not return product prior to receiving authorization.) For additional details about Restek's return policy, visit www.restek.com/warranty



Headspace Crimp Vials (20 mm)

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial, Flat Bottom	20 mL	Clear	23 x 75 mm	24685	24686

Vial-to-instrument compatibility are designated in instrument reference chart on the product web page.



Medical Cannabis Terpenes Standards

Medical Cannabis Terpenes Standard #1 (19 components)

(-)alpha-Bisabolol (23089-26-1)	Linalool (78-70-6)
Camphene (79-92-5)	beta-Myrcene (123-35-3)
delta-3-Carene (13466-78-9)	Nerolidol (7212-44-4)
beta-Caryophyllene (87-44-5)	Ocimene (13877-91-3)
Geraniol (106-24-1)	alpha-Pinene (80-56-8)
(-)Guaiol (489-86-1)	(-)beta-Pinene (18172-67-3)
alpha-Humulene (6753-98-6)	alpha-Terpinene (99-86-5)
p-Isopropyltoluene (p-cymene) (99-87-6)	gamma-Terpinene (99-85-4)
(-)Isopulegol (89-79-2)	Terpinolene (586-62-9)
d-Limonene (5989-27-5)	

2,500 µg/mL each in isopropanol, 1 mL/ampul
cat.# 34095 (ea.)

Did you know?

You'll save money ordering from Restek because we understand the need to control costs and build efficient workflows. We develop as many analyses as possible using the same columns and consumables, so you can minimize the number of products you need to stock.

Medical Cannabis Terpenes Standard #2 (2 components)

(-)Caryophyllene oxide (1139-30-6)
1,8-Cineole (Eucalyptol) (470-82-6)
2,500 µg/mL each in isopropanol, 1 mL/ampul
cat.# 34096 (ea.)

TECH TIP

Did you know that headspace analysis eliminates the possibility of column contamination from nonvolatile matrix components? This results in an extremely clean chromatogram, minimal instrument maintenance, and longer column lifetimes.



RESIDUAL SOLVENT ANALYSIS

Improve Productivity—Keep Analyzing Samples Instead of Changing Columns Between Residual Solvent and Terpene Methods.

As the popularity of medical cannabis grows, so does concern over the safety of the drug products. Cannabis concentrates can contain residual solvents left over from manufacturing that can be harmful to human health. Because of this risk, many states will require residual solvent testing of cannabis concentrates. Due to their high volatility, residual solvents can

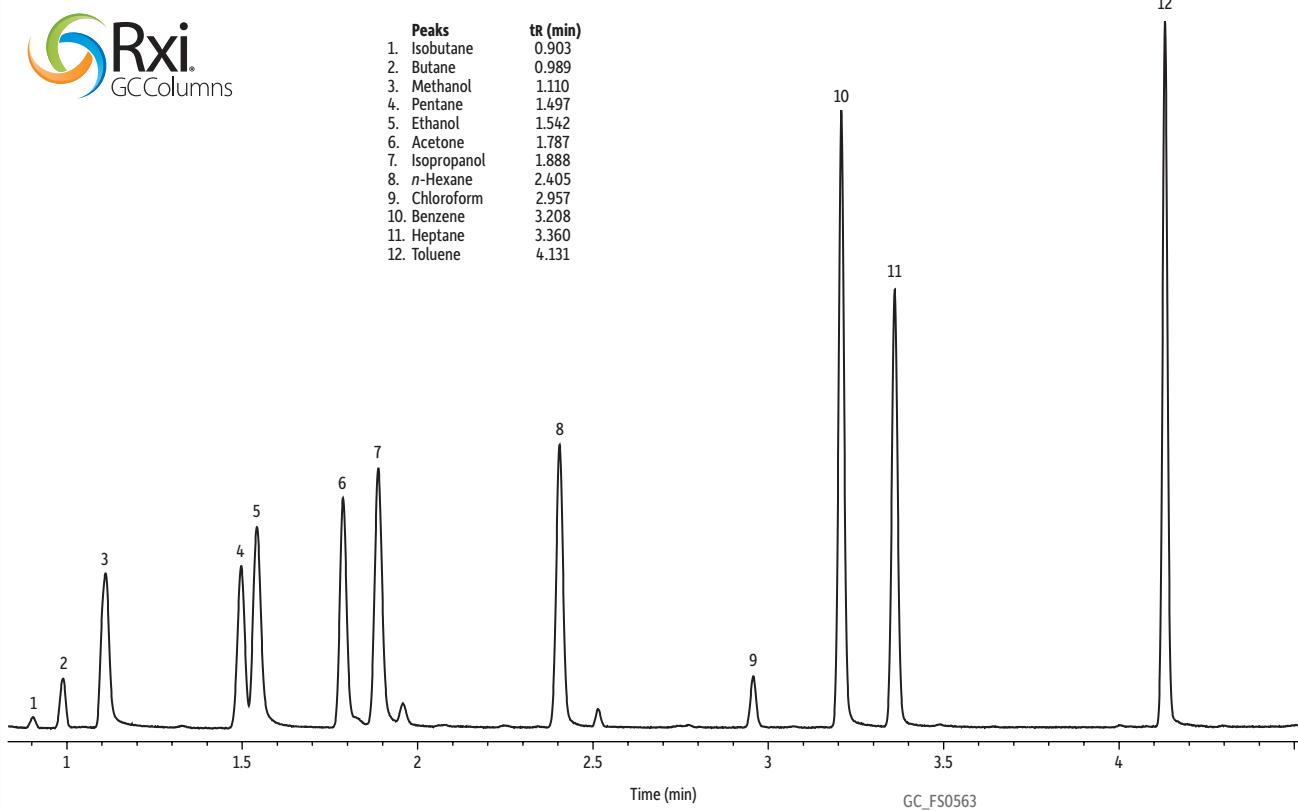
only be analyzed using GC techniques. The chemists at Restek have developed a quick and easy method that allows for residual solvent analysis (Figure 4) and terpene profiling (Figure 3) on the same column and instrument platform with minimal sample preparation (see page 6 for terpene profiling).

TECH TIP

For full method details on headspace GC analysis of residual solvents, visit www.restek.com/cannabis_solvents



Figure 4: Improve productivity and reduce downtime for column changes—this sensitive headspace GC-FID analysis of residual solvents can be accomplished on the same instrument and Rxi®-624Sil MS column that is used in Restek's terpenes profiling method.



Column: Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868); **Sample:** Residual solvent mix; Diluent: Dimethyl sulfoxide (DMSO); Conc.: 25 ppm (For the HS-FID technique, 10 µL of a 50 µg/mL standard was placed into a 20 mL headspace vial to represent a 25 ppm sample concentration, assuming a 20 mg sample weight.); **Injection:** headspace-loop split (split ratio 10:1); Liner: Sky® 1.0 mm ID straight inlet liner (cat.# 23333.1); **Headspace-Loop:** Inj. Port Temp.: 250 °C; Instrument: Tekmar HT3; Inj. Time: 1.0 min; Transfer Line: Temp.: 160 °C; Valve Oven Temp.: 160 °C; Needle Temp.: 140 °C; Sample Temp.: 140 °C; Platen temp equil. time: 1.0 min; Sample Equil. Time: 30.0 min; Vial Pressure: 20 psi; Pressurize Time: 5.0 min; Loop Pressure: 15 psi; Loop Fill Time: 2.0 min; Oven Temp.: 35 °C (hold 1.5 min) to 300 °C at 30 °C/min (hold 2.0 min); **Carrier Gas:** He, constant flow; Linear Velocity: 80 cm/sec; **Detector:** FID @ 320 °C; Make-up Gas Flow Rate: 45 mL/min; Make-up Gas Type: N₂; Hydrogen flow: 40 mL/min; Air flow: 450 mL/min; Data Rate: 20 Hz; **Instrument:** Agilent/HP6890 GC; **Notes:** The butane used for standard preparation was a mixture of butane and isobutane in an unknown ratio. The concentrations should be considered approximate, but do not exceed 50 ppm for any component.



