Automatisation of the cleanup step of multiresidue methods in LC-MS for high fat content commodities

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1. Aim and scope

This document compares the effectiveness of various clean-up procedures. It also evaluates the implementation of automated µSPE (micro-solid phase extraction) method alongside a manual dispersive clean-up approach. The goal is to analyze 264 pesticide residues in diverse fat matrices using liquid chromatography. This combined approach aims to achieve increased sample throughput while minimizing manual labor involved in the experiment.

2. Short description

QuEChERS method for the analysis of pesticide residues introduced the use of dispersive solid-phase extraction clean-up (dSPE). This step removes unwanted matrix components (like co-extracted compounds) that can interfere with analysis. However, dSPE is time-consuming and requires selection of the most adequate sorbents for specific matrices (e.g., Z-Sep for high-oil content or EMR with Polish). Therefore, developing a unified automated clean-up procedure could significantly reduce analysis time and laboratory workload.

This study compared manual dSPE with automated µSPE workflows for cleaning extracts of olives, avocado, and various spices (paprika and curry). Both methods employed QuEChERS extraction for a target list of 264 pesticides.

To account for the varying fat content in 100 grams (around 12.5 g in olives, 12 g in avocado, 13 g in paprika, and 15 g in curry) [1], different clean-up procedures were evaluated (Table 1):

Table 1: Clean-up procedures evaluated in this study.

Sorbent	Amount	Format	Automatisation
anhydrous $MgSO_4$/PSA/C18/CarbonX	20/12/12/1 mg	µSPE	✓
EMR	30 mg	µSPE	✓
EMR	15 mg	µSPE	✓
C18	15 mg	µSPE	✓
anhydrous $MgSO_4$/Zsep	750/175 mg	dSPE (avocado)	
EMR-Lipid/EMR Lipid Polish	1000 mg / 2000 mg (anhydrous $MgSO_4$/NaCl (4:1))	dSPE (spices)	

All samples were analyzed by liquid chromatography-tandem mass spectrometry (LC-MS/MS). The results from both clean-up procedures were compared in terms of extract cleanliness, performance, interferences, and workflow efficiency.

[1] Spanish Food Composition Database. https://www.bedca.net/bdpub/ (Access in May 2024)

3. Experimental

3.1. Sample treatment

The samples were extracted using the QuEChERS method. The general experimental procedure was as follows:

1. Weigh 10 g (olives and avocado) or 2 grams (paprika and curry) of sample in a 50-mL PTFE centrifuge tube.
2. Add 7 mL H_2O and shake manually for 3 sec (only for spices).
3. Add 10 mL acetonitrile.
4. Shake the sample in an axial agitator (Agitax) for 6 minutes.
5. Add 4 g anhydrous magnesium sulphate, 1 g sodium chloride, 1 g trisodium citrate dihydrate and 0.5 g disodium hydrogencitrate sesquihydrate and shake manually (3 sec).
6. Shake the sample in an axial agitator (Agitax) for 6 minutes.
7. Centrifuge the tubes at 4000 rpm for 5 min.
8. Take an aliquot of the supernatant for the µSPE experiments.

The **dSPE clean-up** procedure was adapted to each matrix, as described below.

Olives and avocado:

1. Transfer 5 mL of the supernatant to a 15-mL PFTE centrifuge tube containing 750 mg of anhydrous magnesium sulfate and 175 mg of Z-Sep and vortex for 30 sec
2. Centrifuge the tubes at 4000 rpm for 5 min.
3. Transfer the supernatant to a 4-mL vial.

Spices:

1. Transfer 5 mL of the supernatant to an EMR-Lipid tube previously conditioned with 5 mL of water and vortex for 30 sec.
2. Centrifuge the tubes at 4000 rpm for 5 min.
3. Transfer 5 mL of the supernatant to a Polish tube and vortex for 30 sec.
4. Centrifuge the tubes at 4000 rpm for 5 min.
5. Transfer the supernatant to a 4-mL vial.

For the injection vial preparation, the calibration curve is also subjected to µSPE clean up and the resulting extracts of µSPE were five-fold diluted with Optima® water (with dimethoate-d6 as injection standard) for olives and avocado; ten-fold dilution for spices. For the vial corresponding to the extracts subjected to dSPE clean-up, the calibration curve is prepared by adding aliquots of the mix to the matrix blank, considering that the proportion of matrix is the same as in the vials mentioned above.

3.2. Automated µSPE

µSPE cartridges (**Figure 1**) were employed to perform an automated clean-up procedure which was then compared to the manual dispersive clean-up methods.

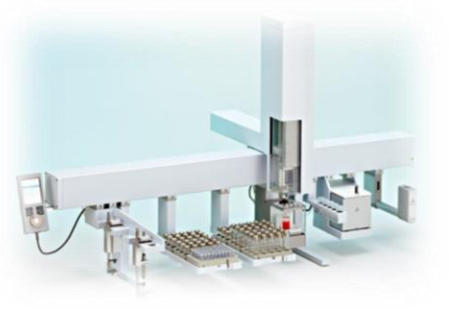

Figure 1: Robot for automated sample treatment.

The following simple **workflow was optimized for $MgSO_4$/PSA/C18/CarbonX** (**Table 2**):

a) the vial was prepared with 200 µL of raw extract without clean-up and 50 µL of ACN (for recoveries samples) or corresponding standard mix (for calibration line).

b) The process carried out by the robot was: first, the cartridges were pre-conditioned with 100 µL acetonitrile prior to sample loading. Then, 200 µL of each sample raw extracts were loaded into the cartridge at 5 µL/sec and the clean extract was collected into a 2-mL vial with a pre-cut septum cap. Then, the cartridges were eluted with 100 µL acetonitrile (5% formic acid).

And **workflow for EMR cartridges and C18 cartridges** (**Table 2**):

a) the vial was prepared with 150 µL of raw extract without clean-up and 50 µL of ACN (for recoveries samples) or corresponding standard mix (for calibration line).

B) The process carried out by the robot was: first, the cartridges were pre-conditioned with 100 µL (acetonitrile (20% H_2O) for EMR and with acetonitrile for C18) prior to sample loading. Then, 150 µL of each sample raw extracts were loaded into the cartridge at 5 µL/sec and the clean extract was collected into a 2-mL vial with a pre-cut septum cap.

Finally, the preparation of injection vials was as follows:

- **$MgSO_4$/PSA/C18/CarbonX cartridges:** 100 µL of the clean-up extract were mixed with 400 µL of Optima® water (dilution 1:5) (for olives and avocado) or with 900 µL of Optima® water (for spices)
- **EMR cartridges and C18 cartridges:** 71 µL of the clean-up extract were mixed with 29 µL of acetonitrile and 400 µL of Optima® water (dilution 1:5) (for olives and avocado) or with 900 µL of Optima® water (for spices)
- **dSPE:** 53 µL of the clean-up extract were mixed with 47 µL of acetonitrile and 400 µL of Optima® water (dilution 1:5) (for olives and avocado) or with 900 µL of Optima® water (for spices)

In this way, the matrix-solvent ratio remains consistent regardless of the cleaning method used. This consistency is crucial because, in the $MgSO_4$/PSA/C18/CarbonX workflow, a dilution occurs when eluting with 100 µL of ACN (5% formic acid). This elution is essential for evaluating acidic compounds, as demonstrated in the document: Cost-benefit analysis of not applying a clean-up step and an evaluation of the negative effects of clean-up sorbents on the analytes

Table 2: Automated µSPE workflows for the different cartridges

WORKFLOW (µSPE CLEAN-UP)		
CARTRIDGE COMPOSITION	**EMR or C18**	**$MgSO_4$/PSA/C18/CarbonX**
PRE-CONDITION OF THE CARTRIDGE	100 µL of ACN (20% H_2O only EMR)	100 µL of ACN
SAMPLE VOLUME	150 µL	200 µL
ELUTION	Not applied	100 µL ACN (5% formic acid)

3.3. Analysis by LC-QqQ-MS/MS

All samples were analyzed by LC operating in multiple reaction monitoring mode (MRM). Selected reaction monitoring (SRM) experiments were carried out to obtain the maximum sensitivity for the detection of the target molecules. For confirmation of the studied compounds, two SRM transitions and a correct ratio between the abundances of the two optimised SRM transitions (SRM2/SRM1) were used, along with retention time matching. The mass transitions used are presented in **Appendix I (Table 1).**

Instrumentation and analytical conditions for the LC- MS/MS system

- Column: Zorbax Eclipse Plus C8 2.1x100 mm and 1.8 µm particle size
- Mobile phase A: Water (0.1 % formic acid, 5 mM ammonium formate, 2 % MeOH)
- Mobile phase B: Methanol (0.1 % formic acid, 5 mM ammonium formate, 2 % water)
- Column temperature: 35 °C
- Flow rate: 0.3 ml/min
- Injection volume: 5 µL
- Autosampler temperature: 12 °C

Mobile phase gradient for pesticides analysis (**Figure 2**):

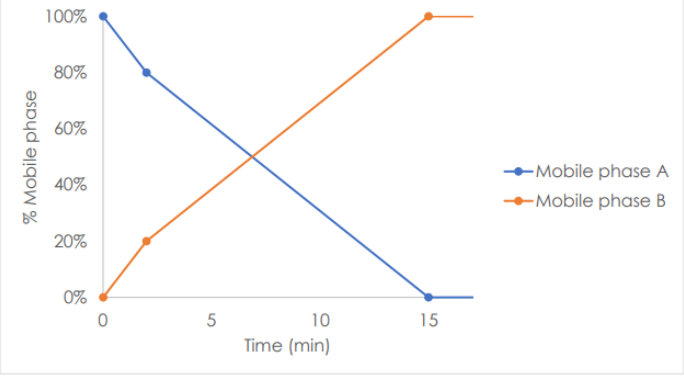

Figure 2: Elution gradient of LC-MS/MS method. Mobile phase gradient used. A (Water (0.1 % formic acid, 5 mM ammonium formate, 2 % MeOH)) and B (Methanol (0.1 % formic acid, 5 mM ammonium formate, 2 % water))

Triple quadrupole system

- Ionisation mode: Positive and negative
- Capillary (positive and negative): 3000 V
- Nebulizer: 45 psi

- Nozzel: 400 V
- Drying gas flow: 13 L/min
- Drying gas temperature: 120 °C
- Sheat gas flow: 10 L/min
- Sheat gas temperature: 375 °C
- High Pressure RF (Positive): 150 V
- High Pressure RF (Negative):110 V
- Low Pressure RF (Positive): 60 V
- Low Pressure RF (Negative): 60 V

4. Results and discussion

4.1. TICs and extract appearance

To compare the Total Ion Current (TIC) of both methods, dSPE blank extracts (considering the µSPE dilution) and µSPE blank extracts were injected in *full scan* mode **(Figure 3- Figure 6)**.

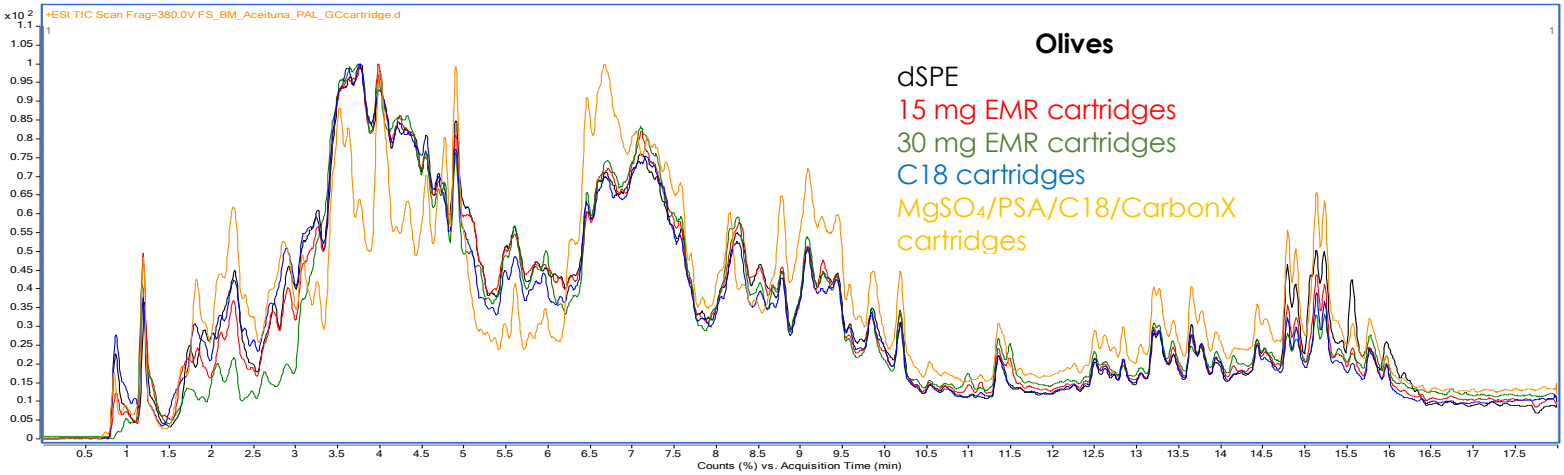

Figure 3: Total Ion Current (TIC) of blank olives with different clean-ups

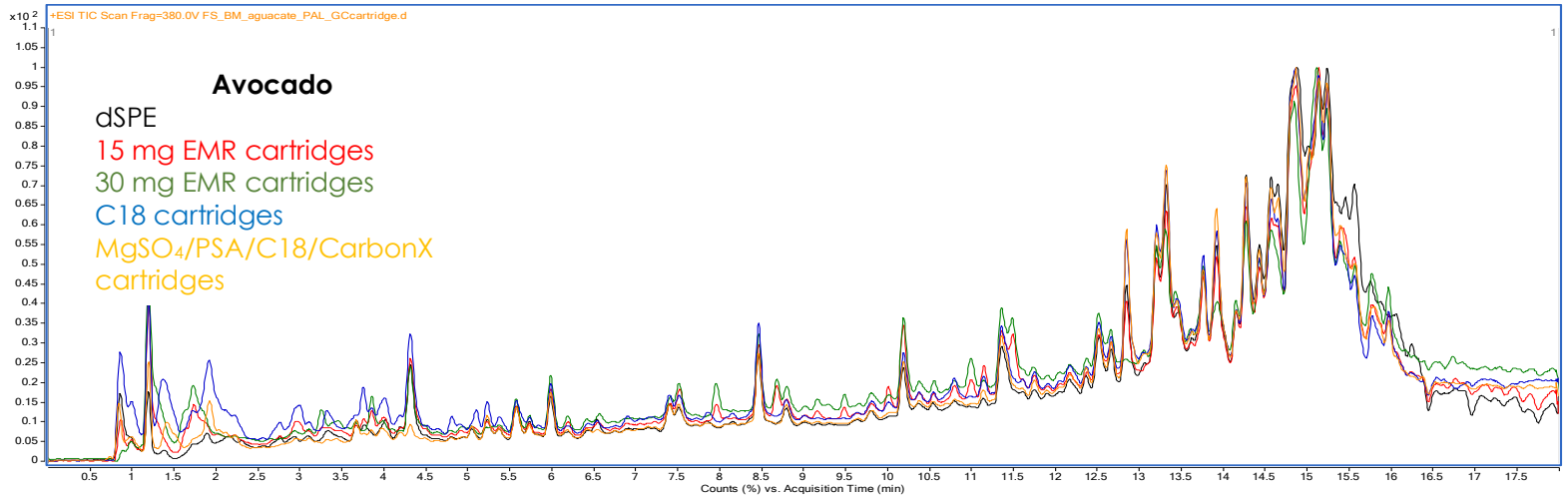

Figure 4: Total Ion Current (TIC) of blank avocado with different clean-ups

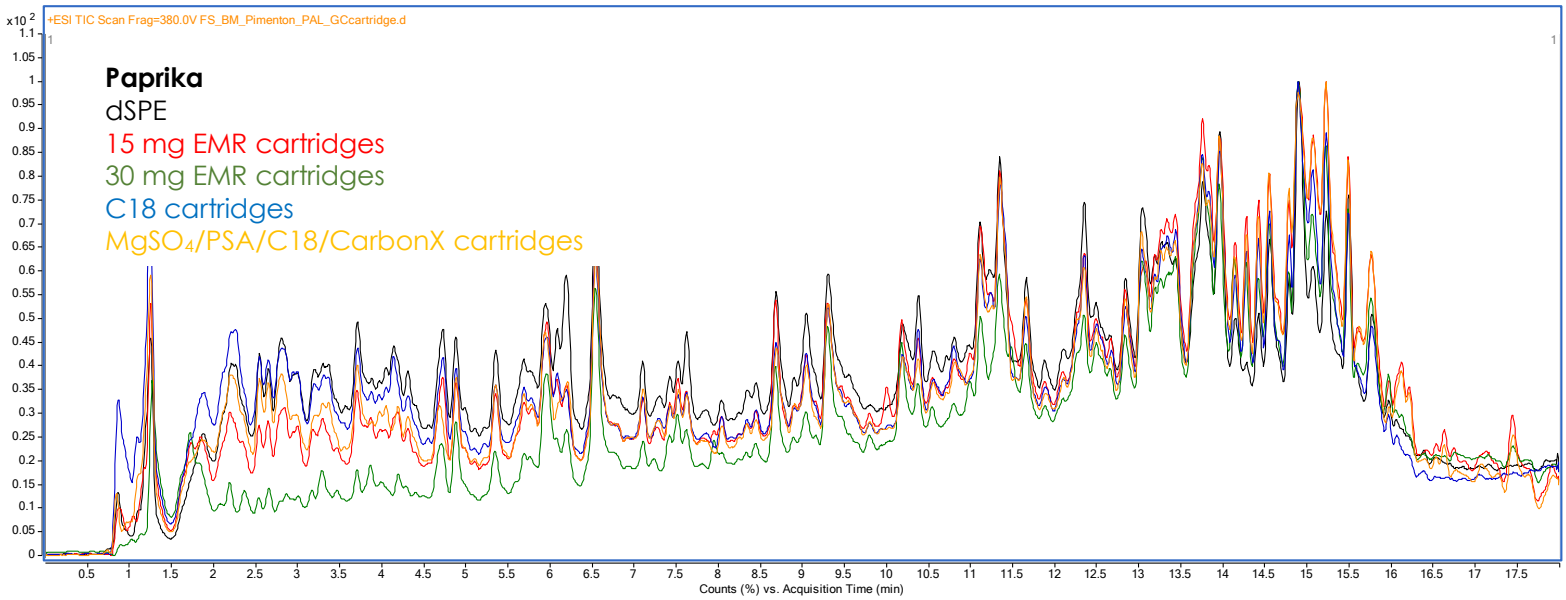

Figure 5: Total Ion Current (TIC) of blank paprika with different clean-ups

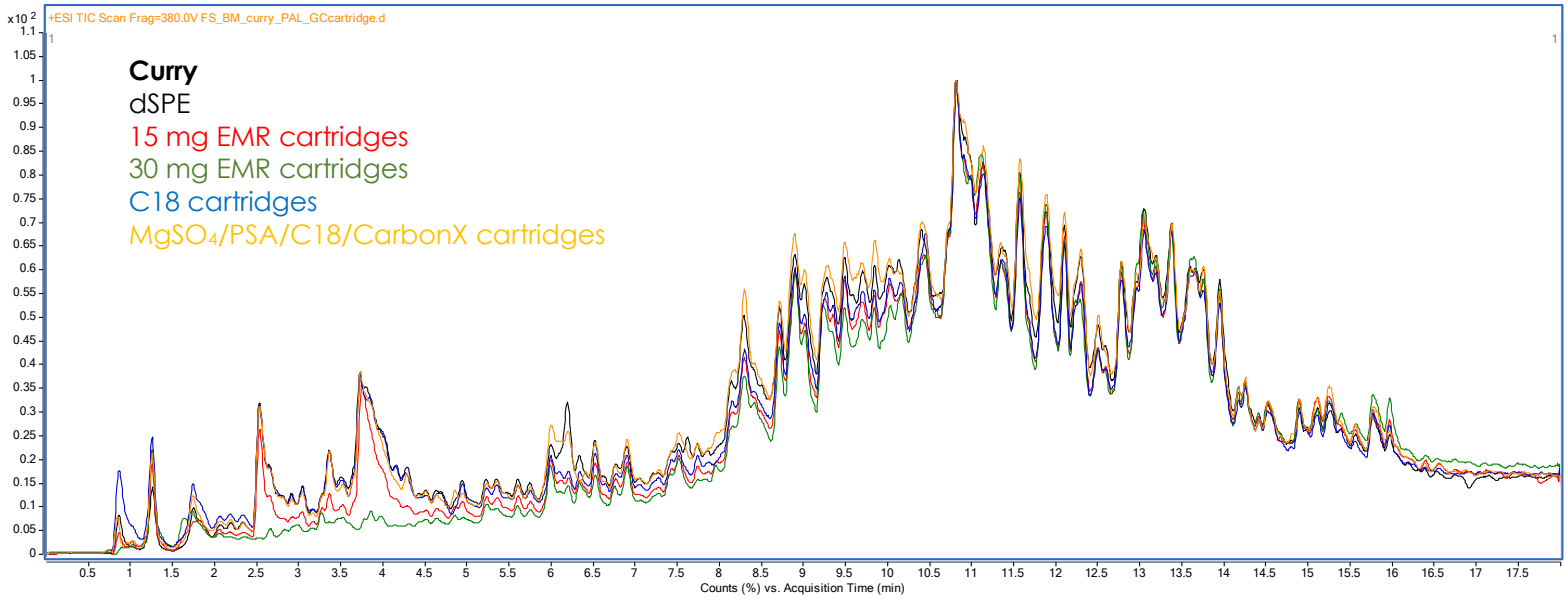

Figure 6: Total Ion Current (TIC) of blank curry with different clean-ups

At first glance, differences can be seen between the baselines obtained as well as in the appearance of the extracts (**Figures 7 and 8**), however, it is important to evaluate the recoveries and the presence of interferents.

