Sample Prep

QuEChERS Made Even Easier:

Comprehensive Solutions Simplify Sample Prep and Analysis

- New free-flowing salts in slim packets make extraction a snap.
- Complete line of easy-to-use QuEChERS products, reference standards, and accessories.
- Follow up sample prep with a wide range of analytical columns for both LC and GC.

RESTEK Pure Chromatography www.restek.com

Save Time and Money with QuEChERS

- New free-flowing salts in slim packets make extraction a snap.
- Complete line of easy-to-use QuEChERS products, reference standards, and accessories.
- Follow up sample prep with a wide range of analytical columns for both LC and GC.

For years, the QuEChERS approach to sample preparation has been making the lives of food safety scientists easier. Gone are the days of time-consuming, solvent-intensive extraction techniques and multiple solid phase extraction cartridge cleanup steps! Research published by the U.S. Department of Agriculture Eastern Regional Research Center in Wyndmoor, PA, [1] introduced to the world QuEChERS—a method that is **Qu**ick, **E**asy, **Ch**eap, **E**ffective, **R**ugged, and **S**afe.

With QuEChERS, a homogenized sample simply undergoes a quick extraction step where the analytes are driven into an organic solvent by the partitioning power of a blend of salts. After extraction, the sample is cleaned up through the use of a dispersive solid phase extraction (dSPE) step that is also quick and easy to perform. This simple, two-stage process offers significant savings in time, materials, and effort, making QuEChERS sample preparation faster and easier than other approaches (Table I).

Since its introduction, the QuEChERS technique has evolved to accommodate an expanding list of pesticides in an increasingly diverse list of foodstuffs. At Restek, we offer Q-sep products to cover the four major approaches to QuEChERS, along with a host of other items to help make your QuEChERS experience simple and successful. We carry a comprehensive line of sample prep supplies, reference standards, and LC and GC columns that will help make QuEChERS even easier, whether you are new to the approach or developing a method for a new sample matrix. If you are frustrated with the time and expense of your current pesticide sample cleanup procedure, we suggest you try this simple, economical new method.

Table I: Prepare samples more quickly, easily, and cost effectively with QuEChERS.

	Mini-Luke or Modified Luke Method	QuEChERS	Savings with QuEChERS
Estimated time to process 6 samples (min)	120	30	4x faster
Solvent used (mL)	60-90	10	6-9x less solvent
Chlorinated waste (mL)	20-30	0	Safer, cheaper, greener
Glassware/specialized equipment	capacity for 200 mL, quartz wool, funnel, water bath, or evaporator	none	Ready-to-use

Try QuEChERS risk-free today!

Call 1-814-353-1300 or 1-800-356-1688 to request a free sample pack of Q-sep QuEChERS tubes.

Quick and Easy...

Prepare Samples for LC or GC Analysis in Two Simple Stages

Stage 1: Sample Extraction

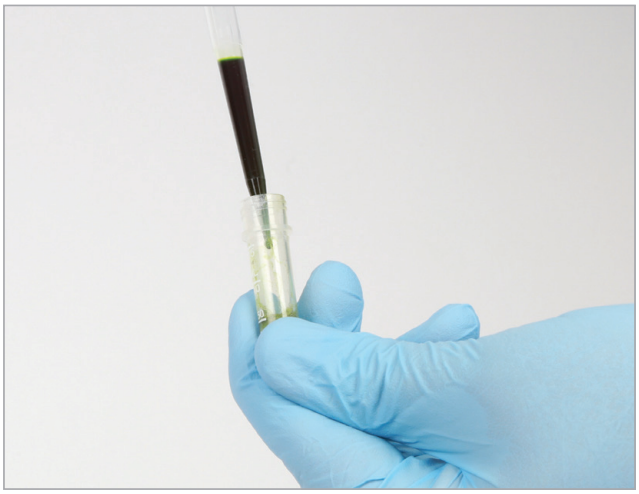
Analytes of interest are extracted from the sample through the addition of an organic solvent and a blend of salts. The salts enhance extraction efficiency and allow the normally miscible organic solvent to separate from the water in the sample.

Add acetonitrile and internal standard, then shake vigorously.

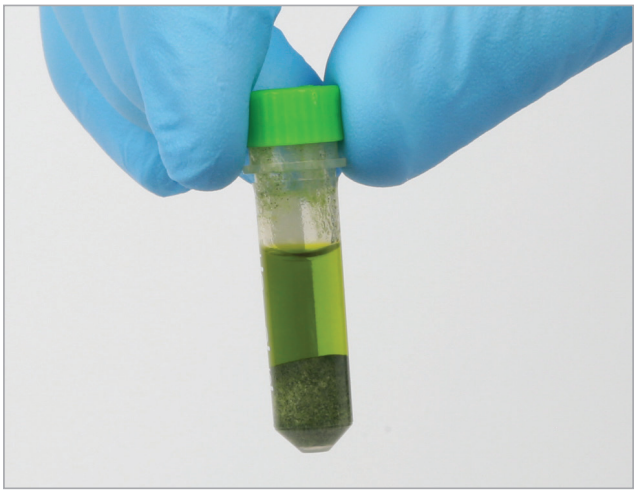
Add extraction salts and shake, then centrifuge to separate the phases.

Stage 2: Sample Cleanup

A subsample of the organic solvent extract from Stage 1 is cleaned up through the use of dSPE. Stage 2 offers a variety of cleanup options that can be selected to match the specific characteristics of your particular sample type (low fat content, highly pigmented, etc.)



