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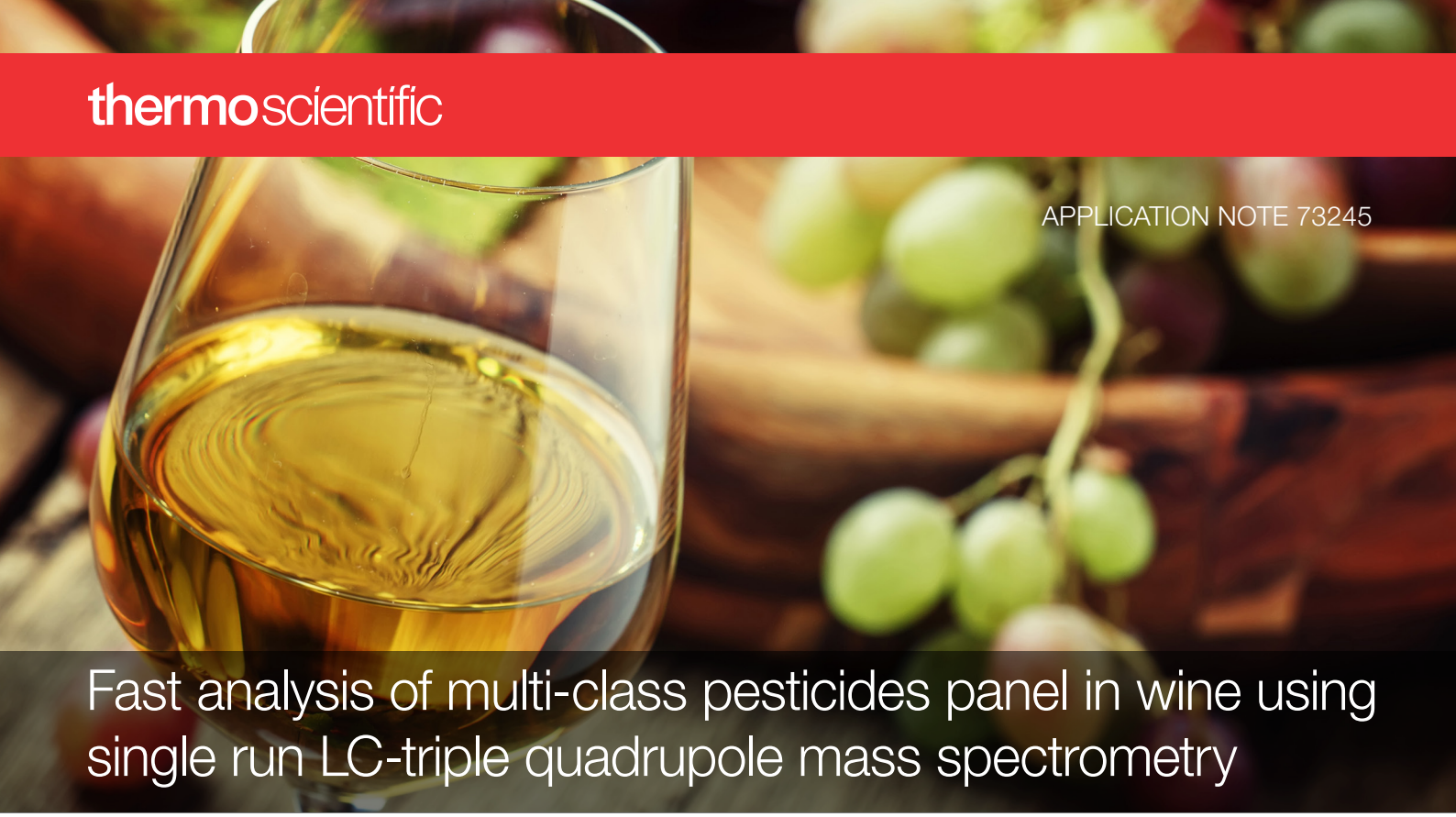

APPLICATION NOTE 73245

Fast analysis of multi-class pesticides panel in wine using single run LC-triple quadrupole mass spectrometry

Authors

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Keywords

SANTE/11813/2017, TSQ Quantis, Vanquish Flex, pesticides, QuEChERS, sample prep, Pesticide Explorer II

Goal

Demonstrate a fully tested LC-MS/MS workflow for fast and robust quantification of more than 400 pesticides below maximum residue limits (MRLs) with accuracy and precision that meet the EU SANTE guidelines.

Introduction

Pesticides are chemical or biological agents that repel, destroy, or mitigate plants or animals considered to be pests. Their benefits include improved productivity and protection against the loss of crops. However, if these compounds are misused or used indiscriminately, they can have adverse effects on human health. Therefore, the identification and quantification of pesticide residues in food products is an important part of routine food control.

In this application note we present the Thermo Scientific™ Pesticide Explorer II solution for fast, robust, accurate, and reproducible quantitation of more than 400 pesticides below their maximum residue limits. The solution includes the

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Thermo Scientific™ QuEChERS sample preparation kit, Thermo Scientific™ Vanquish™ Flex Binary UHPLC system, Thermo Scientific™ TSQ Quantis™ triple quadrupole mass spectrometer, Thermo Scientific™ TraceFinder™ software, Thermo Scientific™ Accucore™ aQ C18 Polar Endcapped LC column, and method parameters to provide a start-to-finish workflow for pesticide analysis. The method was tested according to the requirements of the EU SANTE guidelines, which provide best practices for analytical quality control and method validation procedures for pesticide residue analysis in foodstuffs.[1]

Experimental

Materials

- Thermo Scientific™ HyperSep™ Dispersive SPE Mylar Pouch 4000 mg magnesium sulfate, 1 g sodium chloride, 500 mg sodium citrate dibasic sesquihydrate, 1000 mg sodium citrate tribasic, 50/pack (P/N 60105-344-SP)
- Thermo Scientific™ Nunc™ 50 mL Conical Sterile Polypropylene Centrifuge Tubes (50/pack) (P/N 339652)
- Thermo Scientific™ Target2™ Regenerated Cellulose Syringe Filters, 0.45 µm, 30 mm, 100/pack (P/N F2500-7)
- Thermo Scientific™ National Target All-Plastic Disposable Syringes 3 mL luer-lock syringe, 100/pack (P/N S7510-3)
- Methanol, Thermo Scientific™, 1 L (P/N 458-1)
- Water, Thermo Scientific™ ultra-grade, 1 L (P/N W8-1)
- Ammonium formate, Fisher Chemical™ Optima™ (P/N A11550)
- Formic acid, 99%+, Thermo Scientific™ Pierce™, 10 × 1 mL ampules (P/N 28905)
- Acetonitrile, Thermo Scientific™ ultra-grade, 1 L (P/N A9561)

Sample preparation

Wine extraction

Ten milliliters of wine were added to a 50 mL Nunc polypropylene centrifuge tube (P/N 339652), followed by addition of 10 mL of acetonitrile (P/N 10784551). The tube was capped and shaken vigorously for approximately 1 minute. The tube was uncapped and a salt mixture (P/N 60105-344) was added. It was then shaken for approximately one minute and centrifuged at 4000 rpm for five minutes. Next, 1.5 mL of supernatant was aspirated into a National Target all-plastic disposable 3 mL luer-lock syringe (P/N S7510-3) and filtered through a Target2 45 µm syringe filter (P/N F2500-7) into an HPLC vial before the sample was submitted for LC/MS analysis.

Pesticide stock solution

A stock solution was created from all individual pesticide vials and labeled Solution K = 1 ppm final concentration. A second sub-stock solution was created (labeled Solution Y) by taking 100 µL of solution K and adding 900 µL of acetonitrile.

Internal standard, triphenyl phosphate (TPP), was added according to the wine extraction procedure above for testing of recovery. Tables 1 and 2 describe the preparation of the matrix extracted spikes (MES) and the matrix-matched calibration solutions (MMS), respectively.

