Chromatography

MACHEREY-NAGEL

CHROMABOND® QuEChERS

Convenient sample preparation solutions for food analysis

- Fulfills official EN, Original and AOAC methods
- Large portfolio of pre-mixed QuEChERS products
- Excellent price-performance ratio

Table of Contents

Contents

Introduction

- QuEChERS methodology 3
- Advantages of QuEChERS in comparison with classical clean-up methods 3

QuEChERS procedure 4

QuEChERS product selection 6

- Extraction and salting out 6
- Clean-up by dSPE 7

Adsorbents and what they are used for 7

Applications 8

- Topic overview 8

Procedures 9

Ordering information 22

- Extraction mixes 22
- Clean-up mixes 23

CHROMABOND® QuEChERS

Introduction

QuEChERS methodology

"Quick, Easy, Cheap, Effective, Rugged and Safe" – these are the demands of sample preparation in modern food analysis. The QuEChERS (pronounced as "catchers") method, introduced by Anastassiades et al. in 2003[1], and the subsequent development of ready-to-use mixes meet these needs. QuEChERS became the method of choice in sample preparation for the analysis of pesticides and drugs and other processing contaminants and residues in fruit, vegetables and other food products.

Advantages of QuEChERS in comparison with classical clean-up methods:

- Easy to handle and time-saving procedure
- No need for glassware
- Low consumption of solvents
- No need for chlorinated solvents
- Broad range of pesticides can be deteced
- Rugged method with high and safe recovery rates

Improved lab productivity

Your benefits with our QuEChERS mixes!

- Highest quality and reproducibility – reliable over many years
- Lowest contamination
- Convenient to use – pre-weighed packaging
- Cost-efficiency
- Broad range of mixes

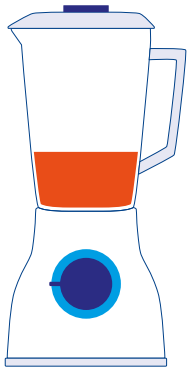
[1] M. Anastassiades, S. J. Lehotay, D. Stajnbaher, F. J. Schenck, J. AOAC Int. 86 (2003), 412–431.

Our products help you to keep an eye on your food!

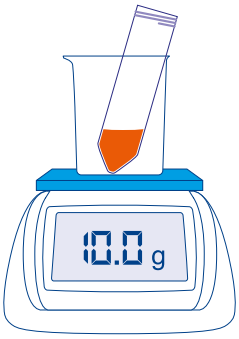
QuEChERS procedure*

It is simple and consists of two major steps:

Step 1 – Extraction and salting-out

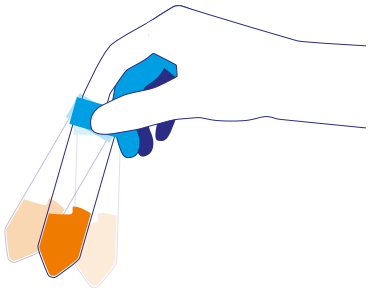


1. Sample is homogenized, e.g, with dry ice in a blender.

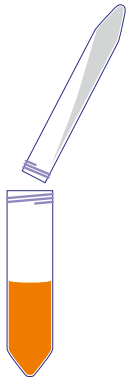


2. Weigh 10 g of the sample into a centrifuge tube.

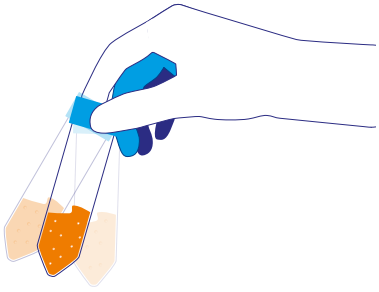
3. Add 10 mL of acetonitrile and internal standard.



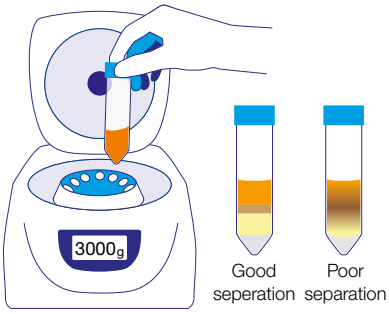
4. Shake vigorously for 1 min.



5. Add extraction mix to centrifuge tube. Optional: check pH and adjust pH to 5.0 – 5.5 with 5 mol/L aqueous NaOH.



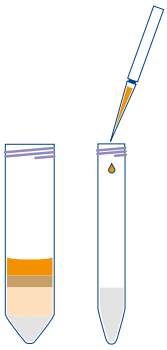
6. Shake vigorously for 1 min.



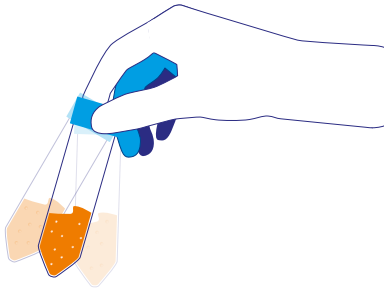
7. Centrifuge for 5 min at > 3000 g. For the determination of pesticides with acidic groups, the raw extract should be analyzed directly (preferably by LC/MS ESI neg.).

*Procedure described in accordance with method EN 15662:2008

Step 2 – Clean-up by dSPE

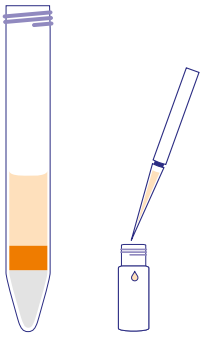


1. Transfer an aliquot of the supernatant to a centrifuge tube containing a clean-up mix. This dispersive solid phase extraction mix (dSPE) removes matrix components such as fats, sterols and pigments.



2. Shake for 30 s.

3. Centrifuge for 5 min at > 3000 g.



4. Transfer supernatant to vial, acidify with 5 % formic acid in acetonitrile (10 µL/mL extract) and analyze sample by LC/MS or GC/MS.

Select the right QuEChERS products for your sample!

For each of the two steps we provide the proper CHROMABOND® QuEChERS mixes.
The contents are pre-weighed and mixed according to the standardized methods:

Step 1 – Extraction and salting-out

Method	Sample weight	Solvent	Content of mix	Mix no.
Original non-buffered [1]	10 g	10 mL acetonitrile	4 g $MgSO_4$, 1 g NaCl	Mix XII
EN 15662:2008 citrate-buffered [2]	10 g	10 mL acetonitrile	4 g $MgSO_4$, 1 g NaCl, 0.5 g Na_2H citrate · 1.5 H_2O, 1 g Na_3 citrate · 2 H_2O	Mix I
AOAC 2007.01 acetate-buffered [3]	15 g	15 mL 1 % acetic acid in acetonitrile	6 g $MgSO_4$, 1.5 g Na acetate	Mix II

Samples with less than 80 % water content require the addition of sufficient cold water.
The amount of water needed is listed in the table below. [1]

Sample type	Sample weight	Water added	Note
Fruit and vegetables > 80 % water content	10 g	–	
Fruit and vegetables 25–80 % water content	10 g	x g	x = 10 g minus water amount in sample
Original non-buffered	10 g	10 g	
Cereals	5 g	10 g	
Dried fruit	5 g	7.5 g	Water can be added during comminution step
Honey	5 g	10 g	
Spices	2 g	10 g	

Referencias

[1] M. Anastassiades, S. J. Lehotay, D. Stajnbaher, F. J. Schenck, J. AOAC Int. 86 (2003), 412–431.

