

Application News

No. C172

Liquid Chromatograph Mass Spectrometry

High Speed Analysis of Pesticides Listed in Appendix Method 20-2 for the Complementary Items for Water Quality Management in Japan Using a Triple Quadrupole LC/MS/MS

In March 2018, Notification Nos. 0328-1 to 4 were issued by the Director of the Water Supply Division, Pharmaceutical Safety and Environmental Health Bureau, MHLW and the number of pesticides listed in an inspection method for the Complementary Items for water quality management in Japan's water quality standards was greatly increased. The method is Appendix Method 20-2 which describes simultaneous analysis using a liquid chromatograph mass spectrometer system and the number of pesticides was increased to 181.

A total of 113 pesticides were added. Of these, 7 are newly added pesticides and the remaining 106 are those that can be analyzed according to the analytical conditions of Appendix Method 20-2 but were already listed in other appendix methods. The other methods are Appendix Method 5 and 5-2 for simultaneous analysis using a solid-phase extraction gas chromatograph mass spectrometer system, Appendix Method 18 for simultaneous analysis using a solid-phase extraction liquid chromatograph mass spectrometer system, Appendix Method 19 for analysis using a solid-phase extraction liquid chromatograph mass spectrometer system, and Appendix Method 20 for simultaneous analysis using a liquid chromatograph mass spectrometer.

This article introduces an example analysis in which the 181 pesticides are analyzed within a short time of 25 min. Also, based on the validation guidelines of the drinking water inspection method, the results of using the LCMS-8050 for evaluating 152 of the pesticides, excluding the 29 pesticides for which the method is regarded to be referential, are introduced as well.

H. Horiike

■ Analysis of a Solution Containing 181 Pesticide Standards

We measured the total ion current (TIC) chromatogram of a mixed standard solution containing all of the 181 pesticides listed in Appendix Method 20-2, including the added 113 pesticides. The chromatogram is shown in Fig. 1.

The measurement duration was 25 min.

The analytical conditions are listed in Table 1. Since many of the pesticides added to the liquid chromatograph mass spectrometry method are also included in the method for simultaneous analysis using a solid-phase extraction GC-MS system, the properties of the pesticides are various.

Taking into consideration the characteristic of some pesticides in which adsorption to the analytical column occurs, a metal-free ODS column was selected for use in analysis.

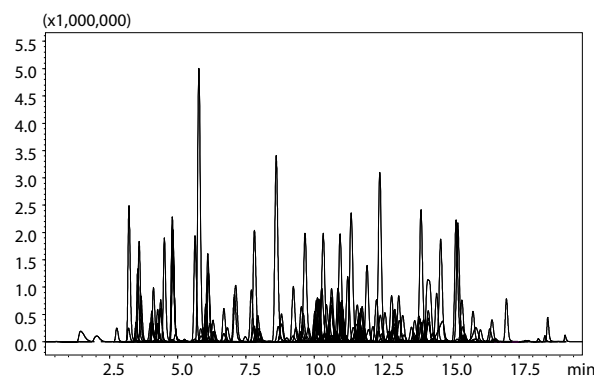


Fig. 1 TIC Chromatogram of a Mixed Standard Solution of 181 Pesticides (1 to 2 µg/L of each pesticide)

