SUPELCO®
Solutions within.™

Supel™ QuE Products for "QuEChERS" Method

NEW Products

Applications

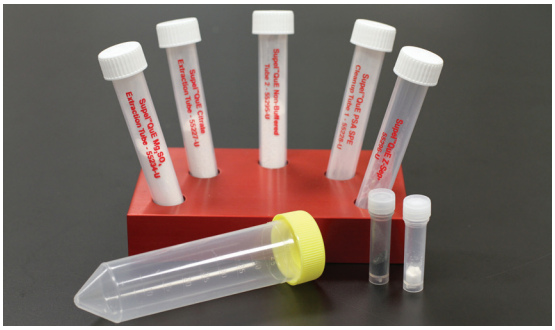
Related Products

SIGMA-ALDRICH®

Supel QuE (Dispersive SPE) for "QuEChERS" Method

Eliminate Problematic Matrix Interferences for Robust Analysis of Pesticide Residues, PAHs, Fungicides and More

Quick and Simple Cleanup of Food Samples Prior to Chromatographic Analysis



Features and Benefits

- Efficient and economic sample cleanup
- Pre-weighed amounts of sorbents and salts save labor and time
- High-purity reagents from Sigma-Aldrich®
- Convenient and reliable in ready-to-use 2 mL, 12 mL and 15 mL centrifuge tubes

In "QuEChERS" methodology, the use of loose extraction salts and cleanup sorbents in combination with shaking and centrifugation results in a **Qu**ick, **E**asy, **Ch**eap, **E**ffective, **R**ugged and **S**afe sample cleanup technique. The "QuEChERS" method has emerged as a sample prep technique popular in the area of multi-residue pesticide analysis in food and agricultural products, and is formalized in method EN15662:2008 and AOAC 2007.01.[1-2] Recently, QuEChERS has been expanded into areas including PAH, PCB, PBDE and flame retardant analysis.[3]

The Supel™ QuE line of vials and centrifuge tubes contains pre-determined amounts of salts and SPE sorbents to support the most common method configurations used today for QuEChERS. The sorbents and their uses are listed in **Table 1**.

Table 1. QuEChERS Cleanup Sorbents and Uses

Sorbent	For the removal of:
Zirconia on silica	Pigments and lipids or fats
PSA on silica	Sugars, organic acids, fatty acids and polar pigments
C18 on silica	Lipids or fats
Carbon	Pigments

Z-Sep Sorbents: Lipid and Pigment Removal in Difficult Matrices

- Significantly diminishes fatty matrix interferences and some color due to pigments
- Provides more robust LC/MS and GC/MS methods by eliminating problematic matrix interferences
- Can replace C18 and PSA phases in current methods without additional method development

The patented zirconia-coated silica particles of Supel QuE Z-Sep sorbents selectively remove more fat and color from sample extracts than traditional phases for QuEChERS methods. Lipid retention is based on two synergetic interactions, as illustrated in **Figure 1**. The makeup and use of each sorbent in the Z-Sep family is summarized in **Table 2**.

Figure 1. Retention Mechanism for Fats on Supel QuE Z-Sep Sorbents

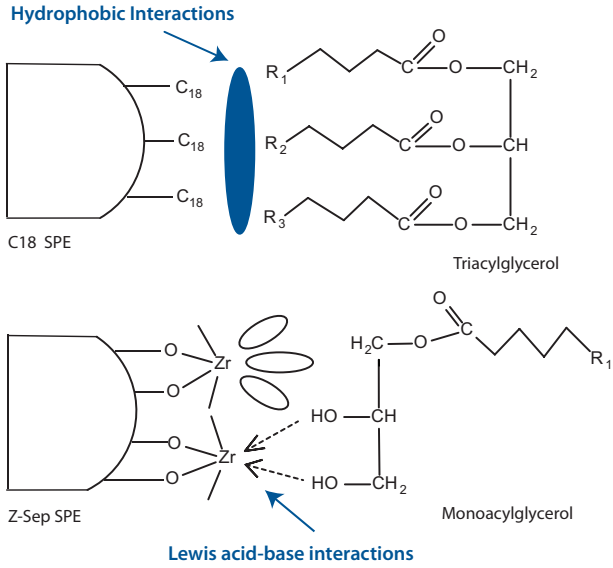


Table 2. Supel QuE Z-Sep Sorbents, Composition and Uses

Sorbent	Composition	For use with:
Z-Sep	Zirconia bonded to silica	Highly hydrophobic analytes such as PAHs and PCBs
Z-Sep/C18	Combination of Z-Sep and Discovery® DSC-18 particles	Samples with less than 15% fat content
Z-Sep+	Zirconia and C18 dual bonded to silica	Samples with greater than 15% fat content

Improved Recovery of the Fungicide Carbendazim from Orange Juice Matrices

A recent study conducted on various orange juice matrices evaluated three sample preparation methods for the analysis of carbendazim fungicide. Orange juice samples of various matrices were processed using the procedures described in **Table 3**. Method 3 employs a solvent extraction followed by QuEChERS cleanup with PSA/C18. Regarding the components of the PSA/C18 sorbent, the primary-secondary amine (PSA) is used to remove sugars, organic acids, fatty acids and polar pigments whereas the C18 is used to remove fats.