[2] EN 15662:2008 Foods of plant origin – Determination of pesticide residues using GC-MS and/or LC-MS/MS following acetonitrile extraction/partitioning and clean-up by dispersive SPE – QuEChERS method.

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

CHROMABOND® QuEChERS

Step 2 – Clean-up by dSPE

	Sample property	Content of mix	EN 15662	AOAC 2007.01
	Low fat content ■ Apple ■ Pear ■ Apricot ■ Pineapple ■ Asparagus ■ Strawberry ■ Broccoli	$MgSO_4$ Diamino (PSA)	Mix III	Mix XX
	Moderate content of chlorophyll and carotinoids ■ Carrot ■ Coffee ■ Lettuce ■ Tea	$MgSO_4$ Diamino (PSA) Carbon (GCB)	Mix IV	Mix XVII
	Higher content of chlorophyll and carotinoids ■ Pepper ■ Blackberry ■ Spinach ■ Raspberry	$MgSO_4$ Diamino (PSA) Carbon (GCB)	Mix V	–
	Higher fat content ■ Avocado ■ Pork ■ Cereals ■ Dairy products ■ Nuts ■ Soil ■ Beef ■ Oils ■ Chicken ■ Baby food	$MgSO_4$ Diamino (PSA) C_{18} ec	Mix VI	Mix XIX

Adsorbents and what they are used for

$MgSO_4$	Removes excess of water
NaCl	For phase separation
CHROMABOND® Diamino (PSA) (Primary Secondary Amine)	Removes organic and fatty acids, sugars and anthocyanin pigments
CHROMABOND® C_{18} ec (reversed phase modified silica)	Traps nonpolar compounds, e.g., lipids
CHROMABOND® Carbon (GCB) (Graphitized Carbon Black)	Removes pigments and sterols Note: planar pesticides are also removed

Applications

Topic overview

Method	Procedure	MN Appl. No.	Matrix	QuEChERS Mix	REF	Page number
EN 15662	Procedure for sample matrices with low fat content	306760	Apple, peach, potato, lettuce, honey	Mix I Mix III	730970.3 730646.2	9
EN 15662	Procedure for sample matrices with moderate content of chlorophyll and carotinoids	306770	Carrot, savoy, brussels sprouts	Mix I Mix IV	730970.3 730850.2	10
EN 15662	Procedure for sample matrices with higher content of chlorophyll and carotinoids	306780	Arugula salad, spinach, pepper	Mix I Mix V	730970.3 730358.2	11
EN 15662	Procedure for sample matrices with higher fat content	306790	Avocado, hazelnut, olive oil, quark, cheese, walnut	Mix I Mix VI	730970.3 730858.2	12
AOAC 2007.01	Procedure for sample matrices with low fat content	306810	Apple	Mix II Mix XX	730971.3 730670.2	13
AOAC 2007.01	Procedure for sample matrices with higher fat content	306820	Corn semolina	Mix II Mix XIX	730971.3 730657.2	14
AOAC 2007.01	Analysis of chloramphenicol from honey	306830	Honey	Mix I or II Mix III or VI	730970 or 730971 730972 or 730974	15
AOAC 2007.01	Analysis of acrylamide from coffee	306530	Coffee	Mix I Mix XX	730970 730658	16
AOAC 2007.01	Analysis of mycotoxins in food and feed	306860	Wheat flour, rye flour	Mix XII Mix M1	730648 730779	17
EURLs	Analysis of quaternary ammonium compounds (QACs) in foodstuffs	306850	Ice cream, honey	Mix I Mix III	730970 730646.2	18
AOAC 2007.01	Analysis of triphenylmethane dyes from aquaculture samples	306560 306570 306580	Brown trout, shrimp, tuna	Mix II Mix III	730971 730972	19
FDA C-010.02	Analysis of PFAS in food	306840	Milk, quark, bread, brussels sprouts, spinach, egg	Mix XII Mix L	730648 7300008	20, 21

Procedure for sample with low fat content

Sample pretreatment (MN Appl. No. 306760)

- Weigh amount of homogenized sample based on Table 1 into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.1 mL of pesticide standard solution (1 µg/mL each compound in acetonitrile) for determining recovery rate
- Shake the mixture for 1 min
- Add amount of LC/MS grade water based on Table 1 and shake
- Add 9.9 mL acetonitrile
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix I (REF 730970.3)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 1 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix III (REF 730646.2)
- Shake for 1 minute
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 128660)

Sample matrix	Amount of sample used (g)	Water added (mL)
Apple	10	0
Peach	10	0
Potato	10	0
Lettuce	10	0
Honey	5	10

Table 1: Sample preparation conditions based on food commodity type

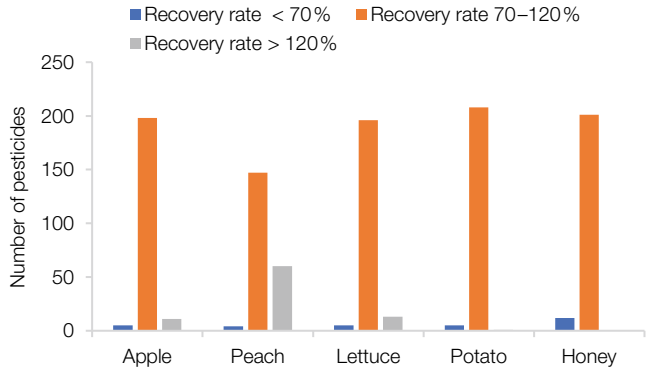


Figure 1: Recovery rates of pesticides

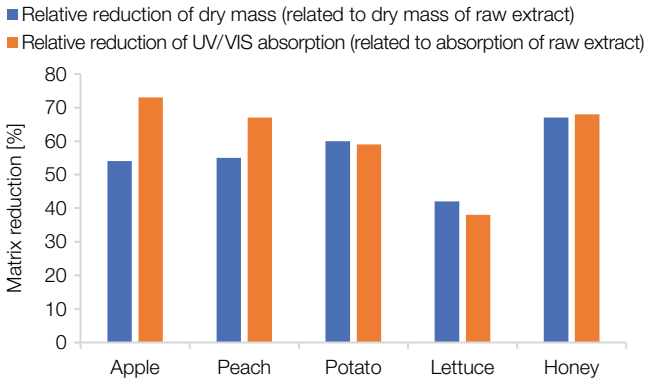


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption

Procedure for sample matrices with moderate content of chlorophyll and carotinoids

Sample pretreatment (MN Appl. No. 306770)

- Weigh 10.0 g homogenized sample into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.1 mL of pesticide standard solution (1 µg/mL each compound in acetonitrile) for determining recovery rate
- Shake the mixture for 1 min
- Add 9.9 mL acetonitrile
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix I (REF 730970.3)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 1 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix IV (REF 730850.2)
- Shake for 1 minute
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 128990)