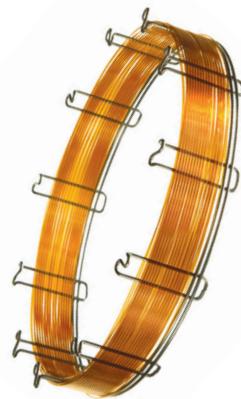
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Sky® 1.0 mm ID Straight Inlet Liner

for Agilent GCs equipped with split/splitless inlets

RESTEK

ID x OD x L	qty.	cat.#
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1.0 mm x 6.3 mm x 78.5 mm	5-pk.	23333.5
1.0 mm x 6.3 mm x 78.5 mm	25-pk.	23333.25

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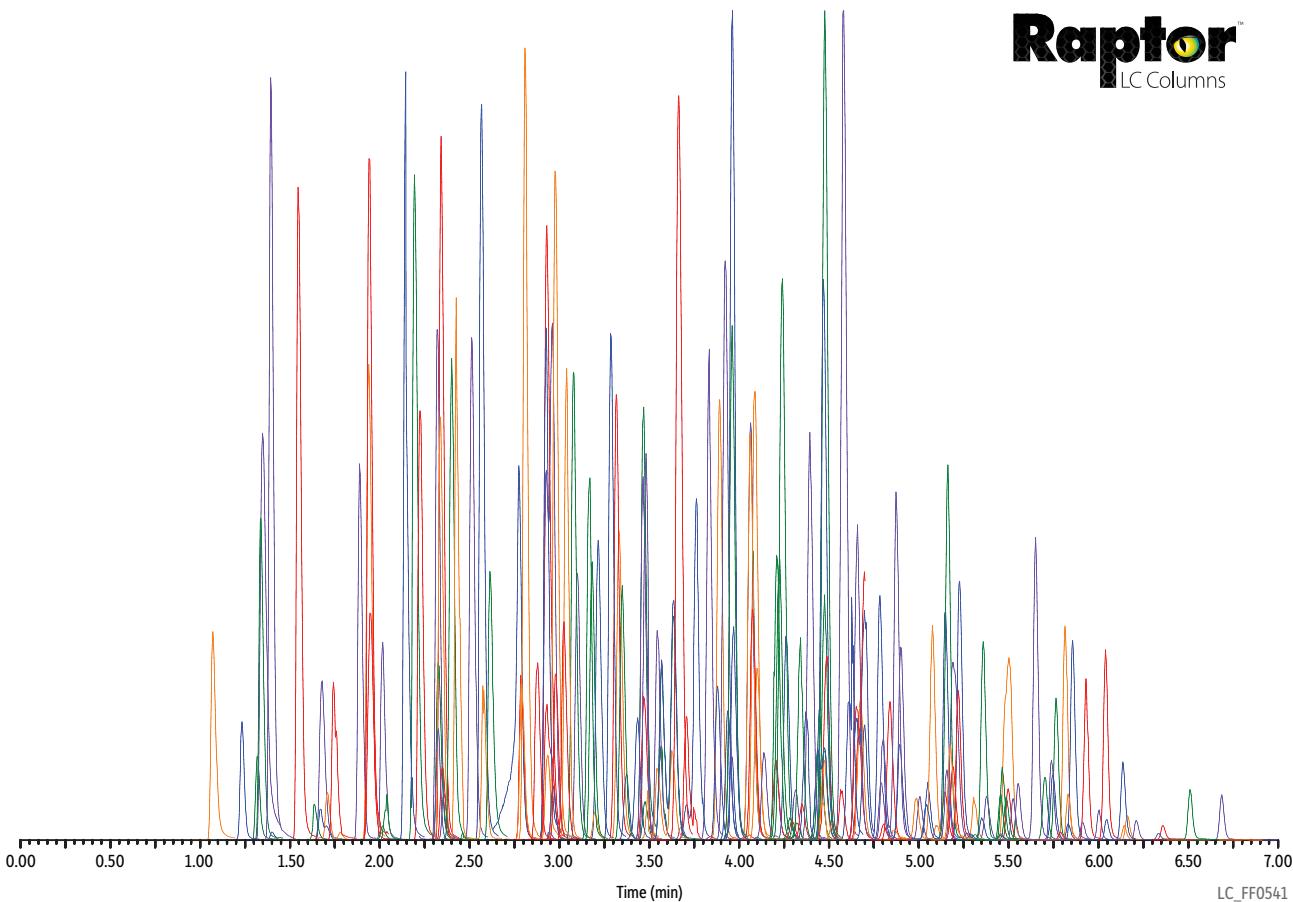
PESTICIDE ANALYSIS

Ensure Product Safety With Fast, Selective Multiresidue Pesticide Analysis

In addition to residual solvents, cannabis products can contain residues of pesticides that were applied to cannabis plants during growth in order to control agricultural pests. These pesticides can be analyzed by LC-MS/MS, GC-MS/MS, and GC-MS. Regardless of the technique used, lists of target compounds can be extensive, so column selectivity is an important factor in achieving good separations. Both Raptor™

ARC-18 LC columns (Figure 5) and Rxi®-5ms GC columns (Figure 6) provide the selectivity needed for accurate and reliable multiresidue pesticides analysis. Removing matrix interferences while also recovering the analytes of interest is also crucial for a successful pesticide analysis using either LC or GC, and Restek's Q-sep® QuEChERS products allow for fast, easy, adaptable cleanup of a wide variety of matrices.

Figure 5: A high-throughput separation of 204 pesticides by LC-MS/MS can be achieved in only 7 minutes with the Raptor™ ARC-18 column.