Analysis by LC-MS/MS (**Figure 2**), followed by calculation of average recovery and %RSD, revealed that the QuEChERS method (method 3) produced the best analyte recoveries for all three orange juice matrices (**Table 4**).

Table 4. Results for 1 ppb Spiked Replicates (n=3)

Matrix	Method 1	Method 2	Method 3
Juice, Pulp-Free	25% (79)	49% (7)	73% (5)
Juice, With Pulp	45% (18)	64% (14)	73% (15)
Concentrate, Frozen	N/A	36% (13)	72% (20)

Figure 2. LC-MS/MS Analysis of Unspiked and Spiked Orange Juice with Pulp

sample/matrix: Add 10 mL of orange juice with pulp to a 50 mL empty extraction tube (55248-U); add carbendazim at 1 ppb to 'spiked' sample; add 10 mL acetonitrile; mix well for 1 min; add contents of citrate extraction tube (55227-U); shake well; mix for 1 min; centrifuge at 3,200 rpm for 5 min; mix 0.7 mL of the acetonitrile layer with the contents of the PSA/C18 cleanup tube (55288-U); recover 0.25 mL of the supernatant; mix with 0.25 mL water

column: Ascentis Express C18, 5 cm x 2.1 mm I.D., 2.7 µm particles (53822-U)

mobile phase: (A) 10 mM ammonium acetate in water (B) 10 mM ammonium acetate in methanol

gradient: 0–1 min: 30% B; 1.5–3.5 min: 100% B; 3.5–7 min: 30% B

flow rate: 0–1 min: 0.3 mL/min; 1.5–7 min: 0.5 mL/min

column temp.: 30 °C

detector: MS, ESI(+), MRM, m/z 192/160, 192/132

injection: 5 µL

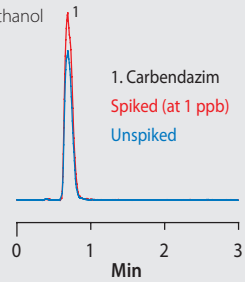


Table 3. Method Descriptions

Method 1
(Filter and Shoot)

1. Add 1 mL of orange juice to a 2 mL centrifuge tube
2. Centrifuge at 10,000 rpm for 5 min
3. Filter supernatant through a 0.45 µm PVDF filter

Method 2
(Acetonitrile Extraction)

1. Add 10 mL of orange juice, or 10 g of orange concentrate, to a 50 mL empty extraction tube (55248-U)
2. Add 10 mL acetonitrile and shake well for 1 min
3. Add contents of citrate extraction tube (55227-U), shake well for 1 min
4. Centrifuge at 3,200 rpm for 5 min
5. Take the acetonitrile layer and dilute 1:1 with water

Method 3
(Acetonitrile Extraction + QuEChERS Cleanup)

1. Add 10 mL of orange juice or 10 g of orange concentrate to a 50 mL empty extraction tube (55248-U)
2. Add 10 mL acetonitrile and shake well for 1 min
3. Add contents of citrate extraction tube (55227-U), shake for 1 min
4. Centrifuge at 3,200 rpm for 5 min
5. Transfer 0.7 mL of the acetonitrile layer to the PSA/C18 cleanup tube (55288-U), shake for 1 min
6. Centrifuge at 3,200 rpm for 3 min
7. Recover 0.25 mL of the supernatant and mix with 0.25 mL water

References

1. EN15662:2008, 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
2. AOAC Official Method 2007.01, Pesticide Residues in Foods by Acetonitrile Extraction and Partitioning with Magnesium Sulfate
3. Sapozhnikova, Y.; Lehotay, S.J. Multi-class, multi-residue analysis of pesticides, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, polybrominated diphenyl ethers and novel flame retardants in fish using fast, low-pressure gas chromatography–tandem mass spectrometry. *Analytica Chimica Acta*, **2013**, *758*, 80-92.

Increased Pigment Removal for the Analysis of Pesticide Residues in Oranges

In the cleanup of whole orange extracts, a comparison of Supel QuE Z-Sep/C18, PSA/C18 and PSA QuEChERS sorbents for color removal and analyte recovery of pesticide residues revealed that the Z-Sep/C18 sorbent provided improved color removal over PSA containing sorbents (**Figure 3**), while maintaining or improving upon analyte recovery (**Figure 4**). The chromatogram in **Figure 5** illustrates the LC-MS/MS analysis of 38 pesticides extracted from a spiked orange sample following sample cleanup with Z-Sep/C18 sorbent. These observations support the fact that Supel QuE Z-Sep/C18 may be used as an alternative to PSA containing sorbents to improve pigment removal in difficult sample matrices.