Transfer supernatant to dSPE tube.



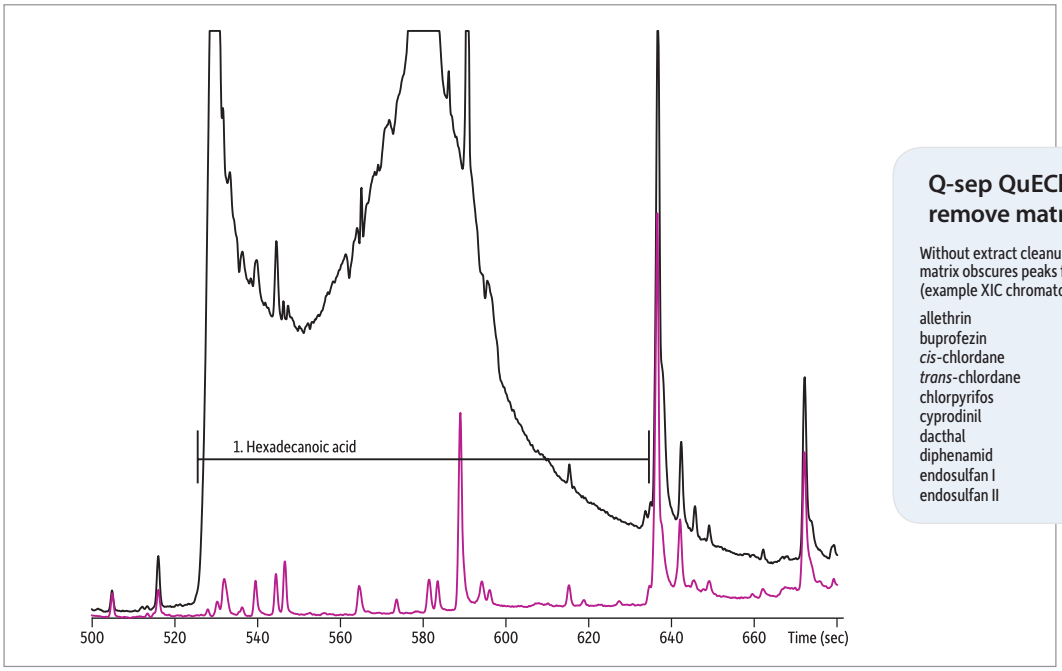
Shake, centrifuge, and transfer to an autosampler vial for analysis by GC or LC.

Effective...

QuEChERS dSPE Cleanup Assures Optimal Results for Pesticide Analysis

- Removes matrix interferences that obscure target analytes or cause ion suppression.
- Protects GC inlet, and LC and GC columns from contamination.
- Improves integration and mass spectral matches.

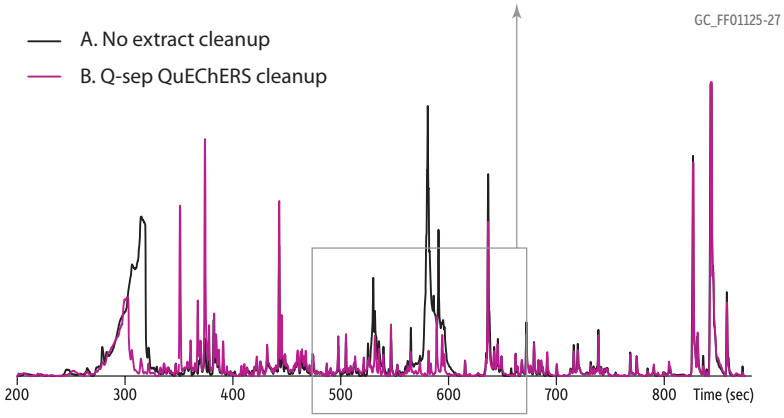
Figure 1: QuEChERS dSPE cleanup removes interferences that obscure target pesticides.



Q-sep QuEChERS tubes easily remove matrix interferences.

Without extract cleanup, hexadecanoic acid from the matrix obscures peaks for all the following pesticides. (example XIC chromatogram = endosulfan I)

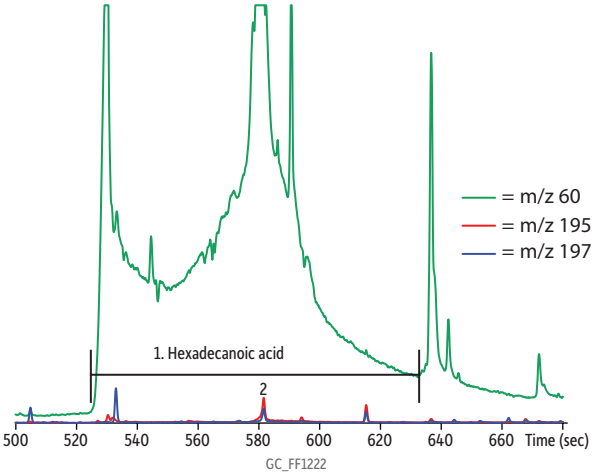
allethrin
buprofezin
cis-chlordane
trans-chlordane
chlorpyrifos
cyprodinil
dacthal
diphenamid
endosulfan I
endosulfan II
fenthion
metolachlor
myclobutanil
oxyfluorfen
pendimethalin
pentachlorothioanisole
pirimiphos methyl
triadimefon
triadimenol



Column	Rxi-5Sil MS, 20 m, 0.18 mm ID, 0.18 µm (cat.# 43602)
Sample	Sweet potato spiked with pesticide mix and extracted with acetonitrile and Q-sep QuEChERS EN Method 15662 extraction salts
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1 min)
Liner:	Gooseneck splitless (4 mm) w/deact. wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	72.5 °C (hold 1 min) to 350 °C at 20 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	
Transfer Line Temp.:	300 °C
Analyzer Type:	TOF
Ionization Mode:	EI
Acquisition Range:	45-550 amu
Instrument	Agilent/HP6890 GC
Notes	A. Extract (without cleanup step) acidified with formic acid to pH 5 B. Extract with cleanup using Q-sep QuEChERS dSPE cleanup tube (cat.# 26124) acidified with formic acid to pH 5. Scan range: m/z 60, 73, 87, 129, 256 plotted

Figure 2: QuEChERS dSPE cleanup significantly improves quantification and identification.