Table 1 Analytical Conditions

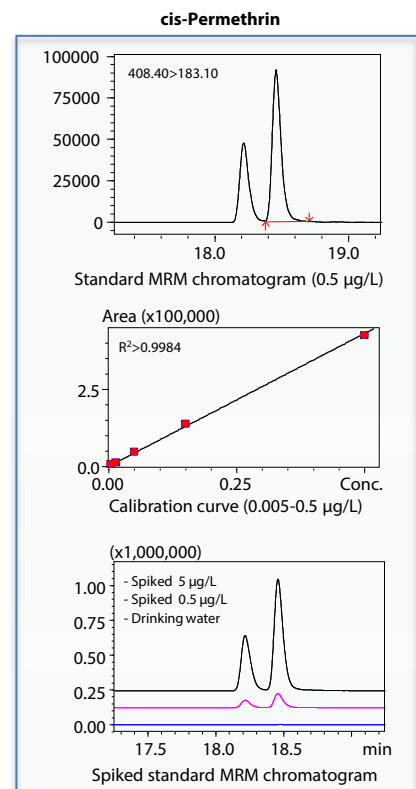
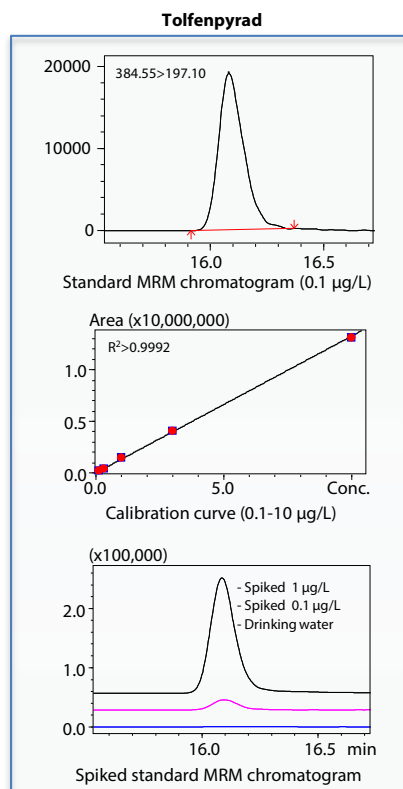
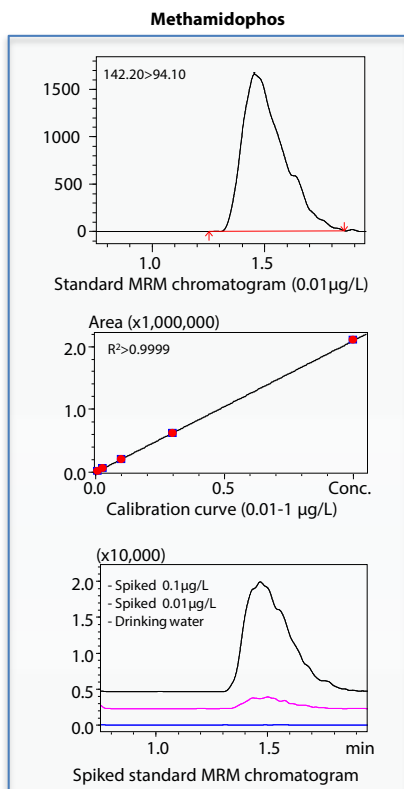
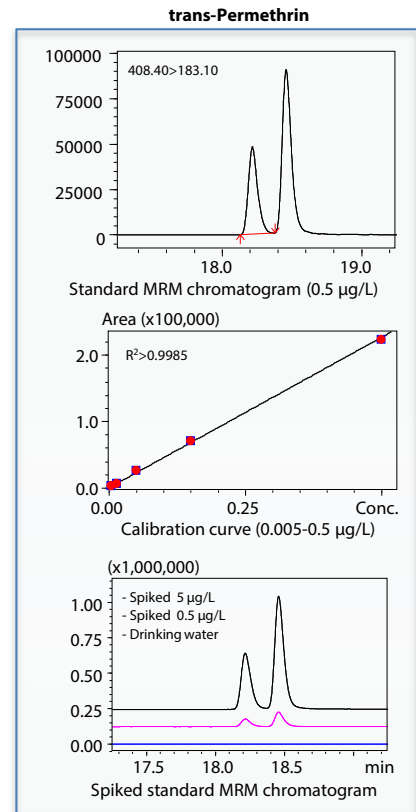
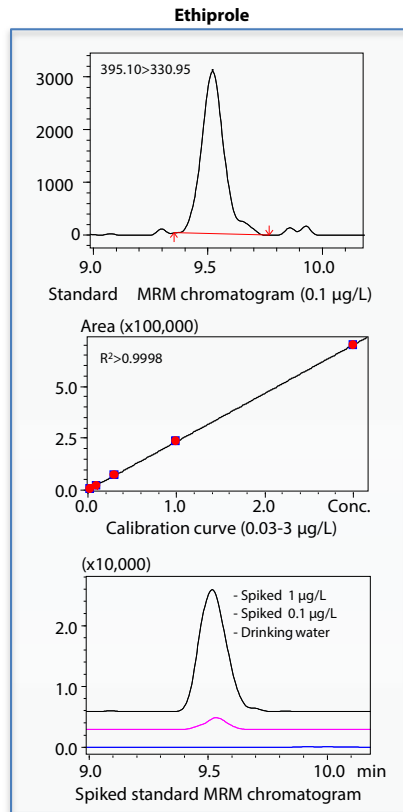
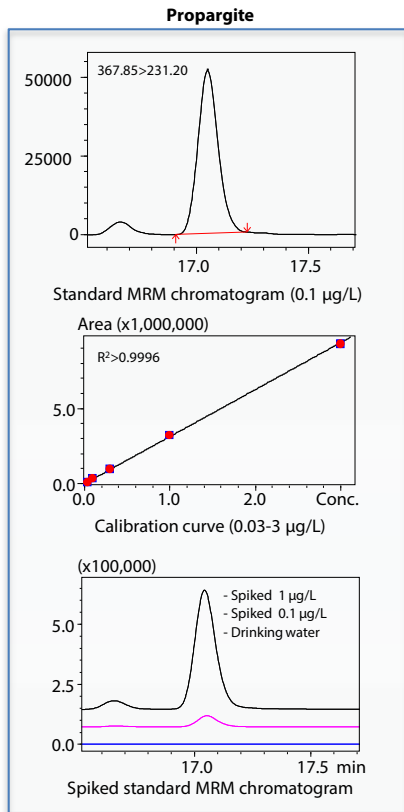
Column	: InertSustain® AQ-C18 PEEK (50 mm L. × 2.1 mm I.D., 1.9 µm, GL Sciences)
Mobile phases	: A 5 mmol/L Ammonium acetate-water B 5 mmol/L Ammonium acetate-methanol
Time schedule	: B conc. 10 % (0 - 0.50 min) → 45 % (3.00 min) → 80 % (15.50 min) → 100 % (18 - 21 min) → 10 % (21.01 - 25 min)
Flow rate	: 0.25 mL/min
Column temperature	: 40 °C
Injection volume	: 50 µL
Ionization	: ESI (Positive / Negative)
DL temperature	: 200 °C
Block heater temperature	: 400 °C
Interface temperature	: 200 °C
Nebulizing gas flow	: 3 L/min
Drying gas flow	: 10 L/min
Heating gas flow	: 10 L/min