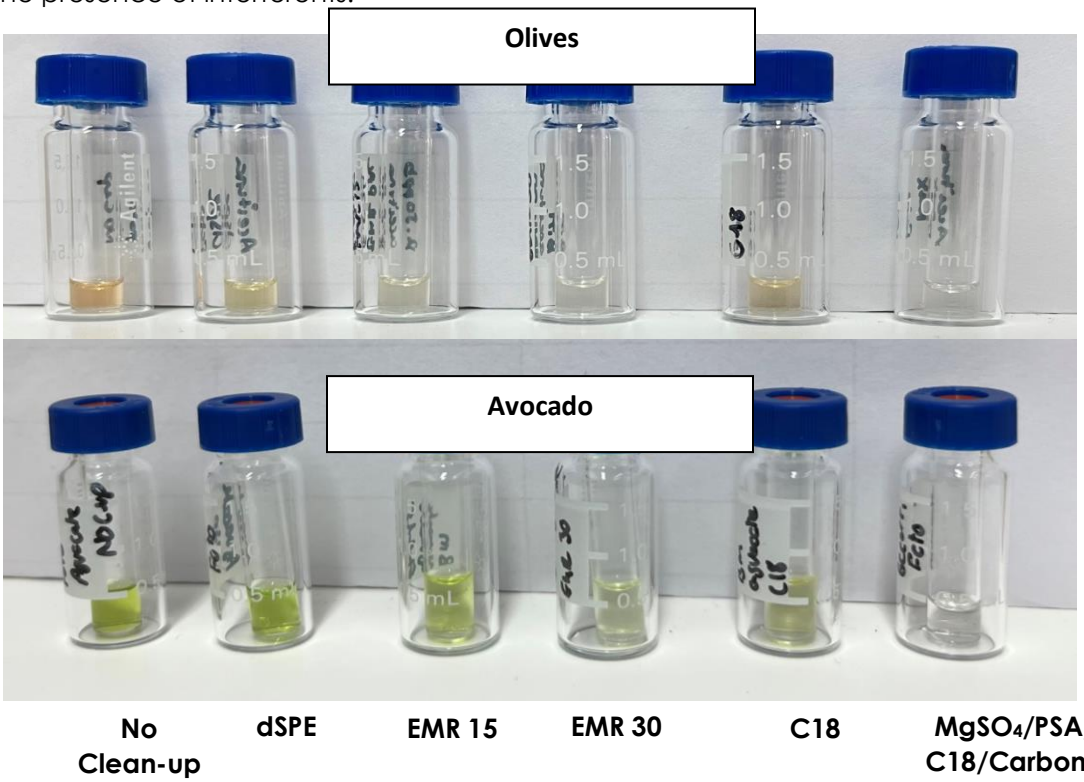

Figure 7: Top: olives extracts; Bottom: avocado extracts. From left to right, extracts without clean-up, with dSPE, µSPE EMR 15 mg, µSPE EMR 30 mg, µSPE C18, and µSPE $MgSO_4$/PSA/C18/CarbonX.

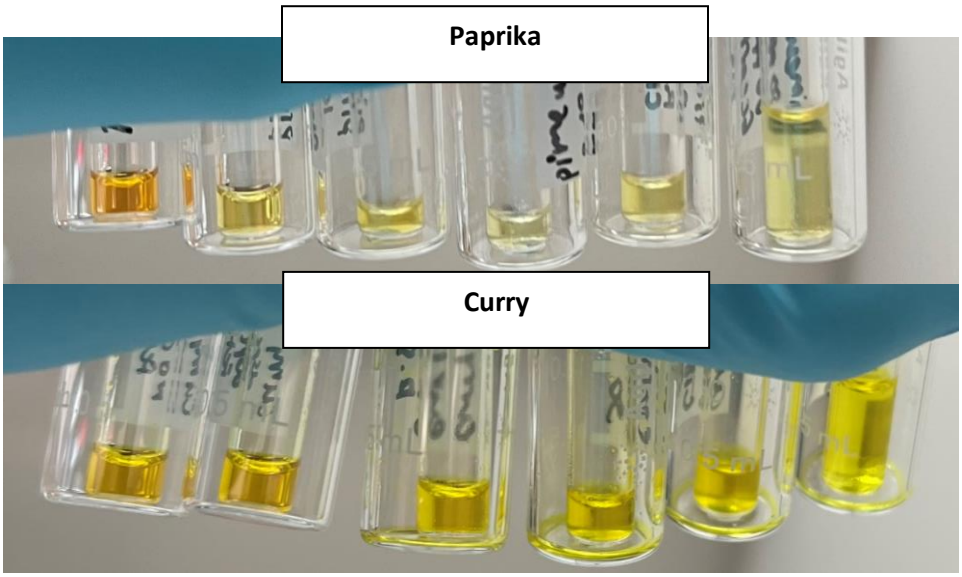

Figure 8: Top: paprika extracts; Bottom: curry extracts. From left to right, extracts without clean-up, with dSPE, µSPE EMR 15 mg, µSPE EMR 30 mg, µSPE C18 and µSPE $MgSO_4$/PSA/C18/CarbonX.

4.2. Apparent recoveries

Apparent recoveries were studied for each matrix at 10 µg/kg, although for spices the studied level was 50 µg/kg, since the majority of MRLs in spices are set at this concentration.

Olives

Figure 9 shows the number of compounds with recoveries in different recovery ranges (see also **Appendix I: Table 2**). In all cases, the number of compounds with recoveries between 60-140 % is similar but it is important to highlight that when the $MgSO_4$/PSA/C18/CarbonX cartridges were used, there were no recoveries above 140% and no cases of undetected qualifiers or strong signal suppression.

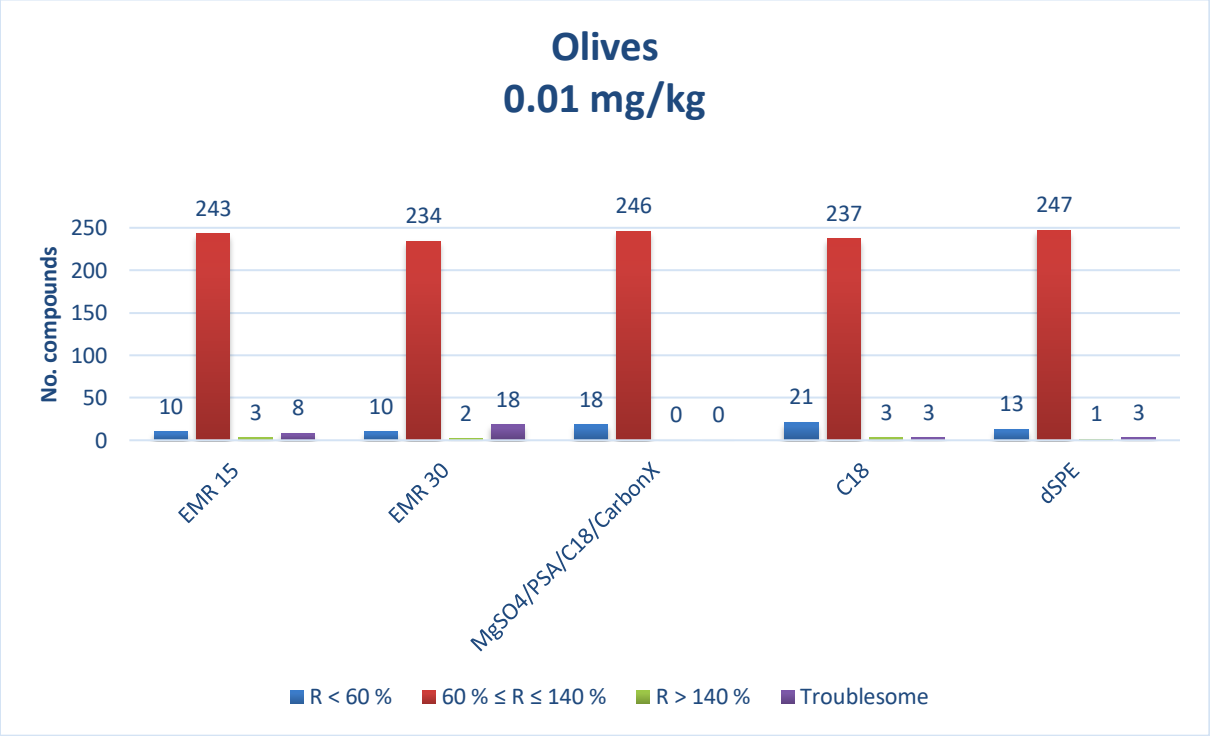

Figure 9. Classification of compounds in different apparent recoveries ranges for olives spiked at 10 µg/kg.

Figure 10 and 11 show examples of two troublesome compounds and how their problems are solved using a cartridge containing MgSO4/PSA/C18/CarbonX. **Figure 10** illustrates the qualifier transition ion for butoxycarboxim, where significant signal suppression is observed. In the TIC, the lowest baseline indicates an area where the signal does not suffer from suppression effects. **Figure 11** corresponds to thiamethoxam, where both ion transitions (quantifier and qualifier) experience high signal suppression. However, using the specified cartridge, signal suppression is reduced, enabling identification of the compound. In this case, a zoomed view of the TIC also shows a lower baseline in the retention time area of thiamethoxam.

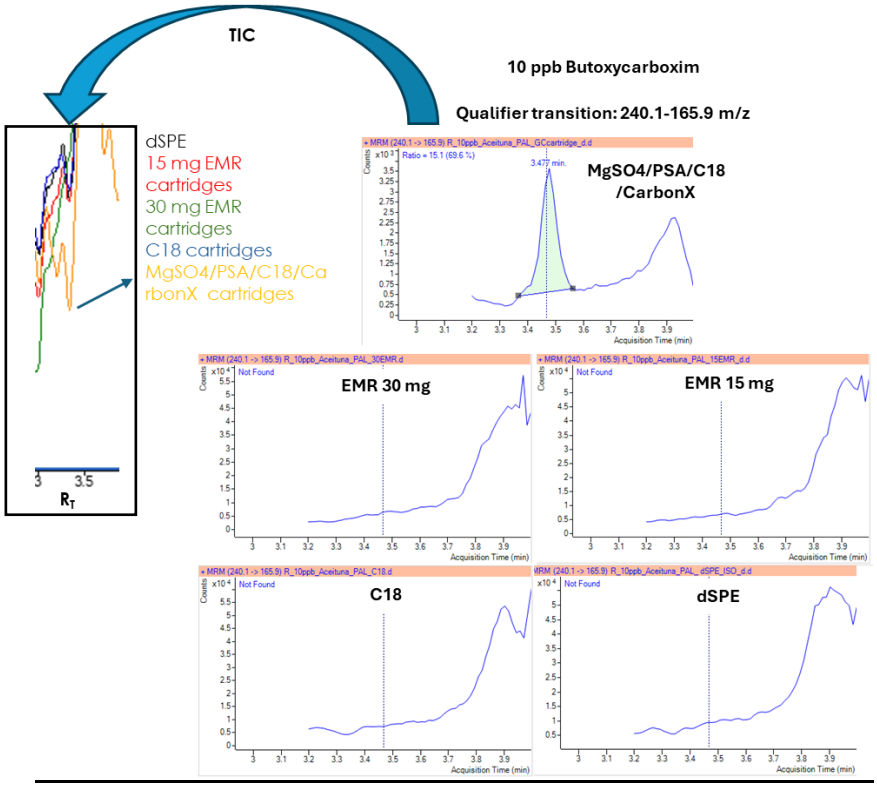

Figure 10: Butoxycarboxim at 10 ppb in olives.

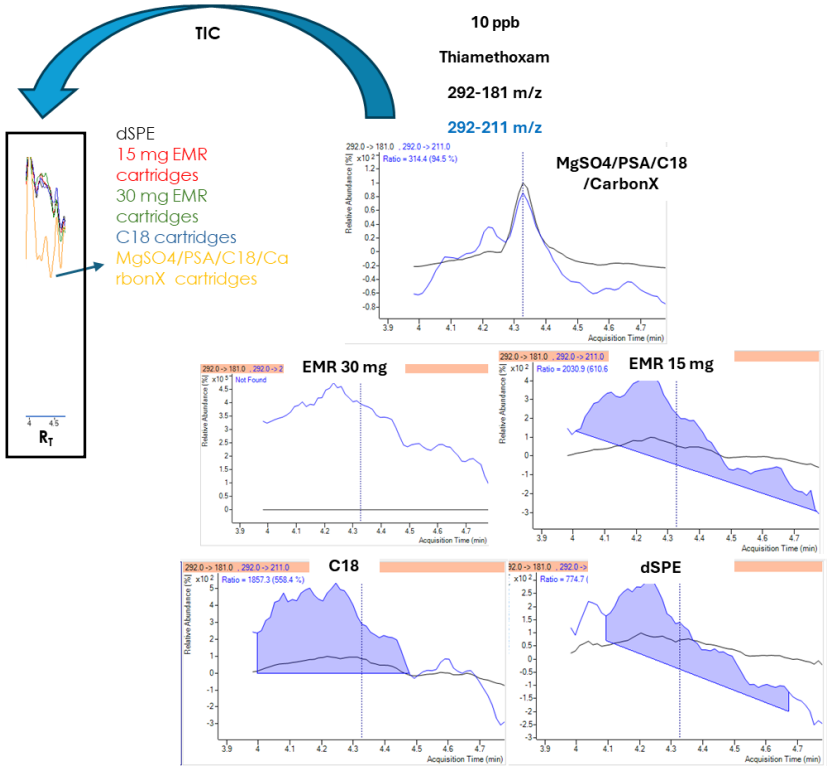

Figure 11: Thiamethoxam at 10 ppb in olives.

Avocado

Figure 12 shows the number of compounds with recoveries in different recovery ranges (see also **Appendix I: Table 3**). In all cases, the number of compounds with recoveries between 60-140 % is similar but it is important to highlight that when the $MgSO_4$/PSA/C18/CarbonX cartridges were used, there were no recoveries above 140% and no cases of undetected qualifiers or strong signal suppression.

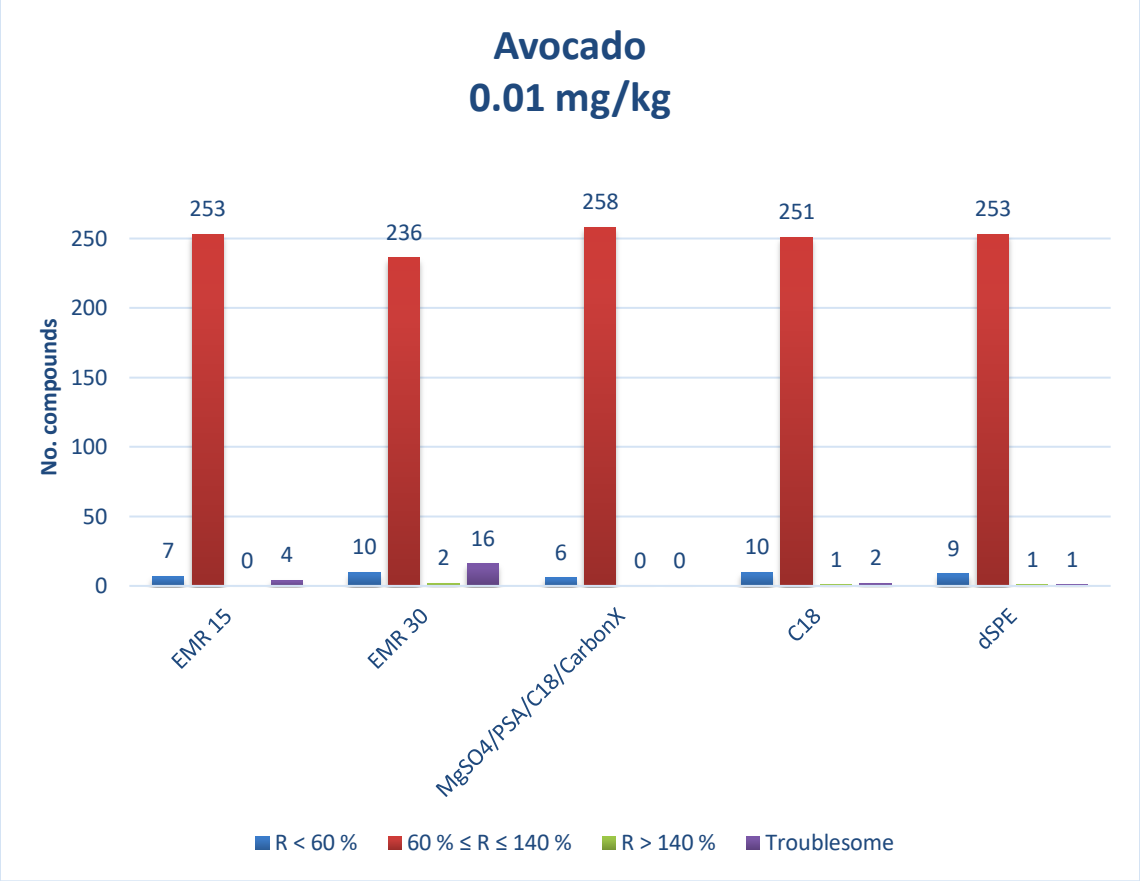

Figure 12. Classification of compounds in different apparent recoveries ranges for avocado spiked at 10 µg/kg.