Figure 3. Visual Comparison of Orange Extracts after Cleanup

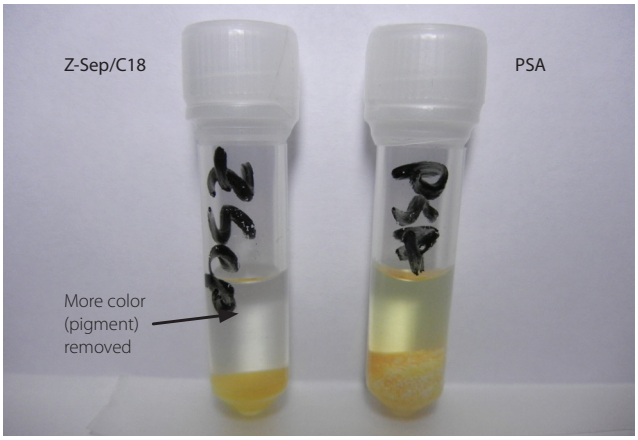


Figure 4. Average Recovery of Selected Pesticides from Spiked Oranges (n=3)

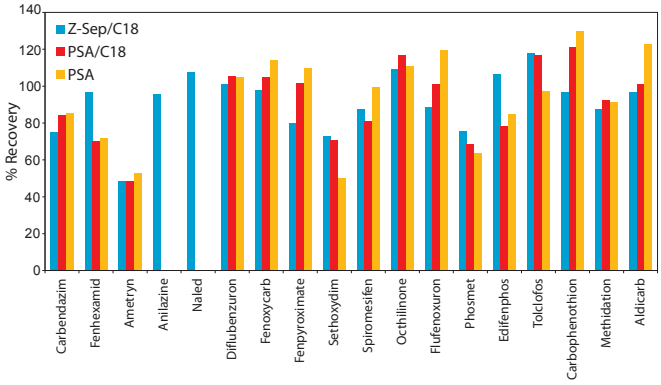
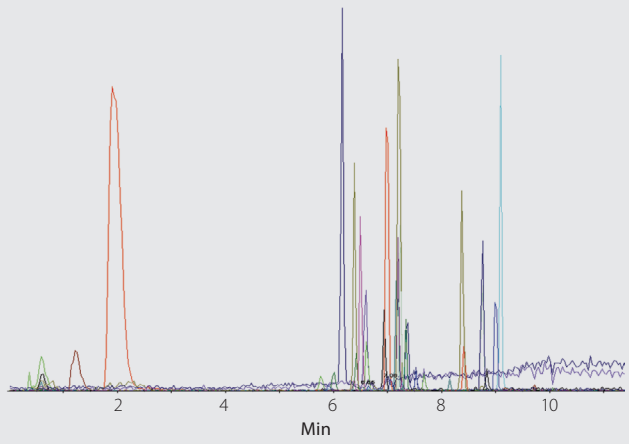


Figure 5. LC-MS/MS MRM Transition Chromatograms of a Spiked Orange Extract after Z-Sep/C18 Cleanup

sample/matrix:	10 g of pureed oranges (homogenized with rind); spike at 50 ppb (add 16.75 µL of a custom-made pesticide mix, each analyte at 30 µg/mL)
extraction:	Add 10 mL acetonitrile; shake for 1 minute; add contents of a Supel QuE citrate extraction tube (55227-U); shake immediately for 1 minute; centrifuge at 3200 rpm for 5 minutes; transfer 0.7 mL of the acetonitrile layer into a Supel QuE Z-Sep/C18 cleanup tube (55284-U); shake for 1 minute; centrifuge at 5000 rpm for 5 minutes; transfer 0.2 mL of the supernatant into an empty 1.5 mL centrifuge tube; add 0.2 mL of water; centrifuge at 5000 rpm for 2 minutes
column:	Ascentis Express C18, 5 cm x 2.1 mm I.D., 2.7 µm particles (53822-U)
mobile phase:	(A) 10 mM ammonium acetate in water (B) 10 mM ammonium acetate in acetonitrile
gradient:	Hold at 30% B for 1 min; 30% to 80% B in 2 min; hold at 80% B for 4 min; hold at 100% B for 3 min; hold at 30% B for 3 min
flow rate:	0.3 mL/min
pressure:	2730 psi
column temp.:	30 °C
detector:	MS/MS, ESI positive