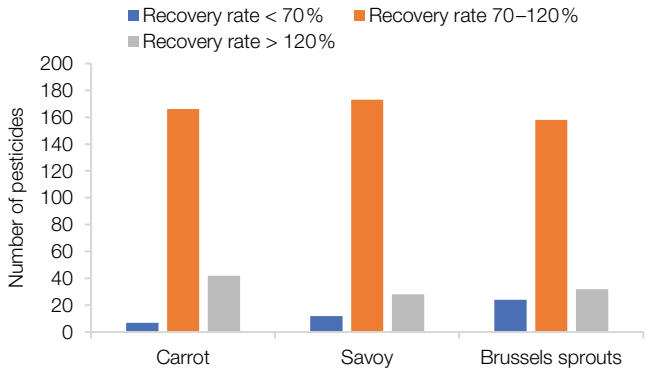


Figure 1: Recovery rates of pesticides

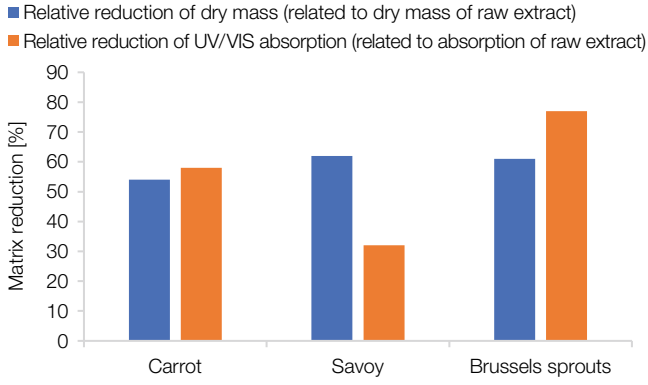


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption

Procedure for sample matrices with higher content of chlorophyll and carotinoids

Sample pretreatment (MN Appl. No. 306780)

- Weigh 10.0 g homogenized sample into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.1 mL of pesticide standard solution (1 µg/mL each compound in acetonitrile) for determing recovery rate
- Shake the mixture for 1 min
- Add 9.9 mL acetonitrile
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix I (REF 730970.3)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 1 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix V (REF 730358.2)
- Shake for 1 min
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 128990)

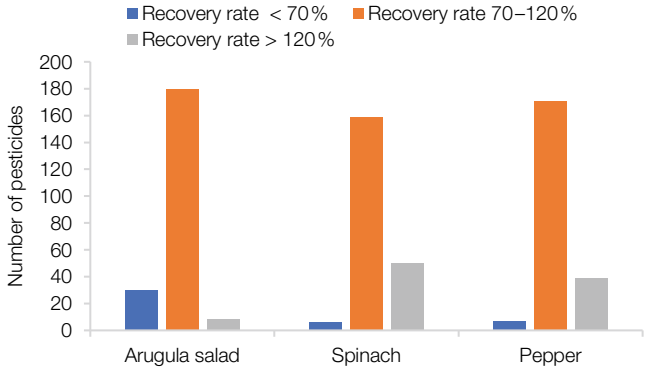


Figure 1: Recovery rates of pesticides

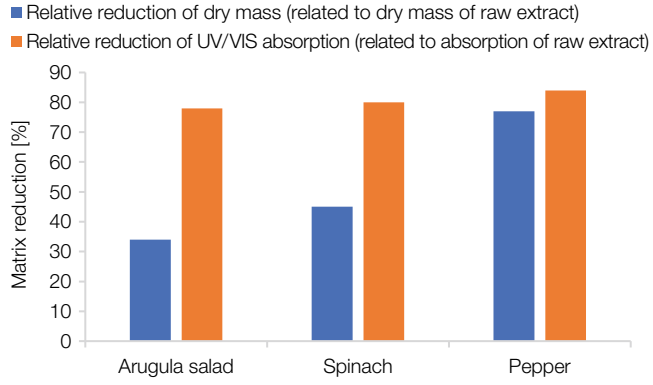
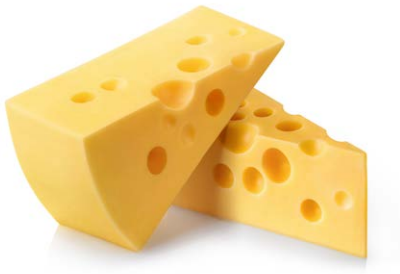


Figure 2 Relative matrix reduction of dry mass and UV-VIS absorption

Procedure for sample matrices with higher fat content

Sample pretreatment (MN Appl. No. 306790)



- Weigh amount of homogenized sample based on Table 1 into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.1 mL of pesticide standard solution (1 µg/mL each compound in acetonitrile) for determining recovery rate
- Shake the mixture for 1 min
- Add amount of LC/MS grade water based on Table 1 and shake
- Add 9.9 mL acetonitrile
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix I (REF 730970.3)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 1 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix VI (REF 730858.2)
- Shake for 1 minute
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 128990)

Sample matrix	Amount of sample used (g)	Water added (mL)
Avocado	5	0
Hazelnut	5	10
Olive oil	2	10
Quark	10	10
Cheese	5	10
Walnut	5	10

Table 1: Sample preparation conditions based on food commodity type

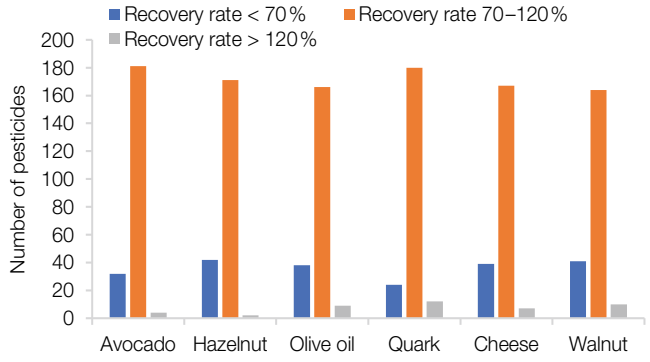


Figure 1: Recovery rates of pesticides

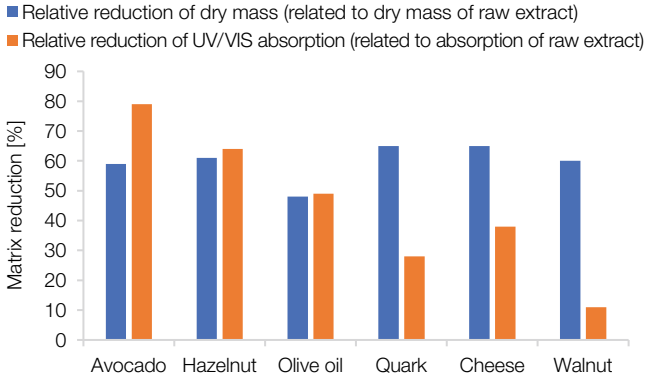


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption

Procedure for sample matrices with low fat content

Sample pretreatment (MN Appl. No. 306810)

