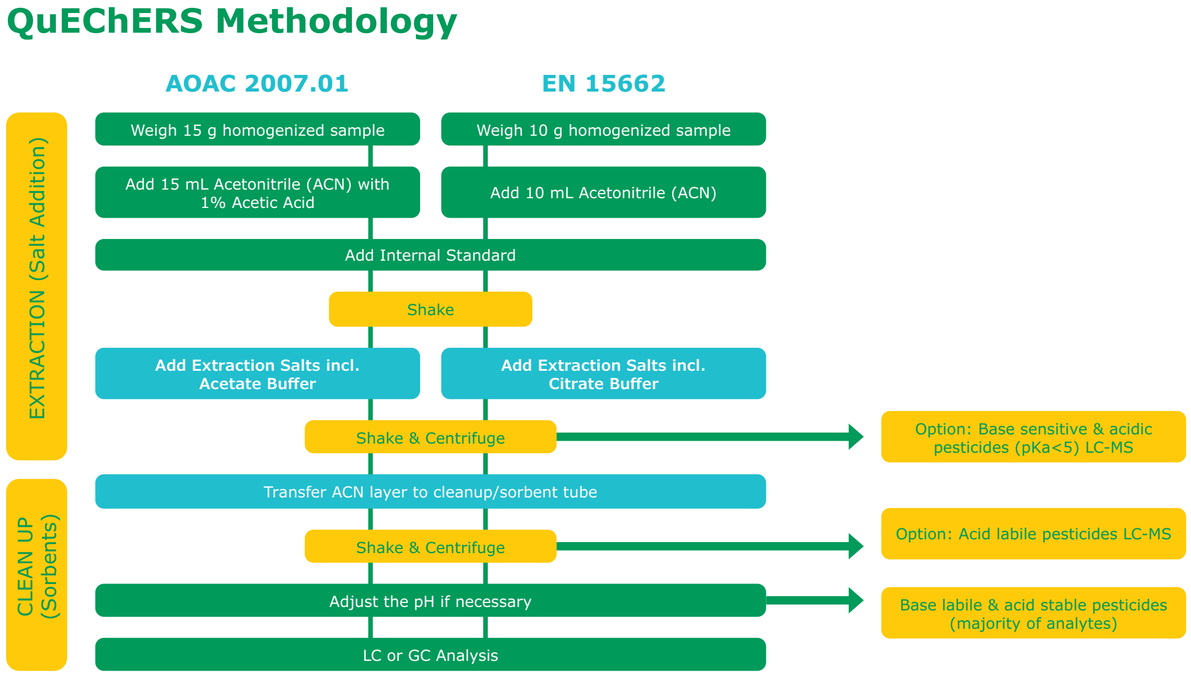
Supel™ QuE Products for QuEChERS Selection Guide

In “QuEChERS” methodology, the use of loose extraction salts and cleanup sorbents in combination with shaking and centrifugation results in a **Q**uick, **E**asy, **C**heap, **E**ffective, **R**ugged and **S**afe sample cleanup technique. The “QuEChERS” method has emerged as a sample prep technique popular for multi-residue pesticide analysis in food and agricultural products, and is formalized in the methods EN 15662 and AOAC 2007.01.

QuEChERS Methodology



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STEP 1: EXTRACTION

Analytes of interest are extracted from the sample using an organic solvent and salts/buffers.

Original
Non-Buffered Method

4 g $MgSO_4$,
1 g NaCl
Cat. No. 55294-U

6 g $MgSO_4$,
1.5 g NaCl
Cat. No. 55295-U

AOAC
AOAC 2007.01 Method

6 g $MgSO_4$,
1.5 g NaOAc
Cat. No. 55234-U

EN
EN 15662 Method

4 g $MgSO_4$,
1 g NaCl,
1 g sodium citrate tribasic dihydrate,
0.5 g sodium citrate dibasic sesquihydrate
Cat. No. 55227-U

EN 15662 Related Method

4 g $MgSO_4$,
1 g NaCl,
5 g sodium bicarbonate,
0.5 g sodium citrate dibasic sesquihydrate,
1 g sodium citrate tribasic dihydrate
Cat. No. 55237-U

Solvents:
SigmaAldrich.com/solvents

Pesticide Reference Materials:
SigmaAldrich.com/pesticides

STEP 2: CLEANUP

An aliquot of the organic layer from the extraction step is cleaned up using dSPE. Typically the 2 mL tubes are meant for 1 mL extract and the 15 mL tubes for 8 mL (AOAC) or 6 mL (EN) extract.