1. Methomyl (0.60 min)
2. Trichlorfon (1.22 min)
3. Carbendazim (1.94 min)
4. Aldicarb (2.70 min)
5. Parathion-methyl (5.87 min)
6. Methabenzthiazuron (6.16 min)
7. Naled (6.37 min)
8. Methidathion (6.38 min)
9. Clethodim (6.42 min)
10. Phosmet (6.50 min)
11. Ametryn (6.58 min)
12. Sethoxydim (6.61 min)
13. Anilazine (6.78 min)
14. Fenhexamid (6.94 min)
15. Mecarbam (7.00 min)
16. Oryzalin (7.06 min)
17. Diflunezuron (7.18 min)
18. Fenoxycarb (7.19 min)
19. Iprobenfos (7.21 min)
20. Quinalphos (7.23 min)
21. Edifenphos (7.28 min)
22. Etrimfos (7.33 min)
23. Fenthion (7.34 min)
24. Fenitrothion (7.36 min)
25. Diazinon (7.37 min)
26. Tolclofos (7.52 min)
27. Phorate (7.53 min)
28. Chlorpyrifos-methyl (7.67 min)
29. EPN (7.68 min)
30. Terbufos (8.14 min)
31. Ethion (8.36 min)
32. Lufenuron (8.40 min)
33. Spiromesifen (8.74 min)
34. Octhilinone (8.74 min)
35. Pyraclostrobin (8.75 min)
36. Carbophenothion (8.83 min)
37. Flufenoxuron (9.02 min)
38. Fenpyroximate (9.10 min)



Reduced Matrix Background and Improved Overall Analyte Recovery for the Analysis of Pesticides in Beef Kidney

The exposure of farm animals to agricultural pesticides continues to be a major concern among food producers. Lipophilic pesticides, such as organochlorine and some pyrethroids, can bioaccumulate in fatty tissues, thus finding their way into animal products consumed by the public.

A recent experiment evaluated and compared Supel QuE Z-Sep+ to PSA/C18 for removal of fatty components from beef kidney matrix prior to pesticide residue analysis by GC-MS. This study demonstrated that Z-Sep+ provided better cleanup than PSA/C18 in the form of reduced background and less interference in the GC-MS/SIM analysis of the target pesticides themselves (**Figures 6 and 7**). For a majority of the pesticides, Z-Sep+ exhibited higher average recovery values than PSA/C18, with acceptable reproducibility (**Table 5**). In addition, less matrix enhancement affect was observed after cleanup with Z-Sep+ as compared to PSA/C18, resulting in the difference in response observed in **Figure 7**.

Figure 6. GC-MS full scan chromatograms of beef kidney extract (a) with no cleanup (b) PSA/C18 cleanup (c) Z-Sep+ cleanup. All are on the same Y-scale.

column: SLB®-5ms, 20 m x 0.18 mm I.D., 0.36 µm (28576-U)
oven: 70 °C (0.5 min), 25 °C/min to 125 °C, 10 °C/min to 200 °C, 5 °C/min to 300 °C (1 min)
inj. temp: programmed, 60 °C (0.28 min), 600 °C/min to 325 °C (5 min)
carrier gas: helium, 1 mL/min constant
detector: MS
injection: 10 µL, PTV solvent vent, 100 mL/min vent flow at 0.28 min, 5 psi vent pressure
liner: 4 mm I.D. FocusLiner™ with taper

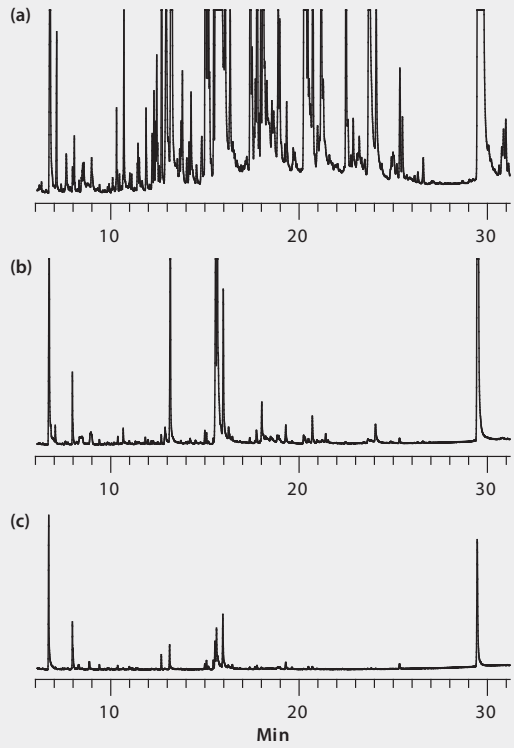


Figure 7. TICs of GC-MS/SIM Analysis of Pesticides at 50 ng/g in Beef Kidney Extract, Cleaned Using (a) Z-Sep+ and (b) PSA/C18.

Conditions same as Figure 1.