- Weigh 15.0 g homogenized apple sample into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.15 mL of pesticide standard solution (1 µg/mL each compound in acetonitrile) for determining recovery rate
- Shake the mixture for 1 min
- Add 14.85 mL acetonitrile
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix II (REF 730971.3)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 1 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix XX (REF 730670.2)
- Shake for 1 min
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 128990)

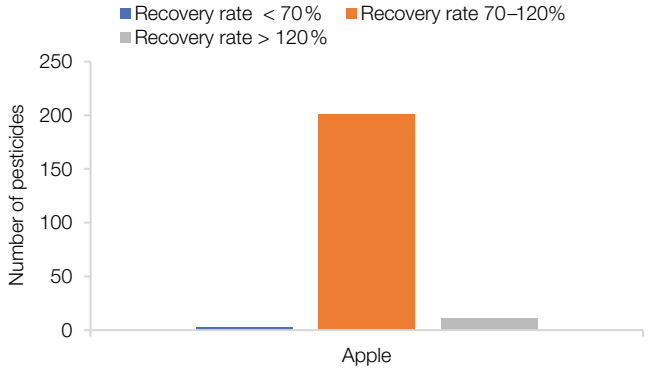


Figure 1: Recovery rates of pesticides

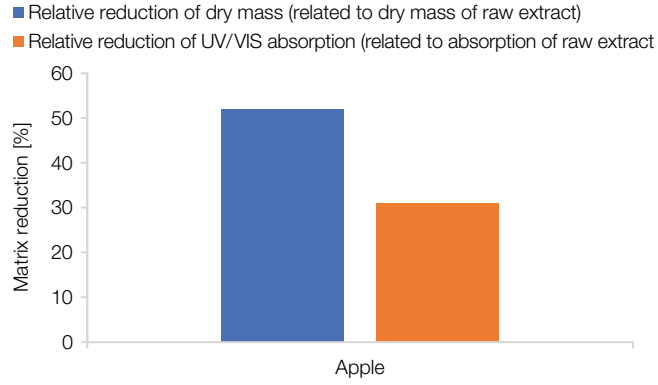


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption

Procedure for sample matrices with higher fat content

Sample pretreatment (MN Appl. No. 306820)

- Weigh 5.0 g homogenized corn semiola sample into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.15 mL of pesticide standard solution (1 µg/mL each compound in acetonitrile) for determining recovery rate
- Shake the mixture for 1 min
- Add 10 mL water
- Shake the mixture for 1 min
- Add 14.85 mL acetonitrile
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix II (REF 730971.3)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 1 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix XIX (REF 730657.2)
- Shake for 1 min
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 128990)

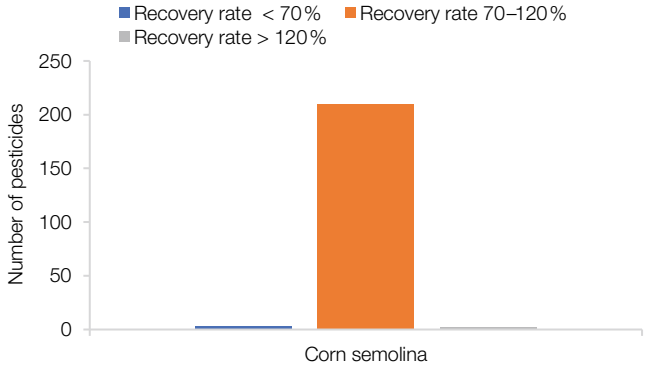


Figure 1: Recovery rates of pesticides

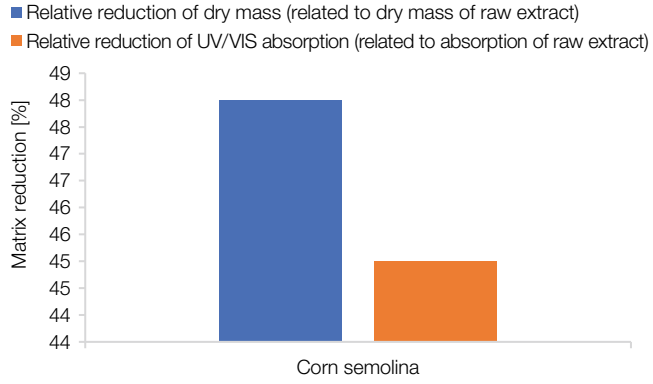


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption

Analysis of chloramphenicol from honey

Sample pretreatment (MN Appl. No. 306830)

- Weigh out 2 g honey sample into a 50 mL centrifuge tube
- Add 10 µL of a chloramphenicol-d_5 solution (β= 0.1 µg/mL in acetonitrile)
- Add 10 µL of a chloramphenicol solution (β= 0.1 µg/mL in acetonitrile) for determining recovery rate
- Add 10 mL water and shake
- Add 10 mL acetonitrile and shake
- Add CHROMABOND® QuEChERS extraction Mix I or II (REF 730970 or REF 730971)
- Shake vigorously for 1 min and cool down the mixture in an ice bath
- Centrifuge the mixture at 4500 rpm, for 5 min at 4 °C
- Put 6 mL acetonitrile supernatant in a 15 mL centrifuge tube
- Add CHROMABOND® QuEChERS cleaning Mix III or VI (REF 730972 or REF 730974)
- Shake vigorously for 1 min and cool down the mixture in an ice bath
- Centrifuge the mixture at 4500 u/min, for 5 min at 4 °C
- Transfer 1 mL of the acetonitrile supernatant into a vial
- Evaporate extract to dryness at 40 °C under a stream of nitrogen and dissolve residue in 1.0 mL water/acetonitrile, 95/5, v/v
- Sample is ready to be analyzed by LC-MS/MS (MN Appl. No. 128140)

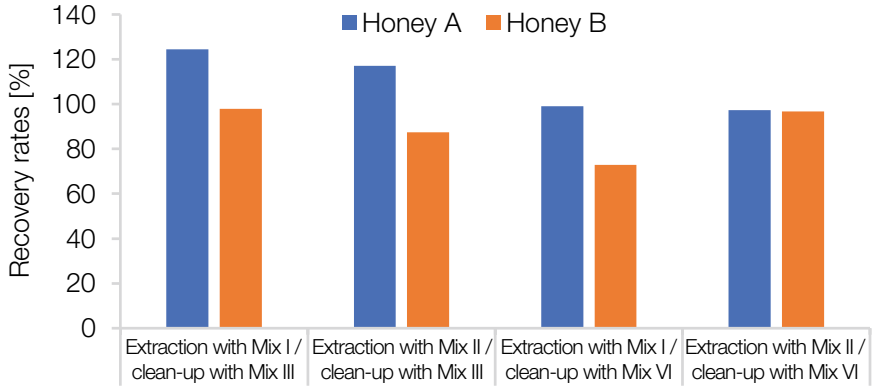


Figure 1: Recovery rates for chloramphenicol using different extraction and clean-up Mixes

Analysis of acrylamide from coffee

Sample pretreatment (MN Appl. No. 306530)