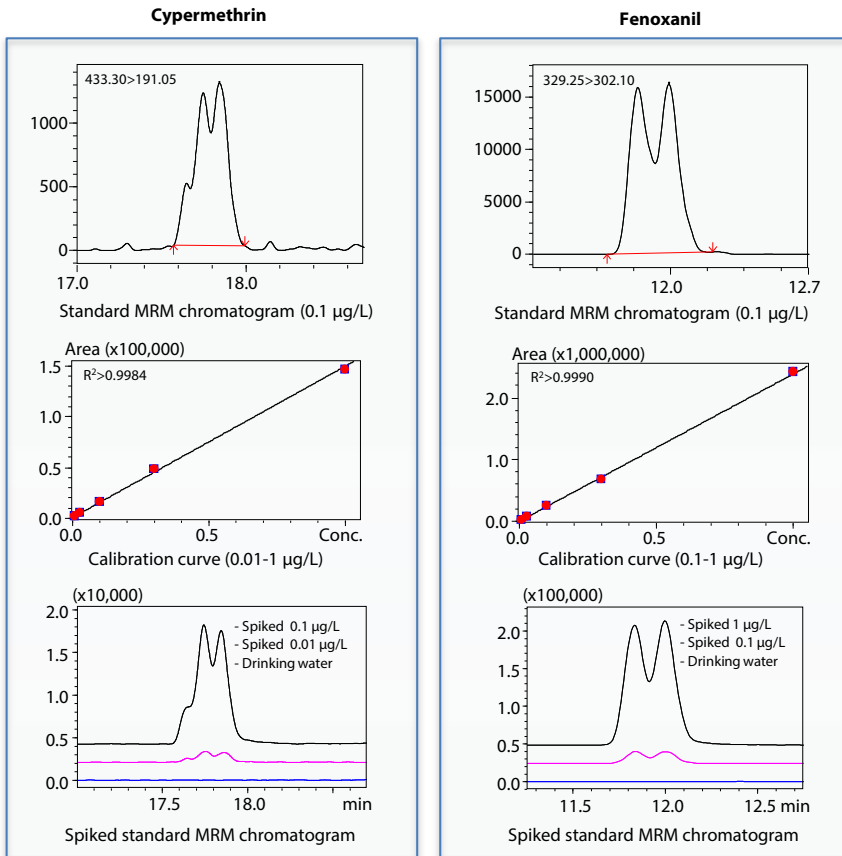
■ Analysis of the Seven Newly Added Pesticides

Among the pesticides added to Appendix Method 20-2, seven are new pesticides which until now did not have a designated inspection method. These seven^{*1} are propargite, cypermethrin, ethiprole, cis-permethrin, trans-permethrin, fenoxanil, methamidophos, and tolfenpyrad. The following figures show the MRM chromatogram of each pesticide when the concentration is a hundredth of the target value or lower, and a five-point calibration curve when

including a solution with a concentration that is a hundredth of the target value or lower. In addition, the figures include MRM chromatograms obtained when tap water dechlorinated using sodium ascorbate is spiked to a concentration of a tenth or a hundredth of the target value or lower.

*1 Counting isomers as individual items, there are eight items in all.

