# ISOLUTE® cSPE for QuEChERS

ISOLUTE® cSPE for QuEChERS are pre-packed columns designed for efficient clean-up of pesticide residues in fruit and vegetables. The columns use the same sorbent blends as dispersive solid phase extraction (dSPE) QuEChERS, and are designed to replace the traditional dSPE step with column solid phase extraction (cSPE). The columns are available for both AOAC and EN methods and for general, waxed and pigmented fruits and vegetables.

Compared to traditional QuEChERS dSPE clean-up, these columns deliver:

- A simplified workflow with fewer time-consuming manual steps
- Cleaner extracts
- Improved reproducibility
- Automated processing options for improved accuracy


**Figure 1.** ISOLUTE® cSPE columns for QuEChERS

## QuEChERS Clean-up Workflow

Typically, clean-up of pesticide residues in fruit and vegetables using QuEChERS methods relies on the dSPE workflow where the sample is shaken with dSPE media and then centrifuged to separate the cleaned-up sample. This is time consuming and complex because of the numerous manual transfer, capping and de-capping steps involved.

With pre-packed cSPE columns the workflow is significantly enhanced using a convenient flow-through format. So, instead of the usual procedure, the columns can be processed using vacuum, manual positive pressure or automated systems, leading to increased throughput. The simplified workflow means fewer manual transfer steps, which improves reproducibility, and reduces the risk of errors leading to lost samples or repeats.

The simplified cSPE process is illustrated in figure 2. Unlike dSPE, there is no need to shake the QuEChERS extract with dSPE media, or centrifuge to separate out the cleaned-up extract. Simply add the extract to the cSPE column, apply gentle vacuum or pressure, and collect the clean extract directly into a vial, ready for analysis.

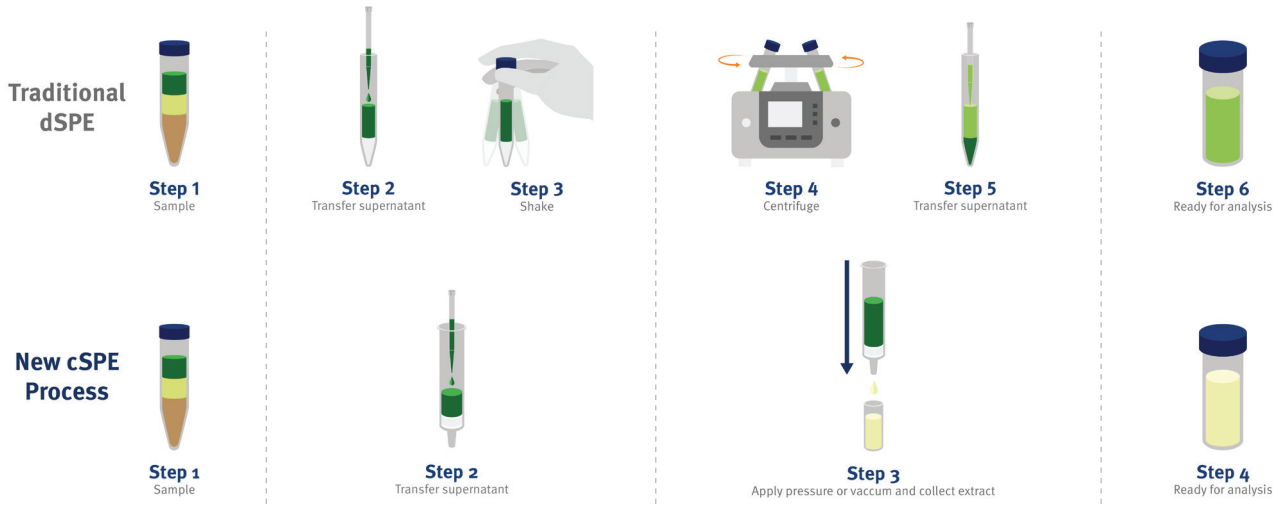


**Figure 2.** Traditional dSPE clean-up workflow vs ISOLUTE® cSPE for QuEChERS clean-up workflow

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## Enhanced Clean-up and Data Robustness with cSPE

Extract clean-up is enhanced due to the improved matrix scavenging efficiency provided by the packed column format compared with more traditional dSPE. Removal of more of the matrix components from the extracts results not only in visibly cleaner extracts (Fig. 3), but also in cleaner analytical baselines (Fig. 4), which means that peak integration is easier and more accurate, and the need for time consuming manual integration is reduced.