Table 1. Matrix extracted spikes (MES) preparation

Concentration (ppb)	Mix standard	CH_3CN (mL)	Matrix (mL) wine
100	1000 µL of K	9.000	10.00
25	250 µL of K	9.750	10.00
10	100 µL of K	9.900	10.00
2.5	25 µL of K	9.975	10.00
1	100 µL of Y	9.900	10.00
0.5	50 µL of Y	9.950	10.00

Table 2. Matrix-matched calibration solutions (MMS)

Matrix (µL) wine	CH_3CN (µL)	Mix standard	Cal. point
900	-	100 µL K	G
900	50	50 µL K	F
900	75	25 µL K	E
900	90	10 µL K	D
900	50	50 µL K	C
900	75	25 µL Y	B
900	90	10 µL Y	A

Chromatographic conditions

HPLC system:	Vanquish Flex Binary UHPLC system
Column:	Accucore aQ C18 column, 100 × 2.1 mm, with a particle size of 2.6 µm
Mobile phase A:	Water with 5 mM ammonium formate and 0.1% formic acid
Mobile phase B:	Methanol with 5 mM ammonium formate and 0.1% formic acid
Injection volume:	1 µL
Flow rate:	300 µL/min
Column temperature:	25 °C
Run time:	15 min
Tray temperature:	4 °C
Gradient:	Table 3

Table 3. HPLC gradient

Time (min)	Flow (mL/min)	% A	% B
0.0	0.300	98	2
1.0	0.300	98	2
2.0	0.300	50	50
9.0	0.300	2	98
12.0	0.300	2	98
12.1	0.300	98	2
15.0	0.300	98	2

Mass spectrometry conditions

MS system:	TSQ Quantis triple quadrupole mass spectrometer
Ionization mode:	Heated electrospray (HESI)
Scan type:	Timed-SRM
Polarity:	Positive and Negative
Spray voltage for positive mode:	3500 V
Spray voltage for negative mode:	2500 V
Sheath gas pressure:	30 arb
Aux gas pressure:	6 arb
Sweep gas pressure:	1 arb
Ion transfer tube temp.:	290 °C
Vaporizer temp.:	350 °C
CID gas pressure:	2.0
Cycle time:	0.5 s
Q1 resolution (FWHM):	0.7
Q3 resolution (FWHM):	0.7

Data analysis

Fully automated data analysis was carried out using TraceFinder software during acquisition of the next sample to speed up data review.

Results and discussion

Samples of various red and white wines were obtained for method validation. Typically, matrix-matched standards (MMS) are required for calibration, and matrix-extracted spikes (MES) are used to assess recovery. For excellent quantitation, there must be enough scans across all the target quantitation peaks. At least one or two SRMs can be used for confirmation. Figure 1 shows a 10 ppb MES for a method containing over 400 pesticides with positive and negative polarity switching occurring throughout the run. The number of scans across each peak are sufficient for accurate and reproducible quantitation.

Figure 2 shows some typical results of calibration curves from 0.5 to 100 ppb. Over 95% of the pesticides studied had calibration curves with $r^2 \geq 0.990$. Confirmation ions are displayed in the middle of each panel at 1 ppb for each pesticide, with indicator colors (green) easily visible to show passing ion ratio criteria. The ISVEA laboratory then wanted to expand the list of analytes beyond the original scope and decided to create a comprehensive and validated quantitation method using the SRM compound database. A method of over 400 compounds was developed and optimized to ensure that at least two SRM transitions were detected per compound (one for quantitation and the other for confirmation) while still maintaining polarity switching throughout the run.

Recovery criteria for MES, as outlined by the EU guidelines, state the value must fall between 70% and 120%. A summary of results is shown in Figure 3. The method allowed ISVEA to quickly quantitate samples with confidence at or below the EU MRL for a wide variety of pesticides, giving their clients added confidence in the safety of their products. See Table A1, Appendix.

Method robustness is key to any laboratory. The screening and quantitation method showed excellent reproducibility in terms of consistent peak shapes and long column lifetime over 1000 injections (and still going strong), with consistent peak response over time. Figure 4 shows some select pesticides across the retention time range of the method (1–10 minutes) for approximately 300 injections.

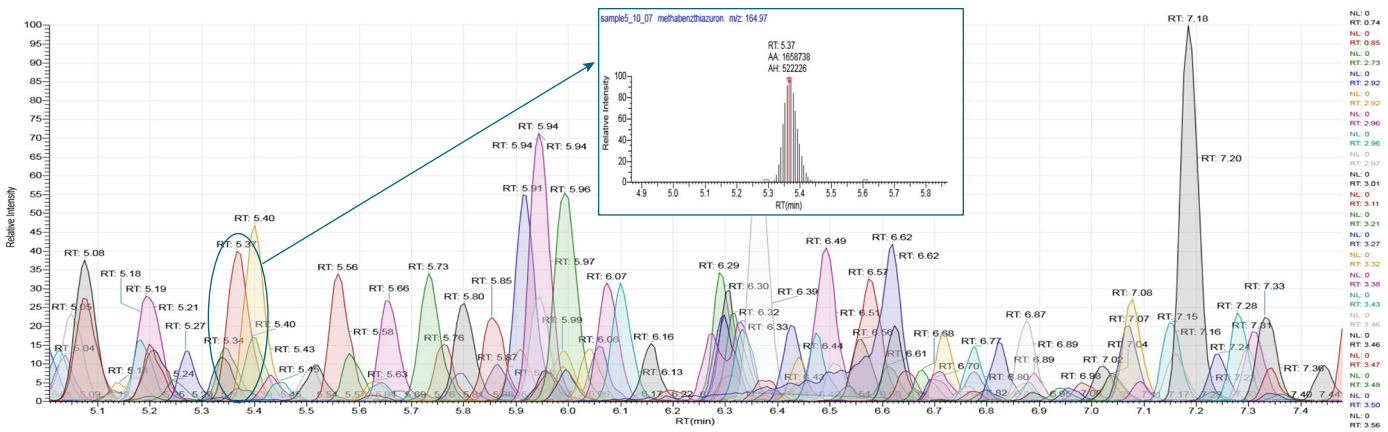
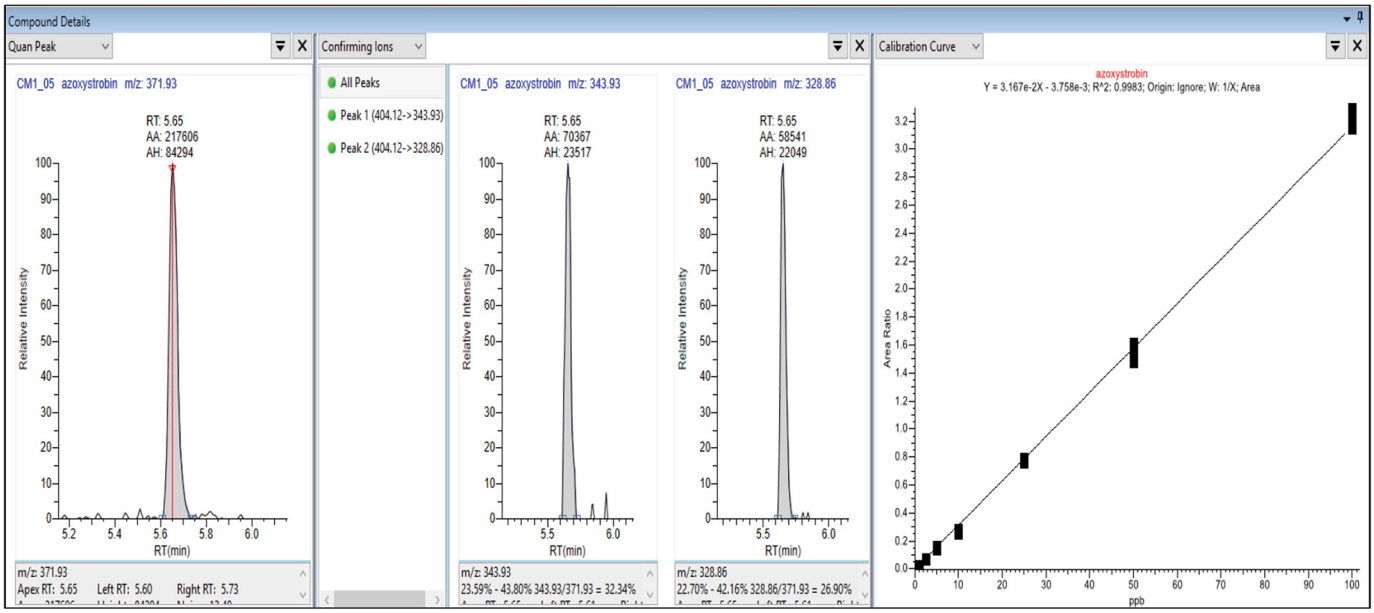


Figure 1. White wine MES standard at 10 ppb. The peak at 5.37 minutes is methabenzthiazuron, showing over 15 scans across the quantitation ion used for the analysis. Large pesticide panels of extracted SRMs are easily displayed in TraceFinder software.