Figure 13 illustrates a challenge in identifying a compound. In this case, fludioxonil was the target, and the best qualifier ion transition for its detection was achieved using a cartridge containing $MgSO_4$/PSA/C18/CarbonX. Although the lowest baseline in the TIC was obtained with dSPE, this method did not produce a good signal for the qualifier ion.

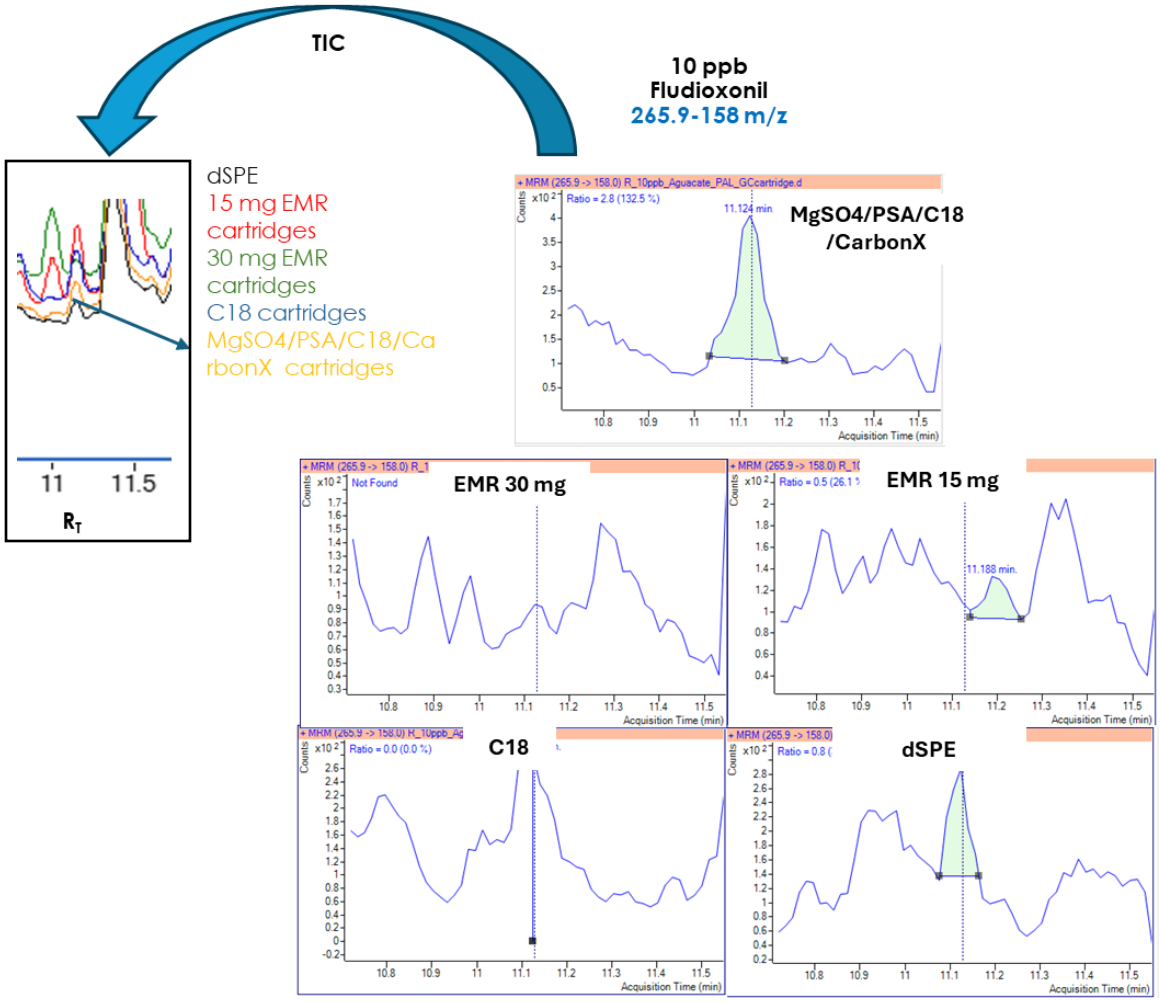

Figure 13: Fludioxonil at 10 ppb in avocado.

Paprika

Figure 14 shows the number of compounds with recoveries in different recovery ranges (see also **Appendix I: Table 4**). The number of compounds with recoveries between 60-140 % is higher when $MgSO_4$/PSA/C18/CarbonX cartridges were used, and there were no troublesome compounds at 50 µg/kg (not detected qualifier or signal suppression).

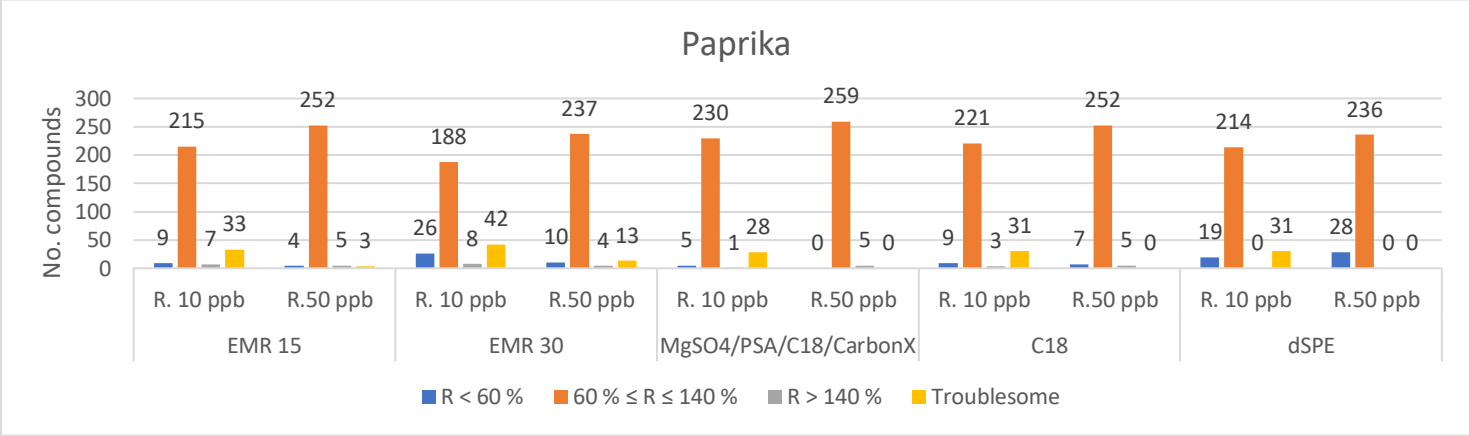

Figure 14: Classification of compounds in different apparent recoveries ranges for paprika spiked at 10 µg/kg and 50 µg/kg.

Figure 15 shows the example of a matrix interference in the blank; in this case the interferent was not removed with EMR sorbent, which caused a problem for the identification of the compound carbofuran, since the interferent coeluted with the qualifier ion transition of the analyte.

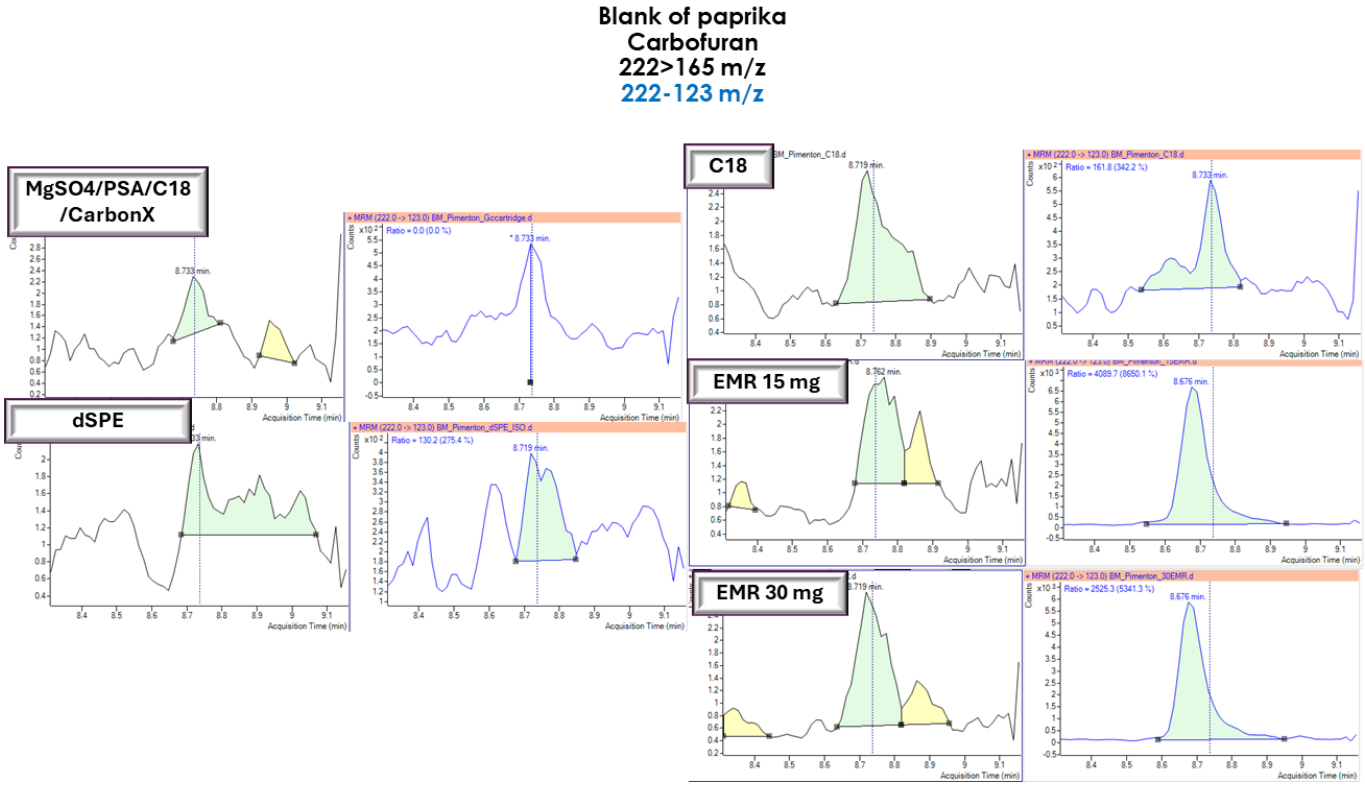

Figure 15: Blank of matrix interference in paprika for the compound carbofuran.

Curry

Figure 16 shows the number of compounds with recoveries in different recovery ranges (see also **Appendix I: Table 5**). The number of compounds with recoveries between 60-140 % is similar when using $MgSO_4$/PSA/C18/CarbonX or C18 cartridges or dSPE.

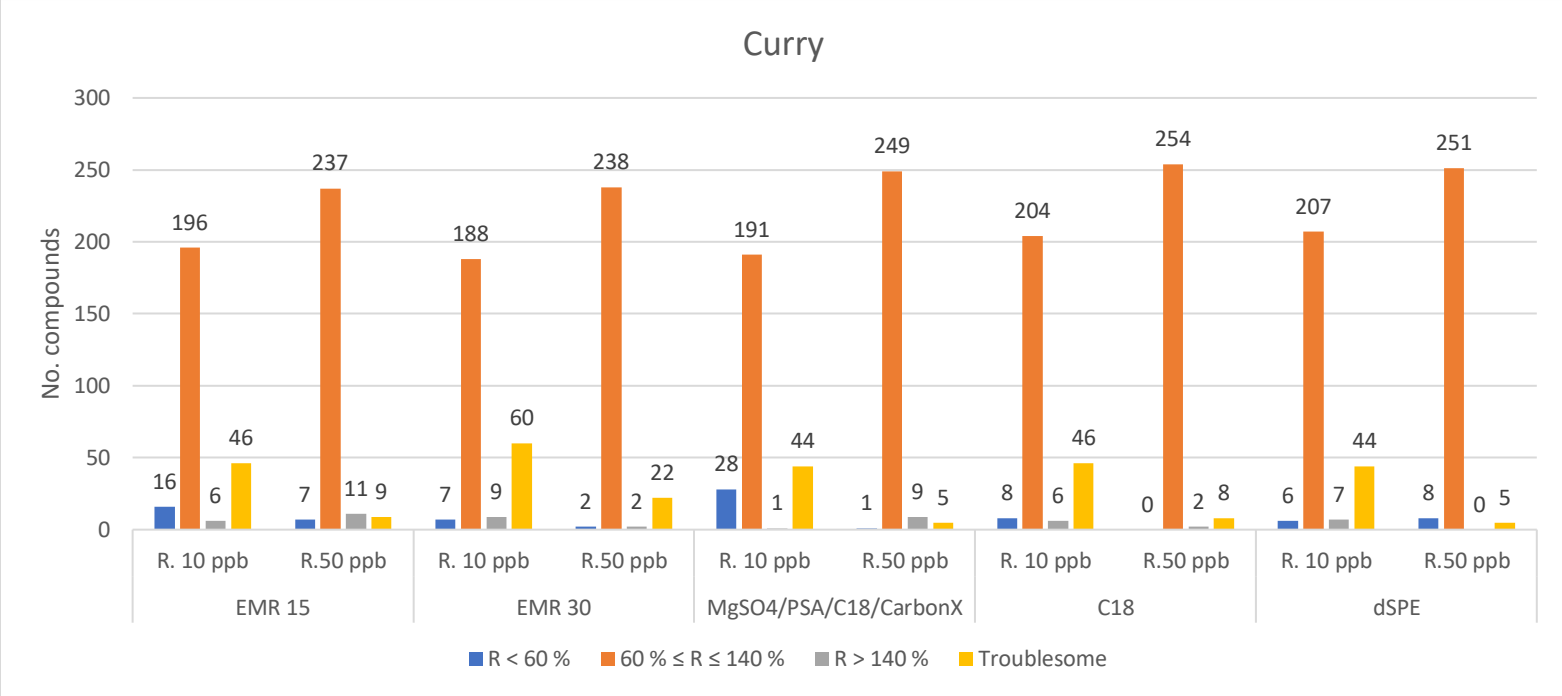

Figure 16: Classification of compounds in different apparent recoveries ranges for curry spiked at 10 µg/kg and 50 µg/kg.

If we focus on one of the problematic compounds in curry, in this case boscalid (**Figure 17**), we can see that quantification is only possible with the $MgSO_4$/PSA/C18/CarbonX cartridges.

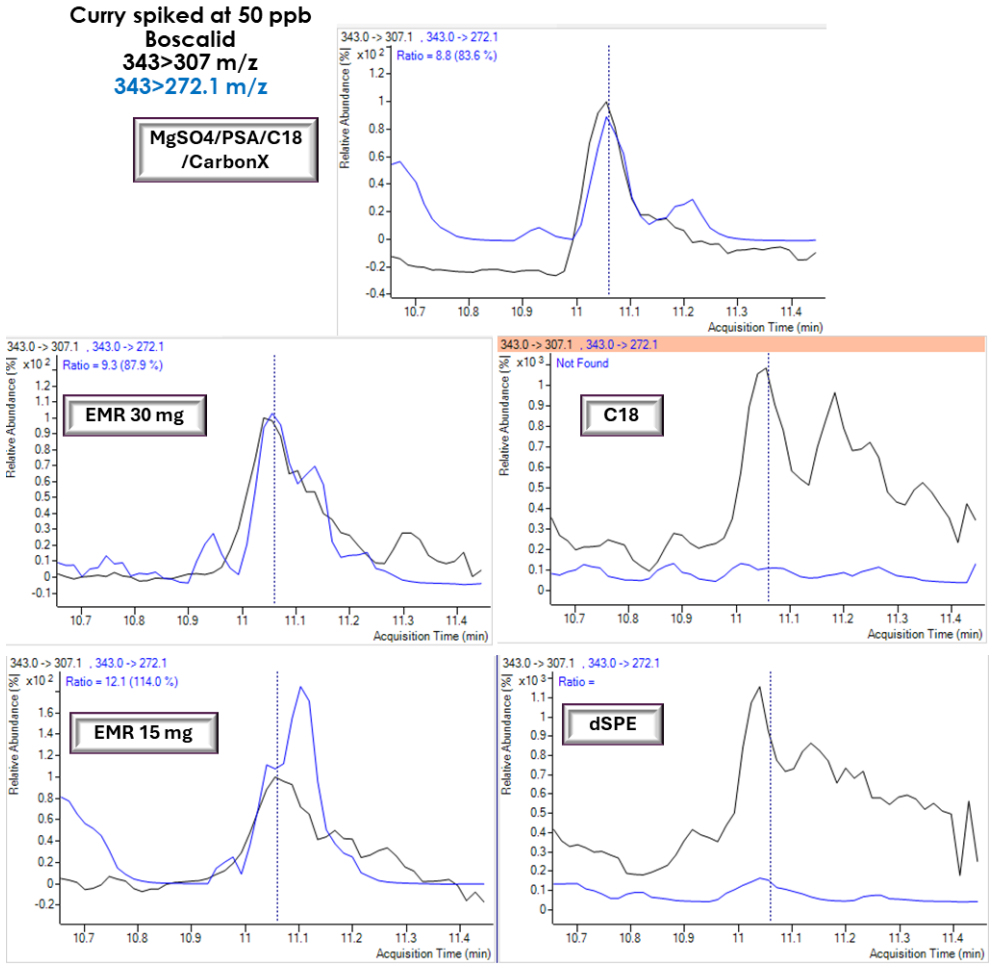

Figure 17: Boscalid in curry spiked at 50 µg/kg

5. Conclusions

In this report, various µSPE clean-up cartridges and dSPE were compared. Across all studied cases, approximately 90% of the compounds were recovered within a range of 60-140% in the analyzed matrices. Automation has the advantage of standardizing the clean-up process for these types of matrices. Notably, the cartridges $MgSO_4$/PSA/C18/CarbonX and C18 achieved the highest recovery rates of compounds in the mentioned range (Table 3):

Table 3: Percentage of compounds in recovery range 60-140%

Matrix	$MgSO_4$/PSA/C18/CarbonX	C18	EMR 15 mg	EMR 30 mg	dSPE
Olives	**94**	90	92	89	**94**
Avocado	**98**	95	96	89	96
Paprika	**98**	95	95	90	89
Curry	94	**96**	90	90	95

Improvements were observed with the $MgSO_4$/PSA/C18/CarbonX cartridge for certain compounds that exhibited interferences in specific matrices; this cartridge effectively minimized the presence of interferents. Additionally, cartridges with EMR retained compounds, such as dodine.

Implementing an automated µSPE clean-up workflow significantly reduces laboratory workload and increases sample throughput in routine analyses by eliminating the manual clean-up process, often the most time-consuming step in any extraction method. Furthermore, obtaining cleaner extracts can positively impact instrument maintenance, extending the lifespan of critical components like the ion source and columns.