**Figure 3.** Spinach extract (a) before clean-up, (b) after dSPE clean-up, and (c) after cSPE clean-up. The flow-through cSPE format enhances matrix removal, leading to cleaner extracts.

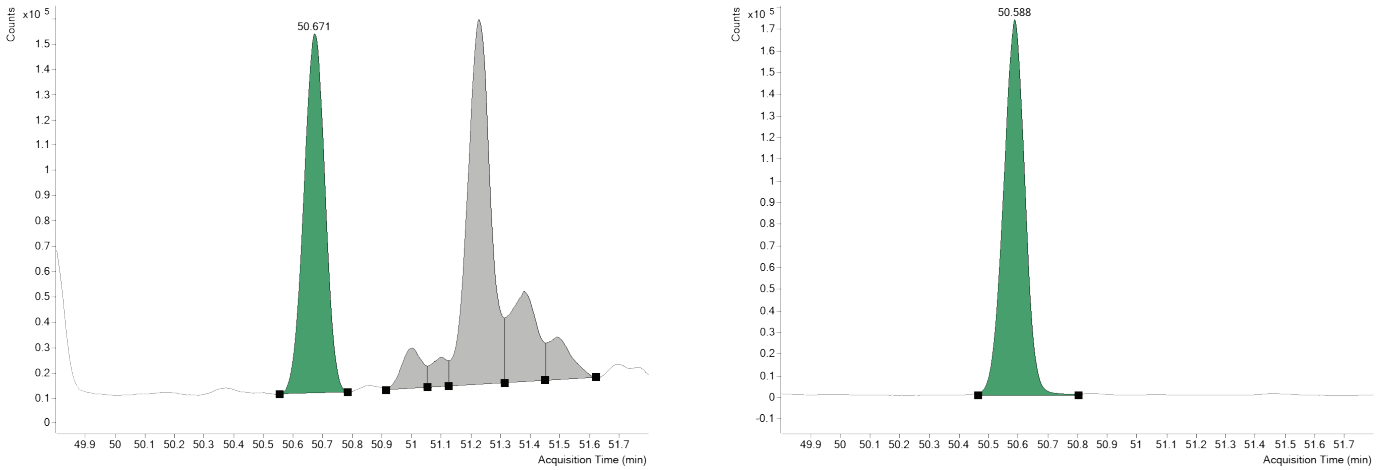


**Figure 4.** Chlorfenapyr in apple, extracted using AOAC salt blend, and cleaned-up using (a) dSPE and (b) cSPE equivalent. cSPE achieves improved matrix removal, leading to easier, more accurate quantitation.