A. Azoxystrobin



B. Flusilazole

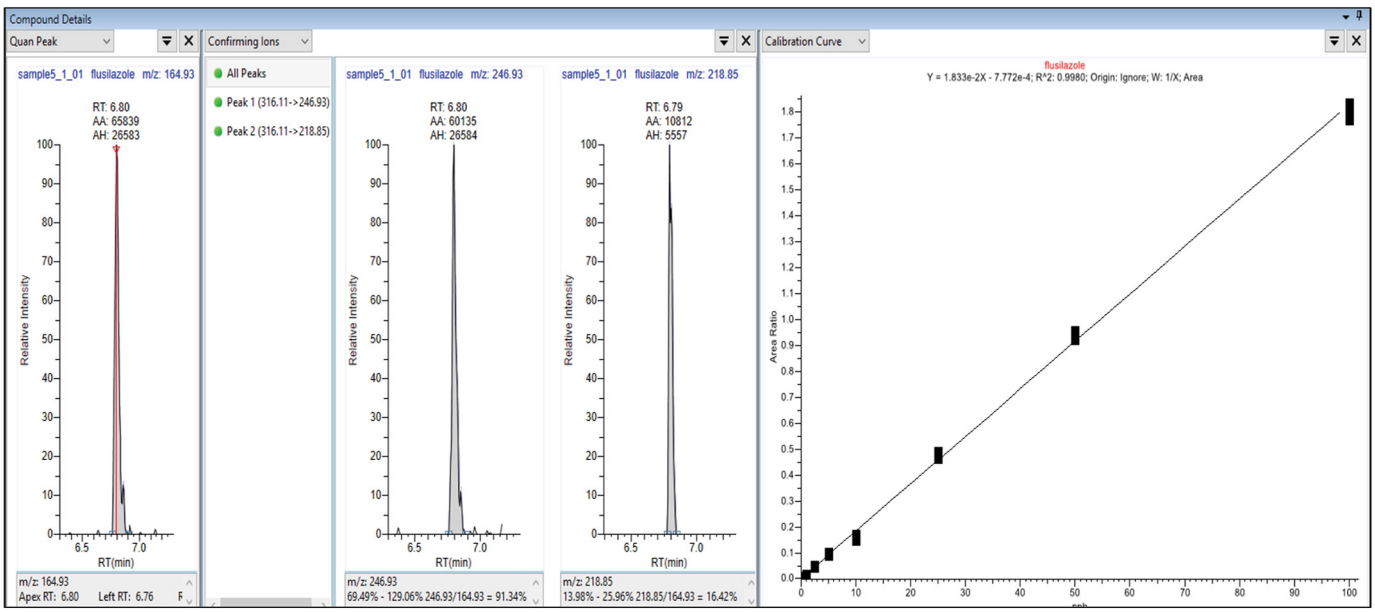


Figure 2. Quantitation and confirming ions at 1 ppb in a MES, along with calibration range from 0.5 to 100 ppb in white wine for azoxystrobin (A) and flusilazole (B). The technique allows for confident screening with confirmation well below the MRL concentration.

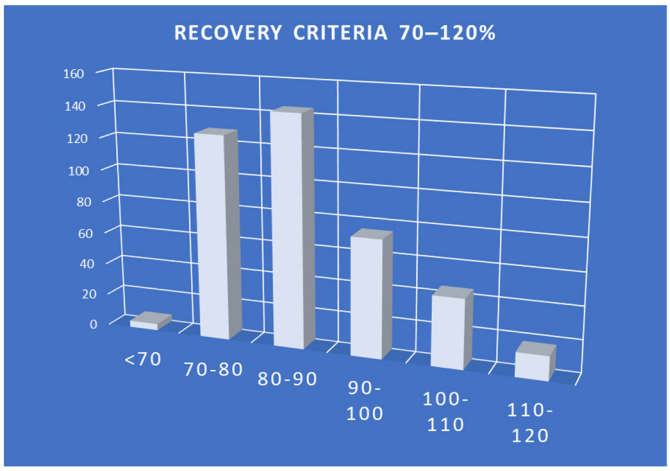


Figure 3. Recovery results for pesticide residues in wine matrix at the LOQ

Conclusion

European Union regulations that set maximum residue limits of pesticides in foods are analytically challenging due to the low LOQs that must be achieved in complex matrices. This application note describes a multi-residue LC-MS/MS method that uses the TSQ Quantis triple quadrupole mass spectrometer-based Pesticide Explorer II solution, for rapid and robust quantitation of more than 400 pesticides in wine at or below their respective MRLs and conforming to the EU SANTE guidelines. The LC-MS/MS system enabled analysis of 1 µL sample injections, without the need for dispersive SPE sample cleanup or sample dilution, with increased robustness and throughput.

Reference

1. SANTE/11813/2017. Guidance document on analytical quality control and method validation procedures for pesticides residues analysis in food and feed. Supersedes SANTE/11945/2015. Implemented by 01/01/2018. https://ec.europa.eu/food/sites/food/files/plant/docs/pesticides_mrl_guidelines_wrkdoc_2017-11813.pdf

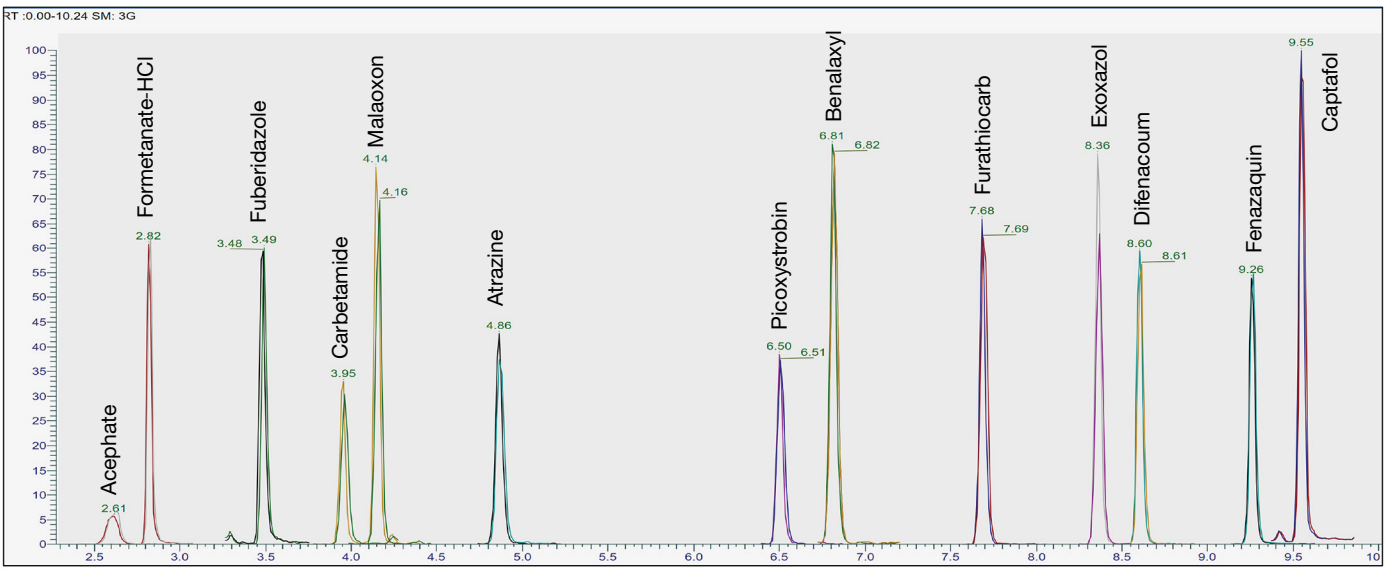


Figure 4. LC-MS/MS extracted ion chromatograms of spiked white wine of select pesticides (overlay of injection #1 and injection # 300) demonstrate good robustness of the analytical system and API source.