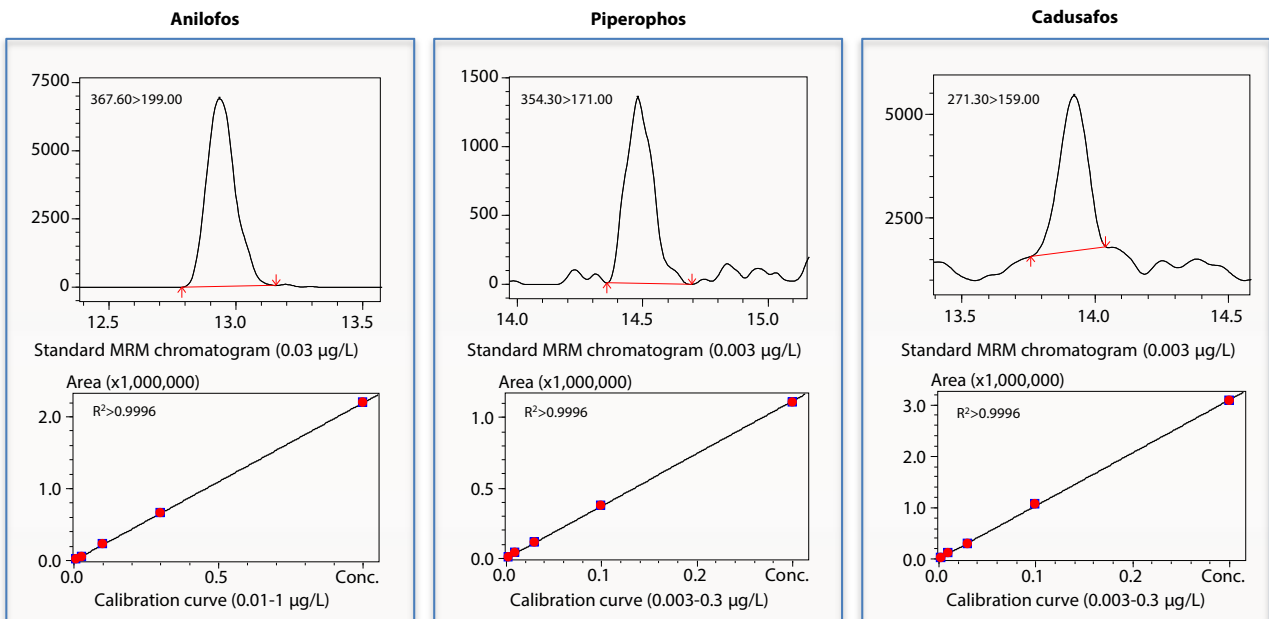




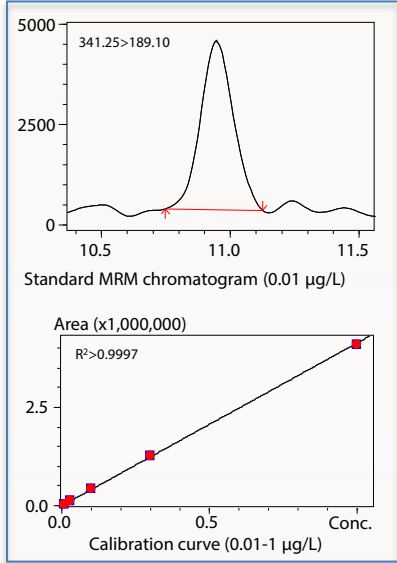
■ Analysis of Pesticides with a Low Concentration as the Target Value and Pesticides with a Revised Target Value

From among the pesticides included in Appendix Method 20-2 that have a low concentration as the target value, we selected nine pesticides for analysis: anilofos, piperophos, cadusafos, pyridaphenthion, propaphos, simazine, fipronil, tefuryltrione, and monocrotophos. The following figures show for each pesticide an MRM chromatogram when the concentration is a hundredth of the target value or lower and a five-point calibration curve including a solution with a concentration that is a hundredth of the target value or lower.

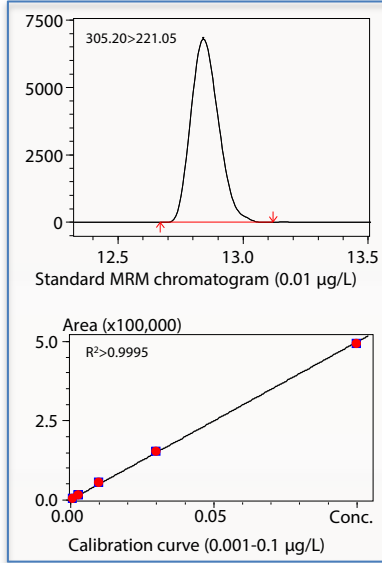
Regarding 2,4-D, cyanazine, and isoxathion (as well as for isoxathion oxon), the target value has become stricter. For these three pesticides as well, the MRM chromatogram when the concentration is a hundredth of the target value or lower and a five-point calibration curve including a solution with a concentration that is a hundredth of the target value or lower are shown below.