APPENDIX I: MASS TRANSITIONS AND VALIDATION RESULTS

Table 1. Detection and chromatographic parameters for the compounds analyzed by LC-MS/MS.

Compound Name	Precursor Ion (m/z)	Product Ion (m/z)	Ret Time (min)	Fragmentor (V)	Collision Energy (eV)	Polarity
Acephate	184	143	2.816	380	5	Positive
Acephate	184	125	2.816	380	15	Positive
Acetamiprid	223	126	6.041	380	20	Positive
Acetamiprid	223	56	6.041	380	15	Positive
Alachlor	270.1	238.1	11.865	380	10	Positive
Alachlor	270.1	162	11.865	380	20	Positive
Albendazole	266.2	234.1	10.104	380	15	Positive
Albendazole	266.2	191	10.104	380	20	Positive
Aldicarb-sulfone	239.9	223	3.653	380	5	Positive
Aldicarb-sulfone	239.9	86	3.653	380	20	Positive
Ametoctradin	276.2	176.1	12.991	380	35	Positive
Ametoctradin	276.2	149	12.991	380	35	Positive
Anilofos	368.1	198.7	12.521	380	10	Positive
Anilofos	368.1	170.9	12.521	380	20	Positive
Atrazine	216.2	173.8	9.766	380	15	Positive
Atrazine	216.2	131.9	9.766	380	20	Positive
Azinphos-ethyl	368	160.1	11.63	380	10	Positive
Azinphos-ethyl	368	131.9	11.63	380	15	Positive
Azinphos-methyl	318	261	10.364	380	0	Positive
Azinphos-methyl	318	132.1	10.364	380	8	Positive
Azoxystrobin	404	372	10.749	380	10	Positive
Azoxystrobin	404	344	10.749	380	20	Positive
BAC 10	276.2	184.3	11.446	380	20	Positive
BAC 10	276.2	90.8	11.446	380	25	Positive
BAC 8	248.3	156.2	9.792	380	15	Positive
BAC 8	248.3	91.2	9.792	380	35	Positive
Benalaxyl	326.2	208	12.579	380	15	Positive
Benalaxyl	326.2	148	12.579	380	15	Positive
Bendiocarb	224.1	166.7	8.717	380	5	Positive
Bendiocarb	224.1	109.1	8.717	380	20	Positive
Benzovindiflupyr	398	377.9	12.483	380	10	Positive
Benzovindiflupyr	398	342	12.483	380	15	Positive
Bifenazate	301.1	198.2	11.567	380	10	Positive
Bifenazate	301.1	169.9	11.567	380	20	Positive
Bifenazate-diazene	299.2	213.2	12.865	380	5	Positive

Bifenazate-diazene	299.2	183.9	12.865	380	26	Positive
Bitertanol	338.2	269.2	12.711	380	5	Positive
Bitertanol	338.2	99.1	12.711	380	10	Positive
Boscalid	343	307.1	11.057	380	16	Positive
Boscalid	343	272.1	11.057	380	32	Positive
Bromacil	261	204.8	8.606	380	25	Negative
Bromacil	261	81.1	8.606	380	25	Negative
Bromuconazole	378	159	11.827	380	20	Positive
Bromuconazole	378	70	11.827	380	20	Positive
Bupirimate	317	272	11.739	380	20	Positive
Bupirimate	317	166	11.739	380	20	Positive
Buprofezin	306	201	13.649	380	10	Positive
Buprofezin	306	116	13.649	380	15	Positive
Butoxycarboxim	240.1	222.7	3.595	380	5	Positive
Butoxycarboxim	240.1	165.9	3.595	380	5	Positive
Carbaryl	202	145	9.027	380	10	Positive
Carbaryl	202	127	9.027	380	20	Positive
Carbendazim	192	160	4.166	380	15	Positive
Carbendazim	192	132	4.166	380	20	Positive
Carbendazim-D3	195.1	159.8	4.155	380	20	Positive
Carbendazim-D3	195.1	131.9	4.155	380	20	Positive
Carbofuran	222	165	8.717	380	10	Positive
Carbofuran	222	123	8.717	380	15	Positive
Chlorantraniliprole	483.9	452.9	10.415	380	16	Positive
Chlorantraniliprole	483.9	285.9	10.415	380	8	Positive
Chlorbromuron	292.9	203.9	11.002	380	20	Positive
Chlorbromuron	292.9	181.9	11.002	380	15	Positive
Chlorfenvinphos	358.9	155	12.78	380	8	Positive
Chlorfenvinphos	358.9	99.2	12.78	380	28	Positive
Chlorfluazuron	540	382.9	14.307	380	20	Positive
Chlorfluazuron	540	158.1	14.307	380	15	Positive
Chloridazon	222.1	104.1	5.978	380	20	Positive
Chloridazon	222.1	92	5.978	380	20	Positive
Chlorotoluron	213.1	140	9.512	380	20	Positive
Chlorotoluron	213.1	72	9.512	380	20	Positive
Chloroxuron	291.2	217.8	11.476	380	20	Positive
Chloroxuron	291.2	71.9	11.476	380	20	Positive
Chlorpyrifos	352	200	13.791	380	20	Positive
Chlorpyrifos	349.93	198	13.791	380	20	Positive
Chlorpyrifos-methyl	321.9	289.9	12.86	380	14	Positive
Chlorpyrifos-methyl	321.9	125	12.86	380	16	Positive
Chromafenozide	395.2	339.1	11.873	380	5	Positive
Chromafenozide	395.2	174.9	11.873	380	10	Positive

Clofentezine	303	138	12.48	380	12	Positive
Clofentezine	303	102	12.48	380	40	Positive
Clomazone	240.1	127.8	10.544	380	10	Positive
Clomazone	240.1	124.9	10.544	380	20	Positive
Coumaphos	363	307	12.366	380	20	Positive
Coumaphos	363	227	12.366	380	28	Positive
Cyantraniliprole	474.9	444	9.259	380	15	Positive
Cyantraniliprole	474.9	285.8	9.259	380	25	Positive
Cyazofamid	325	261.2	11.915	380	10	Positive
Cyazofamid	325	108.1	11.915	380	15	Positive
Cyflufenamid	413	294.9	12.892	380	15	Positive
Cyflufenamid	413	240.8	12.892	380	15	Positive
Cyhalofop-butyl	375.1	256	13.119	380	15	Positive
Cyhalofop-butyl	375.1	120.1	13.119	380	15	Positive
Cymoxanil	199.1	128	6.437	380	4	Positive
Cymoxanil	199.1	110.9	6.437	380	12	Positive
Cyproconazole	292.1	125	11.52	380	32	Positive
Cyproconazole	292.1	70	11.52	380	16	Positive
Cyprodinil	226.2	92.9	11.666	380	40	Positive
Cyprodinil	226.2	76.9	11.666	380	40	Positive
DEET	192.1	119	10.042	380	15	Positive
DEET	192.1	91.1	10.042	380	20	Positive
Deltamethrin	522.9	280.8	14.505	380	10	Positive
Deltamethrin	520.9	278.7	14.505	380	10	Positive
Demeton-S-methyl	230.9	89.1	8.764	380	5	Positive
Demeton-S-methyl	230.9	61.1	8.764	380	20	Positive
Demeton-S-methylsulfone	263.02	169	4.401	380	12	Positive
Demeton-S-methylsulfone	263.02	109	4.401	380	24	Positive
Demeton-S-methylsulfoxide (Oxydemeton-methyl)	247	169	4.131	380	8	Positive
Demeton-S-methylsulfoxide (Oxydemeton-methyl)	247	109	4.131	380	24	Positive
Desethylterbuthylazine	202.1	146.1	9.06	380	15	Positive
Desethylterbuthylazine	202.1	110.1	9.06	380	20	Positive
Diazinon	305	169	12.598	380	15	Positive
Diazinon	305	153	12.598	380	20	Positive
Dichlorvos	220.8	108.8	8.563	380	15	Positive
Dichlorvos	220.8	78.9	8.563	380	30	Positive
Dichlorvos-D6	226.9	132.9	8.511	380	20	Positive
Dichlorvos-D6	226.9	115	8.511	380	20	Positive
Dicrotophos	238.09	112.1	5.154	380	8	Positive
Dicrotophos	238.09	72.1	5.154	380	28	Positive

Diethofencarb	268	226	10.703	380	5	Positive
Diethofencarb	268	180	10.703	380	15	Positive
Difenoconazole	406	337	12.936	380	15	Positive
Difenoconazole	406	251	12.936	380	20	Positive
Difenoxuron	287.2	123.1	9.939	380	15	Positive
Difenoxuron	287.2	72.1	9.939	380	15	Positive
Diflubenzuron	311	158	11.941	380	8	Positive
Diflubenzuron	311	141	11.941	380	32	Positive
Dimethoate	230	199	6.065	380	5	Positive
Dimethoate	230	171	6.065	380	10	Positive
Dimethoate-D6	236	205	6	380	4	Positive
Dimethoate-D6	236	131	6	380	16	Positive
Dimethomorph	388	301	11	380	20	Positive
Dimethomorph	388	165	11	380	20	Positive
Dimethylvinphos	331	204.8	11.56	380	10	Positive
Dimethylvinphos	331	127	11.56	380	10	Positive
Diniconazole	326.1	159	13.049	380	28	Positive
Diniconazole	326.1	70	13.049	380	28	Positive
Dinotefuran	203.1	129.1	3.28	380	9	Positive
Dinotefuran	203.1	114.1	3.28	380	9	Positive
Diuron	233.03	160	10.092	380	20	Positive
Diuron	233.03	72.1	10.092	380	20	Positive
Diuron	233.03	46.1	10.092	380	16	Positive
DMA	122	106.9	6.357	380	15	Positive
DMA	122	79.1	6.357	380	20	Positive
DMA	122	77.1	6.357	380	20	Positive
Dodine	228.2	60.1	12.617	380	20	Positive
Dodine	228.2	57.2	12.617	380	20	Positive
Edifenphos	311.1	282.8	12.401	380	10	Positive
Edifenphos	311.1	110.9	12.401	380	20	Positive
Emamectin B1a benzoate	886.5	302.2	13.456	380	35	Positive
Emamectin B1a benzoate	886.5	158.1	13.456	380	40	Positive
EPN	324.05	296.01	12.974	380	10	Positive
EPN	324.05	156.99	12.974	380	20	Positive
Epoxiconazole	330.1	121	11.804	380	16	Positive
Epoxiconazole	330.1	101.2	11.804	380	52	Positive
Ethiofencarb	226.1	163.8	9.392	380	5	Positive
Ethiofencarb	226.1	107.2	9.392	380	10	Positive
Ethion	385.1	199	13.8	380	5	Positive
Ethion	385.1	171	13.8	380	10	Positive
Ethiprole	397	351	11.055	380	20	Positive
Ethiprole	397	254.8	11.055	380	40	Positive

Ethirimol	210.16	140.1	7.351	380	20	Positive
Ethirimol	210.16	43.1	7.351	380	52	Positive
Ethoprophos	243.1	130.9	11.905	380	15	Positive
Ethoprophos	243.1	97	11.905	380	30	Positive
Etofenprox	394.2	359.1	14.98	380	10	Positive
Etofenprox	394.2	177.3	14.98	380	8	Positive
Etoxazole	360	304	14.114	380	20	Positive
Etoxazole	360	140.9	14.114	380	30	Positive
Famoxadone	392	331	12.536	380	10	Positive
Famoxadone	392	238	12.536	380	20	Positive
Fenamidone	312	92.2	11.056	380	28	Positive
Fenamidone	312	65.1	11.056	380	56	Positive
Fenamiphos	304.1	234	12.121	380	12	Positive
Fenamiphos	304.1	217.1	12.121	380	20	Positive
Fenamiphos-sulfone	336.1	266	9.029	380	16	Positive
Fenamiphos-sulfone	336.1	188	9.029	380	24	Positive
Fenamiphos-sulfoxide	320.11	292.1	8.808	380	8	Positive
Fenamiphos-sulfoxide	320.11	108.1	8.808	380	44	Positive
Fenarimol	331	268	11.788	380	20	Positive
Fenarimol	331	259	11.788	380	20	Positive
Fenazaquin	307.3	161.3	14.419	380	15	Positive
Fenazaquin	307.3	147.2	14.419	380	15	Positive
Fenbendazole	300.1	268	11.196	380	20	Positive
Fenbendazole	300.1	158.9	11.196	380	35	Positive
Fenbuconazole	337.1	125.1	11.97	380	40	Positive
Fenbuconazole	337.1	70	11.97	380	33	Positive
Fenhexamid	302	97	11.698	380	25	Positive
Fenhexamid	302	55	11.698	380	30	Positive
Fenobucarb	208.2	151.9	10.882	380	5	Positive
Fenobucarb	208.2	95.1	10.882	380	20	Positive
Fenoxycarb	302.2	116.2	12.073	380	5	Positive
Fenoxycarb	302.2	88.2	12.073	380	20	Positive
Fenpicoxamid	615.3	515	13.348	380	13	Positive
Fenpicoxamid	615.3	238.9	13.348	380	25	Positive
Fenpropathrin	367.2	350	14.273	380	5	Positive
Fenpropathrin	367.2	124.8	14.273	380	15	Positive
Fenpropidin	274.3	147.1	10.38	380	30	Positive
Fenpropidin	274.3	85.8	10.38	380	25	Positive
Fenpropimorph	304.3	147.1	10.661	380	30	Positive
Fenpropimorph	304.3	130	10.661	380	25	Positive
Fenpyrazamine	332.2	272.1	11.553	380	10	Positive
Fenpyrazamine	332.2	230.2	11.553	380	20	Positive
Fenpyroximate	422.21	366.2	13.97	380	12	Positive

Fenpyroximate	422.21	107	13.97	380	64	Positive
Fensulfothion	309	252.8	10.009	380	17	Positive
Fensulfothion	309	157	10.009	380	29	Positive
Fenthion	279	247.1	12.326	380	8	Positive
Fenthion	279	169.1	12.326	380	12	Positive
Fenthion-sulfone	310.7	125	9.286	380	15	Positive
Fenthion-sulfone	310.7	108.8	9.286	380	15	Positive
Fenthion-sulfoxide	295.02	280	8.986	380	16	Positive
Fenthion-sulfoxide	295.02	109	8.986	380	32	Positive
Fenuron	165.2	92.1	5.674	380	20	Positive
Fenuron	165.2	71.8	5.674	380	20	Positive
Fipronil	434.9	329.9	12.28	380	12	Negative
Fipronil	434.9	249.9	12.28	380	28	Negative
Flazasulfuron	408	227	10.457	380	20	Positive
Flazasulfuron	408	182.1	10.457	380	20	Positive
Flonicamid	230.1	202.6	4.38	380	10	Positive
Flonicamid	230.1	173.9	4.38	380	10	Positive
Florpyrauxifen-benzyl	441.2	90.9	12.781	380	55	Positive
Florpyrauxifen-benzyl	439.2	91.1	12.781	380	40	Positive
Fluacrypyrim	427.1	205	13.118	380	10	Positive
Fluacrypyrim	427.1	145.1	13.118	380	15	Positive
Fluazifop	328.2	282.2	10.969	380	15	Positive
Fluazifop	328.2	254.2	10.969	380	20	Positive
Flubendiamide	680.9	273.9	12.457	380	15	Negative
Flubendiamide	680.9	254	12.457	380	20	Negative
Fludioxonil	265.9	228.9	11.131	380	5	Positive
Fludioxonil	265.9	158	11.131	380	20	Positive
Flufenacet	364.1	194.1	11.912	380	15	Positive
Flufenacet	364.1	152	11.912	380	15	Positive
Flufenoxuron	489.1	158	14.07	380	20	Positive
Flufenoxuron	489.1	140.9	14.07	380	56	Positive
Fluometuron	233.2	187.9	9.461	380	20	Positive
Fluometuron	233.2	72.2	9.461	380	20	Positive
Fluopicolide	382.9	172.9	11.329	380	20	Positive
Fluopicolide	382.9	144.8	11.329	380	20	Positive
Fluopyram	397.1	208	11.765	380	20	Positive
Fluopyram	397.1	173.1	11.765	380	20	Positive
Flupyradifuron	289.2	126	6.13	380	20	Positive
Flupyradifuron	289.2	72.9	6.13	380	75	Positive
Fluquinconazole	376	307.1	11.55	380	24	Positive
Fluquinconazole	376	108	11.55	380	56	Positive
Flusilazole	316.1	247.1	12.159	380	12	Positive
Flusilazole	316.1	165	12.159	380	24	Positive

Flutriafol	302.1	95	9.897	380	56	Positive
Flutriafol	302.1	70.1	9.897	380	16	Positive
Fluxapyroxad	381.9	362	11.302	380	10	Positive
Fluxapyroxad	381.9	342	11.302	380	15	Positive
Forchlorfenuron	248	128.9	9.948	380	20	Positive
Forchlorfenuron	248	93	9.948	380	30	Positive
Formetanate Hydrochloride	222.13	165.1	2.89	380	8	Positive
Formetanate Hydrochloride	222.13	65.1	2.89	380	52	Positive
Fosthiazate	284	227.8	9.52	380	10	Positive
Fosthiazate	284	103.8	9.52	380	20	Positive
Haloxyfop	362.1	316.2	12.22	380	12	Positive
Haloxyfop	362.1	288.1	12.22	380	24	Positive
Haloxyfop-methyl	375.9	316	13.076	380	15	Positive
Haloxyfop-methyl	375.9	287.9	13.076	380	25	Positive
Hexaconazole	314.1	159	12.775	380	30	Positive
Hexaconazole	314.1	70.1	12.775	380	20	Positive
Hexaflumuron	459	439	13.121	380	5	Negative
Hexaflumuron	459	276.1	13.121	380	20	Negative
Hexythiazox	353.1	228.2	13.98	380	10	Positive
Hexythiazox	353.1	168.2	13.98	380	20	Positive
Imazalil	297	255	9.508	380	15	Positive
Imazalil	297	159	9.508	380	20	Positive
Imidacloprid	256	209	5.287	380	15	Positive
Imidacloprid	256	175	5.287	380	15	Positive
Indoxacarb	528.1	218	13.131	380	20	Positive
Indoxacarb	528.1	203	13.131	380	45	Positive
Ioxynil	369.8	214.8	10.096	380	30	Negative
Ioxynil	369.8	126.8	10.096	380	30	Negative
Iprovalicarb	321.2	202.9	11.883	380	0	Positive
Iprovalicarb	321.2	119	11.883	380	16	Positive
Isofenfos-methyl	231	199	12.39	380	15	Positive
Isofenfos-methyl	231	121	12.39	380	15	Positive
Isoprocarb	194.1	152	9.917	380	5	Positive
Isoprocarb	194.1	95.1	9.917	380	15	Positive
Isoprothiolane	291	230.7	11.248	380	10	Positive
Isoprothiolane	291	189.1	11.248	380	15	Positive
Isoproturon	207.15	165.1	9.984	380	20	Positive
Isoproturon	207.15	72.1	9.984	380	10	Positive
Isopyrazam	360.214	320	9	380	29	Positive
Isopyrazam	360.214	244	9	380	31	Positive
Isoxaflutole	360	250.9	10.168	380	15	Positive
Isoxaflutole	360	219.7	10.168	380	50	Positive