Appendix

Table A1 (part 1). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
2-methyl-4-6-dinitrophenol (DNOC)	5.01	Negative	197.020	109.042	137.000		25	75
3,4,5-trimethacarb	5.17	Positive	194.117	106.899	122.000		1	86
3-hydroxycarbofuran	3.38	Positive	238.107	135.000	163.054		1	70
Abamectin	8.99	Positive	890.512	305.012	306.970		25	71
Acetamiprid	3.52	Positive	223.074	89.774	98.702	125.702	10	98
Acetochlor	6.44	Positive	270.125	133.042	148.071	224.060	10	72
Albendazole	5.38	Positive	266.095	158.970	190.845	233.929	0.5	110
Aldicarb	3.86	Positive	208.050	69.929	88.970	115.929	10	102
Aldicarb-sulfone-NH_4^+	3.00	Positive	240.101	86.000	166.042	222.970	5	70
Allethrin	7.90	Positive	303.195	90.929	122.982	134.929	5	77
Allidochlor	3.91	Positive	174.068	80.929	97.946	105.774	2.5	76
Alloxidim-sodio	6.44	Positive	324.181	178.083	234.083	266.155	0.5	100
Ametoctradin	7.51	Positive	276.218	149.000	176.000	176.970	100	83
Ametryn	5.09	Positive	228.127	67.917	95.899	185.899	1	94
Amicarbazone	4.06	Positive	242.161	42.857	84.929	142.857	25	73
Ancymidol	4.27	Positive	257.128	76.857	80.827	134.845	2.5	87
Anilofos2	6.86	Positive	368.030	124.845	170.887	198.762	1	99
Aramite-NH_4^+	8.04	Positive	352.134	57.054	191.125	255.054	2.5	102
Aspon	8.47	Positive	379.092	114.762	210.607	336.774	0.5	100
Atraton	4.14	Positive	212.150	99.929	113.857	169.929	0.5	106
Atrazine	4.98	Positive	216.101	95.970	103.917	173.970	1	90
Atrazine-desethyl	3.68	Positive	188.069	103.845	109.917	145.917	2.5	104
Atrazine-desisopropyl	3.34	Positive	174.054	95.917	103.845	131.917	10	11
Azaconazole	5.32	Positive	300.030	122.845	158.845	230.845	2.5	95
Azamethiphos	4.09	Positive	324.980	111.845	138.845	182.833	0.5	83
Azimsulfuron	5.03	Positive	425.109	139.000	181.917	226.970	0.5	110
Azinphos-ethyl	6.43	Positive	346.044	76.917	131.917	260.887	25	74
Azoxystrobin	5.51	Positive	404.124	328.857	343.929	371.929	10	81
Beflubutamid	6.73	Positive	356.126	64.857	90.845	161.929	2.5	82
Benalaxyl	6.95	Positive	326.175	148.000	207.929	293.929	2.5	87
Benazolin-ethylester	5.55	Positive	272.014	169.774	197.833	225.744	1	84
Benodanil	4.90	Positive	323.987	75.929	202.762	230.762	1	104
Benoxacor	5.34	Positive	260.023	119.917	133.857	148.929	2.5	84
Bensulfuron-methyl	5.32	Positive	411.096	91.000	149.000	181.970	0.5	89
Bensulide	6.66	Positive	398.067	157.917	217.845	313.690	25	83
Benthiavalicarb-isopropyl	5.91	Positive	382.159	115.929	179.845	196.845	2.5	96
Benzoaminopurine	3.94	Positive	226.108	64.917	90.845	147.988	1	71
Benzofap	7.64	Positive	431.092	104.857	118.875	132.988	0.5	87
Benzoximate	7.24	Positive	364.094	104.845	183.815	198.774	2.5	93

Table A1 (part 2). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Benzyldimethyldode-cylammonium chloride	7.33	Positive	305.307	57.929	90.857	213.083	2.5	89
Benzyldimethylhexade-cylammonium chloride	9.05	Positive	361.370	57.929	90.845	269.095	1	87
Benzyldimethyltetrade-cylammonium chloride	8.27	Positive	333.339	58.000	90.786	241.167	2.5	97
Bifenazate	6.19	Positive	301.154	151.929	170.000	197.857	10	94
Bifenthrin-NH_4^+	9.51	Positive	440.088	165.083	166.125	181.125	10	82
Bioallethrin	7.95	Positive	303.195	92.845	122.929	134.857	0.5	82
Bioresmethrin	8.99	Positive	339.195	127.946	142.929	170.929	0.5	87
Bolster (sulprofos)	8.34	Positive	323.035	154.917	218.815	246.845	2.5	90
Boscalid	5.82	Positive	343.039	270.940	271.970	306.845	10	73
Brodifacoum	9.25	Positive	523.090	177.917	255.970	334.804	1	89
Bromfenvinfos	7.01	Positive	402.926	98.762	154.845	169.762	1	87
Bromobutide	6.39	Positive	312.095	90.899	118.929	193.774	10	85
Bromoxynil	4.93	Negative	275.800	78.762	80.762	166.762	10	72
Bupirimate	6.28	Positive	317.164	165.929	209.940	237.012	2.5	86
Buprofezin	7.90	Positive	306.163	105.857	115.845	200.857	0.5	99
Butafenacil-NH_4^+	6.17	Positive	492.075	179.815	330.774	348.845	2.5	73
Butamifos	7.09	Positive	333.103	95.851	151.857	179.857	0.5	99
Butralin	8.50	Positive	296.160	131.929	221.857	239.929	2.5	77
Butylate	7.76	Positive	218.157	56.929	99.929	156.012	100	99
Butylbenzyl-phthalate	7.59	Positive	313.143	90.970	148.917	204.857	10	93
Cadusafos	7.41	Positive	271.094	130.762	158.845	214.845	0.5	100
Carbaryl	4.58	Positive	202.086	114.929	126.929	144.929	2.5	90
Carbetamide	4.02	Positive	237.123	117.929	119.845	191.845	1	84
Carbofuran	4.24	Positive	222.112	76.929	122.845	164.929	10	120
Carfentrazone-ethyl	6.73	Positive	412.043	345.774	365.845	383.845	10	81
Carpropamid	6.92	Positive	334.052	102.917	138.917	195.845	10	89
Chlorantraniliprole	5.15	Positive	481.978	111.845	283.875	450.815	2.5	79
Chlordimeform	3.29	Positive	197.084	45.857	88.857	116.857	10	118
Chlorfenvinphos	6.98	Positive	358.976	98.774	154.899	169.815	2.5	86
Chlorfluazuron	8.68	Positive	539.970	140.988	157.970	382.833	2.5	88
Chloridazon	3.54	Positive	222.042	76.929	91.845	103.845	10	79
Chlorimuron-ethyl	5.84	Positive	415.047	82.970	120.845	185.869	1	81
Chloroxuron	6.32	Positive	291.089	45.857	71.917	217.845	10	83
Chlorpyriphos	8.34	Positive	349.933	96.833	197.762	321.679	2.5	106
Cinidon-ethyl	8.20	Positive	394.060	106.857	347.917	365.917	10	87
Clethodim	7.64	Positive	360.139	163.929	166.000	267.982	10	74
Climbazol	5.12	Positive	293.105	69.000	196.917	224.952	0.5	87
Clodinafop	5.62	Positive	312.000	90.970	221.917	265.970	2.5	90
Clodinafop-propargyl ester	6.64	Positive	350.058	90.970	237.917	265.899	1	81