1. Diphenylamine
2. Hexachlorobenzene
3. γ-BHC
4. Endosulfan I
5. 4,4′-DDE
6. Endosulfan II
7. 4,4′-DDD
8. Endosulfan sulfate
9. 4,4′-DDT
10. Piperonyl Butoxide
11. Bifenthrin
12. Cyhalothrin
13. Permethrin (isomers)
14. Cyfluthrin (isomers)

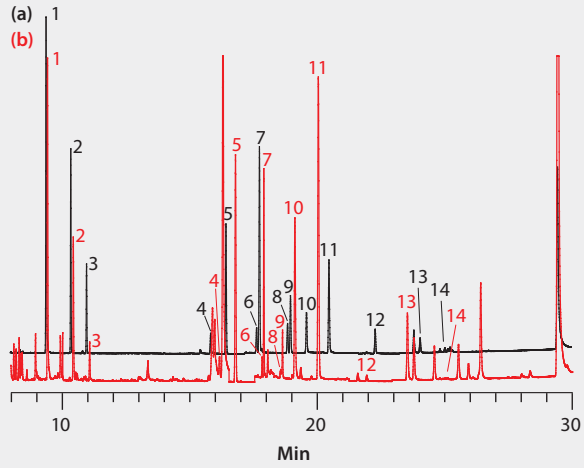


Table 5. Average Pesticide Recoveries from Beef Kidney Spiked at 50 ng/g, Average of n=3 with (%RSD)

	Z-Sep +	PSA/C18
Diphenylamine	70 (1)	81 (1)
Hexachlorobenzene	74 (1)	73 (2)
γ-BHC (lindane)	81 (1)	77 (1)
Endosulfan I	106 (5)	79 (4)
4,4'-DDE	71 (2)	77 (2)
Endosulfan II	108 (6)	73 (5)
4,4'-DDD	91 (3)	78 (1)
Endosulfan Sulfate	98 (4)	67 (4)
4,4'-DDT	83 (4)	74 (2)
Piperonyl Butoxide	91 (5)	86 (2)
Bifenthrin	101 (7)	82 (2)
Cyhalothrin	101 (6)	87 (13)
Permethrin	99 (7)	86 (2)
Cyfluthrin	110 (8)	93 (2)

Improved Recovery and Fatty Matrix Removal for the Analysis of Polynuclear Aromatic Hydrocarbons (PAHs) in Grilled Hamburger

Highly lipophilic analytes, such as polynuclear aromatic hydrocarbons (PAHs), tend to be retained on cleanup sorbents containing a C18 moiety, leading to low analyte recoveries. The Supel QuE Z-Sep sorbent does not contain C18 and, therefore, is more suitable for the cleanup of fatty samples in the analysis of highly lipophilic compounds.

Recently, a study was performed on hamburger containing 25% fat, grilled to well-done, spiked with common PAHs at 100 ng/g. The experiment compared background removal and analyte recovery for extracts cleaned with Supel QuE Z-Sep+, Z-Sep+/PSA, Z-Sep and PSA/C18. It was observed that Z-Sep removed the most background of the 4 sorbents, providing adequate cleanup for the GC/MS analysis of 29 PAHs (**Figure 8**). In addition, the Z-Sep sorbent exhibited the best overall PAH recoveries of the 4 sorbents (**Figure 9**). While recovery of the heavier PAH's was reduced with sorbents containing the C18 moiety (including Z-Sep+), the Z-Sep sorbent produced acceptable recoveries of all PAH's, with good reproducibility. These results support the premise that the Supel QuE Z-Sep sorbent is considerably advantageous for the analysis of highly hydrophobic analytes in fatty matrices.

Figure 8. TIC of GC-MS/SIM Analysis of PAHs at 100 ng/g in Grilled Hamburger, Cleaned Using Z-Sep

column: SLB-5ms, 20 m x 0.18 mm I.D., 0.36 µm (28576-U)
oven: 70 °C (0.5 min), 25 °C/min to 125 °C, 10 °C/min to 200 °C, 5 °C/min to 300 °C (1 min)
inj. temp: programmed, 60 °C (0.28 min), 600 °C/min to 325 °C (5 min)
carrier gas: helium, 1 mL/min constant
detector: MS
injection: 10 µL, PTV solvent vent, 100 mL/min vent flow at 0.28 min, 5 psi vent pressure
liner: 4 mm I.D. FocusLiner™ with taper

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Biphenyl
5. 2,6-Dimethyl-naphthalene
6. Acenaphthylene
7. Acenaphthene
8. 2,3,5-Trimethyl-naphthalene
9. Fluorene
10. Dibenzothiophene
11. Phenanthrene
12. Anthracene
13. 1-Methylphenanthrene
14. Fluoranthene-d_{10} (I.S.)
15. Fluoranthene
16. Pyrene
17. Retene
18. Benzo[a]anthracene
19. Chrysene and Triphenylene
20. Benzo[b]fluoranthene
21. Benzo[k]fluoranthene
22. Benzo[j]fluoranthene
23. Benzo[e]pyrene
24. Benzo[a]pyrene
25. Perylene-d_{12} (I.S.)
26. Perylene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[g,h,i]perylene