Without cleanup, matrix masks Endosulfan I.

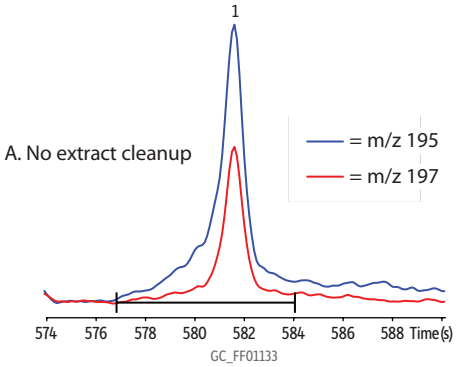


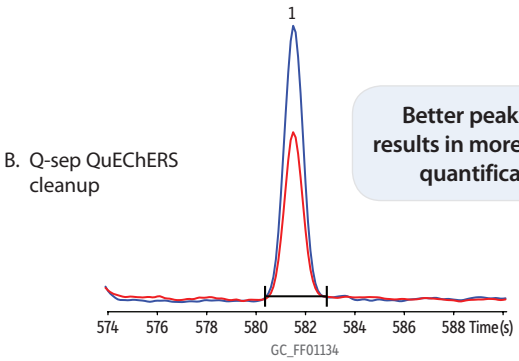
Peak List
1. Hexadecanoic acid
2. Endosulfan I

Column:	Rxi-5Sil MS, 20 m, 0.18 mm ID, 0.18 µm (cat.# 43602)
Sample:	sweet potato spiked with pesticide mix, extracted with acetonitrile and Q-sep QuEChERS EN Method 15662 extraction salts, then acidified with formic acid to pH 5
Inj.:	1.0 µL splitless (hold 1 min.), 4 mm single gooseneck liner with w/wool (cat.# 22405)
Inj. temp.:	250°C
Carrier gas:	helium, constant flow
Flow rate:	1.2 mL/min.
Oven temp.:	72.5°C (hold 1 min.) to 350°C @ 20°C/min.
Det:	TOFMS
Transfer line temp.:	225°C
Scan range:	45-550 amu, m/z 60, 195, 197 plotted
Ionization:	EI
Instrument:	Agilent 6890, LECO Pegasus III

QuEChERS dSPE cleanup improves quantification and identification.

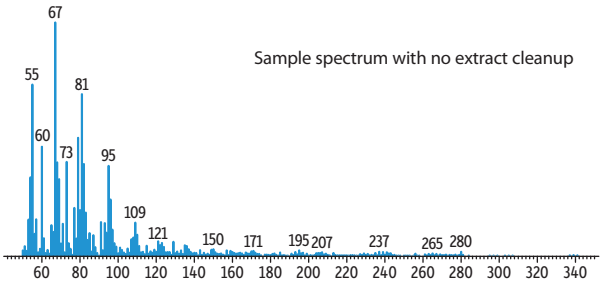
Peak Integration (extracted ion chromatograms)

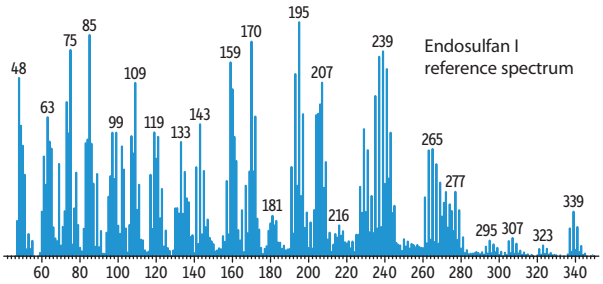




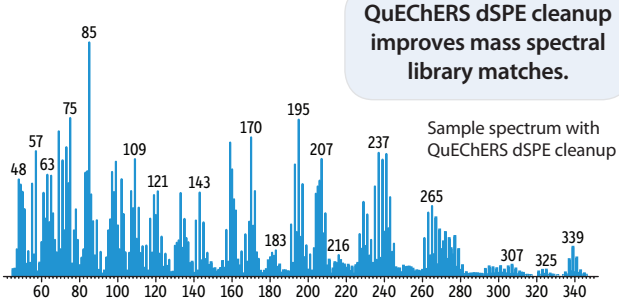
Better peak shape results in more accurate quantification.

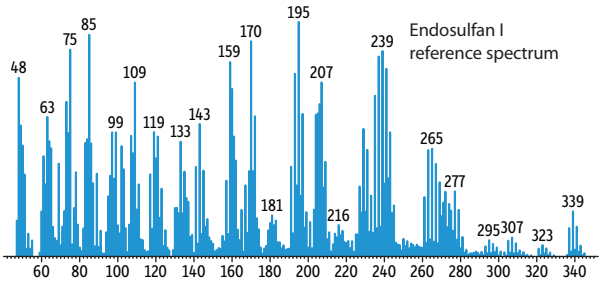
Spectral Identification





QuEChERS dSPE cleanup improves mass spectral library matches.