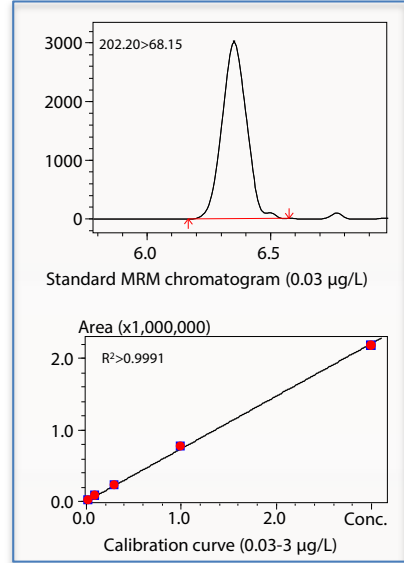
Pyridaphenthion



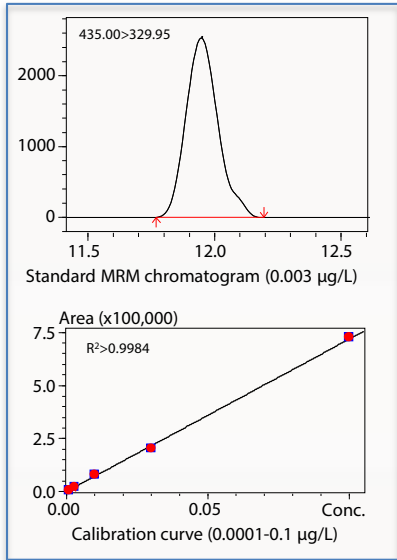
Propaphos



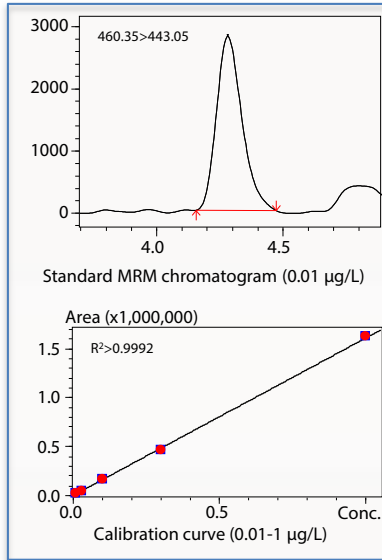
Simazine (CAT)



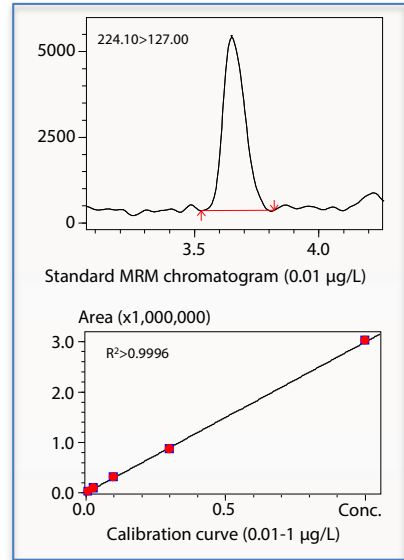
Fipronil



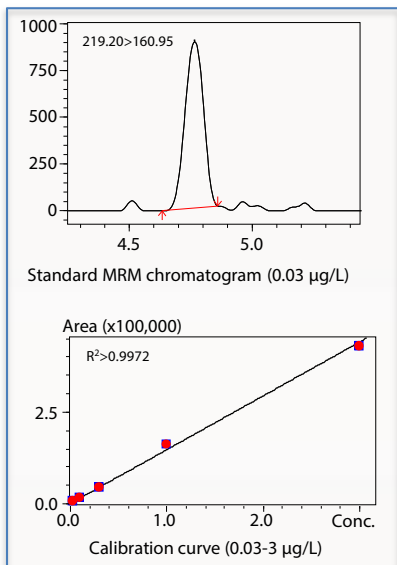
Tefuryltrione



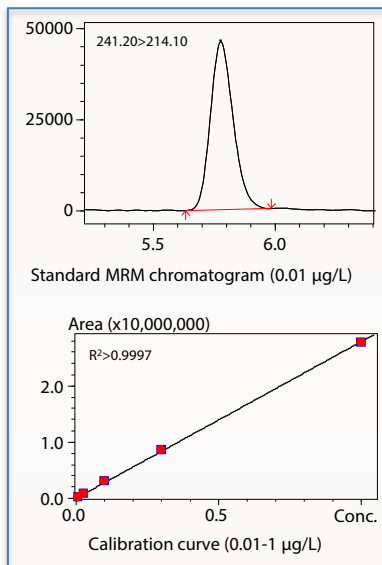
Monocrotophos



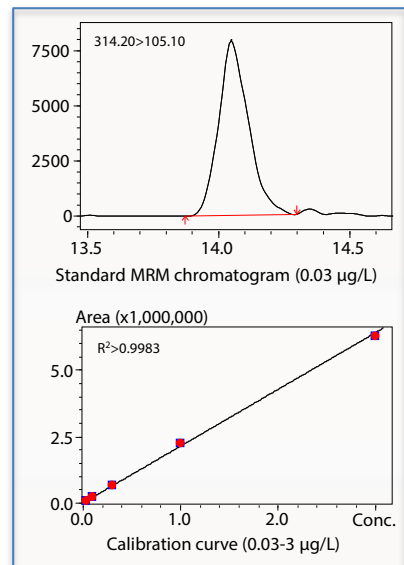
2,4-D



Cyanazine



Isoxathion



■ Repeatability and Accuracy Results of Spike-and-Recovery Tests Using Tap Water (152 Pesticides)

Excluding the 29 pesticides deemed to be referential, spike-and-recovery tests were conducted for the 152 pesticides listed in Appendix Method 20-2. Tap water was spiked to a concentration of a hundredth of the target value or lower for each pesticide and the sample solution was measured (n=5). The results are shown below.