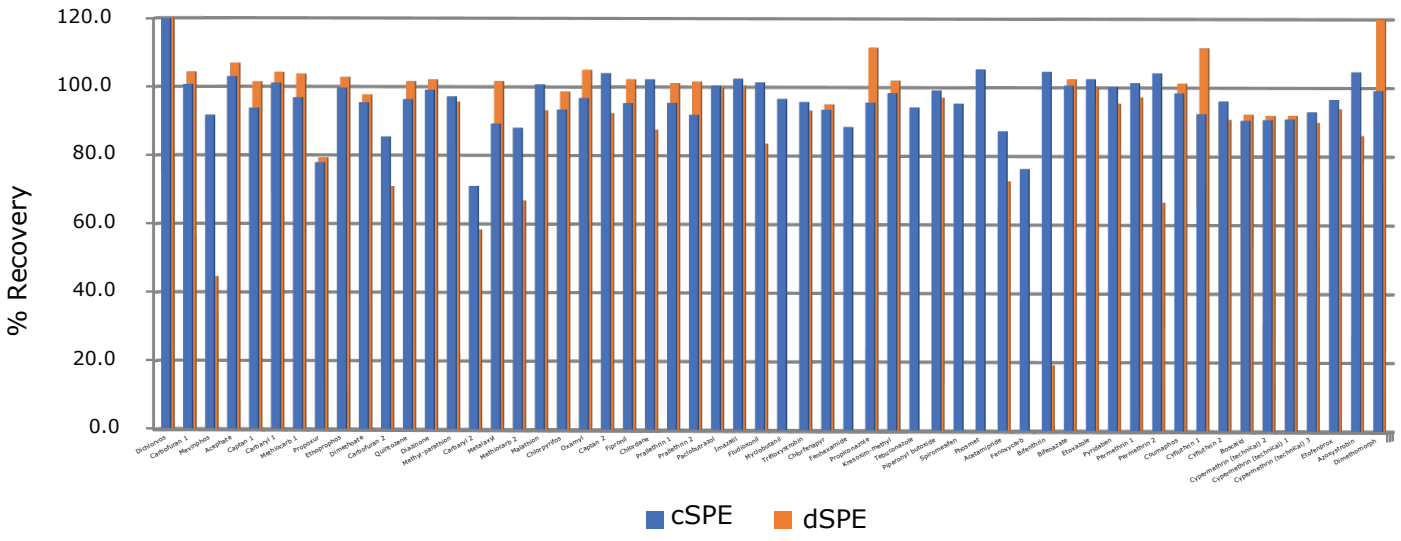


**Figure 5.** Recovery of pesticides (120 ng/g spiked equivalent) from oats using dSPE vs cSPE.

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Using a variety of produce types, including apples, oranges, oats, broccoli and spinach, we have compared the performance of traditional dSPE with the cSPE format. Analyte recovery of a representative suite of 56 pesticides is comparable between the two formats. Figure 5 shows pesticide recovery from oats using dSPE and cSPE clean-up. The enhanced clean-up using the column format means that some pesticides that are not quantifiable using dSPE can be successfully quantified using cSPE clean-up. In this case six pesticides were not detected using dSPE clean-up (myclobutanil, fenhexamide, tebuconazole, spiromesifen, bifenazate, fenoxycarb) whereas all were quantified in the cSPE extract.

Variability in analyte recovery from sample to sample is also improved in cSPE, due to the reduced number of manual steps, as well as the ease of quantitation due to cleaner extracts. This is demonstrated in figure 6 below. %RSD (n=7) across the pesticide panel for cSPE were significantly lower %RSDs than in the equivalent dSPE experiment.

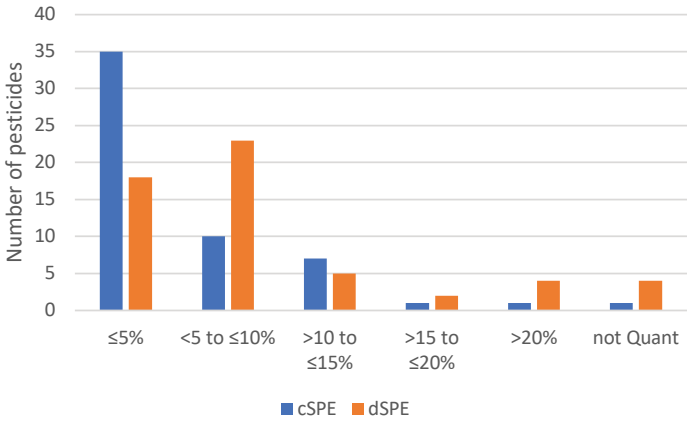


**Figure 6.** cSPE provides superior reproducibility compared to dSPE. For a panel of 56 pesticides spiked into oranges, extracted using EN QuEChERS salts, and cleaned-up using ISOLUTE® EN Waxed media, 35 (~60%) had %RSD of <5%, compared to only 18 (~30%) with dSPE. In addition, five pesticides (captan 2, fenhexamide, tebuconazole, spiromefisen and acetamipride) were not detected using dSPE, with only one (spiromefisen) not detected using cSPE.

## Automated cSPE Processing


**Figure 7.** Biotage® Extrahera™ HV-5000 automated sample preparation workstation

The ISOLUTE® cSPE format is ideal for automation of the QuEChERS clean-up step. Biotage® Extrahera™ HV-5000 automated sample preparation workstation (Fig. 7) can process a batch of 12 samples in just over 10 minutes. QuEChERS salt extracts are transferred from the homogenization/extraction step (performed in 50 mL tubes) directly into the sample rack without the need for any manual sample transfer.

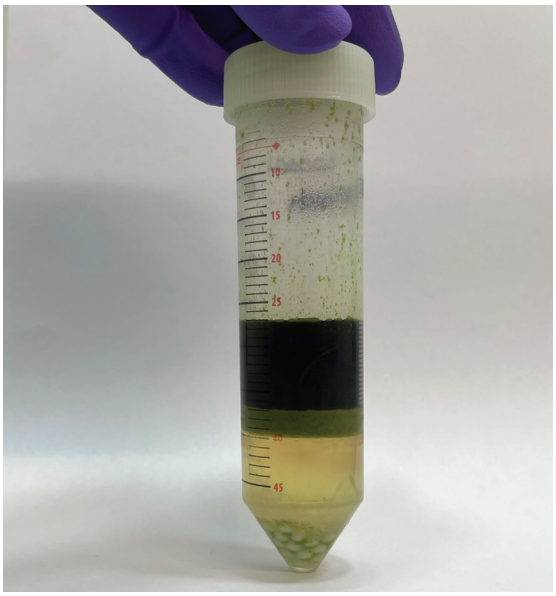

**Figure 8.** Extrahera's intelligent pipetting can transfer the top QuEChERS layer cleanly from the QuEChERS homogenization/ extraction tube directly to the cSPE clean-up column

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Extrahera's intelligent pipetting feature means that QuEChERS extracts can be accurately loaded onto the cSPE column without perturbation of the sample or risking contamination of the clean-up column (Fig. 8). The entire volume of cleaned-up extract can then be collected directly into a vial suitable for subsequent evaporation or analytical steps.