Optimize Analysis with Sorbent Choice

Choosing a QuEChERS dSPE Sorbent

Primary and secondary amine exchange material (PSA) is the base sorbent used for QuEChERS dSPE cleanup of fruit and vegetable extracts because it removes many organic acids and sugars that might act as instrumental interferences. In addition, C18 or graphitized carbon black (GCB) may be used to remove lipids or pigments, respectively. Choice of sorbent should be based on matrix composition and target analyte chemistry. Most methods make specific recommendations for acidic, basic, and planar pesticides, which may require additional considerations.

As seen in Table II, GCB can have a negative effect on the recoveries of certain pesticides that can assume planar shapes (e.g., chlorothalonil and thiabendazole). The work shown here was done with 50 mg GCB per mL extract, which emphasizes this effect. The EN 15662 QuEChERS method recommends less GCB, which improves recoveries of planar pesticides, but still assures the removal of pigments that can degrade GC-MS performance. To simplify and speed up sample prep, Restek QuEChERS tubes are available in the sorbent combinations and amounts specified by EN 15662 and AOAC methods, as well as in other combinations that may provide better results for difficult matrices (Table III).

Table II: Select sorbents based on matrix and target analyte chemistry. (Percent recovery using C18 or GCB, relative to PSA alone).

t_R (min)	pesticide	CAS Number	action/use	classification	C18*	GCB**
9.50	dichlorvos	62-73-7	insecticide	organophosphorus	111	116
9.67	methamidophos	10265-92-6	insecticide	organophosphorus	105	107
11.75	mevinphos	7786-34-7	insecticide	organophosphorus	112	130
12.02	*o*-phenylphenol	90-43-7	fungicide	unclassified	106	97
12.14	acephate	30560-19-1	insecticide	organophosphorus	128	147
13.89	omethoate	1113-02-6	insecticide	organophosphorus	120	119
14.74	diazinon	333-41-5	insecticide	organophosphorus	108	127
14.98	dimethoate	60-51-5	insecticide	organophosphorus	124	151
15.69	chlorothalonil	1897-45-6	fungicide	organochlorine	125	13
15.86	vinclozolin	50471-44-8	fungicide	organochlorine	102	98
16.21	metalaxyl	57837-19-1	fungicide	organonitrogen	105	117
16.28	carbaryl	63-25-2	insecticide	carbamate	114	111
16.60	malathion	121-75-5	insecticide	organophosphorus	124	160
16.67	dichlofluanid	1085-98-9	fungicide	organohalogen	122	103
17.51	thiabendazole	148-79-8	fungicide	organonitrogen	88	14
17.70	captan	133-06-2	fungicide	organochlorine	88	91
17.76	folpet	133-07-3	fungicide	organochlorine	108	63
18.23	imazalil	35554-44-0	fungicide	organonitrogen	115	95
18.39	endrin	72-20-8	insecticide	organochlorine	104	101
18.62	myclobutanil	88671-89-0	fungicide	organonitrogen	119	114
19.07	4,4-DDT	50-29-3	insecticide	organochlorine	102	95
19.22	fenhexamid	126833-17-8	fungicide	organochlorine	118	77
19.40	propargite 1	2312-35-8	acaricide	organosulfur	110	95
19.43	propargite 2	2312-35-8	acaricide	organosulfur	121	114
19.75	bifenthrin	82657-04-3	insecticide	pyrethroid	106	81
20.04	dicofol	115-32-2	acaricide	organochlorine	98	54
20.05	iprodione	36734-19-7	fungicide	organonitrogen	118	90
20.21	fenpropathrin	39515-41-8	insecticide	pyrethroid	113	96
21.32	*cis*-permethrin	52645-53-1	insecticide	pyrethroid	106	65
21.47	*trans*-permethrin	51877-74-8	insecticide	pyrethroid	109	71
23.74	deltamethrin	52918-63-5	insecticide	pyrethroid	97	52

*50 mg PSA, 50 mg C18, **50 mg PSA, 50 mg GCB

$$\% \text{ recovery} = \frac{\text{RRF C18 or GCB}}{\text{RRF PSA}} \times 100$$

Strawberry extracts were spiked at 200 ng/mL with pesticides and subjected to dSPE with PSA only. Results were used to generate single point calibration curves. Spiked extracts were then subjected to additional dSPE sorbents (either C18 or GCB). Results are shown as percent recoveries relative to PSA alone.

Try QuEChERS risk-free today!

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Table III: Restek Q-sep dSPE products are formulated with different sorbents in different ratios so that your dSPE choice can be tailored to the composition of your particular sample type (e.g., fatty, highly pigmented, etc.)