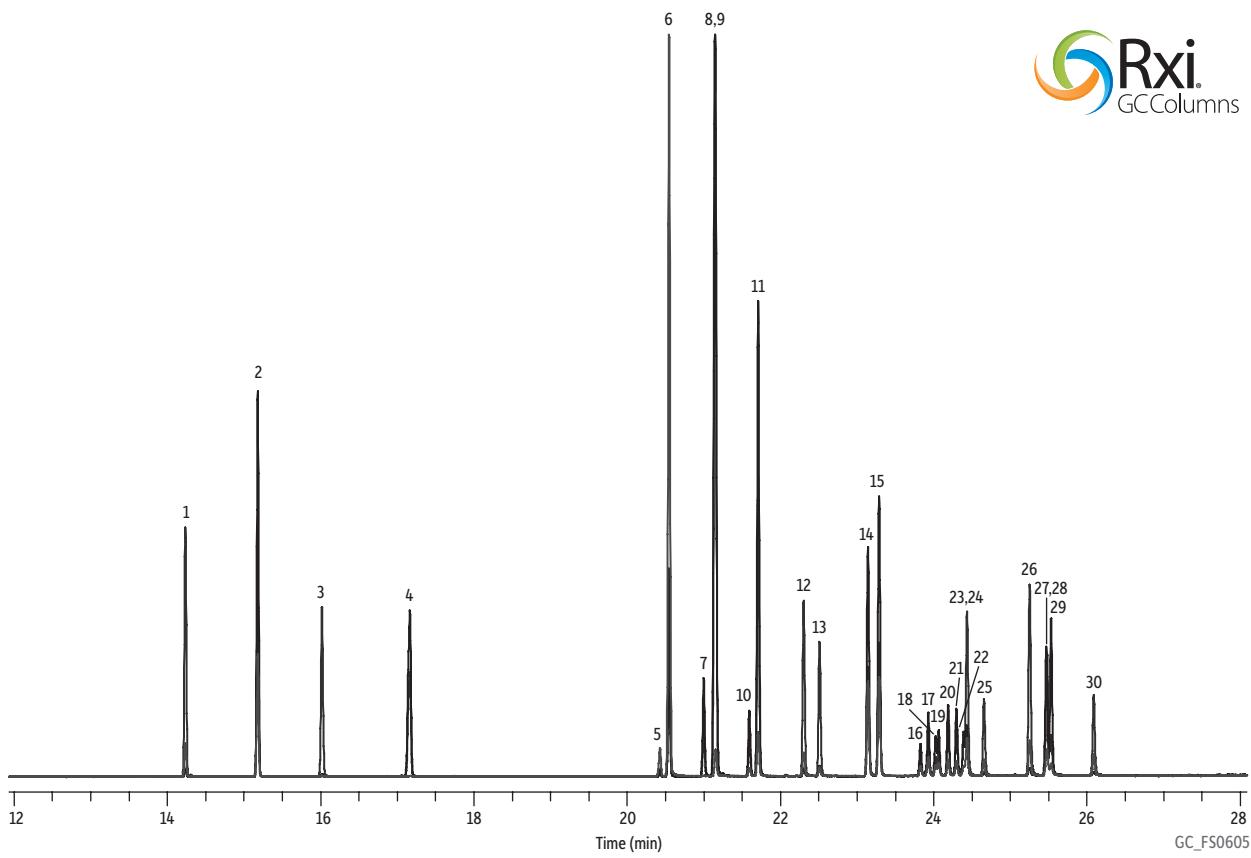
Column: Raptor™ ARC-18 (cat.# 9314A12), Dimensions: 100 mm x 2.1 mm ID, Particle Size: 2.7 µm, Temp.: 50 °C; **Sample:** LC multiresidue pesticide kit (cat.# 31971), Diluent: Water, Conc.: 20 ng/mL, Inj. Vol: 5 µL; **Mobile Phase:** A: Water + 2 mM ammonium formate + 0.2% formic acid, B: Methanol + 2 mM ammonium formate + 0.2% formic acid; **Gradient (%B):** 0.00 min (5%), 2.00 min (60%), 4.00 min (75%), 6.00 min (100%), 7.00 min (100%), 7.01 min (5%), 9.50 min (5%); **Flow:** 0.4 mL/min; Max Pressure: 525 bar; **Detector:** Waters Xevo TQ-S, Ion Source: Waters Zspray™ ESI, Ion Mode: ESI+, Mode: MRM, Instrument: Waters ACQUITY UPLC® I-Class; **Notes:** When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating our LC multi-residue pesticide standard kit (cat.# 31971), we extensively studied the 204 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. Several of these compounds are isomeric and separation of the isomers accounts for 216 peaks in the chromatogram compound list. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.