Table A1 (part 3). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Clofentezine	7.61	Positive	303.019	74.929	101.845	137.845	25	83
Cloquintocet-1-methylhexyl ester	8.16	Positive	336.136	178.917	191.845	237.917	0.5	84
Coumachlor	6.46	Positive	343.073	120.917	162.970	284.970	0.5	89
Coumaphos	7.14	Positive	363.021	226.774	306.762	334.762	2.5	103
Coumatetralyl	6.31	Positive	293.117	90.952	106.917	174.97	1	73
Crimidine	3.87	Positive	172.063	94.970	108.929	136.000	2.5	83
Crufomate	6.61	Positive	292.086	107.845	203.774	235.845	1	85
Cumyluron	6.07	Positive	303.125	90.970	124.899	184.917	2.5	79
Cyanazine	4.03	Positive	241.096	103.845	131.845	213.929	1	102
Cyazofamid	6.50	Positive	325.052	107.774	216.845	260.929	10	86
Cycloate	7.40	Positive	216.141	83.054	133.970	154.054	5	84
Cyclosulfamuron	6.33	Positive	422.112	198.857	217.845	260.917	0.5	107
Cycloxydim	7.58	Positive	326.178	106.982	180.000	280.054	2.5	91
Cyflufenamid	7.16	Positive	413.128	202.845	240.917	294.899	2.5	101
Cyhalofop-butyl-NH_4^+	7.41	Positive	375.171	120.000	256.054	358.083	25	77
Cyhalothrin-NH_4^+	8.56	Positive	467.000	224.970	423.054	450.042	10	81
Cymiazole	3.46	Positive	219.095	104.929	143.982	171.000	10	72
Cyprazine	4.91	Positive	228.101	107.929	143.988	185.970	0.5	94
Cyproconazole	6.00	Positive	292.121	69.917	88.970	124.899	2.5	80
Cyprodinil	6.96	Positive	226.133	92.857	107.857	117.857	25	87
DEF	8.90	Positive	315.103	112.762	168.845	224.899	0.5	85
Deltamethrin-NH_4^+	8.81	Positive	522.900	180.970	280.833	505.833	10	77
Demeton-S-methyl	4.37	Positive	231.027	54.929	60.917	88.899	5	75
Desmedipham	5.12	Positive	318.145	107.857	135.899	181.982	10	87
Desmetryne	4.53	Positive	214.112	81.845	90.845	171.899	0.5	105
Dialifos	7.42	Positive	394.009	180.845	186.815	207.845	10	76
Diallate	7.58	Positive	270.048	85.982	108.762	128.000	25	75
Diclobutrazol	6.76	Positive	328.097	69.917	122.845	158.845	10	84
Diclofop-methyl	7.97	Positive	358.050	119.929	280.845	340.845	10	66
Diclosulam	4.52	Positive	405.993	124.899	160.899	377.887	2.5	79
Dicyclohexyl-phthalate	8.49	Positive	331.190	148.970	166.970	249.054	0.5	101
Diethofencarb	5.46	Positive	268.154	123.917	179.929	225.929	0.5	92
Difenacoum	8.68	Positive	445.179	175.042	179.054	257.054	1	72
Difenoconazole	7.52	Positive	406.071	187.845	250.845	336.845	2.5	105
Difenoxuron	5.15	Positive	287.000	71.929	94.970	122.899	1	99
Diflufenican	7.60	Positive	395.000	217.899	245.899	265.970	2.5	81
Dimefox	3.31	Positive	155.074	43.929	109.917	135.000	0.5	90
Dimefuron	5.30	Positive	339.121	71.929	166.917	255.917	10	78
Dimepiperate	7.47	Positive	264.141	90.970	119.000	146.000	1	90

Table A1 (part 4). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Dimethametrin	6.39	Positive	256.159	67.845	90.845	185.845	1	89
Dimethenamid	5.68	Positive	276.081	110.845	167.929	243.917	2.5	79
Dimethirimol	3.81	Positive	210.160	70.929	97.845	139.929	10	80
Dimethoate	3.49	Positive	230.006	124.845	170.815	198.762	1	90
Dimethomorph	5.80	Positive	388.131	138.845	164.929	300.845	10	83
Diniconazole	7.31	Positive	326.082	69.929	158.887	251.917	25	76
Divinoterb	7.07	Negative	239.000	176.000	176.899	207.000	10	79
Diphenamid	5.23	Positive	240.138	117.857	133.929	166.929	1	80
Dipropetryn	6.27	Positive	256.159	143.899	172.000	213.982	0.5	110
Disulfoton-sulfoxide	4.78	Positive	291.030	156.833	184.762	212.774	0.5	84
Ditalimfos	6.44	Positive	300.045	129.845	147.917	243.845	0.5	92
Diuron	5.34	Positive	233.024	45.857	71.917	159.815	10	79
Dodine	7.42	Positive	228.264	42.857	56.929	59.929	10	85
Drazoxolon	6.60	Positive	238.037	98.988	129.786	176.756	10	78
Edifenphos	6.92	Positive	311.032	108.845	110.845	282.845	1	87
Emamectin-benzoate	8.17	Positive	886.538	81.929	125.929	158.000	2.5	72
Epoxiconazole	6.44	Positive	330.080	100.917	120.899	122.917	2.5	79
Etaconazole	6.40	Positive	328.061	122.917	158.917	204.887	2.5	86
Ethiofencarb-sulfone	3.26	Positive	258.079	76.929	106.845	200.845	2.5	12
Ethion	8.12	Positive	384.994	142.762	170.815	198.774	0.5	98
Ethofumesate	5.57	Positive	287.094	120.929	160.929	258.899	10	90
Ethoprop (ethoprofos)	6.28	Positive	243.063	96.905	130.905	172.958	0.5	108
Etobenzanid	7.01	Positive	340.050	120.970	149.000	178.970	1	78
Etrimfos	6.92	Positive	293.071	124.845	232.845	264.917	10	80
Famoxadone	7.07	Positive	392.160	194.827	237.911	330.911	25	86
Fenamidone	5.65	Positive	312.116	91.899	235.929	264.000	2.5	79
Fenamiphos	6.59	Positive	304.113	201.774	216.845	233.917	2.5	77
Fenamiphos-sulfoxide	4.22	Positive	320.107	107.929	232.845	291.899	1	96
Fenarimol	6.32	Positive	331.039	80.899	188.845	258.845	2.5	96
Fenazaquin	9.38	Positive	307.180	56.929	130.929	161.054	0.5	107
Fenbuconazole	6.56	Positive	337.121	69.917	88.899	124.845	10	78
Fenbutatin-oxide	9.94	Positive	519.175	288.917	350.917	463.000	10	112
Fenchlorazol-ethyl	7.04	Positive	401.913	285.875	355.804	373.804	2.5	80
Fenfuram	4.65	Positive	202.086	82.929	108.845	119.845	0.5	98
Fenhexamid	6.18	Positive	302.070	54.929	96.929	141.845	100	84
Fenobucarb	5.50	Positive	208.133	76.970	94.917	151.970	2.5	81
Fenotiocarb	6.73	Positive	254.121	72.000	149.054	160.125	2.5	81
Fenoxanil	6.50	Positive	329.081	86.054	188.887	301.917	2.5	87
Fenoxaprop-*p*-ethyl	7.71	Positive	362.078	119.000	121.042	243.970	1	102
Fenpropathrin	8.45	Positive	350.175	55.000	97.071	125.054	2.5	79