Kresoxim-methyl	314.1	267	12.26	380	0	Positive
Kresoxim-methyl	314.1	222.1	12.26	380	10	Positive
Linuron	249.02	160.1	10.784	380	20	Positive
Linuron	249.02	133	10.784	380	36	Positive
Lufenuron	508.9	339	13.742	380	10	Negative
Lufenuron	508.9	325.9	13.742	380	10	Negative
Malathion	331	285	11.283	380	5	Positive
Malathion	331	127.1	11.283	380	15	Positive
Malathion-D10	341.11	132	11.315	380	12	Positive
Malathion-D10	341.11	100	11.315	380	24	Positive
Mandipropamid	412.13	356.1	11.153	380	4	Positive
Mandipropamid	412.13	328.1	11.153	380	8	Positive
Mebendazole	296.1	263.9	9.227	380	21	Positive
Mebendazole	296.1	105	9.227	380	37	Positive
Mebendazole	296.1	77	9.227	380	55	Positive
Metaflumizone	505	328	13.377	380	10	Negative
Metaflumizone	505	302	13.377	380	10	Negative
Metalaxyl	280.3	220	10.103	380	5	Positive
Metalaxyl	280.3	192.4	10.103	380	10	Positive
Metamitron	203.2	174.9	5.662	380	15	Positive
Metamitron	203.2	104.1	5.662	380	15	Positive
Metazachlor	280	212	9	380	25	Positive
Metazachlor	278	213.7	9	380	25	Positive
Metconazole	320.1	125	12.728	380	48	Positive
Metconazole	320.1	70.1	12.728	380	24	Positive
Methamidophos	142.1	125	2.305	380	10	Positive
Methamidophos	142.1	94.1	2.305	380	10	Positive
Methidathion	302.9	145	10.294	380	0	Positive
Methidathion	302.9	85.1	10.294	380	15	Positive
Methiocarb	226.1	121.1	10.961	380	12	Positive
Methiocarb	226	169	10.961	380	5	Positive
Methiocarb-sulfone	275	201.1	6.353	380	5	Positive
Methiocarb-sulfone	275	122	6.353	380	15	Positive
Methiocarb-sulfoxide	242	185	5.792	380	10	Positive
Methiocarb-sulfoxide	242	170	5.792	380	20	Positive
Methomyl	163.1	106	4.114	380	4	Positive
Methomyl	163.1	88	4.114	380	0	Positive
Methoxyfenozide	369.3	149	11.567	380	15	Positive
Methoxyfenozide	369.3	133	11.567	380	20	Positive
Metobromuron	259	170	9.576	380	15	Positive
Metobromuron	259	148	9.576	380	10	Positive
Metolachlor	284.2	252.1	12.013	380	15	Positive
Metolachlor	284.2	175.9	12.013	380	20	Positive

Metrafenone	409.1	226.9	12.83	380	16	Positive
Metrafenone	409.1	209.1	12.83	380	8	Positive
Monocrotophos	224.2	193.1	4.725	380	5	Positive
Monocrotophos	224.2	127	4.725	380	10	Positive
Monolinuron	215.06	148.1	9.175	380	8	Positive
Monolinuron	215.06	126	9.175	380	16	Positive
Monuron	199.1	125.8	8.197	380	20	Positive
Monuron	199.1	71.9	8.197	380	15	Positive
Myclobutanil	289.2	125.1	11.522	380	20	Positive
Myclobutanil	289.2	70.2	11.522	380	15	Positive
Neburon	275.1	113.9	12.294	380	10	Positive
Neburon	275.07	88.1	12.294	380	12	Positive
Neburon	275.07	57.1	12.294	380	20	Positive
Nitenpyram	271	225	3.833	380	10	Positive
Nitenpyram	271	99	3.833	380	10	Positive
Novaluron	490.8	470.7	13.29	380	5	Negative
Novaluron	490.8	305.1	13.29	380	15	Negative
Omethoate	214.1	183	3.118	380	5	Positive
Omethoate	214.1	125	3.118	380	20	Positive
Orthosulfamuron	425	226.9	10.03	380	15	Positive
Orthosulfamuron	425	199.1	10.03	380	15	Positive
Oxadiargyl	341.05	222.9	12.735	380	13	Positive
Oxadiargyl	341.05	150.9	12.735	380	33	Positive
Oxadixyl	279.1	219.2	7.8	380	5	Positive
Oxadixyl	279.1	132.3	7.8	380	32	Positive
Oxamyl	237	90	3.821	380	5	Positive
Oxamyl	237	72	3.821	380	10	Positive
Oxasulfuron	407.1	209.7	8.143	380	24	Positive
Oxasulfuron	407.1	150.1	8.143	380	16	Positive
Oxathiapipronil	540.2	522	11.217	380	29	Positive
Oxathiapipronil	540.2	500	11.217	380	29	Positive
Oxfendazole	316.1	284.1	7.979	380	20	Positive
Oxfendazole	316.1	159.1	7.979	380	35	Positive
Paclobutrazol	294.1	125.2	11.322	380	36	Positive
Paclobutrazol	294.1	70.1	11.322	380	16	Positive
Penconazole	284	159	12.435	380	20	Positive
Penconazole	284	70	12.435	380	15	Positive
Pencycuron	329.1	125.1	12.972	380	24	Positive
Pencycuron	329.1	89.1	12.972	380	60	Positive
Pendimethalin	282.1	212.1	13.889	380	4	Positive
Pendimethalin	282.1	194.1	13.889	380	16	Positive
Penflufen	318.1	234	12.369	380	10	Positive
Penflufen	318.1	141	12.369	380	20	Positive

Penthiopyrad	357.9	207.6	12.538	380	20	Negative
Penthiopyrad	357.9	149	12.538	380	25	Negative
Phenthoate	321	247.1	12.29	380	4	Positive
Phenthoate	321	79.1	12.29	380	44	Positive
Phosalone	368	182	12.739	380	8	Positive
Phosalone	368	110.9	12.739	380	44	Positive
Phosmet	317.99	160	10.458	380	8	Positive
Phosmet	317.99	133	10.458	380	36	Positive
Phoxim	299	129.1	12.668	380	4	Positive
Phoxim	299	77.1	12.668	380	24	Positive
Pirimicarb	239.2	182.1	7.618	380	15	Positive
Pirimicarb	239.2	72.2	7.618	380	20	Positive
Pirimicarb-desmethyl	225.1	168.1	5.26	380	8	Positive
Pirimicarb-desmethyl	225.1	72.1	5.26	380	20	Positive
Pirimiphos-methyl	306.2	164.2	12.664	380	20	Positive
Pirimiphos-methyl	306.2	108.2	12.664	380	20	Positive
Prochloraz	376	308	12.493	380	10	Positive
Prochloraz	376	266	12.493	380	15	Positive
Profenofos	374.9	347	13.417	380	5	Positive
Profenofos	374.9	304.9	13.417	380	15	Positive
Promecarb	208.2	150.9	11.247	380	5	Positive
Promecarb	208.2	108.8	11.247	380	10	Positive
Prometryn	242.2	201	11.033	380	20	Positive
Prometryn	242.2	157.8	11.033	380	20	Positive
Propamocarb	189.2	144.1	3.271	380	10	Positive
Propamocarb	189.2	102.1	3.271	380	15	Positive
Propaquizafop	444.1	371	13.454	380	15	Positive
Propaquizafop	444.1	99.9	13.454	380	20	Positive
Propargite	368.1	231.2	14.126	380	0	Positive
Propargite	368.1	175.2	14.126	380	8	Positive
Propazine	230.2	187.9	10.868	380	15	Positive
Propazine	230.2	146	10.868	380	20	Positive
Propiconazole	342.1	159	12.48	380	32	Positive
Propiconazole	342.1	69.1	12.48	380	16	Positive
Propoxur	210.11	168.1	8.595	380	5	Positive
Propoxur	210.11	111.1	8.595	380	10	Positive
Propyzamide	256	190	11.31	380	10	Positive
Propyzamide	256	173	11.31	380	20	Positive
Proquinazid	373	331	14.152	380	20	Positive
Proquinazid	373	289.1	14.152	380	20	Positive
Prosulfocarb	252.1	128	13.319	380	10	Positive
Prosulfocarb	252.1	90.9	13.319	380	20	Positive
Prothioconazole	341.9	99.8	12.603	380	20	Negative

Prothioconazole	341.9	306.1	12.603	380	15	Negative
Pyraclostrobin	388.11	193.8	12.536	380	8	Positive
Pyraclostrobin	388.11	163.1	12.536	380	20	Positive
Pyridaben	365.2	309.2	14.536	380	10	Positive
Pyridaben	365.2	147.3	14.536	380	20	Positive
Pyridalyl	490	203.9	15.324	380	20	Positive
Pyridalyl	490	108.8	15.324	380	20	Positive
Pyridaphenthion	341.1	205	11.502	380	20	Positive
Pyridaphenthion	341.1	189	11.502	380	15	Positive
Pyridate	379.1	351.1	14.782	380	5	Positive
Pyridate	379.1	206.8	14.782	380	10	Positive
Pyrimethanil	200	183	10.068	380	20	Positive
Pyrimethanil	200	107	10.068	380	20	Positive
Pyriofenone	366.1	209	12.863	380	20	Positive
Pyriofenone	366.1	183.9	12.863	380	20	Positive
Pyriproxyfen	322	185	13.633	380	20	Positive
Pyriproxyfen	322	96	13.633	380	10	Positive
Quinalphos	299.1	270.8	12.122	380	10	Positive
Quinalphos	299.1	242.8	12.122	380	10	Positive
Quinoclamine	208	105.1	7.697	380	25	Positive
Quinoclamine	208	77	7.697	380	40	Positive
Quinoxyfen	308.1	271.9	13.705	380	25	Positive
Quinoxyfen	308.1	196.9	13.705	380	35	Positive
Quizalofop	345	299	11.834	380	20	Positive
Quizalofop	345	254.9	11.834	380	35	Positive
Quizalofop-ethyl	373.09	271.2	13.254	380	24	Positive
Quizalofop-ethyl	373.09	255.1	13.254	380	36	Positive
Rotenone	395	213.1	11.894	380	20	Positive
Rotenone	395	192.1	11.894	380	20	Positive
Simazine	202.2	131.8	8.447	380	15	Positive
Simazine	202.2	124	8.447	380	15	Positive
Spinetoram J	748.3	203	13.075	380	30	Positive
Spinetoram J	748.3	142	13.075	380	25	Positive
Spinetoram L	760.4	203	13.393	380	35	Positive
Spinetoram L	760.4	142.1	13.393	380	35	Positive
Spinosyn A	732.5	142.1	12.589	380	30	Positive
Spinosyn A	732.5	98.1	12.589	380	40	Positive
Spinosyn D	746.5	142	12.95	380	25	Positive
Spinosyn D	746.5	98	12.95	380	40	Positive
Spirodiclofen	411.1	313	14.429	380	5	Positive
Spirodiclofen	411.1	71.2	14.429	380	15	Positive
Spiromesifen	371	273	14.218	380	5	Positive
Spiromesifen	371	255	14.218	380	20	Positive

Spirotetramat	374.2	330.3	11.723	380	15	Positive
Spirotetramat	374.2	270.1	11.723	380	20	Positive
Spiroxamine	298	144	11.015	380	20	Positive
Spiroxamine	298	100	11.015	380	20	Positive
Sulfoxaflor	278	153.9	6.49	380	20	Positive
Sulfoxaflor	278	105.1	6.49	380	10	Positive
Tau-fluvalinate	503	208	14.792	380	20	Positive
Tau-fluvalinate	503	181.1	14.792	380	20	Positive
Tebuconazole	308	125	12.448	380	20	Positive
Tebuconazole	308	70	12.448	380	20	Positive
Tebufenozide	353.2	296.9	12.345	380	5	Positive
Tebufenozide	353.2	133.1	12.345	380	15	Positive
Tebufenpyrad	334.2	145.1	13.576	380	20	Positive
Tebufenpyrad	334.2	117	13.576	380	47	Positive
Teflubenzuron	379	359	13.573	380	0	Negative
Teflubenzuron	379	339	13.573	380	4	Negative
Terbutryn	242.2	186.2	11.146	380	15	Positive
Terbutryn	242.2	91	11.146	380	20	Positive
Terbutylazine	230	174	11.065	380	15	Positive
Terbutylazine	230	146	11.065	380	20	Positive
Tetraconazole	372	159	11.921	380	36	Positive
Tetraconazole	372	70	11.921	380	20	Positive
Tetramethrin	332.1	163.9	13.47	380	15	Positive
Tetramethrin	332.1	135.1	13.47	380	15	Positive
Thiabendazole	202	175	4.83	380	30	Positive
Thiabendazole	202	131	4.83	380	40	Positive
Thiacloprid	253	186	6.754	380	10	Positive
Thiacloprid	253	126	6.754	380	20	Positive
Thiamethoxam	292	211	4.378	380	10	Positive
Thiamethoxam	292	181	4.378	380	20	Positive
Thiobencarb	258	124.7	12.824	380	15	Positive
Thiobencarb	258	99.9	12.824	380	10	Positive
Tolclofos-methyl	300.9	269	12.621	380	10	Positive
Tolclofos-methyl	300.9	125	12.621	380	15	Positive
Tolfenpyrad	384.1	197	13.534	380	25	Positive
Tolfenpyrad	384.1	170.9	13.534	380	20	Positive
Triadimefon	294.2	225	11.475	380	10	Positive
Triadimefon	294.2	197.1	11.475	380	10	Positive
Triadimenol	296	227	11.4	380	5	Positive
Triadimenol	296	70	11.4	380	10	Positive
Triallate	306.01	145	13.935	380	25	Positive
Triallate	306.01	86	13.935	380	15	Positive
Triazophos	314.1	286.2	11.523	380	10	Positive

Triazophos	314.1	162.2	11.523	380	20	Positive
Trichlorfon	258.9	222.5	5.961	380	5	Positive
Trichlorfon	258.9	108.8	5.961	380	20	Positive
Triclorcarban	313	160	13.103	380	20	Negative
Triclorcarban	313	126	13.103	380	20	Negative
Tricyclazole	190.1	163	7.025	380	25	Positive
Tricyclazole	190.1	136.1	7.025	380	35	Positive
Trifloxystrobin	409.2	206.2	13.199	380	10	Positive
Trifloxystrobin	409.2	186.2	13.199	380	20	Positive
Triflumizole	346.1	277.8	13.234	380	5	Positive
Triflumizole	346.1	72.9	13.234	380	15	Positive
Triflumuron	359	156	12.709	380	8	Positive
Triflumuron	359	139	12.709	380	32	Positive
Trinexapac-ethyl	253.1	68.9	10.158	380	20	Positive
Trinexapac-ethyl	253.1	41.1	10.158	380	45	Positive
Trinexapac-methyl	239.1	69	9.076	380	10	Positive
Trinexapac-methyl	239.1	41.2	9.076	380	40	Positive
Triticonazole	318.1	125.2	11.785	380	20	Positive
Triticonazole	318.1	70.2	11.785	380	20	Positive
Tritosulfuron	446	195	10.607	380	20	Positive
Tritosulfuron	446	145	10.607	380	40	Positive
Valifenalate	399	313	11.58	380	10	Positive
Valifenalate	399	143.7	11.58	380	15	Positive
XMC	180.1	123.1	9.04	380	10	Positive
XMC	180.1	95.1	9.04	380	20	Positive
Zoxamide	336	187	12.594	380	16	Positive
Zoxamide	336	159	12.594	380	44	Positive

ND: Not detected

Table 2. Apparent recoveries for olives at 10 µg/kg

Olives	µSPE				dSPE
Compound	EMR 15 mg	EMR 30 mg	$MgSO_4$/PSA/C18/CarbonX	C18	
Acephate	98	80	86	91	88
Acetamiprid	99	90	80	110	101
Alachlor	78	72	85	98	70
Albendazole	100	94	98	84	88
Aldicarb-sulfone	80	84	89	88	96
Ametoctradin	100	101	87	86	67
Anilofos	95	98	82	101	112
Atrazine	92	78	77	90	103
Azinphos-ethyl	87	95	71	96	124
Azinphos-methyl	122	108	86	120	107
Azoxystrobin	87	87	105	91	110
BAC10	128	ND	83	82	92
BAC8	101	ND	81	111	83
Benalaxyl	83	90	85	85	110
Bendiocarb	107	91	89	105	101
Benzovindiflupyr	106	77	91	76	99
Bifenazate	104	88	69	77	80
Bifenazate-diazene	128	113	68	126	113
Bitertanol	84	91	89	90	101
Boscalid	87	82	73	92	111
Bromacil	62	49	67	149	130
Bromuconazole	76	83	63	109	102
Bupirimate	93	89	106	85	79
Buprofezin	72	65	69	66	67
Butoxycarboxim	ND	ND	90	ND	ND
Carbaryl	83	85	91	83	104
Carbendazim	104	79	89	94	79
Carbendazim-D3	96	80	89	85	72
Carbofuran	104	116	92	142	121
Chlorantraniliprole	99	78	90	89	113
Chlorbromuron	87	84	86	83	93
Chlorfenvinphos	92	94	94	100	93
Chlorfluazuron	96	89	87	71	96
Chloridazon	105	89	86	105	104
Chlorotoluron	105	96	88	96	105
Chloroxuron	91	88	83	70	112
Chlorpyrifos	59	68	58	58	71

Chlorpyrifos-methyl	ND	ND	77	ND	ND
Chromafenozide	108	92	88	77	123
Clofentezine	82	71	68	66	78
Clomazone	93	78	79	89	94
Coumaphos	96	118	96	67	82
Cyantraniliprole	109	79	90	109	103
Cyazofamid	146	117	140	82	139
Cyflufenamid	91	95	78	104	91
Cyhalofop-butyl	101	62	66	52	97
Cymoxanil	92	101	98	108	100
Cyproconazole	99	86	91	91	90
Cyprodinil	64	69	58	56	55
DEET	88	80	84	102	95
Deltamethrin	70	74	75	44	77
Demeton-S-methyl	91	89	89	116	99
Demeton-S-methylsulfone	94	97	98	106	108
Demeton-S-methylsulfoxide (Oxydemeton-methyl)	120	115	90	80	53
Desethylterbuthylazine	95	83	99	109	107
Diazinon	93	88	71	76	82
Dichlorvos	110	93	90	100	87
Dichlorvos-D6	94	98	96	115	97
Dicrotophos	96	92	93	97	85
Diethofencarb	110	90	92	90	97
Difenoconazole	110	120	76	73	80
Difenoxuron	104	91	98	108	114
Diflubenzuron	94	71	84	94	100
Dimethoate	101	90	101	88	98
Dimethomorph	90	98	87	103	111
Dimethylvinphos	98	85	91	83	99
Diniconazole	97	94	79	77	77
Dinotefuran	94	107	92	98	98
Diuron	89	102	77	84	98
DMA	102	81	140	107	86
Dodine	ND	ND	72	79	91
Edifenphos	89	76	89	97	89
Emamectin B1a benzoate	107	ND	96	113	78
EPN	74	88	40	127	184
Epoxiconazole	115	96	105	97	106
Ethiofencarb	116	85	113	122	109
Ethion	83	69	72	69	86
Ethiprole	97	104	110	104	106
Ethirimol	108	ND	90	104	77