Figure 6: Peak List

Peaks	t _r (min)	Precursor	Product 1	Product 2	Peaks	t _r (min)	Precursor	Product 1	Product 2	Peaks	t _r (min)	Precursor	Product 1	Product 2
1. Cyromazine	1.07	167.0	85.0	108.1	75. Isocarbophos	3.48	291.1	121.1	231.1	149. Bromuconazole isomer 2	4.89	376.0	158.9	70.1
2. Methamidophos	1.23	142.0	93.9	124.9	76. Isoproturon	3.48	207.0	72.0	47.0	150. Flubendiamide	4.89	683.0	408.0	274.0
3. Formetanate HCl	1.32	222.0	165.0	46.0	77. Pyrimethanil	3.48	200.0	107.0	82.0	151. Carfentrazone ethyl	4.90	412.0	346.0	266.0
4. Aminocarb	1.34	209.0	137.0	152.0	78. Desmedipharm	3.55	318.0	182.0	154.0	152. Diclobutrazol	4.91	328.0	70.0	59.1
5. Pyremetazine	1.35	218.0	105.0	79.0	79. Metalaxyl	3.56	280.1	220.1	192.1	153. Kresoxim-methyl	4.92	314.1	206.0	116.0
6. Acephate	1.40	184.1	143.0	125.1	80. Spiroxamine isomer 1	3.57	298.0	144.0	100.0	154. Tebuconazole	4.98	308.0	70.1	125.0
7. Propamocarb	1.40	189.1	102.0	144.0	81. Phenmedipharm	3.63	301.0	168.0	136.0	155. Penconazole	5.00	284.0	70.1	159.0
8. Omethoate	1.55	214.1	125.1	183.1	82. Spiroxamine isomer 2	3.63	298.0	144.0	100.0	156. Spinosyn A	5.04	732.6	142.0	98.1
9. Aldicarb sulfoxide	1.64	207.0	89.0	132.0	83. Chlorantraniliprole	3.66	483.9	286.0	453.0	157. Prothioconazole	5.05	344.0	326.0	189.0
10. Dinotefuran	1.64	203.0	129.0	157.0	84. Cycluron	3.68	199.0	89.1	69.2	158. Alanycarb	5.06	400.0	238.2	254.1
11. Butoxycarboxim	1.67	223.0	106.0	166.0	85. Prometryn	3.71	242.0	158.0	200.1	159. Zoxamide	5.08	336.0	187.1	159.0
12. Nitopyram	1.68	271.1	125.9	224.9	86. Terbutryn	3.76	242.1	186.1	91.0	160. Fomaxadone	5.10	392.2	331.1	238.0
13. Aldicarb sulfone	1.71	240.0	148.0	86.0	87. Linuron	3.83	249.1	160.0	182.0	161. Prochloraz	5.15	376.0	308.0	70.1
14. Carbendazim	1.74	192.1	160.1	132.1	88. Fenobucarb	3.84	208.0	94.9	152.0	162. Triflumuron	5.15	359.0	156.1	139.1
15. Oxamyl	1.78	237.0	72.0	90.0	89. Diethofencarb	3.88	268.0	226.0	124.0	163. Benalaxy	5.16	326.1	148.0	91.0
16. Flonicamid	1.89	230.0	203.1	174.1	90. Ethofumesate	3.89	287.1	121.1	259.1	164. Hexaconazole	5.16	314.0	70.1	159.0
17. Methomyl	1.91	163.0	106.0	88.0	91. Azoxystrobin	3.92	404.1	372.0	329.0	165. Hydramethylnon	5.17	495.1	323.2	151.1
18. Thiabendazole	1.94	202.0	175.0	131.0	92. Ethiprole	3.94	396.9	350.9	255.2	166. Meticonazole	5.19	320.1	70.0	125.0
19. Thiamethoxam	1.94	292.0	211.0	181.0	93. Fenamidone	3.96	312.1	236.1	92.0	167. Propiconazole				
20. Mexacarbate	1.95	222.9	151.1	166.1	94. Methiocarb	3.96	226.0	121.0	169.0	isomer 1 & 2	5.19	342.0	159.0	69.0
21. Monocrotophos	2.02	224.1	127.1	98.1	95. Siduron	3.96	233.0	93.8	137.0	168. Clofentezine	5.22	303.0	138.0	102.0
22. Fuberidazole	2.04	185.0	157.0	156.0	96. Fludioxonil	3.97	291.1	229.1	158.1	169. Pyraclostrobin	5.23	388.1	163.0	193.9
23. Dicrotophos	2.14	238.0	112.0	193.0	97. Furalaxy	3.97	302.1	270.1	242.2	170. Bitertanol	5.27	338.1	269.2	70.1
24. Imidacloprid	2.19	256.1	175.1	209.1	98. Halofenozide	3.99	331.1	104.9	275.0	171. Benzoximate	5.29	364.0	199.1	105.0
25. Clothianidin	2.22	250.0	169.0	132.0	99. Acibenzolar-S-methyl	4.06	210.9	91.0	135.9	172. Spinosyn D	5.31	746.5	142.0	98.1
26. Trichlorfon	2.32	257.0	109.0	79.0	100. Boscalid	4.06	342.9	307.0	139.9	173. Thiobencarb	5.31	257.9	125.1	100.1
27. 3-Hydroxycarbofuran	2.33	238.0	181.0	163.0	101. Dimethomorph isomer 1	4.06	388.1	300.9	165.0	174. Diniconazole	5.35	326.1	70.2	159.0
28. Fenuron	2.33	165.0	71.9	45.9	102. Nuiramol	4.08	315.0	252.0	81.1	175. Pencycuron	5.36	329.1	125.0	218.0
29. Dimethoate	2.34	230.1	125.0	199.0	103. Mandipropamid	4.09	412.3	328.2	356.2	176. Spinetoram	5.38	748.5	142.2	98.1
30. Vamidothion	2.34	288.0	146.0	118.0	104. Flutolanil	4.10	324.1	262.1	65.0	177. Hexaflumuron	5.46	461.0	158.0	141.0
31. Dioxacarb	2.35	224.1	123.1	167.1	105. Promecarb	4.10	208.1	151.0	109.0	178. Indoxacarb	5.46	528.0	203.0	218.0
32. Mevinphos isomer 1	2.36	225.1	127.1	193.1	106. Paclobutrazol	4.14	294.1	125.1	70.2	179. Ipcronazole isomer 1	5.46	334.2	70.0	125.1
33. Acetamiprid	2.40	223.0	126.0	56.1	107. Thifanoxan	4.19	219.1	172.9	129.0	180. Triflumizole	5.49	346.0	277.9	60.0
34. Ethirimol	2.43	210.1	140.0	98.0	108. Cyproconazole isomer 1	4.21	292.2	125.1	70.2	181. Difenconazole				
35. Cymoxanil	2.46	199.0	128.0	111.0	109. Mepronil	4.21	270.1	119.0	91.0	isomer 1 & 2	5.50	406.0	251.1	111.1
36. Pirimicarb	2.51	239.1	72.0	182.1	110. Bupirimate	4.22	317.0	166.0	108.0	182. Trifloxystrobin	5.50	409.0	186.0	145.0
37. Thiacloprid	2.56	253.0	126.0	90.1	111. Dimethomorph isomer 2	4.24	388.1	300.9	165.0	183. Novaluron	5.53	493.0	158.0	141.0
38. Mevinphos isomer 2	2.58	225.1	127.1	193.1	112. Myclobutanil	4.26	289.1	70.2	125.1	184. Ipcronazole isomer 2	5.56	334.2	70.0	125.1
39. Mesotrione	2.62	340.1	228.1	104.0	113. Clethodim isomer 1	4.28	360.0	164.0	268.1	185. Emamectin				
40. Butocarbomix	2.68	213.0	156.0	116.0	114. Methoxyfenozide	4.30	369.1	149.1	313.2	benzoate B1b	5.57	872.4	158.2	126.1
41. Aldicarb	2.71	213.1	89.1	116.1	115. Chloroxuron	4.31	291.1	164.1	111.0	186. Clethodim isomer 2	5.65	360.0	164.0	268.1
42. Oxadixyl	2.77	279.0	219.0	132.0	116. Cyprodinil	4.32	226.0	93.0	108.0	187. Buprofezin	5.70	306.1	201.0	57.4
43. Carbetamide	2.79	237.0	118.0	192.0	117. Triadimenol	4.34	294.1	197.2	69.3	188. Teflubenzuron	5.74	380.9	158.0	140.9
44. Tricyclazole	2.79	190.0	163.0	136.0	118. Bifenazate	4.35	301.1	198.0	170.0	189. Emamectin				
45. Simetryn	2.81	214.0	124.0	95.9	119. Triadimenol	4.35	296.1	99.1	70.2	benzoate B1a	5.75	886.5	158.1	126.1
46. Thiophanate-methyl	2.88	343.0	151.0	93.0	120. Cyproconazole isomer 2	4.38	292.2	125.1	70.2	190. Benfuracarb	5.76	411.1	195.0	190.0
47. Bendiocarb	2.93	224.1	109.0	167.0	121. Mefenacet	4.39	299.0	148.0	120.0	191. Fluazinam	5.78	464.8	373.0	338.1
48. Prometon	2.93	226.0	184.3	86.3	122. Mepanipyrim	4.40	224.1	106.0	77.0	192. Metaflumizone	5.79	507.0	287.2	267.1
49. Sebconeton	2.93	226.2	100.2	170.2	123. Iprovalicarb isomer 1	4.44	321.1	119.1	203.1	193. Furathiocarb	5.82	383.2	194.9	252.0
50. Thidiazuron	2.93	221.0	101.9	93.9	124. Flugquinconazole	4.45	376.0	348.8	306.9	194. Lufenuron	5.83	511.2	158.0	141.0
51. Propouxur	2.95	210.0	111.0	168.0	125. Fenheximid	4.46	302.1	97.2	55.3	195. Temephos	5.83	467.1	125.0	418.9
52. Metribuzin	2.96	215.0	131.0	89.0	126. Bromuconazole isomer 1	4.47	376.0	158.9	70.1	196. Tebufenpyrad	5.86	334.0	117.0	145.0
53. Terbumeton	2.96	226.1	114.1	170.1	127. Fluoxastrobin	4.47	459.0	427.0	188.0	197. Pyriproxyfen	5.91	322.1	96.0	227.1
54. Carbofuran	2.98	222.1	123.0	165.1	128. Iprovalicarb isomer 2	4.47	321.1	119.1	203.1	198. Piperonyl butoxide	5.93	356.3	176.9	119.0
55. Imazalil	2.98	297.0	159.0	69.0	129. Butafenacil	4.48	492.0	180.0	331.0	199. Hexythiazox	6.01	353.0	228.1	168.1
56. Sulfentrazone	3.03	387.0	307.0	145.8	130. Tetracronazole	4.48	372.0	159.0	70.1	200. Quinoxifen	6.04	308.0	197.0	161.9
57. Pyracarbolid	3.04	218.1	125.1	97.1	131. Flufenacet	4.49	364.0	152.1	194.1	201. Flufenoxuron	6.05	489.1	158.0	141.0
58. Tebuthiuron	3.08	229.0	172.0	116.0	132. Triticonazole	4.52	318.1	70.1	124.9	202. Amitraz	6.14	294.0	163.0	122.0
59. Carbaryl	3.09	202.0	145.0	127.0	133. Cyazofamid	4.57	325.0	107.9	261.0	203. Propargite	6.14	368.2	175.0	231.1
60. Carboxin	3.10	236.0	143.0	87.0	134. Spirotetramat	4.58	374.2	330.3	302.2	204. Etoxazole	6.16	360.2	304.2	177.2
61. Monolinuron	3.17	215.0	126.0	99.0	135. Diflubenzuron	4.63	311.1	141.0	158.1	205. Spiromesifen	6.20	371.1	273.1	255.1
62. Fluometuron	3.18	233.2	72.2	46.4	136. Epoxiconazole	4.66	330.0	121.0	101.0	206. Chlorfluazuron	6.21	539.8	382.9	158.0
63. Ethofencarb	3.20	226.1	107.0	164.0	137. Etaconazole isomer 1	4.66	328.1	205.0	159.0	207. Spirodiclofen	6.33	411.1	313.0	71.2
64. Ametryn	3.21	228.1	186.1	68.1	138. Fenbuconazole	4.67	337.0	125.0	70.1	208. Fenpyroximate	6.36	422.2	366.1	138.1
65. Chlortoluron	3.29	213.0	72.0	46.0	139. Fenarimol	4.68	331.0	268.0	81.0	209. Abamectin B1b	6.48	876.6	553.4	291.0
66. Metobromuron	3.32	259.1	170.0	148.1	140. Etaconazole isomer 2	4.70	328.1	205.0	159.0	210. Pyridaben	6.51	365.1	147.1	309.1
67. Methylotryptine	3.33	272.2	170.2	198.2	141. Fipronil	4.70	437.0	367.9	290.0	211. Eprinomectin	6.53	914.6	186.0	154.0
68. Propham	3.33	180.0	138.0	120.1	142. Flusilazole	4.78	316.0	247.0	165.0	212. Abamectin B1a	6.61	890.5	305.2	567.3
69. Flutriafol	3.35	302.1	123.1	70.2	143. Picoxystrobin	4.79	368.0	145.1	205.1	213. Fenazaquin	6.69	307.2	161.0	57.2
70. Isoprocobar	3.37	194.1	95.1	137.1	144. Fenoxycarb	4.80</td								