Table A1 (part 5). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Fenpropidin	5.36	Positive	274.252	85.929	116.857	146.929	1	85
Fenpropimorph	5.42	Positive	304.263	117.000	130.054	147.054	0.5	99
Fenpyrazamine	5.95	Positive	332.142	216.054	230.083	231.054	1	105
Fenpyroximate	8.75	Positive	422.207	213.958	214.929	366.012	0.5	94
Fensulfothion	5.06	Positive	309.037	172.845	252.845	280.845	2.5	87
Fenthion-sulfone	4.51	Positive	311.017	108.917	124.917	278.917	0.5	100
Fentrazamide	6.91	Positive	350.137	83.000	154.054	196.929	10	87
Fenuron	3.50	Positive	165.102	45.857	71.917	76.899	10	81
Fipronil-sulfone	6.90	Negative	450.926	243.970	282.000	414.917	1	91
Flamprop	5.40	Positive	322.000	76.970	104.917	171.970	2.5	93
Flamprop-isopropyl	6.83	Positive	364.111	76.970	104.917	303.917	0.5	92
Flamprop-methyl	5.94	Positive	336.079	77.000	104.917	303.970	10	77
Fluazifop	5.59	Positive	328.079	90.899	253.929	281.929	10	88
Fluazinam	7.96	Negative	462.958	369.845	397.917	415.917	10	92
Fluazuron	8.17	Positive	506.000	140.988	157.970	348.887	0.5	102
Flubendiamide	6.72	Positive	683.030	255.792	273.833	407.887	100	106
Flucycloxuron	8.30	Positive	484.123	132.000	170.042	289.042	0.5	109
Fludioxonil	5.95	Negative	247.032	125.929	168.857	179.857	10	71
Flufenacet	6.31	Positive	364.073	123.929	151.970	193.929	1	91
Flufenoxuron	8.48	Positive	489.043	112.917	140.917	157.970	1	74
Fluometuron	4.77	Positive	233.089	45.857	71.917	159.899	1	74
Fluopyram	6.16	Positive	397.053	144.845	172.845	207.845	2.5	75
Fluorochloridon	6.04	Positive	312.016	52.929	144.845	291.917	5	80
Fluoroglycofen-ethyl-NH_4^+	7.48	Positive	465.000	222.845	343.560	447.774	1	77
Fluoxastrobin	6.18	Positive	459.086	187.845	305.845	426.917	2.5	73
Fluridone	5.35	Positive	330.110	293.899	308.929	309.827	0.5	106
Flurtamone	5.59	Positive	334.104	177.786	227.000	246.929	0.5	101
Flusulfamide	7.14	Negative	412.938	170.845	266.714	282.756	10	86
Fluthiacet-methyl	6.77	Positive	404.030	214.845	273.887	343.899	1	99
Flutolanil	5.89	Positive	324.106	241.929	261.929	281.929	0.5	90
Flutriafol	4.87	Positive	302.109	69.917	94.917	122.845	1	85
Fluxapyroxad	5.87	Positive	382.097	313.970	341.929	362.000	0.5	90
Foramsulfuron	4.45	Positive	453.118	139.000	181.899	272.042	0.5	100
Forchlorfenuron (CPPU)	5.25	Positive	248.058	92.917	128.845	154.845	1	75
Formetanate-hydrochloride	2.83	Positive	222.123	45.929	92.845	165.000	1	77
Formothion	3.92	Positive	258.002	124.917	170.917	198.833	10	74
Fosthiazate	4.65	Positive	284.053	103.845	199.762	227.845	1	85
Fuberidazole	3.51	Positive	185.070	130.000	156.012	157.000	1	87
Furalaxyl	5.43	Positive	302.138	94.845	242.000	269.982	0.5	98

Table A1 (part 6). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Furathiocarb	7.81	Positive	383.163	166.970	194.845	251.929	2.5	93
Furmecyclox	6.80	Positive	252.159	109.929	122.899	169.982	0.5	80
Guthion (azinphos-methyl)	5.42	Positive	318.013	124.875	131.804	159.893	10	79
Halosulfuron-methyl	6.23	Positive	435.048	83.042	138.970	181.988	0.5	117
Haloxyfop	6.62	Positive	362.040	271.958	287.845	315.649	25	84
Haloxyfop-2-ethoxyethyl	7.72	Positive	434.097	90.929	287.845	315.845	0.5	116
Haloxyfop-methyl	7.39	Positive	376.055	90.857	287.917	315.845	0.5	111
Heptenophos	5.16	Positive	251.023	108.845	124.899	126.917	2.5	72
Hexaconazole	7.00	Positive	314.082	69.899	124.899	158.845	10	76
Hexaflumuron	7.71	Positive	460.988	113.000	140.988	158.042	25	95
Hexazinone	4.38	Positive	253.165	71.018	85.071	171.054	1	77
Hexythiazox	8.28	Positive	353.108	115.018	168.042	227.988	2.5	77
Hydramethylnon	7.52	Positive	495.197	150.929	170.970	322.982	0.5	118
Imazalil	4.78	Positive	297.055	158.958	176.006	200.863	25	73
Imazamethabenz-methyl	4.13	Positive	289.154	143.899	161.000	228.982	1	102
Imazamox	3.48	Positive	306.144	192.917	261.054	264.000	0.5	80
Imazapic	3.55	Positive	276.000	162.970	216.000	231.000	0.5	104
Imazethapyr	3.87	Positive	290.149	176.970	229.929	245.012	1	86
Imibenconazole	8.11	Positive	410.999	124.988	170.988	341.863	10	71
Indoxacarb	7.39	Positive	528.077	202.845	248.970	292.899	10	89
Ipconazole	7.50	Positive	334.168	69.929	124.899	190.899	1	81
Iprobenfos	6.71	Positive	289.102	91.042	204.935	246.988	0.5	83
Iprovalicarb	6.07	Positive	321.217	119.018	186.018	203.071	2	77
Isazophos	6.02	Positive	314.048	96.833	119.845	161.970	1	83
Isocarbamid	3.69	Positive	186.123	44.000	87.060	130.042	10	79
Isocarbofos	4.99	Positive	307.000	120.988	230.917	272.988	2.5	91
Isofenphos	7.16	Positive	346.123	120.988	216.887	244.917	0.5	117
Isofenphos-methyl	6.65	Positive	332.107	120.899	230.917	272.970	1	85
Isomethiozin	6.85	Positive	269.143	115.917	172.054	199.929	0.5	84
Isoprocarb	4.88	Positive	194.117	76.988	94.970	137.071	1	85
Isopropalin	8.79	Positive	310.176	206.000	207.970	226.054	10	80
Isoprothiolane	5.96	Positive	291.071	144.887	188.887	230.970	1	96
Isoproturon	5.10	Positive	207.149	45.946	71.988	165.071	25	71
Isouron	4.36	Positive	212.139	45.929	71.929	167.054	0.5	106
Isoxadifen-ethyl	6.62	Positive	296.128	203.929	231.929	263.054	1	79
Isoxaflutole	4.95	Positive	360.051	143.917	219.845	250.917	10	76
Isoxathion	7.16	Positive	314.061	96.762	104.845	285.899	1	87
Kadethrin	7.53	Positive	397.146	128.000	143.000	171.054	50	71
Kresoxim-methyl	6.73	Positive	314.138	116.000	222.071	267.071	10	79
Lactofen	7.83	Positive	462.000	222.845	299.815	343.845	50	85
Linuron	5.82	Positive	249.019	132.905	159.976	181.988	2.5	71