- Weigh out 1 g coffee sample into a 50 mL centrifuge tube
- Add 50 µL of an aqueous D_3-acrylamide solution (β = 1 µg/mL)
- Add 50 µL of an aqueous acrylamide solution (β = 1 µg/mL) for determining recovery rate
- Add 5 mL hexane and shake
- Add 10 mL water and shake
- Add 10 mL acetonitrile and shake
- Add CHROMABOND® QuEChERS extraction Mix I (REF 730970)
- Shake vigorously for 1 min and cool down the mixture in an ice bath
- Centrifuge the mixture at 4500 rpm, for 5 min at 4 °C
- Put 6 mL acetonitrile supernatant in a 15 mL centrifuge tube
- Add CHROMABOND® QuEChERS cleaning Mix XX (REF 730658)
- Shake vigorously for 1 min and cool down the mixture in an ice bath
- Centrifuge the mixture at 4500 u/min, for 5 min at 4 °C
- Transfer the acetonitrile supernatant into a vial
- Dilute the extract 1:10 with water and filter through a syringe filter (CHROMAFIL® PTFE, 13 mm, 0.2 µm, REF 729208)
- Sample is ready to be analyzed by LC-MS/MS (MN Appl. No. 127530)

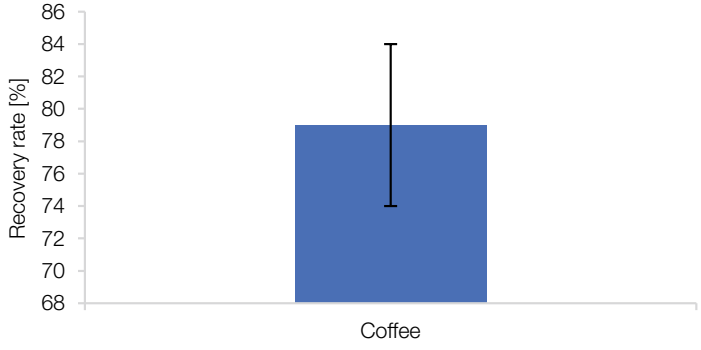


Figure 1: Recovery rates (n=5)

Analysis of mycotoxins in food and feed

Sample pretreatment (MN Appl. No. 306860)

- Weigh 4 g homogenized sample into a 50 mL centrifuge tube (REF 730223)
- Add 25 µL mycotoxin standard mixture (β = 0.1 µg/mL each analyte in acetonitrile)
- Add 10 mL 0.1 % formic acid in water, shake vigorously and wait 10 min
- Add 10 mL acetonitrile and agitate
- Add CHROMABOND® QuEChERS Mix XII (REF 730648), shake vigorously for 1 min and cool the mixture down in an ice bath
- Centrifuge at 4500 rpm for 20 min at 20 °C
- Take organic phase for clean-up procedure
- Add 6 mL of organic phase into centrifuge tube with CHROMABOND® QuEChERS Mix M1 (REF 730779)
- Shake vigorously 1 min
- Centrifuge at 4500 rpm for 20 min at 20 °C
- Evaporate 2 mL extract to dryness at 60 °C under a steam of nitrogen and redissolve in 0.5 mL acetonitrile
- Sample is ready to be analyzed by LC-MS/MS (MN Appl. No. 129020)

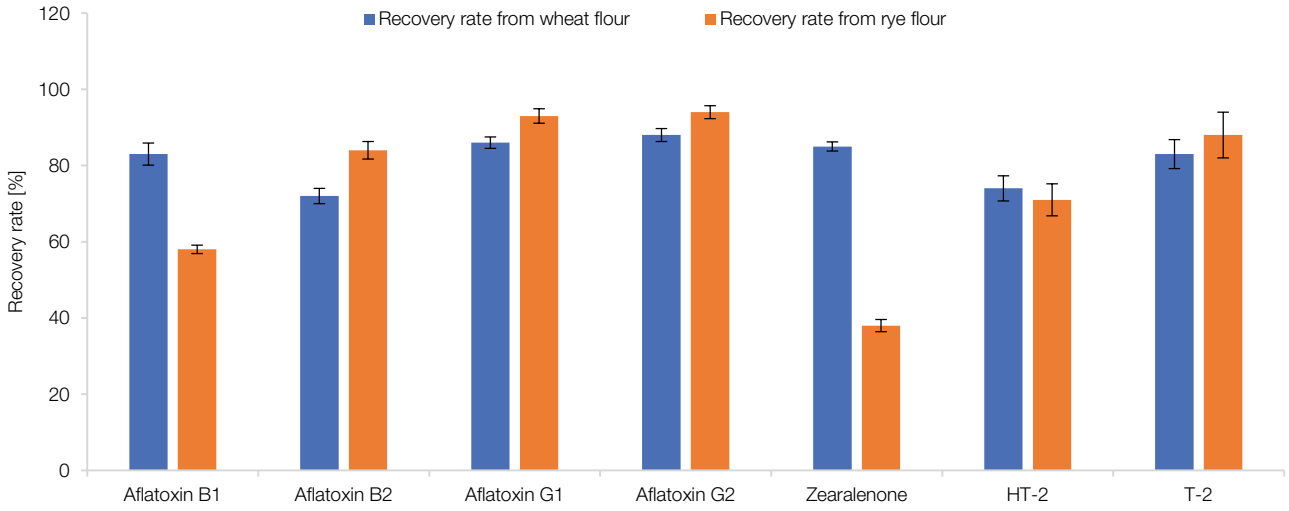


Figure 1: Recovery rates of mycotoxins in food and feed

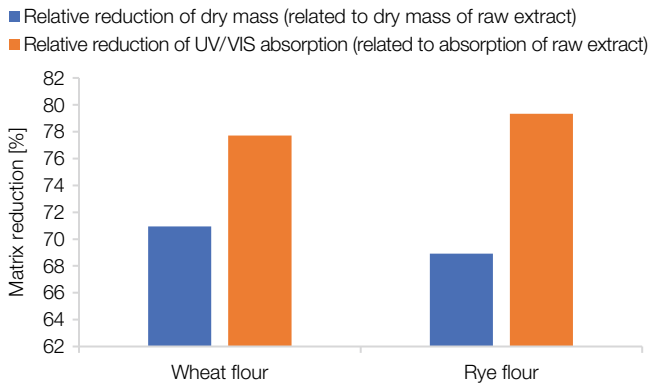


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption

Analysis of quaternary ammonium compounds (QACs) in foodstuffs*

Sample pretreatment (MN Appl. No. 306850)

- Weigh 5 g of homogenized sample into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.1 mL of internal standard solution (1.0 µg/mL each compound in acetonitrile) and 0.1 mL of native standard solution (1.0 µg/mL each compound in acetonitrile) for determining recovery rate
- Shake the mixture for 1 min
- Add 10 mL water
- Shake the mixture for 1 min
- Add 9.8 mL acetonitrile
- Shake the mixture for 1 min and wait 10 min
- Add CHROMABOND® QuEChERS Mix I (REF 730970)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 6 mL supernatant to a 2 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix III (REF 730646.2)
- Shake for 1 min
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 129010)