Figure 6: RxI®-5ms GC columns reliably separate many commonly used pesticides.



Peaks	t _r (min)				
1. Tefluthrin	14.23	12. lambda-Cyhalothrin	22.30	23. Cypermethrin 4*	24.43
2. Transfluthrin	15.18	13. Acrinathrin	22.51	24. Flucythrinate 1*	24.43
3. Anthraquinone	16.02	14. cis-Permethrin	23.14	25. Flucythrinate 2*	24.66
4. Bioallethrin	17.17	15. trans-Permethrin	23.29	26. Fenvalerate 1*	25.25
5. Resmethrin 1*	20.43	16. Cyfluthrin 1*	23.83	27. tau-Fluvalinate 1*	25.47
6. Resmethrin 2*	20.55	17. Cyfluthrin 2*	23.93	28. Fenvalerate 2*	25.48
7. Tetramethrin 1*	21.00	18. Cyfluthrin 3*	24.02	29. tau-Fluvalinate 2*	25.53
8. Tetramethrin 2*	21.14	19. Cyfluthrin 4*	24.06	30. Deltamethrin	26.09
9. Bifenthrin	21.15	20. Cypermethrin 1*	24.19		
10. Phenothrin 1*	21.59	21. Cypermethrin 2*	24.30		
11. Phenothrin 2*	21.71	22. Cypermethrin 3*	24.39		

*Isomers numbered according to elution order.

Column: RxI®-5ms, 30 m, 0.25 mm ID, 0.25 µm (cat. # 13423); **Sample:** GC multiresidue pesticide standard #6-SPP (cat.# 32568); Diluent: Toluene; Conc.: 100 µg/mL; **Injection:** Inj. Vol.: 1 µL split (split ratio 50:1); Liner: Sky® 4.0 mm ID Precision® inlet liner w/wool (cat.# 23305.1); Inj. Temp.: 250 °C; **Oven:** 90 °C (hold 1 min) to 330 °C at 8.5 °C/min (hold 5 min); **Carrier Gas:** He, constant flow; Flow Rate: 1.4 mL/min; **Detector:** MS; Mode: Scan; Start Time: 5 min; Scan Range: 55–550 amu; Scan Rate: 7 scans/sec; Transfer Line Temp.: 290 °C; Analyzer Type: Quadrupole; Source Temp.: 325 °C; Electron Energy: 70 eV; Solvent Delay Time: 5 min; Ionization Mode: EI; **Instrument:** Thermo Scientific TSQ 8000 Triple Quadrupole GC-MS; **Notes:** Bioallethrin isomers are only slightly resolved with this method, so they are treated as one peak. Chromatogram is reconstructed from select ions.

TECH TIP

Struggling with matrix interferences or high back pressures? Contact Restek's Technical Service team at support@restek.com for guard column recommendations.



PESTICIDE ANALYSIS PRODUCTS

Raptor™ ARC-18 LC Columns (USP L1)



Properties:

- Well-balanced retention profile.
- Sterically protected and acid-resistant to resist harsh, low-pH mobile phases.
- Ideal for use with sensitive detectors like mass spec.

Description	cat.#
2.7 µm Columns 100 mm, 2.1 mm ID	9314A12

For guard cartridges, visit our website at www.restek.com



26237

Q-sep

Q-sep® QuEChERS Extraction Salts

Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

- Salt packets eliminate the need for a second empty tube to transfer salts.
- Go green by using packets with reusable tubes.
- Convenient and easy to use.

Description	Material	Methods	qty.	cat.#
Q-sep Kit	6 g MgSO ₄ , 1.5 g NaOAc with 50 mL Centrifuge Tube	AOAC 2007.01	50 packets & 50 tubes	26237

NaOAc—sodium acetate

For LC Analysis

Q-sep® QuEChERS dSPE Tubes for Extract Cleanup

Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

Packaged in foil subpacks of 10 for enhanced protection and storage stability.

Multiple sorbents are used to extract different types of interferences.

- MgSO₄ removes excess water
- PSA removes sugars, fatty acids, organic acids, and anthocyanine pigments
- C18 removes nonpolar interferences

Description	Methods	qty.	cat.#
2 mL Micro-Centrifuge Tubes for dSPE (cleanup of 1 mL extract)			
150 mg MgSO ₄ , 50 mg PSA, 50 mg C18 PSA—primary and secondary amine	AOAC 2007.01	100-pk.	26125

Rxi®-5ms Columns (fused silica)

(low-polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners (e.g., Aroclor mixes), solvent impurities.
- Most inert column on the market.
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- Equivalent to USP G27 and G36 phases.