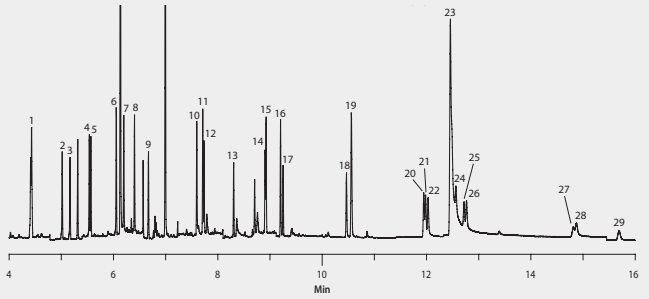
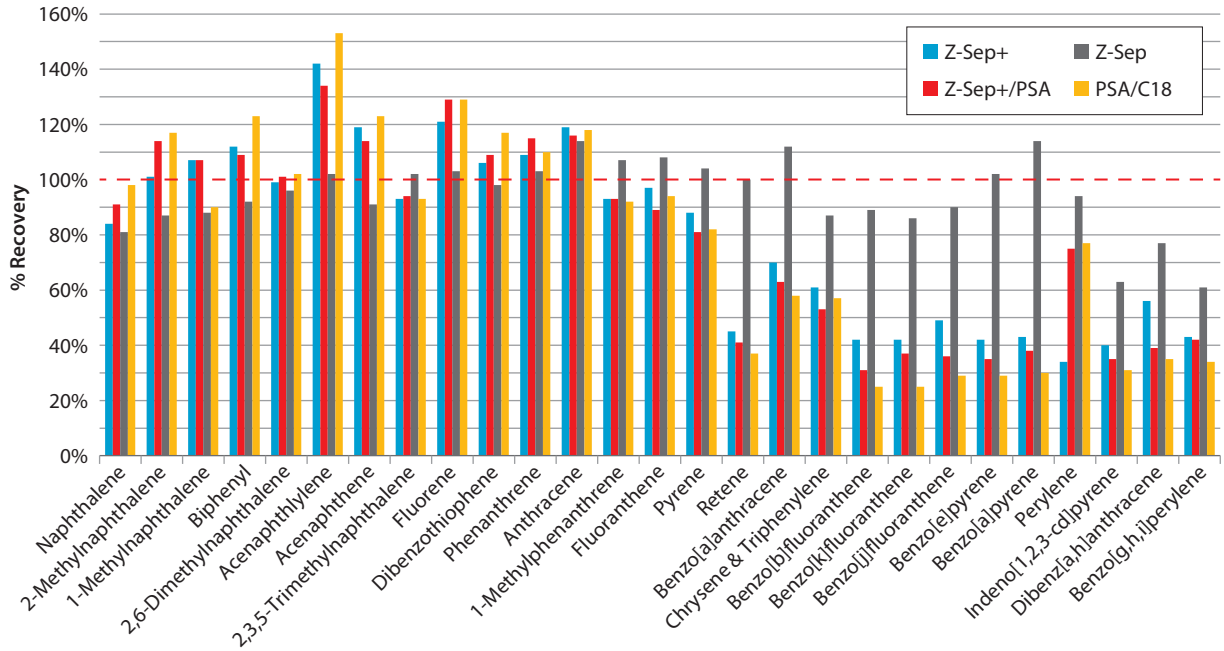


Figure 9. Average PAH Recoveries From Grilled Hamburger Spiked at 100 ng/g, Average of n = 3