Ethoprophos	87	81	83	91	107
Etofenprox	50	61	55	41	60
Etoxazole	68	70	66	72	77
Famoxadone	73	79	76	73	90
Fenamidone	86	83	88	108	109
Fenamiphos	107	70	86	89	87
Fenamiphos-sulfone	116	97	104	118	112
Fenamiphos-sulfoxide	128	120	91	101	63
Fenarimol	68	63	89	54	103
Fenazaquin	49	57	49	49	62
Fenbendazole	90	86	71	94	82
Fenbuconazole	100	84	77	72	93
Fenhexamid	99	76	84	81	111
Fenobucarb	93	80	88	106	113
Fenoxycarb	94	82	73	80	107
Fenpicoxamid	70	68	81	99	81
Fenpropathrin	77	69	51	64	72
Fenpropidin	102	121	87	90	89
Fenpropimorph	104	ND	88	88	86
Fenpyrazamine	93	90	80	78	100
Fenpyroximate	80	82	61	67	93
Fensulfothion	107	90	84	92	110
Fenthion	76	82	82	92	117
Fenthion-sulfone	96	91	102	85	81
Fenthion-sulfoxide	100	86	91	115	104
Fenuron	105	100	83	95	92
Fipronil	94	90	71	96	111
Flazasulfuron	102	96	77	94	93
Flonicamid	68	87	93	66	94
Florpyrauxifen-benzyl	82	69	78	68	92
Fluacrypyrim	98	82	92	82	106
Fluazifop	84	118	109	88	91
Flubendiamide	159	92	67	179	100
Fludioxonil	96	100	88	101	105
Flufenacet	84	84	86	94	110
Flufenoxuron	83	74	64	56	92
Fluometuron	109	85	86	94	92
Fluopicolide	100	98	82	74	94
Fluopyram	114	104	81	97	117
Flupyradifuron	107	90	92	101	110
Fluquinconazole	80	84	100	91	93
Flusilazole	95	110	90	78	102
Flutriafol	100	94	72	83	119

Fluxapyroxad	87	104	86	94	103
Forchlorfenuron	90	94	97	101	101
Formetanate Hydrochloride	74	ND	76	88	58
Fosthiazate	103	93	103	90	116
Haloxyfop	51	119	70	84	91
Haloxyfop-methyl	99	87	75	89	103
Hexaconazole	90	84	73	83	101
Hexaflumuron	55	75	66	74	92
Hexythiazox	63	54	55	57	61
Imazalil	114	ND	105	85	59
Imidacloprid	94	94	85	88	107
Indoxacarb	92	100	68	78	93
Ioxynil	91	89	74	79	85
Iprovalicarb	99	102	93	76	118
Isofenfos-methyl	100	82	97	98	110
Isoprocarb	90	107	87	120	92
Isoprothiolane	92	99	87	89	99
Isoproturon	97	94	101	112	115
Isopyrazam	110	89	97	95	109
Isoxaflutole	115	104	91	84	116
Kresoxim-methyl	105	86	93	95	113
Lenacil	100	101	94	86	91
Linuron	88	86	92	80	86
Lufenuron	65	39	54	51	87
Malathion	97	88	94	97	115
Malathion-D10	88	90	89	104	94
Mandipropamid	98	93	80	116	97
Mebendazole	97	118	98	95	85
Mefentrifluconazole	90	86	72	69	98
Metaflumizone	84	95	52	46	104
Metalaxyl	86	94	102	91	96
Metamitron	97	96	80	98	84
Metazachlor	107	96	90	97	104
Metconazole	88	83	81	111	94
Methamidophos	101	96	90	92	88
Methidathion	96	94	93	100	98
Methiocarb	88	93	80	71	102
Methiocarb-sulfone	114	94	89	109	102
Methiocarb-sulfoxide	94	95	87	94	96
Methomyl	103	101	111	102	93
Methoxyfenozide	96	95	90	98	98
Metobromuron	112	91	83	96	90
Metolachlor	97	86	73	92	104

Metrafenone	81	79	69	85	86
Monocrotophos	102	99	87	85	91
Monolinuron	114	97	85	79	100
Monuron	106	84	99	96	101
Myclobutanil	94	88	110	96	87
Neburon	102	72	84	78	97
Nitenpyram	68	ND	86	74	34
Novaluron	74	ND	75	83	76
Omethoate	91	92	97	90	88
Orthosulfamuron	104	114	90	92	108
Oxadiargyl	148	91	99	62	100
Oxadixyl	111	94	100	109	112
Oxamyl	99	92	94	109	94
Oxasulfuron	102	98	97	99	123
Oxathiapipronil	128	80	93	106	115
Oxfendazole	88	91	87	85	87
Paclobutrazol	78	103	84	82	129
Penconazole	85	78	79	78	82
Pencycuron	84	81	72	78	87
Pendimethalin	66	66	55	55	74
Penflufen	95	79	81	80	91
Penthiopyrad	118	144	96	110	140
Phenthoate	100	93	91	97	106
Phosalone	89	94	80	87	103
Phosmet	96	79	100	76	93
Phoxim	74	93	81	83	87
Pirimicarb	101	90	76	101	87
Pirimicarb-desmethyl	121	79	93	98	88
Pirimiphos-methyl	81	62	79	72	84
Prochloraz	90	83	102	81	85
Profenofos	73	77	74	91	86
Promecarb	107	92	100	92	88
Prometryn	79	76	65	74	88
Propamocarb	89	97	80	89	80
Propaquizafop	80	83	75	75	82
Propargite	62	75	72	78	83
Propazine	89	89	76	97	91
Propiconazole	86	149	93	80	79
Propoxur	89	104	88	102	111
Propyzamide	89	84	82	81	90
Proquinazid	41	39	38	42	44
Prosulfocarb	82	82	88	69	66
Prothioconazole	57	61	81	49	64

Pyraclostrobin	89	78	83	80	94
Pyridaben	65	63	50	51	78
Pyridalyl	43	46	43	34	49
Pyridaphenthion	115	94	104	98	96
Pyridate	61	53	57	54	67
Pyrimethanil	67	69	82	69	90
Pyriofenone	78	73	75	77	78
Pyriproxyfen	67	60	56	57	66
Quinalphos	90	75	82	76	85
Quinoclamine	102	80	102	93	90
Quinoxyfen	52	43	43	48	44
Quizalofop	72	99	58	62	81
Quizalofop-ethyl	85	72	73	84	93
Rotenone	77	81	79	113	64
Simazine	96	92	93	97	88
Spinetoram J	ND	ND	86	106	85
Spinetoram L	ND	ND	83	119	73
Spinosyn A	122	ND	96	93	96
Spinosyn D	ND	ND	100	115	88
Spirodiclofen	79	55	79	72	73
Spiromesifen	91	76	84	84	74
Spirotetramat	112	91	89	93	106
Spiroxamine	ND	ND	93	121	102
Sulfoxaflor	119	94	94	120	121
Tau-fluvalinate	96	67	90	77	85
Tebuconazole	93	105	69	87	86
Tebufenozide	98	95	83	108	117
Tebufenpyrad	67	79	67	63	82
Teflubenzuron	66	73	84	76	93
Terbutryn	83	76	69	70	85
Terbutylazine	86	78	79	85	77
Tetraconazole	123	83	85	76	104
Tetramethrin	90	111	76	77	69
Thiabendazole	81	75	83	77	59
Thiacloprid	103	83	95	110	114
Thiamethoxam	ND	ND	83	ND	ND
Thiobencarb	74	70	66	71	71
Tolclofos-methyl	83	64	70	105	52
Tolfenpyrad	68	74	67	57	74
Triadimefon	93	112	81	87	102
Triadimenol	96	116	92	94	112
Triallate	38	56	54	64	50
Triazophos	121	89	79	104	114

Trichlorfon	94	90	99	80	107
Triclorcarban	63	60	62	53	83
Tricyclazole	100	70	81	91	43
Trifloxystrobin	83	80	82	102	119
Triflumizole	102	90	86	87	91
Triflumuron	102	94	76	77	89
Trinexapac-ethyl	93	86	94	103	77
Trinexapac-methyl	116	98	99	113	73
Triticonazole	122	100	77	80	94
Tritosulfuron	117	114	105	95	101
Valifenalate	102	107	72	90	119
XMC	92	88	87	99	111
Zoxamide	83	81	80	100	90

ND: Not detected

Table 3: Apparent recoveries of avocado at 10 µg/kg

Avocado	µSPE				dSPE
Compounds	EMR 15 mg	EMR 30 mg	$MgSO_4$/PSA/C18/CarbonX	C18	
Acephate	89	87	86	87	108
Acetamiprid	97	90	76	100	113
Alachlor	134	88	64	75	108
Albendazole	92	89	98	82	90
Aldicarb-sulfone	105	89	86	82	107
Ametoctradin	96	101	87	72	98
Anilofos	93	94	94	76	96
Atrazine	93	72	81	94	95
Azinphos-ethyl	91	97	87	105	97
Azinphos-methyl	99	92	98	75	110
Azoxystrobin	95	100	83	94	93
BAC10	98	ND	100	103	97
BAC8	110	ND	96	81	71
Benalaxyl	89	91	103	107	95
Bendiocarb	104	76	96	95	111
Benzovindiflupyr	96	88	96	95	92
Bifenazate	82	83	87	83	127
Bifenazate-diazene	93	79	85	125	101
Bitertanol	92	101	98	103	123
Boscalid	92	97	72	96	117
Bromacil	103	68	73	141	138
Bromuconazole	88	120	110	81	99
Bupirimate	105	86	86	88	116
Buprofezin	68	72	75	79	88
Butoxycarboxim	97	106	86	107	110
Carbaryl	96	87	92	98	111
Carbendazim	96	84	89	87	93
Carbendazim-D3	94	90	90	98	97
Carbofuran	119	112	103	102	131
Chlorantraniliprole	90	86	98	101	109
Chlorbromuron	84	81	81	106	117
Chlorfenvinphos	87	93	82	90	124
Chlorfluazuron	84	90	69	84	75
Chloridazon	93	91	88	92	105
Chlorotoluron	92	90	82	91	124
Chloroxuron	101	92	89	81	122

Chlorpyrifos	93	70	72	77	77
Chlorpyrifos-methyl	ND	71	98	ND	78
Chromafenozide	111	81	97	96	99
Clofentezine	81	77	87	71	91
Clomazone	91	94	90	89	114
Coumaphos	106	103	82	67	110
Cyantraniliprole	93	85	114	111	132
Cyazofamid	137	123	96	111	111
Cyflufenamid	105	92	90	86	101
Cyhalofop-butyl	68	76	71	106	92
Cymoxanil	96	82	89	91	117
Cyproconazole	99	86	99	98	91
Cyprodinil	79	72	71	77	79
DEET	96	82	94	93	111
Deltamethrin	93	90	48	63	115
Demeton-S-methyl	110	115	86	93	102
Demeton-S-methylsulfone	101	90	93	95	111
Demeton-S-methylsulfoxide (Oxydemeton-methyl)	102	104	92	93	50
Desethylterbuthylazine	102	88	85	86	109
Diazinon	93	90	91	84	102
Dichlorvos	98	86	88	94	109
Dichlorvos-D6	99	95	84	92	101
Dicrotophos	103	91	92	98	94
Diethofencarb	100	89	89	100	118
Difenoconazole	91	97	97	89	114
Difenoxuron	104	95	100	97	114
Diflubenzuron	90	87	94	87	123
Dimethoate	100	88	98	92	120
Dimethomorph	112	89	102	97	97
Dimethylvinphos	102	99	82	95	121
Diniconazole	103	75	86	88	112
Dinotefuran	75	73	94	85	101
Diuron	76	89	81	89	114
DMA	99	102	92	100	117
Dodine	ND	ND	77	64	60
Edifenphos	89	111	88	96	97
Emamectin B1a benzoate	93	ND	106	94	76
EPN	110	80	129	81	116
Epoxiconazole	88	94	94	108	124
Ethiofencarb	111	94	84	91	98
Ethion	89	73	80	71	97
Ethiprole	102	86	83	81	114

Ethirimol	99	ND	87	98	58
Ethoprophos	86	76	90	95	115
Etofenprox	71	64	72	80	87
Etoxazole	70	68	64	70	91
Famoxadone	95	73	84	70	90
Fenamidone	95	82	113	108	124
Fenamiphos	132	89	90	95	84
Fenamiphos-sulfone	92	95	101	93	117
Fenamiphos-sulfoxide	97	110	93	98	67
Fenarimol	87	70	86	68	98
Fenazaquin	59	62	56	57	66
Fenbendazole	85	83	96	88	97
Fenbuconazole	85	92	100	95	109
Fenhexamid	87	100	94	96	118
Fenobucarb	80	81	96	89	91
Fenoxycarb	98	96	84	91	119
Fenpicoxamid	86	96	86	93	77
Fenpropathrin	72	65	64	71	85
Fenpropidin	101	80	101	99	94
Fenpropimorph	99	ND	86	92	81
Fenpyrazamine	107	88	79	90	116
Fenpyroximate	129	72	68	56	123
Fensulfothion	112	86	94	89	118
Fenthion	89	172	64	121	112
Fenthion-sulfone	109	95	82	90	125
Fenthion-sulfoxide	98	92	96	100	122
Fenuron	90	88	91	95	96
Fipronil	98	93	97	105	100
Flazasulfuron	108	86	106	99	104
Flonicamid	111	94	93	84	98
Florpyrauxifen-benzyl	86	69	71	72	95
Fluacrypyrim	107	80	85	101	117
Fluazifop	123	59	102	83	118
Flubendiamide	94	91	93	100	91
Fludioxonil	ND	ND	95	ND	112
Flufenacet	85	83	104	100	111
Flufenoxuron	89	85	91	79	106
Fluometuron	80	83	83	103	117
Fluopicolide	88	104	92	91	119
Fluopyram	106	73	106	90	93
Flupyradifuron	92	92	95	93	108
Fluquinconazole	106	97	97	106	114
Flusilazole	116	88	98	95	99

Flutriafol	90	87	89	90	112
Fluxapyroxad	100	90	100	92	119
Forchlorfenuron	98	88	95	98	105
Formetanate Hydrochloride	91	ND	86	85	49
Fosthiazate	102	95	95	97	116
Haloxyfop	89	179	105	123	91
Haloxyfop-methyl	102	96	85	79	108
Hexaconazole	92	83	86	79	90
Hexaflumuron	79	87	97	72	106
Hexythiazox	67	63	64	67	84
Imazalil	103	ND	100	95	76
Imidacloprid	97	95	95	97	105
Indoxacarb	100	87	101	80	98
Ioxynil	88	79	92	92	103
Iprovalicarb	95	89	78	73	95
Isofenfos-methyl	114	110	89	100	104
Isoprocarb	94	98	105	115	105
Isoprothiolane	88	89	96	92	112
Isoproturon	91	86	85	82	103
Isopyrazam	113	98	78	101	100
Isoxaflutole	110	102	90	105	112
Kresoxim-methyl	83	85	84	109	116
Lenacil	97	87	95	84	114
Linuron	89	72	103	90	99
Lufenuron	98	65	100	52	97
Malathion	95	91	81	110	116
Malathion-D10	103	79	88	78	106
Mandipropamid	97	87	113	78	131
Mebendazole	97	113	108	95	111
Mefentrifluconazole	92	96	110	93	115
Metaflumizone	59	46	66	73	69
Metalaxyl	104	88	85	89	115
Metamitron	138	96	87	115	119
Metazachlor	97	80	93	100	103
Metconazole	99	83	86	84	107
Methamidophos	89	86	79	85	78
Methidathion	100	91	94	85	113
Methiocarb	97	77	96	91	115
Methiocarb-sulfone	101	104	94	101	118
Methiocarb-sulfoxide	91	97	86	103	90
Methomyl	95	88	95	93	117
Methoxyfenozide	92	74	74	92	120
Metobromuron	92	92	101	91	106

Metolachlor	113	74	90	106	102
Metrafenone	86	72	79	77	91
Monocrotophos	101	102	92	99	103
Monolinuron	98	87	81	85	103
Monuron	101	99	91	92	110
Myclobutanil	92	81	78	89	96
Neburon	107	72	102	93	127
Nitenpyram	88	ND	83	88	17
Novaluron	98	97	79	59	89
Omethoate	90	88	84	94	87
Orthosulfamuron	92	95	110	96	110
Oxadiargyl	92	70	98	67	98
Oxadixyl	103	97	102	103	132
Oxamyl	101	92	91	92	110
Oxasulfuron	98	106	103	98	102
Oxathiapipronil	94	87	88	95	117
Oxfendazole	95	98	94	83	92
Paclobutrazol	105	92	80	78	121
Penconazole	106	71	83	87	91
Pencycuron	100	82	75	76	108
Pendimethalin	66	65	65	59	73
Penflufen	112	97	83	97	110
Penthiopyrad	128	86	94	91	120
Phenthoate	90	90	85	94	97
Phosalone	81	75	83	75	96
Phosmet	87	80	90	102	119
Phoxim	99	88	85	84	104
Pirimicarb	98	88	90	85	88
Pirimicarb-desmethyl	102	91	80	91	75
Pirimiphos-methyl	82	81	58	69	91
Prochloraz	88	82	101	76	86
Profenofos	77	71	74	75	79
Promecarb	107	85	103	101	110
Prometryn	91	81	89	84	103
Propamocarb	99	106	88	94	74
Propaquizafop	77	84	84	76	99
Propargite	93	83	77	86	95
Propazine	94	89	88	82	107
Propiconazole	96	81	81	85	90
Propoxur	104	96	84	93	107
Propyzamide	106	86	85	87	107
Proquinazid	53	53	45	50	59
Prosulfocarb	84	77	74	66	110

Prothioconazole	76	39	110	33	ND
Pyraclostrobin	97	108	96	92	111
Pyridaben	80	61	69	70	91
Pyridalyl	54	48	47	47	57
Pyridaphenthion	99	99	93	99	104
Pyridate	62	62	54	57	79
Pyrimethanil	78	70	69	87	103
Pyriofenone	89	64	72	82	99
Pyriproxyfen	72	63	69	73	80
Quinalphos	100	65	74	75	100
Quinoclamine	100	85	96	85	100
Quinoxyfen	56	59	65	51	64
Quizalofop	93	78	107	87	63
Quizalofop-ethyl	80	72	67	85	85
Rotenone	122	85	74	71	110
Simazine	82	72	82	93	102
Spinetoram J	103	ND	91	78	76
Spinetoram L	77	ND	95	98	66
Spinosyn A	136	ND	103	103	84
Spinosyn D	137	ND	87	83	88
Spirodiclofen	88	75	66	72	89
Spiromesifen	89	73	77	84	117
Spirotetramat	98	84	103	93	113
Spiroxamine	101	ND	85	95	82
Sulfoxaflor	87	97	81	88	109
Tau-fluvalinate	73	88	63	98	87
Tebuconazole	118	85	78	87	113
Tebufenozide	94	86	95	118	117
Tebufenpyrad	72	51	68	97	64
Teflubenzuron	98	84	83	103	87
Terbutryn	83	79	83	82	102
Terbutylazine	99	78	87	83	100
Tetraconazole	113	97	94	101	112
Tetramethrin	104	79	97	93	98
Thiabendazole	90	103	87	81	65
Thiacloprid	101	88	99	105	114
Thiamethoxam	102	102	87	97	108
Thiobencarb	92	75	74	84	90
Tolclofos-methyl	51	46	78	130	81
Tolfenpyrad	77	65	71	94	78
Triadimefon	116	81	85	85	94
Triadimenol	105	105	79	88	86
Triallate	31	52	77	61	95