Description	temp. limits	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm	-60 to 330/350 °C	ea.	13423

QuEChERS Performance Standards Kit

- Kit contains organochlorine, organonitrogen, organophosphorus, and carbamate pesticides commonly used on fruits and vegetables.
- Ideal for initial method evaluations and ongoing method performance validations.
- Analytes are divided into three ampuls based on compatibility for maximum stability and shelf life.*
- Precise formulations improve data quality and operational efficiency; spend more time running samples and less time sourcing and preparing standards.

Contains 1 mL each of these mixtures.

31153: QuEChERS Performance Standard A
31154: QuEChERS Performance Standard B
31155: QuEChERS Performance Standard C

300 µg/mL each in acetonitrile/acetic acid (99.9:0.1), 1 mL/ampul.
Blend equal volumes of all three ampuls for a 100 µg/mL final solution.

cat.# 31152 (kit)



kit

*When combining compounds with different functionalities, chemical stability can be an issue. The analytes in this kit are separated into three mixes to ensure maximum long-term storage stability. For analysis, a fresh working standard should be prepared by combining the three kit mixes in a 1:1:1 ratio to prepare a 100 µg/mL working standard solution. Once blended, Restek does not recommend storing working standards or subsequent dilutions for future use.

For GC Analysis

Pesticide Residue Cleanup SPE Cartridges

- Convenient, multiple adsorbent beds in a single cartridge.
- For use in multiresidue pesticide analysis to remove matrix interferences.
- Excellent for cleanup of dietary supplement extracts.

SPE Cartridge	qty.	cat.#
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg PSA, Polyethylene Frits	30-pk.	26194

PSA—primary and secondary amine



PESTICIDE ANALYSIS PRODUCTS (CONT.)

LC Multiresidue Pesticide Kit

- Accurately detect and quantify pesticides of global food safety concern in a wide range of fruits, vegetables, and other commodities by LC-MS/MS.
- Full kit contains 204 compounds of interest, covering many LC-determined pesticides listed by government agencies; individual ampuls also sold separately.
- Formulated and grouped for maximum long-term stability* and well-balanced chromatographic performance, even for early eluting compounds.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Optimized multiresidue pesticide method is offered free of charge; downloadable XLS file includes conditions and transition tables.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.



Reference Materials

Cat.# 31972: LC Multiresidue Pesticide Standard #1 (13 components)

Organophosphorus Compounds
Acephate (30560-19-1)
Carbarlyl (Sevin) (63-25-2)
Dicrotophos (141-66-2)
Dimethoate (60-51-5)
Dimethylmorph (110488-70-5)
Isocarbophos (24353-61-5)
Methamidophos (10265-92-6)
Mevinphos (7786-34-7)
Monocrotophos (6923-22-4)
Ometotheate (1113-02-6)
Temephos (Abate) (3383-96-8)
Trichlorfon (Dylox) (52-68-6)
Vamidothion (Vamidoate) (2275-23-2)

Cat.# 31973: LC Multiresidue Pesticide Standard #2 (16 components)

Carbamate/Uron Compounds
Alanycarb (83130-01-2)
Aldicarb (116-06-3)
Aldicarb sulfone (1646-88-4)
Aldicarb sulfoxide (1646-87-3)
Benfuracarb (82560-54-1)
Butocarboxim (34681-10-2)
Butoxycarboxim (34681-23-7)
Ethiofencarb (29973-13-5)
Furathiocarb (65907-30-4)
Methabenzthiazuron (18691-97-9)
Methiocarb (2032-65-7)
Methomyl (16752-77-5)
Oxamyl (23135-22-0)
Tebuthiuron (34014-18-1)
Thidiazuron (51707-55-2)
Thiophanate-methyl (23564-05-8)

Cat.# 31974: LC Multiresidue Pesticide Standard #3 (38 components)

Carbamate/Uron Compounds
Bendiocarb (22781-23-3)
Bifenazate (149877-41-8)
Carbofuran (1563-66-2)
Chlorfluazuron (71422-67-8)
Chloroxuron (1982-47-4)
Chlortoluron (15545-48-9)
Cycluron (2163-69-1)
Diethofencarb (87130-20-9)
Diflubenzuron (35367-38-5)
Dioxacarb (6988-21-2)

Diuron (330-54-1)
Fenobucarb (BPMC) (3766-81-2)
Fenoxy carb (79127-80-3)
Fenuron (101-42-8)
Flufenuron (101463-69-8)

Organophosphorus Compounds
Fluometuron (2164-17-2)
Forchlorfenuron (68157-60-8)
Hexaflumuron (86479-06-3)
3-Hydroxycarbofuran (16655-82-6)
Indoxacarb (173584-44-6)
Iprovalicarb (140923-17-7)
Isopropcarb (2631-40-5)
Isoproturon (34123-59-6)
Linuron (330-55-2)
Lufenuron (103055-07-8)
Metobromuron (3060-89-7)
Monolinuron (1746-81-2)
Neburon (555-37-3)
Novaluron (116714-46-6)
Pirimicarb (23103-98-2)
Promecarb (2631-37-0)
Propham (122-42-9)
Propoxur (Baygon) (114-26-1)
Pyraclostrobin (175013-18-0)
Siduron (1982-49-6)
Teflubenzuron (83121-18-0)
Thiobencarb (28249-77-6)
Triflumuron (64628-44-0)

Cat.# 31975: LC Multiresidue Pesticide Standard #4 (63 components)

Organonitrogen Compounds

Abamectin (71751-41-2)
Acetamiprid (135410-20-7)
Ametryn (834-12-8)
Amitraz (33089-61-1)
Azoxystrobin (131860-33-8)
Benalaxyl (71626-11-4)
Benzoximate (29104-30-1)
Boscalid (188425-85-6)
Butafenacil (134605-64-4)
Carbetamide (16118-49-3)
Carfentrazone-ethyl (128639-02-1)
Chlorantraniliprole (500008-45-7)
Clofentezine (74115-24-5)
Cymoxanil (57966-95-7)
Cyprodinil (121552-61-2)
Cyromazine (66215-27-8)
Dimoxystrobin (149961-52-4)
Dinotefuran (165252-70-0)
Doramectin (117704-25-3)
Eprinomectin (123997-26-2)

Famoxadon (131807-57-3)
Fenazaquin (120928-09-8)
Fenhexamid (126833-17-8)
Fenpyroximate (111812-58-9)
Flonicamid (158062-67-0)