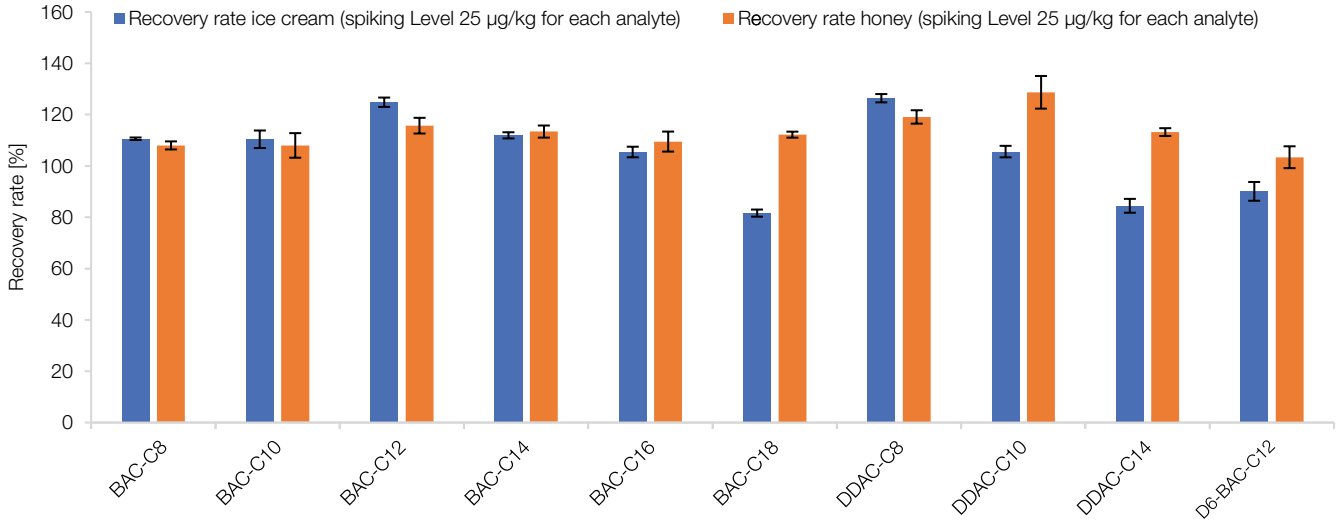


Figure 1: Recovery rates of QAC's; EURLs, version 5 (last update: 24.02.2016)

*According to EU Reference Laboratories (EURLs) procedure described in method: Analysis of Quaternary Ammonium Compounds (QACs) in Fruits and Vegetables using QuEChERS and LC-MS/MS Version 5 (last update: 24.03.2016)

Analysis of triphenylmethane dyes from aquaculture samples

Sample pretreatment (MN Appl. No. 306560/306570/306580)

- Weigh 5 g of homogenized sample into an empty 50 mL centrifuge tube (REF 730223)
- Add 5 µL of internal standard solution (β = 1 µg/mL Malachite Green-d5 and Leucomalachite Green-d5 each in acetonitrile)
- Add 25 µL of standard solution (β = 200 ng/mL Malachite Green, Leucomalachite Green, Leucocrystal Violet, Crystal Violet each in acetonitrile) for determining recovery rate
- Add 5 mL water and shake
- Add 10 mL 1 % acetic acid in acetonitrile and shake
- Add the CHROMABOND® QuEChERS extraction Mix II (REF 730971)
- Shake vigorously for 30 sec and cool down the mixture in an ice bath
- Centrifuge the mixture at 4500 rpm for 5 min at 4 °C
- Put 5 mL acetonitrile supernatant in a 15 mL brown centrifuge tube
- Add the CHROMABOND® QuEChERS clean-up Mix III (REF 730972), (for samples with high fat content add 1 mL hexane)
- Shake vigorously for 30 sec
- Centrifuge the mixture at 4500 rpm for 5 min at 4 °C
- Dilute the extract 1:1 with an aqueous solution of 5 mmol/L ammonium acetate + 1 mL/L formic acid and filter through a syringe filter (CHROMAFIL® Xtra PTFE, 13 mm, 0.2 µm, REF 729208)
- Sample is ready to be analyzed by LC-MS/MS (MN Appl. No. 128430)

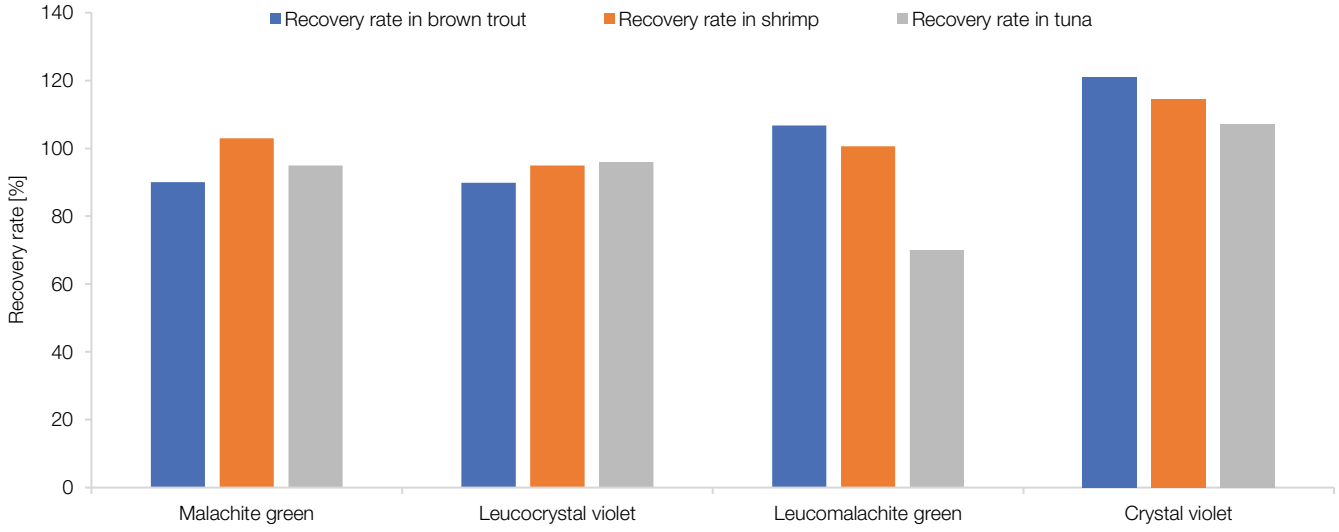


Figure 1: Recovery rates of triphenylmethane dyes from aquaculture samples

Analysis of PFAS in food*

Sample pretreatment (MN Appl. No. 306840)