The tap water used in the evaluations was dechlorinated using sodium ascorbate. However, regarding flazasulfuron and bensulfuron methyl, sodium thiosulfate was used instead likewise nereistoxin and ferimzone since decomposition occurs when sodium ascorbate is used.

1) Pesticides included in Appendix Method 5 (51 pesticides)

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
1	Alachlor	15.9	+	270	238	0.3	0.3	101	1.4	0.1-10	0.9997
2	Anilofos	12.9	+	368	199	0.03	0.03	97	2.9	0.01-1	0.9996
3	Atrazine	7.9	+	216	174	0.1	0.1	100	3.8	0.03-3	0.9975
4	Bifenox	14.2	+	359	310	2	1	97	12.5	0.3-10	0.9960
5	Bromobutide	11.4	+	314	196	1	0.3	101	2.8	0.01-1	0.9998
6	Buprofezin	15.8	+	306	201	0.2	0.1	94	3.5	0.1-10	0.9987
7	Butamifos	13.8	+	333	180	0.2	0.1	101	3.3	0.01-1	0.9995
	Butamifos Oxon	10.6	+	317	244	0.2	0.1	99	1.7	0.01-1	0.9998
8	Cafenstrole	11.0	+	351	100	0.08	0.03	93	10.9	0.01-1	0.9995
9	Chlorpyrifos	16.4	+	350	198	0.03	0.03	83	5.3	0.03-3	0.9997
	Chlorpyrifos Oxon	11.8	+	336	280	0.03	0.03	100	7.3	0.01-1	0.9996
10	Dithiopyr	15.2	+	402	354	0.09	0.03	113	9.0	0.03-3	0.9995
11	Diazinon	13.3	+	305	169	0.03	0.03	83	15.5	0.03-3	0.9997
	Diazinon Oxon	8.8	+	289	153	0.03	0.03	97	3.4	0.01-1	0.9997
12	Dimepiperate	14.4	+	264	146	0.03	0.03	107	6.0	0.03-3	0.9995
13	Dimethametryn	12.6	+	256	186	0.2	0.1	98	1.5	0.01-1	0.9997
14	Dimethoate	4.3	+	230	199	0.5	0.03	100	8.2	0.01-1	0.9997
15	Edifenphos (EDDP)	13.0	+	311	283	0.06	0.03	107	3.6	0.01-1	0.9999
16	EPN	14.7	+	324	296	0.04	0.03	99	14.8	0.03-3	0.9997
	EPN Oxon	9.6	+	308	280	0.04	0.03	97	5.2	0.01-1	0.9994
17	Esprocarb	15.5	+	266	91	0.3	0.3	95	3.3	0.1-10	0.9997
18	Ethofenprox	18.6	+	394	177	0.8	0.3	104	3.6	0.01-1	0.9989
19	Fenobucarb (BPMC)	9.0	+	208	95	0.3	0.3	95	4.1	0.1-10	0.9997
20	Flutolanil	10.4	+	324	262	2	0.3	95	3.8	0.01-1	0.9999
21	Fthalide	10.6	-	271	243	1	1	96	17.9	1-30	0.9998
22	Iprobenfos (IBP)	12.4	+	289	91	0.9	0.3	85	2.5	0.03-3	0.9982
-	Isofenphos Oxon	11.0	+	330	201	0.01	0.01	100	5.3	0.003-0.3	0.9989
23	Isoprocarb (MIPC)	7.5	+	194	95	0.1	0.1	94	5.6	0.01-1	0.9996
24	Isoprothiolane (IPT)	10.6	+	291	231	3	0.3	94	2.3	0.01-1	0.9998
25	Isoxathion	14.0	+	314	105	0.05	0.03	97	3.4	0.03-3	0.9983
	Isoxathion Oxon	10.1	+	298	242	0.08	0.03	97	4.0	0.01-1	0.9999
26	Malathion	10.5	+	348	331	7	1	96	4.5	0.03-3	0.9989
	Malaoxon	6.3	+	315	99	7	1	90	3.0	0.03-3	0.9985
27	Mefenacet	11.0	+	299	148	0.2	0.1	98	2.7	0.01-1	0.9997
-	MEP Oxon	6.4	+	262	104	0.1	0.1	98	13.7	0.03-3	0.9995
28	Mepronil	10.5	+	270	119	1	0.3	91	2.7	0.01-1	0.9999
29	Metalaxyl	7.9	+	280	220	0.6	0.3	95	1.2	0.01-1	0.9999
30	Methidathion (DMTP)	8.7	+	320	145	0.04	0.03	87	5.7	0.03-3	0.9977
31	Methyldymron	11.0	+	269	151	0.3	0.3	89	4.2	0.03-3	0.9989
32	Napropamide	11.5	+	272	171	0.3	0.3	93	4.8	0.1-10	0.9988
33	Pencycron	14.0	+	329	125	1	1	92	4.5	0.1-10	0.9997
34	Pendimethalin	16.6	+	282	212	3	1	101	1.6	0.1-10	0.9996
35	Phenthoate (PAP)	12.7	+	321	247	0.07	0.03	110	11.1	0.03-3	0.9996
36	Piperophos	14.5	+	354	171	0.009	0.003	86	0.2	0.003-0.3	0.9996