Sample Type		Example	Method	Sorbent Mass (mg)				Product Information	
				$MgSO_4$	PSA*	C18-EC	GCB**	Vial Volume (mL)	Cat.#
				Removes					
				Excess water	Sugars, fatty acids, organic acids, anthocyanine pigments	Lipids, nonpolar interferences	Pigments, sterols, nonpolar interferences		
	General fruits and vegetables	Celery, head lettuce, cucumber, melon	AOAC 2007.01	150	50	-	-	2	26124
			Original unbuffered, EN 15662, mini-multiresidue	150	25	-	-	2	26215
			AOAC 2007.01	1,200	400	-	-	15	26220
			Original unbuffered, EN 15662	900	150	-	-	15	26223
	Foodstuffs with fats and waxes	Cereals, avocado, nuts, seeds, and dairy	Mini-multiresidue	150	25	25	-	2	26216
			-	150	-	50	-	2	26242
			AOAC 2007.01	150	50	50	-	2	26125
			AOAC 2007.01	1,200	400	400	-	15	26221
			-	1,200	-	400	-	15	26244
			-	900	150	150	-	15	26226
	Pigmented fruits and vegetables	Strawberries, sweet potatoes, tomatoes	Mini-multiresidue, EN 15662	150	25	-	2.5	2	26217
			AOAC 2007.01	150	50	-	50	2	26123
			AOAC 2007.01	1,200	400	400	400	15	26222
			EN 15662	900	150	-	15	15	26224
	Highly pigmented fruits and vegetables	Red peppers, spinach, blueberries	Mini-multiresidue, EN 15662	150	25	-	7.5	2	26218
			AOAC 2007.01	150	50	50	50	2	26219
			EN 15662	900	150	-	45	15	26225
			-	900	300	-	150	15	26126
	General Purpose	Wide range of commodities, including fatty and pigmented fruits and vegetables	-	150	50	50	7.5	2	26243
			-	900	300	300	45	15	26245

Note: No entry in the Method column refers to dSPE formulations not specifically included in one of the cited references. These products can be used to accommodate the various needs of specific matrices not directly met by the cited references.

*PSA = primary secondary amine exchange material

**GCB = graphitized carbon black

Rugged Technique...

QuEChERS Methods for Complex and Varied Matrices

QuEChERS has been successfully applied to many different types of matrices. When developing procedures for your lab, start with these selected references—or visit www.restek.com/quechers for an expanded version that includes hyperlinks. (Note: references not available from Restek.)

General/Original

[1] M. Anastassiades, S.J. Lehotay, D. Stajnbaher, F.J. Schenck, Fast and easy multiresidue method employing acetonitrile extraction/partitioning and "dispersive solid-phase extraction" for the determination of pesticide residues in produce, J. AOAC Int. 86 (2003) 412.

[2] QuEChERS—A Mini-Multiresidue Method for the Analysis of Pesticide Residues in Low-Fat Products, http://www.quechers.com (accessed July 15, 2008).

[3] Pesticide Residues in Foods by Acetonitrile Extraction and Partitioning with Magnesium Sulfate, AOAC Official Method 2007.01.

[4] Foods of Plant Origin—Determination of Pesticide Residues Using GC-MS and/or LC-MS/MS Following Acetonitrile Extraction/Partitioning and Cleanup by Dispersive SPE, QuEChERS-method, EN 15662 Version 2008.

General Fruits and Vegetables

[5] S.J. Lehotay, A. de Kok, M. Hiemstra, P. Van Bodegraven, Validation of a fast and easy method for the determination of residues from 229 pesticides in fruits and vegetables using gas and liquid chromatography and mass spectrometric detection, J. AOAC Int. 88 (2005) 595.

[6] F. Schenck, J. Wong, C. Lu, J. Li, J.R. Holcomb, L.M. Mitchell, Multiresidue analysis of 102 organophosphorus pesticides in produce at parts-per-billion levels using a modified QuEChERS method and gas chromatography with pulsed flame photometric detection, J. AOAC Int. 92 (2009) 561.

Dairy and Fatty Matrices

[7] S.C. Cunha, S.J. Lehotay, K. Mastovska, J.O. Fernandes, M. Beatriz, P.P. Oliveira, Evaluation of the QuEChERS sample preparation approach for the analysis of pesticide residues in olives, J. Sep. Sci. 30 (2007) 620.

[8] T. Dagnac, M. Garcia-Chao, P. Pulleiro, C. Garcia-Jares, M. Llompart, Dispersive solid-phase extraction followed by liquid chromatography-tandem mass spectrometry for the multi-residue analysis of pesticides in raw bovine milk, J. Chromatogr. A 1216 (2009) 3702.

Grains, Nuts, and Seeds

[9] T.D. Nguyen, E.M. Han, M.S. Seo, S.R. Kim, M.Y. Yun, D.M. Lee, G.H. Lee, A multi-residue method for the determination of 203 pesticides in rice paddies using gas chromatography/mass spectrometry, Anal. Chim. Acta. 619 (2008) 67.

[10] S. Walorczyk, Development of a multi-residue method for the determination of pesticides in cereals and dry animal feed using gas chromatography-tandem quadrupole mass spectrometry II. Improvement and extension to new analytes, J. Chromatogr. A 1208 (2008) 202.

Oils

[11] L. Li, Y. Xu, C. Pan, Z. Zhou, S. Jianc, F. Liu, Simplified pesticide multiresidue analysis of soybean oil by low-temperature cleanup and dispersive solid-phase extraction coupled with gas chromatography/mass spectrometry, J. AOAC Int. 90 (2007) 1387.

Baby Food

[12] J. Wang, D. Leung, Determination of 142 pesticides in fruit- and vegetable-based infant foods by liquid chromatography/electrospray ionization-tandem mass spectrometry and estimation of measurement uncertainty, J. AOAC Int. 92 (2009) 279.

[13] C. Przybylski, C. Segard, Method for routine screening of pesticides and metabolites in meat based baby-food using extraction and gas chromatography-mass spectrometry, J. Sep. Sci. 32 (2009) 1858.

Non-Food Matrices

[14] F. Plössl, M. Giera, F. Bracher, Multiresidue analytical method using dispersive solid-phase extraction and gas chromatography/ion trap mass spectrometry to determine pharmaceuticals in whole blood, J. Chromatogr. A 1135 (2006) 19.