Triazophos	110	94	100	87	120
Trichlorfon	94	91	99	103	101
Triclorcarban	86	54	78	60	92
Tricyclazole	101	82	87	96	20
Trifloxystrobin	85	95	87	86	110
Triflumizole	100	81	97	77	89
Triflumuron	89	85	96	79	101
Trinexapac-ethyl	101	82	94	98	39
Trinexapac-methyl	88	90	101	93	33
Triticonazole	ND	ND	97	80	88
Tritosulfuron	98	95	96	94	141
Valifenalate	109	88	112	95	140
XMC	90	82	92	94	112
Zoxamide	93	68	77	93	106

ND: Not detected

Table 4: Apparent recoveries of paprika at 10 µg/kg and 50 µg/kg

Paprika	$MgSO_4$/PSA/C18/ CarbonX		EMR 30 mg		EMR 15 mg		C18		dSPE	
Compuesto	10 µg/kg	50 µg/kg	10 µg/kg	50 µg/kg	10 µg/kg	50 µg/kg	10 µg/kg	50 µg/kg	10 µg/kg	50 µg/kg
Acephate	78	95	68	77	77	94	80	81	78	73
Acetamiprid	83	104	64	81	95	93	90	94	88	80
Alachlor	ND	88	ND	85	ND	106	ND	70	ND	73
Albendazole	85	116	28	64	76	87	70	92	70	64
Aldicarb-sulfone	ND	97	ND	84	ND	97	ND	116	ND	81
Ametoctradin	73	97	ND	39	112	95	70	102	60	61
Anilofos	78	94	92	87	79	88	77	78	84	66
Atrazine	65	108	56	77	85	88	104	91	75	73
Azinphos-ethyl	68	91	83	83	82	91	100	87	83	66
Azinphos-methyl	77	93	66	98	81	107	75	88	98	96
Azoxystrobin	95	91	80	80	91	101	82	98	97	81
BAC10	72	117	177	64	94	118	94	97	72	54
BAC8	71	99	ND	ND	92	112	92	100	73	70
Benalaxyl	80	87	60	83	109	90	110	85	119	87
Bendiocarb	90	102	91	88	80	91	92	76	126	84
Benzovindiflupyr	120	90	66	70	62	112	76	87	79	95
Bifenazate	69	108	83	84	76	84	67	97	100	65
Bifenazate-diazene	112	85	55	56	134	138	108	89	50	95
Bitertanol	ND	118	ND	103	ND	105	ND	107	ND	74
Boscalid	84	101	77	92	65	70	73	72	82	87
Bromacil	92	132	ND	101	ND	87	99	147	ND	41
Bromuconazole	31	89	45	78	93	79	51	96	79	82
Bupirimate	98	98	64	108	82	100	84	89	106	79
Buprofezin	69	95	83	102	85	79	83	103	83	68
Butoxycarboxim	47	81	87	104	94	88	69	83	119	105
Carbaryl	83	99	79	91	102	96	73	93	106	73

Carbendazim	78	96	661	67	84	82	83	80	72	76
Carbendazim-D3	67	105	72	68	86	87	77	83	73	60
Carbofuran	67	87	83	95	80	96	81	104	88	81
Chlorantraniliprole	83	100	99	63	76	100	86	100	76	68
Chlorbromuron	71	103	86	102	104	91	103	96	85	96
Chlorfenvinphos	110	97	53	101	82	104	70	87	101	92
Chlorfluazuron	117	87	58	63	97	96	90	147	95	49
Chloridazon	84	86	80	80	86	87	81	87	93	86
Chlorotoluron	83	90	78	77	88	88	77	97	91	80
Chloroxuron	76	84	79	84	110	77	98	97	86	80
Chlorpyrifos	67	102	58	76	98	79	111	85	74	70
Chlorpyrifos-methyl	ND	66	ND	84	ND	72	ND	98	ND	26
Chromafenozide	76	80	90	98	115	100	84	98	65	77
Clofentezine	63	98	84	88	79	65	79	69	59	72
Clomazone	82	87	75	86	95	99	87	94	86	85
Coumaphos	86	108	65	71	104	104	92	102	69	68
Cyantraniliprole	94	97	63	111	78	113	98	100	91	78
Cyazofamid	ND	108	ND	81	ND	146	ND	59	ND	66
Cyflufenamid	97	93	85	71	71	86	108	79	97	80
Cyhalofop-butyl	ND	83	ND	107	ND	97	ND	122	ND	92
Cymoxanil	89	94	92	81	99	101	100	86	88	78
Cyproconazole	ND	102	ND	67	ND	104	ND	86	ND	88
Cyprodinil	73	109	85	83	81	68	71	74	88	61
DEET	91	91	100	105	106	96	85	100	117	69
Deltamethrin	ND	115	ND	76	ND	80	ND	74	ND	39
Demeton-S-methyl	91	92	86	75	85	88	68	75	78	96
Demeton-S-methylsulfone	86	89	72	89	106	89	100	94	94	82
Demeton-S-methylsulfoxide (Oxydemeton-methyl)	80	92	87	57	92	91	81	86	100	76
Desethylterbuthylazine	83	96	69	82	81	88	84	97	90	71
Diazinon	67	110	52	84	76	95	88	78	76	69

Dichlorvos	93	94	83	82	69	99	66	88	72	77
Dichlorvos-D6	34	81	53	76	150	94	97	121	92	75
Dicrotophos	71	91	75	74	84	91	84	89	85	77
Diethofencarb	74	86	328	88	99	104	83	89	85	94
Difenoconazole	101	96	88	81	96	89	118	87	97	82
Difenoxuron	95	93	84	80	80	94	95	95	94	75
Diflubenzuron	90	86	78	84	119	94	97	83	99	76
Dimethoate	78	89	70	85	87	99	112	95	94	81
Dimethomorph	87	102	60	81	66	117	75	79	128	81
Dimethylvinphos	70	84	79	86	95	97	78	95	83	109
Diniconazole	83	96	42	86	101	108	85	57	54	70
Dinotefuran	86	98	56	78	74	89	83	84	85	73
Diuron	77	102	80	82	83	92	91	89	74	83
DMA	ND	117	ND	73	ND	95	ND	131	ND	74
Dodine	ND	132	ND	ND	ND	ND	ND	64	ND	27
Edifenphos	80	91	69	87	77	82	118	87	80	75
Emamectin B1a benzoate	80	84	ND	ND	166	173	119	99	112	95
EPN	ND	96	ND	95	ND	60	ND	111	ND	81
Epoxiconazole	89	98	69	78	105	129	62	98	70	93
Ethiofencarb	80	82	66	112	78	90	93	100	72	73
Ethion	71	109	67	81	88	85	82	88	54	72
Ethiprole	110	109	50	90	100	108	86	94	111	62
Ethirimol	71	119	ND	ND	111	78	88	84	64	58
Ethoprophos	82	101	54	85	101	93	72	88	103	73
Etofenprox	81	87	64	107	76	79	110	83	37	36
Etoxazole	121	71	59	69	95	78	53	68	94	96
Famoxadone	68	125	153	78	47	114	97	62	89	72
Fenamidone	112	108	83	80	85	90	76	92	95	90
Fenamiphos	72	138	71	80	76	108	87	81	91	94
Fenamiphos-sulfone	100	82	96	76	94	95	88	92	88	86

Fenamiphos-sulfoxide	79	111	82	71	79	85	136	98	94	78
Fenarimol	50	82	163	69	102	96	94	89	46	50
Fenazaquin	74	114	57	56	87	70	90	78	44	50
Fenbendazole	82	128	19	78	73	82	69	81	62	57
Fenbuconazole	71	103	91	75	73	111	89	85	69	87
Fenhexamid	97	115	84	78	78	105	94	107	93	103
Fenobucarb	84	76	116	80	89	75	85	70	81	66
Fenoxycarb	97	81	72	107	89	94	74	83	56	67
Fenpicoxamid	74	83	84	70	104	94	88	98	73	78
Fenpropathrin	74	113	68	146	101	99	86	86	91	110
Fenpropidin	110	106	49	77	108	114	90	81	100	88
Fenpropimorph	82	93	ND	ND	81	108	80	100	96	71
Fenpyrazamine	74	104	78	88	82	104	90	87	94	77
Fenpyroximate	104	111	40	84	59	107	84	96	99	74
Fensulfothion	96	100	104	84	100	84	70	80	85	80
Fenthion	ND	115	ND	48	ND	150	ND	159	ND	75
Fenthion-sulfone	ND	114	ND	91	ND	98	ND	94	ND	80
Fenthion-sulfoxide	97	98	109	79	86	110	88	94	84	70
Fenuron	74	99	86	82	94	92	93	98	90	78
Fipronil	76	81	102	87	104	107	80	94	77	72
Flazasulfuron	95	112	71	73	89	98	81	93	73	70
Flonicamid	76	91	68	95	108	87	83	84	92	80
Florpyrauxifen-benzyl	88	92	83	81	108	85	88	83	77	75
Fluacrypyrim	78	97	89	83	104	95	92	87	103	85
Fluazifop	ND	105	ND	ND	ND	83	ND	174	ND	117
Flubendiamide	177	144	39	63	49	129	391	96	81	83
Fludioxonil	68	82	40	81	124	72	61	73	86	84
Flufenacet	89	95	56	72	84	95	88	97	94	79
Flufenoxuron	84	94	112	82	100	79	112	97	51	61
Fluometuron	74	96	86	73	95	111	78	93	82	76

Fluopicolide	93	113	77	67	105	120	83	94	83	66
Fluopyram	72	87	95	83	98	93	90	95	101	74
Flupyradifuron	80	97	84	82	86	89	77	103	86	87
Fluquinconazole	100	122	61	74	150	95	93	86	115	84
Flusilazole	67	95	76	94	123	96	82	85	124	61
Flutriafol	92	100	80	79	89	95	78	104	95	69
Fluxapyroxad	76	88	89	79	91	87	82	88	108	84
Forchlorfenuron	69	106	87	81	71	87	72	96	92	69
Formetanate Hydrochloride	72	108	ND	ND	110	105	76	82	80	71
Fosthiazate	86	92	77	75	95	101	88	88	83	84
Haloxyfop	ND	159	ND	63	ND	38	ND	110	ND	83
Haloxyfop-methyl	90	108	115	79	74	109	135	81	60	87
Hexaconazole	67	96	87	74	115	86	72	96	94	75
Hexaflumuron	66	91	114	148	54	103	84	88	41	53
Hexythiazox	100	113	74	85	183	126	57	56	75	44
Imazalil	90	88	ND	ND	114	115	62	95	89	79
Imidacloprid	80	94	100	83	96	103	100	101	89	73
Indoxacarb	110	92	64	79	84	62	145	59	77	77
Ioxynil	101	141	55	68	62	93	82	90	59	67
Iprovalicarb	69	88	114	85	71	124	54	111	101	88
Isofenfos-methyl	89	100	87	86	79	82	85	79	118	83
Isoprocarb	92	78	61	78	80	90	69	93	97	63
Isoprothiolane	106	82	77	71	100	80	85	96	91	98
Isoproturon	86	88	81	80	88	89	85	89	85	84
Isopyrazam	81	100	82	78	105	111	81	96	73	70
Isoxaflutole	97	80	100	84	91	102	73	83	100	78
Kresoxim-methyl	90	80	65	94	112	102	89	97	70	78
Lenacil	66	87	71	77	75	85	64	94	91	80
Linuron	77	97	89	91	90	90	80	83	72	75
Lufenuron	127	98	199	75	103	81	152	120	47	58

Malathion	77	84	72	75	96	104	60	98	88	94
Malathion-D10	82	81	88	91	91	96	91	105	90	81
Mandipropamid	102	93	89	70	107	88	92	92	70	96
Mebendazole	83	113	83	65	71	85	89	84	78	72
Mefentrifluconazole	70	79	68	68	100	99	76	80	87	71
Metaflumizone	94	100	100	73	95	95	94	90	82	61
Metalaxyl	83	87	105	91	99	90	103	107	89	85
Metamitron	124	93	342	87	51	77	132	114	115	62
Metazachlor	108	102	78	102	91	87	101	106	105	72
Metconazole	103	98	69	68	80	98	91	95	52	87
Methamidophos	66	107	61	65	79	85	81	86	60	55
Methidathion	81	91	64	94	81	97	97	91	102	88
Methiocarb	75	93	90	89	80	89	81	91	92	71
Methiocarb-sulfone	80	90	83	80	91	86	83	111	109	82
Methiocarb-sulfoxide	82	103	101	82	109	91	87	90	86	84
Methomyl	78	87	72	76	85	109	87	84	111	78
Methoxyfenozide	81	97	80	95	94	111	94	101	82	76
Metobromuron	78	97	94	88	75	100	106	94	69	79
Metolachlor	85	91	57	78	94	94	94	97	110	83
Metrafenone	101	96	71	75	83	83	72	93	82	77
Monocrotophos	79	93	73	82	80	95	79	77	86	74
Monolinuron	80	100	73	81	99	90	100	85	90	74
Monuron	76	89	81	78	87	100	75	77	86	85
Myclobutanil	70	76	99	74	76	91	79	91	70	81
Neburon	87	94	65	83	117	95	110	144	110	72
Nitenpyram	62	120	ND	46	113	101	98	76	92	63
Novaluron	113	98	119	79	275	66	57	53	82	60
Omethoate	73	92	73	80	97	89	79	95	83	64
Orthosulfamuron	111	116	100	73	96	89	70	88	73	77
Oxadiargyl	ND	75	ND	123	ND	134	ND	98	ND	80

Oxadixyl	70	98	81	82	74	98	53	100	75	88
Oxamyl	98	98	78	82	85	102	81	87	104	74
Oxasulfuron	90	115	77	80	99	88	93	89	84	76
Oxathiapipronil	73	94	68	76	59	97	63	75	74	63
Oxfendazole	102	116	109	62	80	78	69	85	106	68
Paclobutrazol	86	93	89	98	83	102	79	100	74	72
Penconazole	71	102	68	66	78	87	81	80	83	65
Pencycuron	83	99	50	77	70	91	89	89	68	69
Pendimethalin	ND	84	ND	75	ND	88	ND	98	ND	65
Penflufen	89	97	80	92	95	106	79	86	88	74
Penthiopyrad	ND	74	ND	183	ND	83	ND	104	ND	105
Phenthoate	ND	103	ND	94	ND	102	ND	80	ND	81
Phosalone	93	82	71	84	108	90	84	95	95	73
Phosmet	71	95	72	90	89	104	126	106	78	83
Phoxim	108	68	121	98	86	67	102	79	97	81
Pirimicarb	83	93	77	82	85	91	79	87	88	88
Pirimicarb-desmethyl	92	102	81	67	56	119	124	87	137	77
Pirimiphos-methyl	96	74	94	51	134	113	108	123	116	81
Prochloraz	118	83	62	92	126	89	88	86	80	75
Profenofos	74	84	100	79	93	95	107	77	107	78
Promecarb	84	102	74	83	61	80	78	109	93	85
Prometryn	81	99	67	84	100	74	83	68	79	66
Propamocarb	97	98	106	82	124	133	97	101	87	75
Propaquizafop	76	102	91	79	103	100	86	81	90	58
Propargite	105	97	68	76	83	79	68	82	63	56
Propazine	ND	96	ND	82	ND	79	ND	78	ND	71
Propiconazole	91	84	81	75	92	90	87	93	81	73
Propoxur	94	86	90	85	77	96	84	91	119	78
Propyzamide	94	76	79	78	104	104	95	91	85	70
Proquinazid	71	113	78	67	79	74	72	66	43	44

Prosulfocarb	79	106	83	74	82	96	89	89	72	64
Prothioconazole	ND	88	ND	71	ND	49	ND	49	ND	34
Pyraclostrobin	85	97	97	83	90	88	92	97	82	75
Pyridaben	90	125	67	65	101	80	68	91	47	52
Pyridalyl	ND	111	ND	101	ND	39	ND	62	ND	17
Pyridaphenthion	61	93	66	80	100	102	85	79	101	74
Pyridate	ND	83	ND	62	ND	124	ND	59	ND	50
Pyrimethanil	73	115	108	97	115	86	77	76	83	73
Pyriofenone	71	105	71	81	76	94	68	87	85	63
Pyriproxyfen	77	107	67	68	92	81	85	82	56	63
Quinalphos	77	89	86	92	78	93	85	92	83	71
Quinoclamine	108	84	127	70	203	85	93	101	83	72
Quinoxyfen	54	114	78	54	56	78	67	91	44	49
Quizalofop	ND	149	ND	47	ND	63	ND	93	ND	73
Quizalofop-ethyl	123	89	73	96	62	72	122	114	94	66
Rotenone	65	107	90	85	51	66	49	63	77	87
Simazine	64	93	95	77	100	102	78	92	66	79
Spinetoram J	78	80	ND	ND	252	154	92	115	109	92
Spinetoram L	82	82	104	ND	103	150	83	88	73	85
Spinosyn A	92	88	ND	ND	ND	ND	ND	96	ND	87
Spinosyn D	84	81	ND	ND	ND	ND	ND	101	114	60
Spirodiclofen	68	87	99	56	63	89	99	107	67	54
Spiromesifen	114	94	62	87	87	95	77	72	54	52
Spirotetramat	136	80	120	88	81	84	76	79	96	70
Spiroxamine	ND	105	ND	ND	ND	103	ND	109	ND	82
Sulfoxaflor	111	91	ND	102	ND	107	104	121	84	77
Tau-fluvalinate	110	101	129	82	128	108	79	79	41	52
Tebuconazole	61	80	67	100	86	126	73	90	83	72
Tebufenozide	81	107	94	78	89	86	63	72	80	92
Tebufenpyrad	70	112	36	74	68	82	85	88	80	66

Teflubenzuron	84	78	114	105	127	135	56	64	70	104
Terbutryn	85	93	67	72	75	87	91	80	75	66
Terbutylazine	80	93	88	71	104	84	66	97	77	64
Tetraconazole	88	115	85	83	87	86	89	108	91	80
Tetramethrin	ND	101	ND	157	ND	79	ND	131	ND	56
Thiabendazole	81	110	83	68	83	77	85	81	89	61
Thiacloprid	75	100	1402	77	88	91	90	89	83	77
Thiamethoxam	91	90	90	80	73	97	88	73	64	71
Thiobencarb	79	108	83	79	97	104	84	91	75	74
Tolclofos-methyl	ND	75	ND	68	ND	114	ND	64	ND	70
Tolfenpyrad	103	101	ND	64	ND	92	ND	76	ND	60
Triadimefon	68	84	64	110	82	94	103	74	65	61
Triadimenol	65	84	78	74	65	120	124	113	61	112
Triallate	83	88	108	69	92	67	101	88	86	62
Triazophos	102	90	79	83	84	108	70	98	82	71
Trichlorfon	86	84	77	80	93	95	100	97	68	70
Triclorcarban	70	164	64	68	61	57	71	70	63	50
Tricyclazole	76	109	84	68	77	83	81	85	74	69
Trifloxystrobin	78	91	70	93	100	91	59	92	81	82
Triflumizole	77	100	107	88	78	94	83	87	83	68
Triflumuron	90	100	64	73	60	78	107	102	64	79
Trinexapac-ethyl	76	105	118	62	107	94	88	74	74	84
Trinexapac-methyl	82	103	80	89	97	94	83	95	80	83
Triticonazole	79	87	77	93	74	109	65	81	78	77
Tritosulfuron	ND	132	ND	107	ND	105	ND	74	ND	95
Valifenalate	86	101	84	93	60	104	80	93	104	107
XMC	97	81	90	102	85	86	82	96	97	89
Zoxamide	100	74	49	80	90	106	75	102	92	80