- Weigh amount of sample and LC/MS grade water based on Table 1 and into an empty 50 mL centrifuge tube (REF 730223)
- Add 0.1 mL of internal standard solution (0.1 µg/mL each compound in methanol) and 0.1 mL of native standard solution (0.1 µg/mL each compound in methanol) for determining recovery rate
- Shake the mixture for 1 min
- Add 9.8 mL acetonitrile and 150 µL formic acid
- Shake the mixture for 1 min
- Add CHROMABOND® QuEChERS Mix XII (REF 730648)
- Shake the mixture for 1 min
- Centrifuge the mixture for 5 min at 4500 rpm at 5 °C
- Transfer 6 mL supernatant to a 15 mL centrifuge tube, which is prefilled with CHROMABOND® QuEChERS Mix L (REF 7300008)
- Shake for 1 min
- Centrifuge again for 5 min at 4500 rpm at 5 °C
- Supernatant is ready to be analyzed by LC-MS/MS (MN Appl. No. 129000)

Sample matrix	Amount of sample used (g)	Water added (mL)	CH_3CN added (mL)
Milk	5	5	10
Quark	1	5	10
Bread	5	15	10
Brussels sprouts	5	5	10
Spinach	5	5	10
Egg	5	5	10

Table 1: Sample preparation conditions based on food commodity type

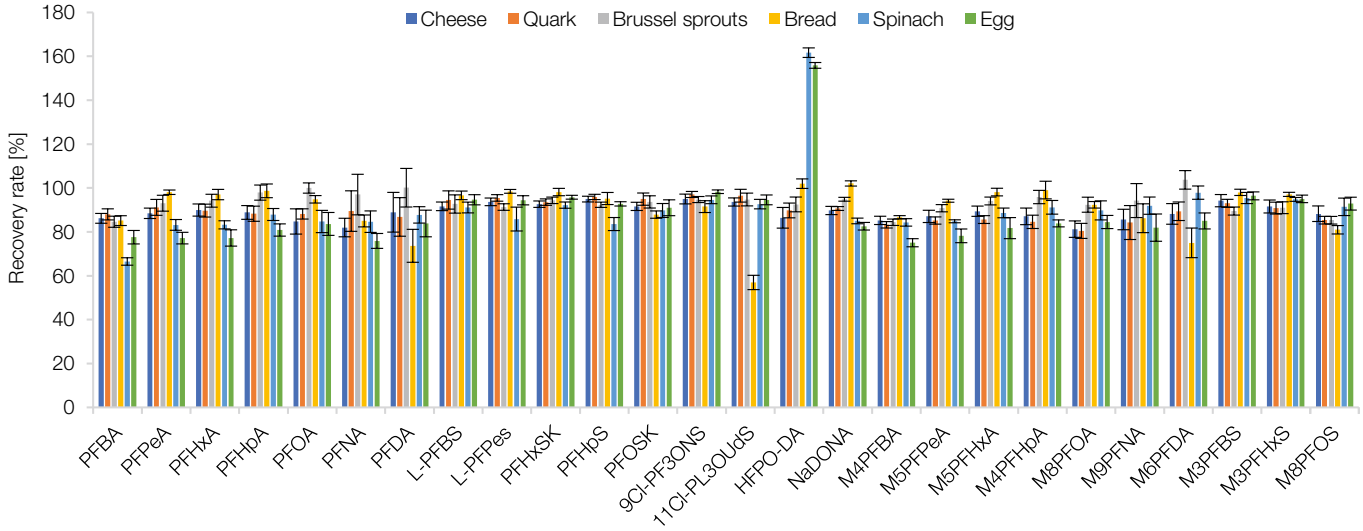


Figure 1: Recovery rates of PFAS

*According to FDA method C-010.02

Continued from page 20 · MN Appl. No. 306840

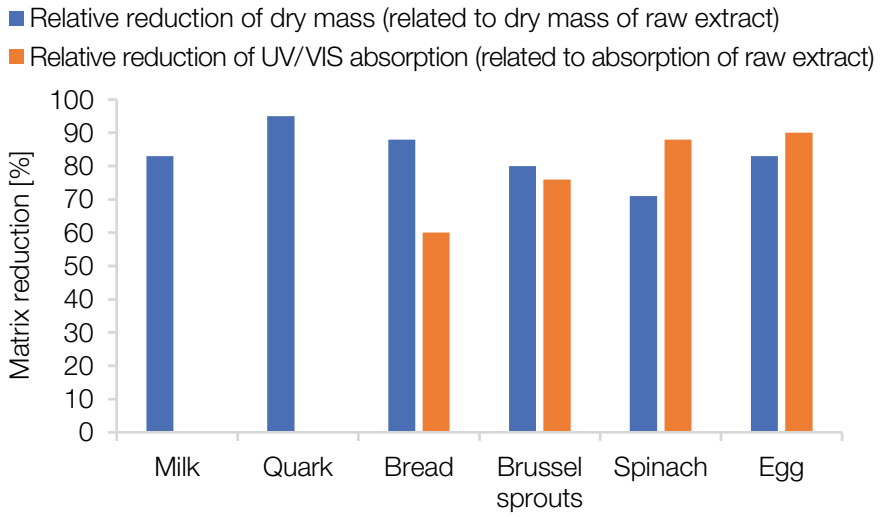


Figure 2: Relative matrix reduction of dry mass and UV-VIS absorption (colored extracts)

Stick format, aluminum packet

Centrifuge tube, 2 mL

Centrifuge tube, 15 mL

Centrifuge tube, 50 mL

Ordering information

Good to know

Check out our QuEChERS mixes online!

Extraction mixes

Method	Mix No.	Content of mix	Volume	Quantity	REF
In aluminum packets (Sticks)					
EN 15662	Mix I	4000 mg $MgSO_4$, 1000 mg NaCl, 500 mg Na_2H citrate x 1.5 H_2O, 1000 mg Na_3 citrate x 2 H_2O	Individually weighed in aluminum packets (Sticks)	50	730970.3
EN 15662	Mix I	4000 mg $MgSO_4$, 1000 mg NaCl, 500 mg Na_2H citrate x 1.5 H_2O, 1000 mg Na_3 citrate x 2 H_2O	Individually weighed in aluminum packet (Sticks), including 50 mL empty centrifuge tubes	50	730970.3T
AOAC 2007.01	Mix II	6000 mg $MgSO_4$, 1500 mg NaOAc	Individually weighed aluminum packets (Sticks), including 50 mL empty centrifuge tubes	50	730971.3T
AOAC 2007.01	Mix II	6000 mg $MgSO_4$, 1500 mg NaOAc	Individually weighed in aluminum packets (Sticks)	50	730971.3
Original	Mix XII	4000 mg $MgSO_4$, 1000 mg NaCl	Individually weighed in aluminum packets (Sticks)	50	730648.3
Original	Mix XII	4000 mg $MgSO_4$, 1000 mg NaCl	Individually weighed aluminum packets (Sticks), including 50 mL empty centrifuge tubes	50	730648.3T
Original	Mix XII	6000 mg $MgSO_4$, 1500 mg NaCl	Individually weighed in aluminum packets (Sticks)	50	730989.3
Original	Mix XII	6000 mg $MgSO_4$, 1500 mg NaCl	Individually weighed aluminum packets (Sticks), including 50 mL empty centrifuges tubes	50	730989.3T
15 mL centrifuge tube (PP) with screw cap (PE)					
EN 15662	Mix I	4000 mg $MgSO_4$, 1000 mg NaCl, 500 mg Na_2H citrate x 1.5 H_2O, 1000 mg Na_3 citrate x H_2O	15 mL	50	730970
EN 15662	Mix I	4000 mg $MgSO_4$, 1000 mg NaCl, 500 mg Na_2H citrate x 1.5 H_2O, 1000 mg Na_3 citrate x 2 H_2O	15 mL	100	730970.100
EN 15662	Mix I	8000 mg $MgSO_4$, 2000 mg NaCl, 1000 mg Na_2H citrate x 1.5 H_2O, 2000 mg Na_3 citrate x 2 H_2O	15 mL	100	730436.100
AOAC 2007.01	Mix II	1200 mg $MgSO_4$, 300 mg NaOAc	15 mL	50	730964
AOAC 2007.01	Mix II	6000 mg $MgSO_4$, 1500 mg NaOAc	15 mL	50	730971
Original	Mix XII	4000 mg $MgSO_4$, 1000 mg NaCl	15 mL	50	730648
Original	Mix XII	1000 mg $MgSO_4$, 250 mg NaCl	15 mL	50	730984
50 mL centrifuge tube (PP) with screw cap (PE)					
EN 15662	Mix I	4000 mg $MgSO_4$, 1000 mg NaCl, 500 mg Na_2H citrate x 1.5 H_2O, 1000 mg Na_3 citrate x 2 H_2O	50 mL	50	730970.1
AOAC 2007.01	Mix II	4000 mg $MgSO_4$, 1000 mg NaOAc	50 mL	50	730694.1
Original	Mix XII	4000 mg $MgSO_4$, 1000 mg NaCl	50 mL	50	730648.1