[15] C. Lesueur, M. Gartner, A. Mentler, M. Fuerhacker, Comparison of four extraction methods for the analysis of 24 pesticides in soil samples with gas chromatography-mass spectrometry and liquid chromatography-ion trap-mass spectrometry, Talanta 75 (2008) 284.

Muscle and Tissues

[16] G. Stubbings, T. Bigwood, The development and validation of a multiclass liquid chromatography tandem mass spectrometry (LC-MS/MS) procedure for the determination of veterinary drug residues in animal tissue using a QuEChERS (QUick, Easy, CHeap, Effective, Rugged and Safe) approach, Anal. Chim. Acta. 637 (2009) 68.

QuEChERS Made Even Easier

Comprehensive Solutions Simplify Sample Prep and Analysis

Q-sep QuEChERS Sample Prep Packets & Tubes

Q-sep QuEChERS Extraction Salts

- Free-flowing salts transfer easily and completely.
- Easy-open packets eliminate the need for a second empty tube for salt transfer.
- Convenient slim packets fit perfectly into tubes to prevent spills.
- Ready-to-use tubes, no glassware required.
- Pre-weighed, ultra-pure extraction salts.
- Ideal for original unbuffered, AOAC (2007.01), and European (EN 15662) QuEChERS methods.

25847

25848

Description	Method	Material	qty.	cat.#
Q-sep QuEChERS Extraction Kit	original unbuffered	4 g $MgSO_4$, 1 g NaCl with 50 mL Centrifuge Tube	50 packets & 50 tubes	25848
Q-sep QuEChERS Extraction Salt Packets Only	original unbuffered	4 g $MgSO_4$, 1 g NaCl	50 packets	25847
Q-sep QuEChERS Extraction Kit	European EN 15662	4 g $MgSO_4$, 1 g NaCl, 1 g TSCD, 0.5 g DHS with 50 mL Centrifuge Tube	50 packets & 50 tubes	25850
Q-sep QuEChERS Extraction Salt Packets Only	European EN 15662	4 g $MgSO_4$, 1 g NaCl, 1 g TSCD, 0.5 g DHS	50 packets	25849
Q-sep QuEChERS Extraction Kit	AOAC 2007.01	6 g $MgSO_4$, 1.5 g NaOAc with 50 mL Centrifuge Tube	50 packets & 50 tubes	25852
Q-sep QuEChERS Extraction Salt Packets Only	AOAC 2007.01	6 g $MgSO_4$, 1.5 g NaOAc	50 packets	25851
Empty 50 mL Centrifuge Tube, Polypropylene w/Blue Cap			50-pk.	25846

TSCD – trisodium citrate dihydrate; DHS – disodium hydrogen citrate sesquihydrate; NaOAc – sodium acetate; $MgSO_4$ – magnesium sulfate; NaCl – sodium chloride

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.

Method	Material	Volumev	qty.	cat.#
General fruits and vegetables (e.g., celery, head lettuce, cucumber, melon)				
AOAC 2007.01	150 mg $MgSO_4$, 50 mg PSA	2 mL	100-pk.	26124
original unbuffered, mini-multiresidue, European EN 15662	150 mg $MgSO_4$, 25 mg PSA	2 mL	100-pk.	26215
AOAC 2007.01	1,200 mg $MgSO_4$, 400 mg PSA	15 mL	50-pk.	26220
original unbuffered, European EN 15662	900 mg $MgSO_4$, 150 mg PSA	15 mL	50-pk.	26223
Foodstuffs with fats and waxes (e.g., cereals, avocado, nuts, seeds, and dairy)				
mini-multiresidue	150 mg $MgSO_4$, 25 mg PSA, 25 mg C18-EC	2 mL	100-pk.	26216
NA	150 mg $MgSO_4$, 50 mg C18-EC	2 mL	100-pk.	26242
AOAC 2007.01	150 mg $MgSO_4$, 50 mg PSA, 50 mg C18-EC	2 mL	100-pk.	26125
AOAC 2007.01	1,200 mg $MgSO_4$, 400 mg PSA, 400 mg C18-EC	15 mL	50-pk.	26221
similar to AOAC 2007.01	1,200 mg $MgSO_4$, 400 mg C18-EC	15 mL	50-pk.	26244
similar to European EN 15662	900 mg $MgSO_4$, 150 mg PSA, 150 mg C18-EC	15 mL	50-pk.	26226
Pigmented fruits and vegetables (e.g., strawberries, sweet potatoes, and tomatoes)				
mini-multiresidue, European EN 15662	150 mg $MgSO_4$, 25 mg PSA, 2.5 mg GCB	2 mL	100-pk.	26217
AOAC 2007.01	150 mg $MgSO_4$, 50 mg PSA, 50 mg GCB	2 mL	100-pk.	26123
AOAC 2007.01	1,200 mg $MgSO_4$, 400 mg PSA, 400 mg C18-EC, 400 mg GCB	15 mL	50-pk.	26222
European EN 15662	900 mg $MgSO_4$, 150 mg PSA, 15 mg GCB	15 mL	50-pk.	26224
Highly pigmented fruits and vegetables (e.g., red peppers, spinach, blueberries)				
mini-multiresidue, European EN 15662	150 mg $MgSO_4$, 25 mg PSA, 7.5 mg GCB	2 mL	100-pk.	26218
AOAC 2007.01	150 mg $MgSO_4$, 50 mg PSA, 50 mg C18-EC, 50 mg GCB	2 mL	100-pk.	26219
European EN 15662	900 mg $MgSO_4$, 150 mg PSA, 45 mg GCB	15 mL	50-pk.	26225
NA	900 mg $MgSO_4$, 300 mg PSA, 150 mg GCB	15 mL	50-pk.	26126
General purpose (wide variety of sample types, including fatty and pigmented fruits and vegetables)				
universal	150 mg $MgSO_4$, 50 mg PSA, 50 mg C18-EC, 7.5 mg GCB	2 mL	100-pk.	26243
universal	900 mg $MgSO_4$, 300 mg PSA, 300 mg C18-EC, 45 mg GCB	15 mL	50-pk.	26245