Organonitrogen Compounds
Fluazinam** (79622-59-6)
Fludioxonil (131341-86-1)
Fluoxastrobin (361377-29-9)
Flutolanil (66332-96-5)
Furalaxyd (57646-30-7)
Halofenoziide (112226-61-6)
Imazalil (35554-44-0)
Imidacloprid (138261-41-3)
Ivermectin (70288-86-7)
Kresoxim-methyl (143390-89-0)
Mandipropamid (374726-62-2)
Mepranypyrim (110235-47-7)
Mepronil (55814-41-0)
Metaflumizone (139968-49-3)
Metalaxyl (57837-19-1)
Methoxyfenozide (161050-58-4)
Moxidectin (113507-06-5)
Myclobutanil (88671-89-0)
Nitpenpyram (120738-89-8)
Oxadixyl (77732-09-3)
Picoxystrobin (117428-22-5)
Piperonyl butoxide (51-03-6)
Prochloraz (67747-09-5)
Prometon (1610-18-0)
Pymetrozine (123312-89-0)
Pyracarbolid (24691-76-7)
Pyrimethanil (53112-28-0)
Pyriproxyfen (95737-68-1)
Quinoxifen (124495-18-7)
Rotenone (83-79-4)
Sebumeton (26259-45-0)
Spiroxamine (118134-30-8)
Tebufenozide (112410-23-8)
Tebufenpyrad (119168-77-3)
Terbumeton (3693-04-8)
Triadimenol (43121-43-3)
Trifloxystrobin (141517-21-7)
Zoxamide (156052-68-5)

Cat.# 31976: LC Multiresidue Pesticide Standard #5 (30 components)

Organonitrogen Compounds

Acibenzolar-S-methyl (135158-54-2)
Bupirimate (41483-43-6)
Buprofezin (69327-76-0)
Carboxin (5234-68-4)
Clethodim (99129-21-2)
Clothianidin (210880-92-5)
Cyazofamid (120116-88-3)

Ethiprole (181587-01-9)
Ethofumesate (26225-79-6)
Fenamidone (161326-34-7)
Fipronil (120068-37-3)

Organonitrogen Compounds
Flubendimide (272451-65-7)
Flufenacet (Fluthiamide) (142459-58-3)
Hexythiazox (78587-05-0)
Mefenacet (73250-68-7)
Mesotriione (104206-82-8)
Methoprotryne (841-06-5)
Metribuzin (21087-64-9)
Prometryne (7287-19-6)
Propargite (2312-35-8)
Prothioconazole (178928-70-6)
Pyridaben (96489-71-3)
Simetryn (1014-70-6)
Sulfentrazone (122836-35-5)
Terbutryn (886-50-0)
Thiabendazole (148-79-8)
Thioclorop (119988-49-9)
Thiamethoxam (153719-23-4)
Thifonanox (39196-18-4)
Tricyclazole (Beam) (41814-78-2)

Cat.# 31977: LC Multiresidue Pesticide Standard #6 (28 components)

Organonitrogen Compounds

Baycor (Bitertanol) (55179-31-2)
Bromuconazole (116255-48-2)
Cyproconazole (113096-99-4)
Diclobutrazol (75736-33-3)
Difenconazole (119446-68-3)
Diniconazole (83657-24-3)
Epoxiconazole (133855-98-8)
Etaconazole (60207-93-4)
Ethirimol (23947-60-6)
Etoxazole (153233-91-1)
Fenarimol (60168-88-9)
Fenbuconazole (114369-43-6)
Fluquinconazole (136426-54-5)
Flusilazole (85509-19-9)
Flutriafol (76674-21-0)
Fuberidazole (3878-19-1)
Hexaconazole (79983-71-4)
Ipconazole (125225-28-7)
Metconazole (125116-23-6)
Nuarimol (63284-71-9)
Paclobutrazol (76738-62-0)
Penconazole (66246-88-6)
Propiconazole (Tilt) (60207-90-1)
Tebuconazole (107534-96-3)
Tetraconazole (112281-77-3)
Triadimenol (55219-65-3)

Cat.# 31978: LC Multiresidue Pesticide Standard #7 (7 components)

Organonitrogen Compounds

Emamectin-benzooate (155569-91-8)
Fenpropimorph (67564-91-4)
Spirodiclofen (148477-71-8)
Spinosad (168316-95-8)
Spirotetramat (203313-25-1)
Spinetoram (J&L) (187166-40-1)
Spiromesifen (283594-90-1)

Cat.# 31980: LC Multiresidue Pesticide Standard #9 (7 components)

Carbamate/Uron Compounds
Aminocarb (2032-59-9)
Desmedipham (13684-56-5)
Formetanate HCL (23422-53-9)
Mexacarbate (Zectran) (315-18-4)
Moneren (Pencycuron) (66063-05-6)
Phenmedipham (13684-63-4)
Propamocarb free base (24579-73-5)

Cat.# 31981: LC Multiresidue Pesticide Standard #10

Carbamate/Uron Compounds
Carbendazim (10605-21-7)



Contains 1 mL each of these mixtures.
cat.# 31971 (kit)

Quantity discounts not available.

* NOTE: When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating these standards, we extensively studied the 204 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.

** NOTE: In this standard, fluazinam should only be used for qualitative analysis. A single-component standard (cat.# 31982) is available for quantitative analysis.



GC Multiresidue Pesticide Kit

- Accurately identify and quantify pesticide residues by GC-MS/MS in fruits, vegetables, botanicals, and herbals like tea, ginseng, ginger, Echinacea, and dietary supplements.
- Comprehensive 203-compound kit covers food safety lists by the FDA, USDA, and other global governmental agencies; individual ampuls also sold separately.
- Formulated and grouped for maximum long-term stability* and well-balanced chromatographic performance, even for early eluting compounds.
- Quantitatively tested to confirm composition; detailed support documentation provided.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs satisfies your ISO requirements.



Reference Materials

Cat. # 32563: GC Multiresidue Pesticide Standard #1 (16 components)

Organophosphorus Compounds
Azinphos ethyl (2642-71-9)
Azinphos-methyl (86-50-0)
Chlorpyrifos (2921-88-2)
Chlorpyrifos methyl (5598-13-0)
Diazinon (333-41-5)
EPN (2104-64-5)
Fenitrothion (122-14-5)
Isazophos (42509-80-8)
Phosalone (2310-17-0)
Phosmet (732-11-6)
Pirimiphos ethyl (23505-41-1)
Pirimiphos methyl (29232-93-7)
Pyraclofos (77458-01-6)
Pyrazophos (13457-18-6)
Pyridaphenthion (119-12-0)
Quinalphos (13593-03-8)

Cat. # 32564: GC Multiresidue Pesticide Standard #2 (40 components)

Organochlorine Compounds
Aldrin (309-00-2)
alpha-BHC (319-84-6)
beta-BHC (319-85-7)
delta-BHC (319-86-8)
gamma-BHC (Lindane) (58-89-9)
Chlorsentene (103-17-3)
cis-Chlordane (5103-71-9)
trans-Chlordane (5103-74-2)
Chorfenson (Ovex) (80-33-1)
Chloreneb (2675-77-6)
2,4'-DDD (53-19-0)
4,4'-DDD (72-54-8)
2,4'-DDE (3424-82-6)
4,4'-DDE (72-55-9)
2,4'-DDT (789-02-6)
4,4'-DDT (50-29-3)
4,4'-Dichlorobenzophenone (90-98-2)
Dieldrin (60-57-1)
Endosulfan I (959-98-8)
Endosulfan II (33213-65-9)
Endosulfan ether (3369-52-6)
Endosulfan sulfate (1031-07-8)
Endrin (72-20-8)
Endrin aldehyde (7421-93-4)
Endrin ketone (53494-70-5)
Etylhan (Perthane) (72-56-0)
Fenson (80-38-6)
Heptachlor (76-44-8)
Heptachlor epoxide (Isomer B) (1024-57-3)
Hexachlorobenzene (118-74-1)
Isodrin (465-73-6)