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
37	Pretilachlor	14.7	+	312	252	0.5	0.3	100	4.3	0.03-3	0.9991
38	Procymidone	10.7	+	284	256	0.9	0.3	107	18.3	0.3-10	0.9993
39	Propiconazole	12.9	+	342	159	0.5	0.3	94	2.4	0.01-1	0.9993
40	Propyzamide	10.1	-	254	228	0.5	0.3	99	5.1	0.03-3	0.9990
41	Pyributicarb	16.5	+	331	181	0.2	0.1	86	4.5	0.1-10	0.9992
42	Pyridaphenthion	10.9	+	341	189	0.02	0.01	110	13.7	0.01-1	0.9997
43	Pyriproxyfen	16.6	+	322	96	3	0.3	83	2.0	0.01-1	0.9994
44	Pyroquilon	5.9	+	174	117	0.4	0.1	96	4.7	0.01-1	0.9999
45	Simazine (CAT)	6.4	+	202	68	0.03	0.03	86	13.9	0.03-3	0.9991
46	Simetryn	8.0	+	214	68	0.3	0.3	95	2.7	0.03-3	0.9981
47	Terbucarb (MBPMC)	14.2	+	295	109	0.2	0.1	97	1.6	0.01-1	0.9999
48	Thenylchlor	11.6	+	324	127	2	0.3	103	1.7	0.01-1	0.9999
49	Thobencarb	13.7	+	258	125	0.2	0.1	107	4.2	0.03-3	0.9991
50	Tolclofos-methyl	13.9	+	301	269	2	1	117	2.6	0.3-30	0.9990
	Tolclofos-methyl Oxon	9.6	+	285	109	2	1	116	1.3	0.03-3	0.9991
51	Trichorfon (DEP)	4.2	+	259	109	0.05	0.03	80	6.9	0.01-1	0.9997

2) Pesticides included in Appendix Method 5-2 (18 pesticides)

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
52	Benfuresate	8.4	+	274	18	0.7	0.3	96	6.1	0.3-30	0.9992
53	Butachlor	15.9	+	312	238	0.3	0.3	109	1.9	0.1-10	0.9996
54	Cadusafos	13.9	+	271	159	0.006	0.003	101	8.5	0.003-0.3	0.9996
55	Cinmethylin	15.5	+	292	105	1	1	104	0.8	0.3-30	0.9999
56	Dichlofenthion (ECP)	16.1	+	315	259	0.06	0.03	104	19.8	0.03-3	0.9982
57	Chlorpyrifos-methyl	14.1	+	322	125	0.3	0.3	96	15.1	0.3-30	0.9998
58	Dimethylvinphos_E	11.4	+	333	127	0.1	0.1	97	15.5	0.01-1	0.9986
	Dimethylvinphos_Z	10.7	+	333	127	0.1	0.1	103	5.2	0.01-1	0.9995
59	Fosthiazate	7.1	+	284	104	0.03	0.03	99	1.6	0.01-1	0.9999
60	Metrachlor	11.6	+	284	252	2	0.3	97	1.6	0.01-1	0.9997
61	Orysastrobin	10.8	+	392	205	1	1	97	3.1	0.1-10	0.9984
62	Paclobutrazol	11.0	+	294	70	0.5	0.3	98	1.6	0.01-1	0.9998
63	Phosalone	13.7	+	368	182	0.05	0.03	90	13.4	0.01-1	0.9997
64	Propaphos	12.8	+	305	221	0.01	0.01	100	4.6	0.001-0.1	0.9995
65	Propoxur (PHC)	6.0	+	210	111	2	1	104	2.2	0.03-3	0.9992
66	Pyraclifos	13.7	+	361	257	0.03	0.03	93	1.9	0.01-1	0.9991
67	Pyrazoxyfen	13.2	+	403	91	0.04	0.03	93	3.2	0.01-1	0.9997
68	Quinoclamine (ACN)	5.9	+	208	105	0.05	0.03	87	14.1	0.01-1	0.9994
69	Uniconazole-P	10.6	+	292	70	0.4	0.3	98	0.7	0.01-1	0.9999