Sorbent Guide

Sorbent	Removes
$MgSO_4$	excess water
PSA	sugars, fatty acids, organic acids, anthocyanine pigments
	organic acids, anthocyanine pigments
C18-EC (end-capped)	nonpolar interferences
GCB	pigments, sterols, nonpolar interferences

Q-sep Accessories

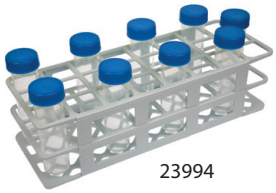
23990

Q-sep Bottle Top Solvent Dispenser

- Adjustment knob offers 56 output volume settings from 2.5 mL to 30 mL per stroke (0.5 mL increments)—ideal for QuEChERS methods!
- Base features 30 mm threads and includes four adaptors (25 mm, 28 mm, 38 mm, and 45 mm).
- Individually calibrated in accordance with ISO 8655 standards (certificate included) and can also be recalibrated by the user.
- PTFE, glass, and polypropylene construction for excellent chemical compatibility and 100% autoclavability.
- Integral safety discharge reduces risk of accidental dispensing, and nozzle cap prevents dripping.
- Easy to disassemble for cleaning and servicing.

Accurately and precisely dispense liquids for QuEChERS extractions with this versatile pump. A quick, simple adjustment lets you set the output volume anywhere from 2.5 mL to 30 mL per stroke, and the included adaptors will accommodate most reagent bottles.

Description	qty.	cat.#
Q-sep Bottle Top Solvent Dispenser, 2.5 mL–30 mL	ea.	23990



23994

Q-sep Tube Racks

- Available for 2 mL, 15 mL, and 50 mL tubes.
- Alphanumerical grid reference on top tier for easy identification of samples.
- Easy to assemble; simply fold and snap together securely.

Description	Size	Material	qty.	cat.#
Q-sep Tube Rack for 2 mL Centrifuge Tube	Holds 100	Polypropylene, White	ea.	23995
Q-sep Tube Rack for 15 mL Centrifuge Tube	Holds 60	Polypropylene, White	ea.	23993
Q-sep Tube Rack for 50 mL Centrifuge Tube	Holds 24	Polypropylene, White	ea.	23994

Dimensions: 9" h x 14.5" w x 17" d (22.9 cm x 36.8 cm x 43.2 cm)

Q-sep 3000 Centrifuge for QuEChERS

- Supports 50 mL, 15 mL, and 2 mL centrifuge tubes.
- Small footprint requires less bench space.
- Safe and reliable—UL, CSA, and CE approved; 1-year warranty.

Priced to fit your laboratory's budget, the Q-sep 3000 centrifuge is the first centrifuge specifically designed for QuEChERS methodology. Centrifuge includes 50 mL tube carriers (six), 50 mL conical tube inserts (six), 4-place 15 mL tube carriers (six), and 2 mL tube adaptors (24).

Description	qty.	cat.#
Q-sep 3000 Centrifuge, 110 V	ea.	26230
Q-sep 3000 Centrifuge, 220 V	ea.	26231

Specifications:

Motor Speed and Force Rating: 4,130 rpm, 3,000 xg	Timer (electronic): 1 to 30 minutes +/-1%
Maximum Capacity with 6-Place Horizontal Rotor: 6 x 50 mL tubes, 18 x 15 mL tubes, 24 x 2 mL tubes	Requirement: 2.0 or 1.0 amps
Motor: 1/2 HP brushless DC	Current Voltage Requirement: 115 or 230 (+/-10%) volts
Nominal Acceleration Time: 45 seconds	Frequency: 50 / 60 Hz
Nominal Braking Time: 60 seconds	Centrifuge Protection Breaker: 4 amp resettable
	Overall Dimensions: 9" h x 14.5" w x 17" d (22.9 cm x 36.8 cm x 43.2 cm)
	Weight: 39 lb (17.7 kg)

26232 26233

26234

26249

Accessories for Q-sep 3000 Centrifuge

Description	qty.	cat.#
50 mL Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26232
50 mL Conical Tube Insert for Q-sep 3000 Centrifuge	6-pk.	26249
15 mL 4-Place Tube Carrier for Q-sep 3000 Centrifuge (fits four 15 mL tubes)	2-pk.	26233
2 mL Tube Adaptors for Q-sep 3000 Centrifuge	4-pk.	26234

GC and HPLC Columns

Rxi-5Sil MS Columns (fused silica)

low-polarity phase; Crossbond 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane

Description	temp. limits	qty.	cat.#
20 m, 0.18 mm ID, 0.18 µm	-60 to 320/350 °C	ea.	43602
20 m, 0.18 mm ID, 0.36 µm	-60 to 320/350 °C	ea.	43604
30 m, 0.25 mm ID, 0.25 µm	-60 to 320/350 °C	ea.	13623
30 m, 0.25 mm ID, 0.50 µm	-60 to 320/350 °C	ea.	13638