Cat. # 32565: GC Multiresidue Pesticide Standard #3 (25 components)

Organonitrogen Compounds
Benfluralin (1861-40-1)
Biphenyl (92-52-4)
Chlorothalonil (1897-45-6)
Dichlofuanid (1085-98-9)
Dichloran (99-30-9)
3,4-Dichloroaniline (95-76-1)
2,6-Dichlorobenzonitrile (*cis*-Dichlobenil) (1194-65-6)
Diphenylamine (122-39-4)
Ethylfluralin (55283-68-6)
Fluchloralrin (33245-39-5)
Isopropalin (33820-53-0)
Nitralin (4726-14-1)
Nitrofen (1836-75-5)
Oxyfluorfen (42874-03-3)
Pendimethalin (40487-42-1)
Pentachloroaniline (527-20-8)
Pentachlorobenzonitrile (20925-85-3)
Pentachloronitrobenzene (Quintozone) (86-68-8)
Prodiamine (29091-21-2)
Profluralin (26399-36-0)
2,3,5,6-Tetrachloroaniline (3481-20-7)
Tetrachloronitrobenzene (Tecnazene) (117-18-0)
THPI (Tetrahydraphthalimide) (1469-48-3)
Tolyfluanid (731-27-1)
Trifluralin (1582-09-8)

Cat. # 32566: GC Multiresidue Pesticide Standard #4 (28 components)

Organonitrogen Compounds
Acetochlor (34256-82-1)
Alachlor (15972-60-8)
Allidochlor (93-71-0)
Clomazone (Command) (81777-89-1)
Cycloate (1134-23-2)
Diallate (*cis* and *trans*)

(2303-16-4)

Dimethachlor (50563-36-5)
Diphenamid (957-51-7)
Fenopropthrin (39515-41-8)
Fluquinconazole (136426-54-5)
Flutolanil (66332-96-5)
Linuron (330-55-2)
Metazachlor (67129-08-2)
Methoxychlor (72-43-5)
Metolachlor (51218-45-2)
N-(2,4-Dimethylphenyl) formamide (60397-77-5)
Norflurazon (27314-13-2)
Oxadiazole (19666-30-9)
Pebulate (1114-71-2)
Pretilachlor (51218-49-6)
Prochloraz (67747-09-5)
Propachlor (1918-16-7)
Propanil (709-98-8)
Propisochlor (86763-47-5)
Propyzamide (23950-58-5)
Pyridaben (96489-71-3)
Tebufenpyrad (119168-77-3)
Triallate (2303-17-5)

Cat. # 32567: GC Multiresidue Pesticide Standard #5 (34 components)

Organonitrogen Compounds
Atrazine (1912-24-9)
Bupirimate (41483-43-6)
Captafol (2425-06-1)
Captan (133-06-2)
Chlorfenapyr (122453-73-0)
Cyprodinil (121552-61-2)
Etofenprox (80844-07-1)
Etridiazole (2593-15-9)
Fenarimol (60168-88-9)
Fipronil (120068-37-3)
Fludioxonil (131341-86-1)
Fluridone (Sonar) (59756-60-4)
Flusilazole (85509-19-9)
Flutriafol (76674-21-0)
Folpet (133-07-3)
Hexazinone (Velpar) (51235-04-2)
Iprodione (36734-19-7)
Lenacil (2164-08-1)
MGK-264 (113-48-4)
Myclobutanil (88671-89-0)
Paclbutrazol (76738-62-0)
Penconazole (66246-88-6)
Procymidone (32809-16-8)
Propargite (2312-35-8)
Pyrimethanil (53112-28-0)
Pyriproxyfen (95737-68-1)
Tebuconazole (107534-96-3)
Terbacil (5902-51-2)
Terbutylazine (5915-41-3)

Triadimefon (43121-43-3) Triadimenol (55219-65-3) Tricyclazole (Beam) (41814-78-2) Triflumizole (68694-11-1) Vinclozolin (50471-44-8)

Cat. # 32568: GC Multiresidue Pesticide Standard #6 (18 components)

Synthetic Pyrethroid Compounds
Acrinathrin (101007-06-1)
Anthraquinone (84-65-1)
Bifenthrin (82657-04-3)
Bioallethrin (584-79-2)
Cyfluthrin (68359-37-5)
lambda-Cyhalothrin (91465-08-6)
Cypermethrin (52315-07-8)
Deltamethrin (52918-63-5)
Fenvalerate (51630-58-1)
Flucythrinate (70124-77-5)
tau-Fluvalinate (102851-06-9)
cis-Permethrin (61949-76-6)
trans-Permethrin (61949-77-7)
Phenothen (*cis* and *trans*) (26002-80-2)
Resmethrin (10453-86-8)
Tefluthrin (79538-32-2)
Tetramethrin (7696-12-0)
Transfluthrin (118712-89-3)

Cat. # 32569: GC Multiresidue Pesticide Standard #7 (10 components)

Herbicide Methyl Esters
Aceanucycl (59760-19-7)
Bromopropylate (18181-80-1)
Carfentrazone ethyl (128639-02-1)
Chlorobenzilate (510-15-6)
Chloropropham (101-21-3)
Chlozolinate (84332-86-5)
DCPA methyl ester (Chlorthal-dimethyl) (1861-32-1)
Fluazifop-*p*-butyl (79241-46-6)
Metalaxy (57837-19-1)
2-Phenylphenol (90-43-7)

Cat. # 32570: GC Multiresidue Pesticide Standard #8 (24 components)

Organophosphorus Compounds
Bromfenvinfos-methyl (13104-21-7)
Bromfenvinfos (33399-00-7)
Bromophos ethyl (4842-78-6)
Bromophos methyl (2104-96-3)

Carbophenothon (786-19-6)
Chlorfenvinfos (470-90-6)
Chlorthiophos (60238-56-4)
Coumaphos (56-72-4)
Edifenphos (17109-49-8)
Ethion (563-12-2)
Fenamiphos (22224-92-6)
Fenchlrophos (Ronnel) (299-84-3)

Fenthion (55-38-9)
Iodoftenphos (18181-70-9)

Leptophos (21609-90-5)
Malathion (121-75-5)

Methacrifos (62610-77-9)

Profenos (41198-08-7)

Prothiofox (34643-46-4)

Sulfotep (3689-24-5)

Sulprofos (35400-43-2)

Terbufos (13071-79-9)

Tetrachlorvinfos (22248-79-9)

Tolclofos-methyl (57018-04-9)
Cat. # 32571: GC Multiresidue
Pesticide Standard #9
(8 components)

Organophosphorus Compounds
Disulfoton (298-04-4)

Fonofos (944-22-9)

Methyl parathion (298-00-0)

Mevinphos (7786-34-7)

Parathion (Ethyl parathion) (56-38-2)

Phorate (298-02-2)

Piperonyl butoxide (51-03-6)

Triazophos (24017-47-8)



Contains 1 mL each of these mixtures.
cat. # 32562 (kit)

* NOTE: When combining a large number of compounds with different chemical functionalities, mix stability can be an issue. In formulating these standards, we extensively studied the 203 compounds involved, then grouped them into as few mixes as possible while still ensuring maximum long-term stability and reliability. For quantitative analysis, we recommend analyzing each mix separately to ensure accurate results for every compound.



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