Ordering information

Clean-up mixes

Method	Mix No.	Content of mix	Volume	Quantity	REF
2 mL centrifuge tube (PP) with snap cap					
EN 15662	Mix III	150 mg $MgSO_4$, 25 mg CHROMABOND® Diamino	2 mL	50	730646.2
EN 15662	Mix IV	150 mg $MgSO_4$, 25 mg CHROMABOND® Diamino, 2.5 mg CHROMABOND® Carbon	2 mL	50	730850.2
EN 15662	Mix V	150 mg $MgSO_4$, 25 mg CHROMABOND® Diamino, 7.5 mg CHROMABOND® Carbon	2 mL	50	730358.2
EN 15662	Mix VI	150 mg $MgSO_4$, 25 mg CHROMABOND® Diamino, 25 mg CHROMABOND® C_{18} ec	2 mL	50	730858.2
EN 15662	Mix XI	150 mg $MgSO_4$, 50 mg CHROMABOND® C_{18} ec	2 mL	50	730983.2
EN 15662	Mix XV	150 mg $MgSO_4$, 100 mg CHROMABOND® C_{18} ec	2 mL	50	730987.2
AOAC 2007.01	Mix XVII	150 mg $MgSO_4$, 50 mg CHROMABOND® Diamino, 50 mg CHROMABOND® Carbon	2 mL	50	730996.2
AOAC 2007.01	Mix XIX	150 mg $MgSO_4$, 50 mg CHROMABOND® Diamino, 50 mg CHROMABOND® C_{18} ec	2 mL	50	730657.2
AOAC 2007.01, EN 15662	Mix XX	150 mg $MgSO_4$, 50 mg CHROMABOND® Diamino	2 mL	50	730670.2
AOAC 2007.01	Mix XLVII	150 mg $MgSO_4$, 50 mg CHROMABOND® Diamino, 50 mg CHROMABOND® Carbon, 50 mg CHROMABOND® C_{18} ec	2 mL	50	730843.2
15 mL centrifuge tube (PP) with screw cap (PE)					
EN 15662	Mix III	600 mg $MgSO_4$, 100 mg CHROMABOND® Diamino	15 mL	50	730980
EN 15662	Mix III	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino	15 mL	50	730972
EN 15662	Mix III	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino	15 mL	100	730972.100
EN 15662	Mix III	450 mg $MgSO_4$, 75 mg CHROMABOND® Diamino	15 mL	50	730992
EN 15662	Mix III	1200 mg $MgSO_4$, 200 mg CHROMABOND® Diamino	15 mL	100	730650.100
EN 15662	Mix IV	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino, 15 mg CHROMABOND® Carbon	15 mL	50	730973
EN 15662	Mix V	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino, 45 mg CHROMABOND® Carbon	15 mL	50	730975
EN 15662	Mix V	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino, 45 mg CHROMABOND® Carbon	15 mL	100	730975.100
EN 15662	Mix VI	450 mg $MgSO_4$, 75 mg CHROMABOND® Diamino, 75 mg CHROMABOND® C_{18} ec	15 mL	50	730155
EN 15662	Mix VI	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino, 150 mg CHROMABOND® C_{18} ec	15 mL	50	730974
EN 15662	Mix VI	900 mg $MgSO_4$, 150 mg CHROMABOND® Diamino, 150 mg CHROMABOND® C_{18} ec	15 mL	100	730974.100
AOAC 2007.01	Mix XVII	1200 mg $MgSO_4$, 400 mg CHROMABOND® Diamino, 400 mg CHROMABOND® Carbon	15 mL	50	730842

CHROMABOND® QuEChERS

Ordering information

AOAC 2007.01	Mix XIX	1200 mg $MgSO_4$, 400 mg CHROMABOND® Diamino, 400 mg CHROMABOND® C_{18} ec	15 mL	50 730669
AOAC 2007.01	Mix XIX	150 mg $MgSO_4$, 50 mg CHROMABOND® Diamino, 50 mg CHROMABOND® C_{18} ec	15 mL	50 730657
AOAC 2007.01, EN 15662	Mix XX	1200 mg $MgSO_4$, 400 mg CHROMABOND® Diamino	15 mL	50 730658
	Mix XXXVI	180 mg $MgSO_4$, 40 mg CHROMABOND® Diamino	15 mL	50 730963
AOAC 2007.01	Mix XLVII	1200 mg $MgSO_4$, 400 mg CHROMABOND® Diamino, 400 mg CHROMABOND® Carbon, 400 mg CHROMABOND® C_{18} ec	15 mL	50 730845
	Mix XLIX	1200 mg $MgSO_4$, 400 mg CHROMABOND® Diamino, 45 mg CHROMABOND® Carbon, 400 mg CHROMABOND® C_{18} ec	15 mL	50 7300000
	Mix M1	Special clean-up-mix for mycotoxin analysis, 1300 mg special sorbent blend	15 mL	50 730779

Presented by

KATEN200134 CHROMABOND® QuEChERS en4 / 1 / 5 / 05.2022

Management System EN ISO 13485:2016 ISO 9001:2015
TÜVRheinland CERTIFIED
www.tuv.com ID 9000008338

MACHEREY-NAGEL GmbH & Co. KG
Valencienner Str. 11
52355 Düren · Germany

DE Tel.: +49 24 21 969-0 info@mn-net.com
CH Tel.: +41 62 388 55 00 sales-ch@mn-net.com
FR Tel.: +33 388 68 22 68 sales-fr@mn-net.com
US Tel.: +1 888 321 62 24 sales-us@mn-net.com