Table A1 (part 7). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Lufenuron	8.22	Positive	511.000	112.988	140.988	158.042	10	72
Malaoxon	4.21	Positive	315.066	98.935	126.988	268.988	1	78
Malathion	5.81	Positive	331.043	98.887	126.899	284.899	2.5	81
Mandipropamid	5.79	Positive	412.131	124.935	328.018	356.018	2.5	86
Mecarbam	6.30	Positive	330.059	96.887	198.815	226.917	1	98
Mefenacet	6.17	Positive	299.084	120.000	148.000	191.845	1	83
Mefenpyr-diethyl	6.92	Positive	373.071	159.917	185.845	252.917	2.5	78
Mephosfolan	4.09	Positive	270.038	139.833	167.899	195.845	0.5	94
Mepronil	5.95	Positive	270.148	91.000	118.970	228.054	1	70
Mesosulfuron-methyl	4.80	Positive	504.085	139.000	181.970	305.863	0.5	98
Metaflumizone	7.97	Positive	507.125	177.970	220.970	287.000	10	87
Metconazole	7.13	Positive	320.152	69.970	89.000	124.970	10	70
Methabenzthiazuron	5.28	Positive	222.069	95.917	149.917	164.970	0.5	73
Methiocarb	5.78	Positive	226.089	77.000	121.000	169.054	2.5	87
Methiocarb-sulfone	3.49	Positive	258.079	106.917	122.071	200.970	5	82
Methiocarb-sulfoxide	3.35	Positive	242.084	122.000	169.970	184.970	1	91
Methomyl	3.12	Positive	163.053	57.970	87.970	105.917	2.5	72
Methyl-paraoxon	3.95	Positive	248.031	89.970	108.917	201.917	25	73
Metolachlor	6.42	Positive	284.141	134.000	176.054	252.054	0.5	102
Metolcarb	4.06	Positive	166.086	91.000	93.970	108.929	2.5	86
Metosulam	4.32	Positive	418.013	139.917	174.917	189.815	10	74
Metoxuron	3.90	Positive	229.073	45.929	71.929	155.970	2.5	77
Metrafenone	7.28	Positive	409.064	165.982	208.929	226.845	2.5	88
Metsulfuron-methyl	4.18	Positive	382.081	134.970	166.970	198.845	2.5	71
Mexacarbate	3.44	Positive	223.144	136.000	151.000	166.054	0.5	103
Molinate	6.16	Positive	188.110	54.982	98.000	126.054	10	73
Monalide	6.42	Positive	240.114	42.929	56.929	85.054	10	76
Monocrotophos	3.18	Positive	224.068	97.827	126.899	192.845	10	78
Monolinuron	4.78	Positive	215.058	98.917	125.917	148.000	1	83
N-1-naphthylphthalamic acid	4.17	Positive	292.096	127.000	144.000	148.917	10	79
Naled-NH_4^+	5.17	Positive	398.000	108.917	126.899	175.75	10	73
Napropamide	6.42	Positive	272.164	129.054	171.054	198.899	1	78
Neburon	6.77	Positive	275.071	57.000	88.054	114.000	10	86
Nicosulfuron	4.14	Positive	411.108	105.917	181.988	212.970	10	71
Orbencarb	7.23	Positive	258.071	88.970	100.000	124.899	0.5	109
Oxadiargyl	7.00	Positive	341.045	150.988	222.917	229.958	2.5	82
Oxadiazon	8.01	Positive	345.076	176.887	219.887	302.917	25	113
Oxadixyl	3.87	Positive	279.133	116.929	132.000	219.054	1	88
Oxamyl-NH_4^+	3.02	Positive	237.025	71.970	89.970	220.000	1	80
Oxathiapiprolin	5.76	Positive	540.148	350.054	500.012	522.083	2.5	84

Table A1 (part 8). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Oxycarboxin	3.57	Positive	268.063	119.970	146.917	174.899	10	83
Oxydemeton-methyl	3.09	Positive	247.022	108.845	124.917	168.970	0.5	113
Paclobutrazol	5.85	Positive	294.136	69.970	89.000	124.899	10	88
Paraoxon	4.85	Positive	276.063	93.970	173.97	219.917	0.5	111
Pebulate	7.35	Positive	204.141	57.054	71.970	128.054	10	94
Penconazole	6.91	Positive	284.071	69.917	122.917	158.917	10	83
Pencycuron	7.33	Positive	329.141	88.970	124.917	218.000	2.5	84
Pendimethalin	8.42	Positive	282.144	118.000	193.917	211.970	10	83
Pentanochlor	6.65	Positive	240.114	71.000	106.929	141.988	0.5	98
Pethoxamid	6.19	Positive	296.141	91.000	131.000	250.000	0.5	114
Phorate-sulfone	4.84	Positive	293.009	114.815	142.917	170.970	1	82
Phorate-sulfoxide	4.76	Positive	277.015	142.833	170.887	198.815	0.5	99
Phosmet	5.51	Positive	318.001	77.000	132.970	159.970	1	74
Phosphamidon	3.90	Positive	300.076	76.113	132.167	174.167	10	93
Phoxim	7.17	Positive	299.061	77.125	97.030	129.113	2.5	92
Picolinafen	8.20	Positive	377.090	145.113	238.125	359.071	0.5	103
Picoxystrobin	6.62	Positive	368.110	115.196	145.113	205.143	10	73
Piperophos	7.44	Positive	354.132	170.887	212.815	254.970	2.5	78
Pirimicarb	3.95	Positive	239.150	71.970	181.982	194.982	1	91
Pirimicarb-desmethyl	3.31	Positive	225.134	71.929	168.054	180.000	1	95
Pirimicarb-desmethyl-formamido	4.17	Positive	253.129	71.970	195.929	225.054	2.5	87
Pirimiphos-ethyl	7.89	Positive	334.134	170.000	182.054	197.929	0.5	95
Pirimiphos-methyl	7.09	Positive	306.103	66.917	107.929	164.054	25	77
Pretilachlor	7.50	Positive	312.172	132.000	176.054	252.071	0.5	97
Primisulfuron-methyl	5.92	Positive	469.043	198.845	253.899	436.899	2.5	75
Prochloraz	7.15	Positive	376.038	69.929	265.887	307.815	10	82
Profenophos	7.80	Positive	372.942	127.917	302.720	344.833	2.5	92
Promecarb	5.82	Positive	208.133	91.000	108.929	151.054	2.5	89
Prometon	4.63	Positive	226.166	85.970	142.000	184.000	0.5	102
Prometryn	5.74	Positive	242.143	67.917	157.970	199.929	2.5	75
Pronamide	5.97	Positive	256.029	144.887	172.887	189.887	0.5	88
Propamocarb	2.87	Positive	189.159	73.970	101.917	144.000	0.5	104
Propaquizafop	7.87	Positive	444.132	99.929	298.899	371.000	0.5	77
Propargite-NH_4^+	8.37	Positive	368.000	106.970	175.054	231.065	0.5	97
Propiconazole	7.00	Positive	342.077	69.000	122.917	158.917	2.5	88
Propoxur	4.17	Positive	210.112	92.970	110.917	168.054	2.5	86
Pyracarbolid	4.37	Positive	218.117	96.917	106.917	124.970	10	95
Pyraclofos	7.21	Positive	361.053	137.917	139.917	256.917	25	70
Pyraclostrobin	7.16	Positive	388.105	162.982	164.042	193.899	2.5	83
Pyrazophos	7.26	Positive	374.093	175.970	193.899	221.929	10	86