Raptor ARC-18 LC Columns (USP L1)

Length	2.1 mm cat.#	3.0 mm cat.#	4.6 mm cat.#
2.7 µm Columns			
30 mm	9314A32	9314A3E	9314A35
50 mm	9314A52	9314A5E	9314A55
100 mm	9314A12	9314A1E	9314A15
150 mm	9314A62	9314A6E	9314A65
5 µm Columns			
30 mm	—	931453E	—
50 mm	9314552	931455E	9314555
100 mm	9314512	931451E	9314515
150 mm	9314562	931456E	9314565
250 mm	—	—	9314575

Topaz 4.0 mm ID Single Taper Inlet Liner w/ Wool

for Agilent GCs equipped with split/splitless inlets

ID x OD x Length	qty.	cat.#
Single Taper, Premium Deactivation, Borosilicate Glass with Quartz Wool		
4.0 mm x 6.5 mm x 78.5 mm	5-pk.	23303

Topaz 4.0 mm ID Single Taper Inlet Liner

for Agilent GCs equipped with split/splitless inlets

ID x OD x Length	qty.	cat.#
Single Taper, Premium Deactivation, Borosilicate Glass		
4.0 mm x 6.5 mm x 78.5 mm	5-pk.	23302

Topaz 4.0 mm ID Cyclo Double Taper Inlet Liner

for Agilent GCs equipped with split/splitless inlets

ID x OD x Length	qty.	cat.#
Cyclo Double Taper, Premium Deactivation, Borosilicate Glass		
4.0 mm x 6.5 mm x 78.5 mm	5-pk.	23310

Topaz 4.0 mm ID Double Taper Inlet Liner

for Agilent GCs equipped with split/splitless inlets

ID x OD x Length	qty.	cat.#
Double Taper, Premium Deactivation, Borosilicate Glass		
4.0 mm x 6.5 mm x 78.5 mm	5-pk.	23308

QuEChERS Standards

QuEChERS Internal Standard Mix for GC-MS Analysis (6 components)

PCB 18 (37680-65-2), 50 µg/mL
PCB 28 (7012-37-5), 50 µg/mL
PCB 52 (35693-99-3), 50 µg/mL
Triphenylmethane (519-73-3), 10 µg/mL
Triphenylphosphate (115-86-6), 20 µg/mL
Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8), 50 µg/mL

In acetonitrile, 5 mL/ampul — cat.# 33267 (ea.)

QuEChERS Internal Standard Mix for GC-NPD and LC-MS/MS Analysis (2 components)

Triphenylphosphate (115-86-6), 20 µg/mL
Tris-(1,3-dichloroisopropyl)phosphate (13674-87-8), 50 µg/mL

In acetonitrile, 5 mL/ampul — cat.# 33266 (ea.)

QuEChERS Single-Component Reference Standards

Compound	CAS #	Solvent	Conc. (µg/mL)	cat.#
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263
Triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
Tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259

ACN = acetonitrile

QuEChERS Internal Standard Mix for LC-MS/MS Analysis (Nicarbazin)

Nicarbazin (bis-nitrophenyl urea) (330-95-0)

10 µg/mL in acetonitrile, 5 mL/ampul — cat.# 33261 (ea.)

QuEChERS Quality Control Standards for GC-MS Analysis

Cat.# 33268:
PCB 138 (35065-28-2)
PCB 153 (35065-27-1)

Cat.# 33264:
Anthracene (120-12-7)

50 µg/mL each in acetonitrile, 5 mL/ampul — cat.# 33268 (ea.)
100 µg/mL in acetonitrile, 5 mL/ampul — cat.# 33264 (ea.)

AOAC QuEChERS QC Spike Mix (27 components)

Atrazine (1912-24-9)
Azoxystrobin (131860-33-8)
Bifenthrin (82657-04-3)
Carbaryl (Sevin) (63-25-2)
Chlorothalonil (1897-45-6)
Chlorpyrifos (2921-88-2)
Chlorpyrifos methyl (5598-13-0)
lambda-Cyhalothrin (91465-08-6)
Cyprodinil (121552-61-2)
2,4'-DDD (53-19-0)
Dichlorvos (DDVP) (62-73-7)
Endosulfan sulfate (1031-07-8)
Ethion (563-12-2)
Imazalil (35554-44-0)
Imidacloprid (138261-41-3)
Kresoxim methyl (143390-89-0)
Linuron (330-55-2)
Methamidophos (10265-92-6)
Methomyl (16752-77-5)
cis-Permethrin (61949-76-6)
trans-Permethrin (61949-77-7)
Procymidone (32809-16-8)
Pymetrozine (123312-89-0)
Tebuconazole (107534-96-3)
Thiabendazole (148-79-8)
Tolylfluanid (731-27-1)
Trifluralin (1582-09-8)

40 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 5 mL/ampul — cat.# 31999 (ea.)

AOAC QuEChERS Triphenylphosphate Solution

Triphenylphosphate (115-86-6)

2 µg/mL in acetonitrile:acetic acid (99:1), 5 mL/ampul — cat.# 31964 (ea.)

AOAC QuEChERS IS Solution (2 components)

α-BHC-d6 (α-HCH-d6) (86194-41-4)
Parathion-d10 (350820-04-1)

40 µg/mL each in acetonitrile, 5 mL/ampul — cat.# 31963 (ea.)

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Lit. Cat.# FFSS1183E-UNV