ND: Not detected

Table 5: Apparent recoveries of curry at 10 µg/kg and 50 µg/kg

Curry	$MgSO_4$/PSA/C18/ CarbonX		EMR 30 mg		EMR 15 mg		C18		dSPE	
Compuesto	**10 µg/kg**	**50 µg/kg**	**10 µg/kg**	**50 µg/kg**	**10 µg/kg**	**50 µg/kg**	**10 µg/kg**	**50 µg/kg**	**10 µg/kg**	**50 µg/kg**
Acephate	103	82	ND	86	83	84	80	82	61	76
Acetamiprid	82	81	89	94	89	91	99	91	97	93
Alachlor	ND	84	ND	ND	ND	66	ND	74	ND	88
Albendazole	82	80	91	79	95	72	83	93	75	85
Aldicarb-sulfone	93	84	77	67	78	137	100	99	106	104
Ametoctradin	77	91	ND	77	98	88	129	91	99	63
Anilofos	63	140	79	86	106	91	78	87	98	93
Atrazine	ND	88	ND	96	ND	80	ND	100	ND	106
Azinphos-ethyl	60	107	73	107	143	131	91	124	49	111
Azinphos-methyl	56	94	117	115	122	96	105	100	78	94
Azoxystrobin	67	92	100	100	91	89	88	88	82	95
BAC10	73	110	ND	ND	46	151	73	83	55	72
BAC8	61	101	ND	ND	79	125	99	116	71	89
Benalaxyl	58	107	91	96	93	95	98	88	99	87
Bendiocarb	93	85	105	94	98	98	87	96	88	85
Benzovindiflupyr	103	100	88	108	91	97	82	97	79	97
Bifenazate	98	98	61	74	126	90	77	89	125	88
Bifenazate-diazene	58	177	106	123	118	101	82	118	167	94
Bitertanol	ND	137	ND	104	ND	72	ND	93	ND	72
Boscalid	ND	78	ND	ND	ND	ND	ND	ND	ND	ND
Bromacil	ND	64	ND	ND	ND	141	ND	ND	ND	78
Bromuconazole	92	121	139	119	125	106	154	108	132	103
Bupirimate	56	105	96	126	131	92	68	85	91	82
Buprofezin	105	85	118	92	95	85	99	102	79	86
Butoxycarboxim	99	87	65	82	104	71	84	103	69	87

Carbaryl	81	93	84	105	90	89	94	100	76	84
Carbendazim	97	76	77	86	82	96	86	89	87	80
Carbendazim-D3	80	76	87	82	89	90	78	89	68	92
Carbofuran	81	93	92	99	69	90	95	109	94	97
Chlorantraniliprole	62	87	90	86	101	84	113	93	77	95
Chlorbromuron	66	82	129	78	71	66	101	130	65	69
Chlorfenvinphos	72	111	79	91	81	90	84	100	106	82
Chlorfluazuron	ND	108	ND	96	ND	115	ND	96	ND	108
Chloridazon	84	80	79	89	86	81	84	106	99	91
Chlorotoluron	94	83	113	91	88	95	96	99	89	92
Chloroxuron	83	103	104	100	100	102	89	82	82	88
Chlorpyrifos	60	104	103	100	93	99	109	100	97	86
Chlorpyrifos-methyl	88	125	ND	96	ND	68	ND	85	ND	124
Chromafenozide	62	112	150	107	113	121	108	104	78	92
Clofentezine	69	118	82	81	85	80	97	102	78	80
Clomazone	89	70	90	103	86	101	94	86	96	99
Coumaphos	57	138	69	72	99	98	121	74	110	103
Cyantraniliprole	122	96	99	134	89	82	113	106	106	82
Cyazofamid	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyflufenamid	84	95	124	104	127	87	119	95	128	90
Cyhalofop-butyl	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cymoxanil	97	93	123	93	79	89	90	98	92	102
Cyproconazole	72	99	138	69	106	109	76	103	108	98
Cyprodinil	103	77	157	85	114	80	102	85	77	92
DEET	100	71	92	102	92	107	83	91	95	89
Deltamethrin	ND	149	ND	85	ND	111	ND	103	ND	74
Demeton-S-methyl	ND	110	ND	97	ND	118	ND	120	ND	93
Demeton-S-methylsulfone	93	93	86	98	85	96	91	95	100	91
Demeton-S-methylsulfoxide (Oxydemeton-methyl)	90	82	62	88	78	95	83	100	90	83
Desethylterbuthylazine	84	90	69	93	110	97	75	101	87	103

Diazinon	81	101	72	93	83	80	139	89	81	98
Dichlorvos	ND	77	ND	107	ND	94	ND	95	ND	115
Dichlorvos-D6	99	88	84	88	90	102	92	100	105	96
Dicrotophos	85	87	85	100	83	92	89	86	98	98
Diethofencarb	93	84	96	93	94	104	111	102	83	94
Difenoconazole	65	114	93	93	74	95	79	95	91	97
Difenoxuron	75	103	79	97	85	98	86	89	86	104
Diflubenzuron	73	121	94	82	86	84	88	107	103	87
Dimethoate	99	89	97	98	96	90	94	96	92	92
Dimethomorph	73	94	92	93	57	102	71	72	93	98
Dimethylvinphos	81	120	96	105	82	91	95	94	74	101
Diniconazole	103	122	97	99	98	102	74	85	57	93
Dinotefuran	88	86	78	92	94	89	73	75	97	97
Diuron	64	103	101	91	109	77	98	93	94	96
DMA	104	76	64	91	142	132	62	102	183	78
Dodine	ND	73	ND	ND	ND	ND	ND	88	ND	31
Edifenphos	62	118	94	125	53	92	69	105	105	85
Emamectin B1a benzoate	67	117	ND	ND	68	178	119	99	105	78
EPN	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Epoxiconazole	68	69	49	101	34	53	155	149	103	86
Ethiofencarb	85	86	98	92	81	89	82	88	76	83
Ethion	50	129	75	88	88	87	71	96	85	79
Ethiprole	ND	91	ND	56	ND	49	ND	88	ND	120
Ethirimol	84	83	ND	ND	64	101	80	88	73	73
Ethoprophos	68	79	132	97	88	90	92	98	110	108
Etofenprox	73	111	89	98	73	91	83	89	76	64
Etoxazole	90	178	88	77	87	77	72	73	113	132
Famoxadone	ND	96	ND	62	ND	87	ND	137	124	56
Fenamidone	ND	96	ND	93	ND	102	ND	140	ND	82
Fenamiphos	72	86	64	128	77	111	117	115	76	113

Fenamiphos-sulfone	112	99	94	102	92	90	94	97	91	76
Fenamiphos-sulfoxide	78	97	183	84	62	89	105	102	90	95
Fenarimol	ND	140	ND	102	ND	139	ND	95	ND	104
Fenazaquin	51	124	107	84	85	85	64	128	94	84
Fenbendazole	59	79	89	86	100	93	80	86	62	85
Fenbuconazole	65	118	85	100	87	89	135	89	128	108
Fenhexamid	ND	108	ND	110	ND	87	ND	94	ND	109
Fenobucarb	104	83	80	103	125	84	73	109	133	90
Fenoxycarb	78	128	95	71	112	84	112	97	86	86
Fenpicoxamid	71	132	70	80	105	115	90	95	101	98
Fenpropathrin	91	128	100	96	65	99	82	125	89	78
Fenpropidin	99	88	ND	84	92	127	77	82	91	100
Fenpropimorph	88	99	ND	ND	69	100	126	94	78	96
Fenpyrazamine	77	99	97	127	102	114	60	97	78	95
Fenpyroximate	89	168	92	88	111	111	126	88	113	106
Fensulfothion	94	92	88	102	93	98	93	86	99	104
Fenthion	ND	128	ND	91	ND	82	ND	82	ND	58
Fenthion-sulfone	80	91	155	104	82	89	152	101	108	93
Fenthion-sulfoxide	80	93	73	82	91	108	88	91	106	89
Fenuron	86	89	90	109	93	90	97	88	93	92
Fipronil	54	111	62	109	79	94	84	95	106	81
Flazasulfuron	73	101	90	85	103	90	71	102	102	98
Flonicamid	83	95	86	101	101	88	134	80	115	103
Florpyrauxifen-benzyl	60	131	125	89	86	94	85	96	100	93
Fluacrypyrim	77	99	96	96	118	87	77	94	92	86
Fluazifop	ND	81	ND	134	ND	94	ND	120	ND	88
Flubendiamide	96	135	117	82	141	69	44	89	84	95
Fludioxonil	ND	68	ND	51	ND	76	ND	123	ND	61
Flufenacet	101	108	101	90	96	123	106	83	87	71
Flufenoxuron	38	110	59	98	89	84	96	102	87	67

Fluometuron	108	82	102	101	87	98	98	96	78	93
Fluopicolide	101	109	86	100	91	98	67	96	103	87
Fluopyram	88	104	92	78	111	87	94	90	104	107
Flupyradifuron	90	84	91	111	101	101	94	98	108	101
Fluquinconazole	ND	139	ND	80	ND	58	ND	82	ND	94
Flusilazole	65	139	74	93	62	104	102	112	114	94
Flutriafol	77	86	119	93	98	97	99	83	88	91
Fluxapyroxad	100	115	91	113	118	89	81	93	109	98
Forchlorfenuron	79	100	108	92	97	99	77	103	94	82
Formetanate Hydrochloride	73	85	ND	ND	52	158	79	102	81	81
Fosthiazate	96	91	93	85	96	94	80	102	99	91
Haloxyfop	ND	43	ND	104	ND	83	ND	131	ND	140
Haloxyfop-methyl	72	91	140	86	102	74	90	74	145	90
Hexaconazole	67	85	116	106	85	77	65	92	74	91
Hexaflumuron	101	145	ND	92	155	78	110	77	74	108
Hexythiazox	58	105	52	93	46	98	60	90	160	64
Imazalil	108	93	ND	ND	55	124	84	112	169	92
Imidacloprid	89	92	96	107	88	107	84	97	106	89
Indoxacarb	ND	125	ND	96	ND	56	ND	94	ND	106
Ioxynil	65	89	81	99	85	100	70	103	75	88
Iprovalicarb	64	89	114	88	76	87	114	87	110	110
Isofenfos-methyl	81	120	93	100	92	82	87	143	83	76
Isoprocarb	94	94	100	96	95	102	86	98	123	75
Isoprothiolane	82	75	135	109	80	117	56	98	98	74
Isoproturon	86	77	110	108	81	90	81	90	96	91
Isopyrazam	57	116	139	94	130	73	104	88	80	82
Isoxaflutole	94	109	94	111	59	81	73	98	129	96
Kresoxim-methyl	88	131	139	104	110	130	98	86	126	73
Lenacil	ND	90	ND	75	ND	106	ND	103	ND	84
Linuron	ND	98	ND	105	ND	108	ND	85	ND	89

Lufenuron	ND	133	ND	69	ND	97	ND	67	ND	77
Malathion	87	99	86	89	80	91	87	120	88	96
Malathion-D10	65	89	48	99	71	89	93	95	69	81
Mandipropamid	68	101	70	111	95	76	47	93	110	85
Mebendazole	94	90	70	96	70	91	82	86	78	83
Mefentrifluconazole	64	99	73	108	83	102	113	79	107	93
Metaflumizone	68	127	100	116	102	100	109	88	80	100
Metalaxyl	96	88	122	95	89	90	84	87	94	97
Metamitron	87	88	124	170	105	134	149	127	50	65
Metazachlor	96	91	98	93	77	93	98	88	138	71
Metconazole	ND	87	ND	97	ND	92	ND	104	ND	93
Methamidophos	80	72	75	79	67	77	80	81	63	65
Methidathion	81	89	99	99	129	88	99	104	81	88
Methiocarb	125	83	115	107	105	89	58	107	98	84
Methiocarb-sulfone	105	88	72	106	82	83	89	91	96	91
Methiocarb-sulfoxide	89	86	89	96	85	91	86	97	90	90
Methomyl	80	85	98	99	103	91	104	106	122	100
Methoxyfenozide	ND	86	ND	89	ND	43	ND	77	ND	77
Metobromuron	87	82	97	80	83	84	100	98	98	92
Metolachlor	83	103	87	96	114	110	80	96	78	96
Metrafenone	59	98	69	67	105	87	82	89	79	104
Monocrotophos	92	86	93	94	86	91	86	91	96	90
Monolinuron	91	80	107	97	95	87	89	103	103	106
Monuron	90	89	90	90	87	89	83	96	89	92
Myclobutanil	80	114	77	98	143	105	71	105	96	86
Neburon	98	108	103	90	69	88	90	112	95	123
Nitenpyram	ND	86	ND	71	ND	51	ND	62	ND	52
Novaluron	ND	114	ND	77	ND	71	ND	106	ND	94
Omethoate	81	78	93	92	83	80	74	91	85	79
Orthosulfamuron	97	96	112	84	103	83	57	91	84	76

Oxadiargyl	ND	140	ND	105	ND	53	ND	126	ND	62
Oxadixyl	63	100	122	60	46	177	90	124	124	131
Oxamyl	ND	80	88	93	108	65	ND	87	184	90
Oxasulfuron	70	103	84	93	83	98	97	97	90	99
Oxathiapipronil	57	130	147	94	102	92	113	73	98	87
Oxfendazole	83	78	88	109	85	78	95	91	102	101
Paclobutrazol	79	91	77	98	94	100	78	93	112	106
Penconazole	77	97	94	81	102	101	103	82	106	100
Pencycuron	69	94	107	86	85	74	90	89	79	85
Pendimethalin	67	116	60	96	93	91	84	97	83	80
Penflufen	89	112	107	96	94	78	97	89	96	95
Penthiopyrad	ND	156	ND	69	ND	86	ND	112	ND	109
Phenthoate	54	130	78	89	86	84	118	96	85	95
Phosalone	74	133	82	92	126	94	110	121	83	90
Phosmet	79	71	115	101	113	96	136	98	90	103
Phoxim	63	121	103	89	101	85	79	94	102	85
Pirimicarb	80	89	88	105	96	94	107	100	99	89
Pirimicarb-desmethyl	95	84	72	98	78	100	88	97	100	88
Pirimiphos-methyl	86	136	91	80	113	100	91	81	117	66
Prochloraz	59	103	105	69	70	105	106	90	107	75
Profenofos	51	119	104	108	103	97	93	86	79	81
Promecarb	115	88	67	86	59	76	89	122	76	80
Prometryn	101	65	148	96	77	87	68	89	87	88
Propamocarb	111	95	90	89	96	208	88	101	74	66
Propaquizafop	56	113	109	105	77	96	95	107	88	79
Propargite	83	119	74	93	86	89	98	100	86	88
Propazine	116	96	113	98	87	90	89	106	103	86
Propiconazole	ND	106	ND	93	ND	98	ND	110	ND	85
Propoxur	111	87	92	107	94	84	102	104	107	93
Propyzamide	77	90	125	87	83	86	75	85	72	114

Proquinazid	76	106	86	87	72	87	90	85	74	70
Prosulfocarb	73	95	99	94	105	109	86	89	87	87
Prothioconazole	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyraclostrobin	76	117	83	93	98	91	130	89	85	93
Pyridaben	52	107	90	88	84	92	94	91	82	76
Pyridalyl	56	99	80	83	84	72	79	76	34	40
Pyridaphenthion	71	106	101	87	94	110	65	114	72	89
Pyridate	105	126	51	92	52	85	88	88	64	51
Pyrimethanil	52	105	118	103	68	111	92	96	88	99
Pyriofenone	72	102	82	101	98	89	82	77	96	81
Pyriproxyfen	69	109	76	93	99	91	93	89	73	84
Quinalphos	83	113	83	80	67	94	41	108	61	69
Quinoclamine	122	77	86	103	107	94	126	95	113	75
Quinoxyfen	68	107	85	83	101	96	82	78	74	81
Quizalofop	ND	83	ND	ND	ND	ND	ND	ND	ND	38
Quizalofop-ethyl	76	116	123	101	115	93	105	110	76	70
Rotenone	69	97	135	60	127	69	64	118	82	68
Simazine	102	96	85	86	86	85	94	102	80	91
Spinetoram J	102	79	ND	ND	29	237	81	77	83	86
Spinetoram L	58	89	ND	ND	ND	ND	52	88	88	71
Spinosyn A	86	76	ND	ND	44	201	81	88	92	69
Spinosyn D	49	115	ND	ND	ND	481	115	88	174	91
Spirodiclofen	110	119	50	90	76	76	73	105	44	67
Spiromesifen	48	108	105	76	131	78	141	71	113	84
Spirotetramat	95	93	101	125	109	116	86	85	138	102
Spiroxamine	ND	102	ND	ND	ND	180	ND	69	ND	70
Sulfoxaflor	53	81	84	138	89	91	81	102	105	93
Tau-fluvalinate	90	101	239	118	115	97	122	91	83	94
Tebuconazole	89	104	83	91	73	108	108	105	73	92
Tebufenozide	96	120	122	88	60	104	58	89	83	71

Tebufenpyrad	ND	68	ND	140	ND	191	ND	135	ND	62
Teflubenzuron	193	201	166	78	11	76	ND	92	ND	132
Terbutryn	99	88	95	94	99	85	106	95	91	100
Terbutylazine	ND	85	ND	87	ND	93	ND	78	ND	69
Tetraconazole	95	105	69	109	95	106	91	78	84	91
Tetramethrin	ND	112	ND	118	ND	112	ND	134	ND	106
Thiabendazole	80	73	83	93	92	88	84	86	76	79
Thiacloprid	93	92	98	86	95	99	91	97	82	97
Thiamethoxam	66	95	80	87	77	96	83	106	96	139
Thiobencarb	71	134	105	93	83	83	92	100	104	75
Tolclofos-methyl	ND	ND	ND	ND	ND	ND	ND	ND	ND	67
Tolfenpyrad	45	110	81	122	83	98	91	85	91	97
Triadimefon	35	72	74	147	70	99	146	102	80	71
Triadimenol	74	83	43	62	176	96	63	136	89	78
Triallate	ND	95	ND	72	ND	108	ND	104	ND	56
Triazophos	82	126	85	72	99	102	98	98	95	95
Trichlorfon	91	78	100	90	86	98	84	88	85	107
Triclorcarban	ND	134	ND	73	ND	84	ND	86	ND	77
Tricyclazole	85	82	103	88	79	93	89	90	85	82
Trifloxystrobin	81	152	113	78	95	93	80	86	83	100
Triflumizole	79	101	116	94	76	90	78	104	68	93
Triflumuron	85	111	127	109	82	87	71	95	103	87
Trinexapac-ethyl	79	98	86	92	86	78	83	84	78	79
Trinexapac-methyl	81	110	99	89	84	100	100	95	94	94
Triticonazole	87	107	105	73	54	110	105	110	101	101
Tritosulfuron	41	98	93	96	23	128	67	102	105	83
Valifenalate	81	80	ND	67	76	108	110	137	135	115
XMC	71	86	64	85	87	97	88	96	102	85
Zoxamide	126	91	120	102	139	108	91	95	112	73

ND: Not detected