	AOAC 2007.01		EN 15662		
Tube size	**2 mL**	**15 mL**	**2 mL**		**15 mL**
General	50 mg PSA, 150 mg $MgSO_4$ Cat. No. 55287-U	400 mg PSA, 1200 mg $MgSO_4$ Cat. No. 55466-U	25 mg PSA, 150 mg $MgSO_4$ Cat. No. 55172-U	C2*	150 mg PSA, 900 mg $MgSO_4$ Cat. No. 55437-U
Bulk PSA (Cat. No. 52738-U) is available to meet specifications for EN 15662 C3* module requiring larger amount of PSA. **Custom QuEChERS tubes are available on request.**					
Fats & Waxes	50 mg PSA, 50 mg C18, 150 mg $MgSO_4$ Cat. No. 55288-U	400 mg PSA, 400 mg C18, 1200 mg $MgSO_4$ Cat. No. 55470-U	25 mg PSA, 25 mg C18, 150 mg $MgSO_4$ Cat. No. 55173-U	C4*	150 mg PSA, 150 mg C18, 900 mg $MgSO_4$ Cat. No. 55439-U
Pigmented	50 mg PSA, 50 mg ENVI-Carb™, 150 mg $MgSO_4$ Cat. No. on request	400 mg PSA, 400 mg ENVI-Carb™, 1200 mg $MgSO_4$ Cat. No. on request	25 mg PSA, 2.5 mg ENVI-Carb™, 150 mg $MgSO_4$ Cat. No. 55147-U	C5a*	150 mg PSA, 15 mg ENVI-Carb™, 900 mg $MgSO_4$ Cat. No. 55446-U
Highly Pigmented	50 mg PSA, 50 mg ENVI-Carb™, 50 mg C18, 150 mg $MgSO_4$ Cat. No. 55289-U	400 mg PSA, 400 mg ENVI-Carb™, 400 mg C18, 1200 mg $MgSO_4$ Cat. No. 55474-U	25 mg PSA, 7.5 mg ENVI-Carb™, 150 mg $MgSO_4$ Cat. No. 55176-U	C5b*	150 mg PSA, 45 mg ENVI-Carb™, 900 mg $MgSO_4$ Cat. No. 55464-U

*Clean-up modules as defined by EN 15662. See table on the right.

Alternative adsorbents for AOAC 2007.01 and EN 15662		
Tube Size	**2 mL**	**15 mL**
Hydrophobic Analytes in Fatty Matrices	75 mg Z-Sep Cat. No. 55411-U OR 50 mg Z-Sep, 150 mg $MgSO_4$ Cat. No. 55417-U	500 mg Z-Sep Cat. No. 55491-U OR 300 mg Z-Sep, 900 mg $MgSO_4$ Cat. No. 55503-U
Fatty Matrices with >15% Fat	75 mg Z-Sep+ Cat. No. 55408-U OR 50 mg Z-Sep+, 150 mg $MgSO_4$ Cat. No. 55414-U	500 mg Z-Sep+ Cat. No. 55486-U OR 300 mg Z-Sep+, 900 mg $MgSO_4$ Cat. No. 55511-U
Fatty or Pigmented Matrix <15% Fat	20 mg Z-Sep, 50 mg C18 Cat. No. 55284-U	120 mg Z-Sep, 300 mg C18 Cat. No. 55506-U
Improved Recovery of Planar Pesticides in Green Matrices	Supel™ QuE Verde 50 mg PSA, 10 mg ENVI-Carb™ Y, 60 mg Z-Sep+, 150 mg $MgSO_4$ Cat. No. 55447-U	Supel™ QuE Verde 400 mg PSA, 80 mg ENVI-Carb™ Y, 480 mg Z-Sep+, 1200 mg $MgSO_4$ Cat. No. 55442-U

EN 15662:2018 cleanup modules

Module	Description	Preferred application	Examples
C0	No clean-up	Pesticides that are base-sensitive and acidic (pKa < 5) and interact with the PSA used in modules C2 to C5, analysis of extracts with low matrix-load	Cucumber, apples, sufficiently diluted raw-extracts
C1	Freezing-out	Cleanup of co-extracted fat (potentially in combination with further clean-up steps, e.g. C2, C3, C5)	Oranges, lemons, cereal grain
C2	Dispersive SPE (dSPE) with amino-sorbent (PSA)	Clean-up of extracts prior to the determination of basic and neutral pesticides	Standard module for any matrix type not shown separately
C3	dSPE with a larger amount of PSA 3a: 50 mg/mL extract 3b: 75 mg/mL extract	Clean-up of extracts of foods of plant origin with high matrix-load prior to the analysis of basic and neutral pesticides	Extracts from extraction modules E5 (e.g. cereal grain and products of those) and E7 (e.g. coffee, tea, dried herbs, spices)
C4	dSPE with a mix of PSA and silica-based reversed phase sorbent (ODS)	Clean-up of extracts with co-extracted fat removal	Citrus fruits, cereal grain and products of those, avocados, olives
C5	dSPE with a mix of PSA and graphitized carbon black (GCB) 5a: 25 mg PSA & 2.5 mg GCB per mL extract 5b: 25 mg PSA & 7.5 mg GCB per mL extract	Clean-up of intensely pigmented extracts prior to the analysis of basic and neutral pesticides	Lettuce, rocket/rucula salad

Adsorbents mentioned in methods:

PSA: Primary Secondary Amine (e.g. Supelclean™ PSA)
GCB: Graphitized Carbon Black (e.g. ENVI-Carb™, ENVI-Carb™ Y)
ODS: Octadecyl Silica or C18 (e.g. Discovery® DSC-18)

STEP 3: Analysis

Extracted and cleaned sample is injected into a gas or liquid chromatography system for analysis.

For more information, visit:

SigmaAldrich.com/GC

SigmaAldrich.com/HPLC

Supelco®
Analytical Products