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Welchrom® QuEChERS Care and Use Manual

1. Introduction

QuEChERS (Quick, Easy, Cheap, Effective, Rugged, Safe) is a rapid sample preparation technique developed internationally in recent years.

2. Principle

The principle of QuEChERS is similar to High-Performance Liquid Chromatography (HPLC) and Solid Phase Extraction (SPE). It utilizes the interaction between adsorbents and impurities in the matrix. The adsorbent filler adsorbs impurities, thereby removing them and purifying the target analyte.

3. Advantages

- High recovery rate: achieves more than 85% recovery for a wide range of polar and volatile pesticides.
- High precision and accuracy: can be corrected using internal standards.
- Wide range of analyzable pesticides: suitable for both polar and non-polar pesticides, achieving good recovery rates.
- Fast analysis: can process six samples within 30 minutes.
- Low solvent usage: minimal pollution, low cost, and no chlorinated solvents are used.
- Ease of operation: simple procedures that can be performed without extensive training or high skill levels.
- Reduced exposure: immediately seal the container after adding acetonitrile, reducing exposure to personnel.
- Minimal Equipment: Uses very few glassware items and simple apparatus during sample preparation.

4. Operation Steps

The QuEChERS method can be summarized in two main steps:
(1) Extraction: Crush the sample, then use acetonitrile to extract the target analyte. Add a salting-out package(extraction kits) to extract and separate the target analyte.
(2) Purification: Use a cleanup tube containing adsorbent filler to remove impurities, then take the supernatant for detection.

Step 1:Extraction

Add acetonitrile solvent and a salting-out package(extraction kits) to a small amount (10g or 15g) of homogenized fruit and vegetable samples. Homogenize or ultrasonically extract, then centrifuge to collect the supernatant for purification.
Note: Adding salt directly to food samples with high water content may cause an exothermic reaction, affecting analyte recovery.

Step 2: Dispersive Solid Phase Extraction(dSPE) Purification

Choose a dSPE cleanup tube based on the type of food being analyzed and the method used. Add an equal amount of the extracted sample solution from step 1 to a 2mL or 15mL cleanup tube. Shake vigorously to mix well, then centrifuge to collect the supernatant for concentration or direct injection for analysis. (The centrifuge tube contains a small amount of SPE adsorbent and $MgSO_4$. The adsorbent removes interfering substances from the sample, while $MgSO_4$ removes excess water and improves sample distribution.)

5. Example Application: Detecting Multiple Pesticide Residues in Apples using Welchrom® QuEChERS(This procedure can be adapted for other sample types)

• Extraction

1) Add 15g of homogenized apple sample (water content > 80%) to a centrifuge tube.
2) Add 15mL of acetonitrile solution containing 1% acetic acid.
3) Add internal standard solution.
4) Shake or vortex for 1 minute.
5) Add the salting-out package(extraction kits) to the centrifuge tube.
6) Shake vigorously for 1 minute.
7) Centrifuge at 4000 rpm for 5 minutes.
8) Collect the supernatant for purification.

• Clean up

1) Use a 2mL cleanup tube for 1mL of supernatant.
2) Use a 15mL cleanup tube for 8mL of supernatant.
3) Add the supernatant to the cleanup centrifuge tube, shake vigorously for 1 minute.
4) Centrifuge at 13000 rpm for 2 minutes.
5) Transfer the supernatant to an injection vial for analysis.

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