Supel QuE Products for QuEChERS and Related Products

Pre-Packed dSPE Tubes

Description	Qty.	Cat. No.
EN15662:2008 (15 mL centrifuge tubes, shaker compatible)		
Supel™ QuE PSA (EN) Tube, 15 mL 150 mg Supelclean PSA, 900 mg $MgSO_4$	50	55437-U
Supel QuE PSA/C18 (EN) Tube, 15 mL 150 mg Supelclean PSA, 150 mg Discovery DSC-18, 900 mg $MgSO_4$	50	55439-U
Supel QuE PSA/ENVI-Carb (EN) Tube 1, 15 mL 150 mg Supelclean PSA, 15 mg Supelclean ENVI-Carb, 900 mg $MgSO_4$	50	55446-U
Supel QuE PSA/ENVI-Carb (EN) Tube 2, 15 mL 150 mg Supelclean PSA, 45 mg Supelclean ENVI-Carb, 900 mg $MgSO_4$	50	55464-U
EN15662:2008 (12 mL centrifuge tubes)		
Supel QuE Citrate (EN) Tube 4 g $MgSO_4$, 1 g NaCl, 0.5 g NaCitrate dibasic sesquihydrate, 1 g NaCitrate tribasic dehydrate	50	55227-U
Supel QuE Citrate/Sodium Bicarbonate (EN) Tube 4 g $MgSO_4$, 5 g NaBicarbonate, 1 g NaCl, 0.5 g NaCitrate dibasic sesquihydrate, 1 g NaCitrate tribasic dehydrate	50	55237-U
Supel QuE PSA (EN) Tube 150 mg Supelclean PSA, 900 mg $MgSO_4$	50	55228-U
Supel QuE PSA/C18 (EN) Tube 150 mg Supelclean PSA, 150 mg Discovery DSC-18, 900 mg $MgSO_4$	50	55229-U
Supel QuE PSA/ENVI-Carb (EN) Tube 1 150 mg Supelclean PSA, 15 mg Supelclean ENVI-Carb, 900 mg $MgSO_4$	50	55230-U
Supel QuE PSA/ENVI-Carb (EN) Tube 2 150 mg Supelclean PSA, 45 mg Supelclean ENVI-Carb, 900 mg $MgSO_4$	50	55233-U
AOAC 2007.01 (15 mL centrifuge tubes, shaker compatible)		
Supel QuE PSA (AC) Tube, 15 mL 400 mg Supelclean PSA, 1200 mg $MgSO_4$	50	55466-U
Supel QuE PSA/C18 (AC) Tube, 15 mL 400 mg Supelclean PSA, 400 mg Discovery DSC-18, 1200 mg $MgSO_4$	50	55470-U
Supel QuE PSA/C18/ENVI-Carb (AC) Tube 1, 15 mL 400 mg Supelclean PSA, 400 mg Discovery DSC-18, 400 mg Supelclean ENVI-Carb, 1200 mg $MgSO_4$	50	55474-U
AOAC 2007.01 (12 mL centrifuge tubes)		
Supel QuE Acetate (AC) Tube 6 g $MgSO_4$, 1.5 g NaAcetate	50	55234-U
Supel QuE PSA (AC) Tube 400 mg Supelclean PSA, 1200 mg $MgSO_4$	50	55282-U
Supel QuE PSA/C18 (AC) Tube 400 mg Supelclean PSA, 1200 mg $MgSO_4$, 400 mg Discovery DSC-18	50	55283-U
Supel QuE PSA/C18/ENVI-Carb (AC) Tube 400 mg Supelclean PSA, 1200 mg $MgSO_4$ 400 mg Discovery DSC-18, 400 mg ENVI-Carb	50	55286-U

Description	Qty.	Cat. No.
AOAC 2007.01 (2 mL centrifuge tubes)		
Supel QuE PSA (AC) Tube, 2 mL 50 mg Supelclean PSA, 150 mg $MgSO_4$	100	55287-U
Supel QuE PSA/C18 (AC) Tube, 2 mL 50 mg Supelclean PSA, 150 mg $MgSO_4$ 50 mg Discovery DSC-18	100	55288-U
Supel QuE PSA/C18/ENVI-Carb (AC) Tube, 2 mL 50 mg Supelclean PSA, 150 mg $MgSO_4$ 50 mg Discovery DSC-18, 50 mg ENVI-Carb	100	55289-U
Supel QuE PSA/ENVI-Carb (AC) Tube 50 mg Supelclean PSA, 150 mg $MgSO_4$ 50 mg ENVI-Carb	100	Custom
Specialty Products for Challenging (Fatty/Lipid containing) Matrices (2 mL centrifuge tubes)		
Supel QuE Z-Sep Tube 75 mg Z-Sep	100	55411-U
Supel QuE Z-Sep/$MgSO_4$ Tube 50 mg Z-Sep, 150 mg $MgSO_4$	100	55417-U
Supel QuE Z-Sep/C18 Tube 20 mg Z-Sep, 50 mg Discovery DSC-18	100	55284-U
Supel QuE Z-Sep+ Tube 75 mg Z-Sep+	100	55408-U
Supel QuE Z-Sep+/$MgSO_4$ Tube 50 mg Z-Sep+,150 mg $MgSO_4$	100	55414-U
Specialty Products for Challenging (Fatty/Lipid containing) Matrices (15 mL centrifuge tubes, shaker compatible)		
Supel QuE Z-Sep Tube, 15 mL 500 mg Z-Sep	50	55491-U
Supel QuE Z-Sep/$MgSO_4$ Tube, 15 mL 300 mg Z-Sep, 900 mg $MgSO_4$	50	55503-U
Supel QuE Z-Sep/C18 Tube, 15 mL 120 mg Z-Sep, 300 mg Discovery DSC-18	50	55506-U
Supel QuE Z-Sep+ Tube, 15 mL 500 mg Z-Sep+	50	55486-U
Supel QuE Z-Sep+/$MgSO_4$ Tube, 15 mL 300 mg Z-Sep+, 900 mg $MgSO_4$	50	55511-U
Specialty Products for Challenging (Fatty/Lipid containing) Matrices (12 mL centrifuge tubes)		
Supel QuE Z-Sep Tube 500 mg Z-Sep	50	55403-U
Supel QuE Z-Sep/$MgSO_4$ Tube 300 mg Z-Sep, 900 mg $MgSO_4$	50	55407-U
Supel QuE Z-Sep/C18 Tube 120 mg Z-Sep, 300 mg Discovery DSC-18	50	55401-U
Supel QuE Z-Sep+ Tube 500 mg Z-Sep+	50	55296-U
Supel QuE Z-Sep+/$MgSO_4$ Tube 300 mg Z-Sep+,900 mg $MgSO_4$	50	55406-U
Non-buffered extraction tubes (12 mL centrifuge tubes)		
Supel QuE Non-Buffered Tube 1 4 g $MgSO_4$, 1 g NaCl	50	55294-U
Supel QuE Non-Buffered Tube 2 6 g $MgSO_4$, 1.5 g NaCl	50	55295-U