Table A1 (part 9). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Pyrazosulfuron-ethyl	6.19	Positive	415.103	82.970	138.970	181.970	1	105
Pyretrins1	8.53	Positive	329.000	133.054	143.000	161.042	5	75
Pyretrins2	7.50	Positive	373.000	104.917	133.000	143.000	10	77
Pyributicarb	8.08	Positive	331.147	133.000	180.899	189.929	1	83
Pyridaben	8.93	Positive	365.144	117.000	147.054	308.988	0.5	91
Pyridalyl	9.76	Positive	489.975	108.887	182.917	203.970	0.5	76
Pyridaphenthion	6.10	Positive	341.071	91.970	188.970	204.899	0.5	90
Pyridate	9.29	Positive	379.124	103.774	206.845	350.982	1	89
Pyrifenox	6.10	Positive	295.039	66.000	66.970	92.970	1	89
Pyriftalid	5.52	Positive	319.074	138.970	178.958	219.917	1	74
Pyrimethanil	5.78	Positive	200.118	106.917	168.000	183.042	2.5	72
Pyrimidifen	8.05	Positive	378.194	150.000	156.970	183.899	0.5	82
Pyriproxyfen	8.19	Positive	322.143	95.988	184.988	227.071	0.5	74
Pyroxsulam	4.17	Positive	435.069	124.000	166.000	194.917	2.5	83
Quinalphos	6.85	Positive	299.061	119.000	147.000	162.970	0.5	85
Quinoxyphen	8.53	Positive	308.003	161.988	196.833	271.935	2.5	83
Quizalofop-ethyl	7.74	Positive	373.094	90.970	271.000	298.899	0.5	86
Quizalofop-P	6.41	Positive	345.063	243.97	270.958	298.899	2.5	100
Quizalofop-P-ethyl	7.74	Positive	373.094	90.929	271.000	298.899	2.5	76
Resmethrin	9.00	Positive	339.195	128.000	143.000	171.071	1	112
Rimsulfuron	4.51	Positive	432.064	138.857	181.899	324.929	0.5	110
Rotenone	6.59	Positive	395.148	191.917	194.917	212.929	10	73
Schradan	3.50	Positive	287.139	134.929	198.917	242.000	10	74
Sebuthylazine	5.56	Positive	230.116	95.917	103.863	173.988	0.5	76
Secbumeton	4.63	Positive	226.166	99.917	113.946	170.000	0.5	91
Sethoxydim	7.87	Positive	328.194	178.000	220.000	282.071	2.5	70
Siduron	5.60	Positive	233.164	77.000	93.970	137.000	0.5	112
Silafluofen-NH_4^+	9.99	Positive	426.000	168.042	181.042	287.054	10	81
Simeconazole	6.24	Positive	294.143	69.970	114.899	135.000	2.5	98
Simetryn	4.47	Positive	214.112	67.917	95.917	124.000	1	85
Spinetoram	7.56	Positive	748.499	97.946	142.000	202.946	10	74
Spirodiclofen	8.54	Positive	411.112	71.000	294.899	312.917	5	87
Spiromesifen	8.30	Positive	371.221	227.012	255.054	273.054	25	85
Spirotetramat	6.10	Positive	374.196	215.982	302.054	330.065	2.5	79
Spirotetramat-enol	4.62	Positive	302.175	145.000	216.000	270.012	25	95
Spiroxamine	5.65	Positive	298.274	72.000	99.929	144.054	1	89
Succinic acid di-n-butyl ester	6.67	Positive	231.159	72.917	100.917	157.054	2.5	93
Sulfotepp	6.72	Positive	323.030	96.833	114.815	170.970	10	74
Tau-fluvalinate	8.95	Positive	503.134	152.000	181.042	207.988	2.5	70
TCMTB	5.75	Positive	238.976	108.845	135.917	179.845	1	89

Table A1 (part 10). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Tebufenpyrad	7.82	Positive	334.168	116.917	144.970	147.054	2.5	88
Tebupirimphos	7.86	Positive	319.123	153.054	230.970	277.000	0.5	107
Tebutame	6.34	Positive	234.185	64.929	90.970	192.000	0.5	96
Tebuthiuron	4.33	Positive	229.111	115.917	157.000	172.054	10	78
Temephos	8.02	Positive	466.996	340.845	404.917	418.917	1	101
TEPP	3.86	Positive	291.075	98.845	178.815	206.815	0.5	96
Tepraloxydim	6.16	Positive	342.146	166.054	222.012	250.012	10	76
Terbucarb	7.34	Positive	278.211	108.929	166.054	222.083	10	85
Terbufos-sulfone	5.39	Positive	321.041	96.833	114.833	142.887	10	87
Terbufos-sulfoxide	5.43	Positive	305.046	96.833	130.887	186.887	0.5	101
Terbumeton	4.69	Positive	226.166	68.917	113.929	170.054	0.5	119
Terbutryn(e)	5.83	Positive	242.143	67.988	90.988	185.988	1	107
Tetrachlorvinphos	6.58	Positive	364.906	126.970	203.833	238.762	0.5	100
Tetraconazole	6.30	Positive	372.028	69.970	122.917	158.887	10	79
Tetramethrin	7.77	Positive	332.185	135.054	164.000	314.071	2.5	81
Thenylchlor	6.25	Positive	324.081	52.929	58.917	96.863	10	90
Thiabendazole	3.47	Positive	202.043	103.917	130.970	174.970	1	78
Thiazafluron	4.42	Positive	241.036	73.970	163.970	183.887	0.5	81
Thiazopyr	6.71	Positive	397.100	316.970	334.899	377.000	1	94
Thiobencarb	7.26	Positive	258.071	89.000	98.917	124.970	2.5	77
Thiodicarb	4.69	Positive	355.056	87.970	107.845	163.042	10	95
Thionazin	4.99	Positive	249.000	96.887	112.917	192.815	10	74
Thiophanate-methyl	4.08	Positive	343.052	92.899	150.827	310.631	2.5	77
Triadimefon	5.93	Positive	294.100	140.917	196.899	224.929	10	73
Triallate	8.23	Positive	304.009	82.887	86.113	142.833	25	73
Triasulfuron	4.02	Positive	402.063	120.845	140.845	166.929	10	70
Triazamate	6.07	Positive	315.148	71.857	197.899	225.911	0.5	96
Triazophos	6.15	Positive	314.072	96.833	118.929	162.000	1	87
Triazoxide	5.46	Positive	248.033	67.917	94.988	123.917	2.5	82
Tributyl phosphate	7.47	Positive	267.171	98.815	155.000	210.839	2.5	91
Triclocarban	7.59	Positive	314.985	126.857	127.958	161.887	10	90
Trietazine	6.28	Positive	230.116	99.000	124.000	201.929	2.5	84
Trifloxystrobin	7.39	Positive	409.136	144.917	185.917	205.929	1	77
Trifloxysulfuron sodium salt	4.92	Positive	438.069	139.000	182.000	257.000	1	85
Triflumizole	7.64	Positive	346.092	42.929	73.000	277.970	2.5	71
Triflumuron	7.13	Positive	359.040	110.845	138.917	155.988	10	86
Triflusulfuron-methyl	5.73	Positive	493.111	95.917	263.929	460.929	0.5	106
Tris(isobutyl) phosphate	7.35	Positive	267.171	98.762	154.899	210.857	2.5	100
Triticonazole	6.19	Positive	318.136	42.946	69.917	124.970	2.5	81
Tritosulfuron	5.22	Positive	446.035	144.917	194.917	220.929	2.5	81

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Table A1 (part 11). Name of the compound, RT, polarity, SRM, LOQ, and %Recovery

Compound	Retention time (min)	Polarity	Precursor (*m/z*)	Product (*m/z*)	Product (*m/z*)	Product (*m/z*)	MES LOQ (µg/kg)	Average % recovery at LOQ (µg/kg) (n=6)
Uniconazole	6.52	Positive	292.121	69.970	124.917	217.929	2.5	76
Valifenalate	5.97	Positive	399.168	144.042	155.000	214.071	2.5	81
Vamidothion	3.38	Positive	288.048	58.000	85.982	89.970	25	94
Vegadex	6.88	Positive	224.032	59.970	87.970	115.970	25	81
Vernolate	7.26	Positive	204.141	43.000	86.054	128.054	10	78
Warfarin	5.67	Positive	309.112	120.845	162.857	250.929	0.5	97
XMC	4.50	Positive	180.101	106.946	107.845	122.929	2.5	81
Zoxamide	6.94	Positive	336.031	122.917	132.000	158.917	1	101

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