Using smaller scale homogenization, or manual transfer from 50 mL homogenization tubes into sample tubes, batches of up to 48 samples can be cleaned-up in as little as 33 minutes*.

## Standardized Media Blends

Standard AOAC and EN QuEChERS dSPE media blends are available pre-packed in this easy-to-use format, so you can match the clean-up to the appropriate sample matrix, delivering consistently effective clean-up and high analyte recoveries.

| ISOLUTE® cSPE QuEChERS Media | QuEChERS Application |
|---|---|
| **AOAC General** | Clean-up of general fruit and vegetables (AOAC method) |
| | e.g. celery, head lettuce, cucumber, melon |
| **AOAC Waxed** | Clean-up of fruit and vegetables with wax or fat content (AOAC method) |
| | e.g. cereals, avocado seeds, nuts, dairy |
| **AOAC Pigment** | Clean-up of pigmented fruit and vegetables (AOAC method) |
| | e.g. strawberries, sweet potatoes, tomatoes |
| **EN General** | Clean-up of general fruit and vegetables (EN method) |
| | e.g. celery, head lettuce, cucumber, melon |
| **EN Waxed** | Clean-up of fruit and vegetables with wax or fat content (EN method) |
| | e.g. cereals, avocado seeds, nuts, dairy |
| **EN Pigment** | Clean-up of pigmented fruit and vegetables (EN method) |
| | e.g. strawberries, sweet potatoes, tomatoes |
| **EN High Pigment** | Clean-up of highly pigmented fruit and vegetables (EN method) |
| | e.g. red peppers, spinach, blueberries |

* Using Biotage® Extrahera™ Classic

## Ordering Information

ISOLUTE® cSPE for QuEChERS Clean-up

| Part Number | Description | Pack size |
|---|---|---|
| **Q0030-0020-BG** | ISOLUTE® AOAC General 200 mg/3 mL (Tabless) | 50 |
| **Q0050-0035-BG** | ISOLUTE® AOAC Waxed 350 mg/3 mL (Tabless) | 50 |
| **Q0070-0022-BG** | ISOLUTE® AOAC Pigment 225 mg/ 3 mL (Tabless) | 50 |
| **Q0035-0020-BG** | ISOLUTE® EN General 200 mg/3 mL (Tabless) | 50 |
| **Q0060-0035-BG** | ISOLUTE® EN Waxed 350 mg/3 mL (Tabless) | 50 |
| **Q0080-0030-BG** | ISOLUTE® EN Pigment 300 mg/3 mL (Tabless) | 50 |
| **Q0090-0050-BG** | ISOLUTE® EN High Pigment 500 mg/3 mL (Tabless) | 50 |

**EUROPE**
Main Office: +46 18 565900
Toll Free: +800 18 565710
Fax: +46 18 591922
Order Tel: +46 18 565710
Order Fax: +46 18 565705
order@biotage.com
Support Tel: +46 18 56 59 11
Support Fax: + 46 18 56 57 11
eu-1-pointsupport@biotage.com

**NORTH & LATIN AMERICA**
Main Office: +1 704 654 4900
Toll Free: +1 800 446 4752
Fax: +1 704 654 4917
Order Tel: +1 704 654 4900
Order Fax: +1 434 296 8217
ordermailbox@biotage.com
Support Tel: +1 800 446 4752
Outside US: +1 704 654 4900
us-1-pointsupport@biotage.com

**JAPAN**
Tel: +81 3 5627 3123
Fax: +81 3 5627 3121
jp_order@biotage.com
jp-1-pointsupport@biotage.com

**CHINA**
Tel: +86 21 68162810
Fax: +86 21 68162829
cn_order@biotage.com
cn-1-pointsupport@biotage.com

**KOREA**
Tel: + 82 31 706 8500
Fax:+ 82 31 706 8510
korea_info@biotage.com
kr-1-pointsupport@biotage.com

Distributors in other regions are listed on www.biotage.com

**Part Number: PPS719**

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