Supel QuE Product Offering and Related Products (continued)

Description	Qty.	Cat. No.
Specialty Extraction Salts		
Supel QuE Ammonium Sulfate Tube 12 mL) 4 g Ammonium Sulfate	1,000	54276-U
Empty Extraction Tubes (50 mL)		
50 mL empty Extraction Centrifuge Tubes	50	55248-U

Bulk Adsorbents and Salts

Description	Qty.	Cat. No.
Supelclean PSA, bulk sorbent	100 g	52738-U
Supelclean ENVI-Carb™, bulk sorbent	50 g	57210-U
Discovery DSC18, bulk sorbent	100 g	52600-U
Z-Sep+	20 g	55299-U
Z-Sep	20 g	55418-U
$MgSO_4$ (as cited in EN15662:2008)	var.	208094
Sodium citrate dibasic sesquihydrate	var.	71635
Sodium citrate tribasic dihydrate	var.	32320
Sodium chloride	var.	71379
Sodium acetate	var.	241245

QuEChERS Shakers and Accessories

Description	Qty	Cat. No.
Benchmark Benchmixer™ XL Laboratory Shakers		
QuEChERS Shaker and Rack Starter Kit, USA compatible plug, AC input 115 V		55278-U
QuEChERS Shaker and Rack Starter Kit, EU compatible Schuko plug, AC input 230 V		55438-U
Multi-tube Vortexer, USA compatible plug, AC input 115 V	1 ea	Z765503
Multi-tube Vortexer, EU compatible Schuko plug, AC input 230 V		Z765511
Benchmark Benchmixer XL Laboratory Shaker Racks		
50 mL QuEChERS Extraction Tube Shaker Rack	pk 1	55279-U
15 mL QuEChERS Cleanup Tube Shaker Rack	pk 1	Z765589
2 mL QuEChERS Cleanup Tube Shaker Rack	pk 1	Z765554
Supel QuE Extraction Products		
Acetate Tube	pk 50	55234-U
Citrate Extraction Tube	pk 50	55227-U
Empty Centrifuge Tube with Lid, 50 mL	pk 50	55248-U

Related Products

Description	Qty.	Cat. No.
Ascentis® Express HPLC Columns (2.7 µm particles)		
C18, 5 cm x 2.1 mm I.D.	1	53822-U
C18, 15 cm x 4.6 mm I.D.	1	53829-U
RP-Amide, 15 cm x 4.6 mm I.D.	1	53931-U
Phenyl-Hexyl, 15 cm x 4.6 mm I.D.	1	53353-U
F5, 15 cm x 4.6 mm I.D.	1	53591-U
Capillary GC Columns		
SLB®-5ms Capillary GC Column 20 m x 0.18 mm I.D., 0.36 µm	1	28576-U
SPB®-608 Capillary GC Column 20 m x 0.18 mm I.D., 0.18 µm	1	custom
Analytical Standards		
Carbendazim, PESTANAL®	250 mg	45368
Analytical Reagents and Solvents		
Ammonium acetate, eluent additive for LC-MS, ≥99.0%		73594
Acetonitrile, LC-MS CHROMASOLV®, >99.9%		34967
Acetonitrile, for pesticide residue analysis		34481
Methanol, LC-MS CHROMASOLV, >99.9%		34966
Water, LC-MS CHROMASOLV		39253
Certified Low Adsorption Sample Vials and Caps		
CD (Center Draining) Vial Kits		
Clear glass vial, 1.5 mL, PTFE/silicone septa	100	29655-U
Clear glass vial, 1.5 mL, PTFE/silicone septa with slit	100	29656-U
MRQ30 CD Vial Kits		
Clear glass vial, 1.2 mL, PTFE/silicone septa	100	29658-U
Clear glass vial, 1.2 mL, PTFE/silicone septa with slit	100	29659-U
QSertVial™ (0.3 mL) Vial Kits		
Clear glass, natural PTFE/silicone septa	100	29661-U
Clear glass, natural PTFE/silicone septa with slit	100	29662-U
Amber glass vial, natural PTFE/silicone septa	100	29663-U
Amber glass vial, natural PTFE/silicone septa with slit	100	29664-U
Standard 2 mL (12 x 32 mm) Vial Kits		
Clear glass vial with marking spot, natural PTFE/silicone septa	100	29651-U
Clear glass vial with marking spot, natural PTFE/silicone septa with slit	100	29652-U
Amber glass vial with marking spot, natural PTFE/silicone septa	100	29653-U
Amber glass vial with marking spot, natural PTFE/silicone septa with slit	100	29654-U

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