3) Newly added pesticides (7 pesticides)

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
70	Cypermethrin	17.8	+	433	191	1	0.1	90	5.0	0.01-1	0.9984
71	Ethiprole	9.5	-	395	331	0.1	0.1	104	7.2	0.03-3	0.9998
72	Fenoxanil	12.0	+	329	302	0.2	0.1	101	3.6	0.01-1	0.9990
73	Methamidophos	1.5	+	142	94	0.01	0.01	100	4.4	0.01-1	0.9999
74	Propargite (BPPS)	17.1	+	368	231	0.2	0.1	92	4.1	0.03-3	0.9996
75	Permethrin_trans	18.2	+	408	183	1	0.5	111	2.5	0.005-0.5	0.9985
	Permethrin_cis	18.5	+	408	183	1	0.5	111	2.1	0.005-0.5	0.9984
76	Tolfenpyrad	16.1	+	385	197	0.1	0.1	80	3.4	0.1-10	0.9992

4) Pesticides included in Appendix Method 18 (20 pesticides)

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
77	2,4-D	4.8	-	219	161	0.2	0.1	101	10.2	0.03-3	0.9972
78	Azoxystrobin	10.1	+	404	372	5	1	103	1.0	0.03-3	0.9985
79	Bensulfuron-methyl	6.9	+	411	149	5	1	72	2.5	0.01-1	0.9999
80	Bensulide (SAP)	12.5	+	398	158	1	1	106	1.6	0.03-3	0.9994
81	Bentazone	3.5	-	239	132	2	1	103	2.9	0.3-10	0.9999
82	Carbaryl (NAC)	6.7	+	202	145	0.5	0.3	100	2.8	0.01-1	0.9994
83	Carbendazim (MBC)	4.8	+	192	160	0.2	0.1	107	1.9	0.01-1	0.9998
84	Carbofuran	6.1	+	222	165	0.05	0.03	80	1.9	0.03-3	0.9986
85	Carpropamid	12.9	+	334	139	0.4	0.3	101	1.1	0.01-1	0.9998
86	Diuron (DCMU)	8.0	+	233	72	0.2	0.1	102	6.0	0.01-1	0.9999
87	Dymron	10.6	+	269	151	8	0.3	87	6.0	0.01-1	0.9994
88	Fipronil	11.9	-	435	330	0.005	0.003	105	8.7	0.001-0.1	0.9984
89	Flazasulfuron	4.3	+	408	182	0.3	0.3	76	0.6	0.003-0.3	0.9995
90	Halosulfuron-methyl	4.9	+	435	182	3	1	89	4.5	0.01-1	0.9988
91	Mecoprop (MCPP)	5.5	-	213	141	0.5	0.3	104	7.7	0.03-3	0.9990
92	Methomyl	3.5	+	163	88	0.3	0.3	100	3.5	0.01-1	0.9997
93	MPP (Fenthion)	13.0	+	279	169	0.06	0.06	93	6.6	0.02-2	0.9984
	MPP Oxon	8.8	+	263	231	0.06	0.06	91	4.1	0.02-2	0.9999
	MPP Oxon Sulfoxide	4.4	+	279	264	0.06	0.06	93	4.9	0.02-2	0.9995
	MPP Oxon Sulfone	4.5	+	312	295	0.06	0.06	95	4.1	0.02-2	0.9999
	MPP Sulfoxide	6.7	+	295	280	0.06	0.06	93	2.1	0.02-2	0.9999
	MPP Sulfone	7.1	+	328	311	0.06	0.06	93	1.5	0.02-2	0.9998
94	Siduron	9.6	+	233	137	3	0.3	99	1.1	0.01-1	0.9998
95	Thiodicarb	7.8	+	355	88	0.8	0.3	102	1.4	0.03-3	0.9977
96	Tricyclazole	5.2	+	190	163	1	1	83	7.6	0.3-10	0.9975

5) Pesticides included in Appendix Methods 19 and 20 (3 pesticides)

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
97	2,2-DPA (Dalapon)	1.2	-	141	97	0.8	0.3	110	15.3	0.3-30	0.9976
98	Acephate	2.0	+	184	143	0.06	0.03	93	3.0	0.03-3	0.9992
99	Benfuracarb	15.5	+	411	195	0.4	0.3	111	1.6	0.03-3	0.9998

6) Pesticides already included in Appendix Method 20-2 (53 pesticides)

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
100	Acetamiprid	4.4	+	223	126	2	0.3	98	1.4	0.01-1	0.9996
101	Ametrine	9.7	+	228	186	2	1	106	1.0	0.1-10	0.9998
102	Benzofenap	15.3	+	431	105	0.05	0.03	93	2.0	0.003-0.3	0.9998
103	Boscalid	10.0	+	343	307	1	0.3	95	3.0	0.01-1	0.9986
104	Bromacil	6.0	+	261	205	0.5	0.3	100	2.0	0.01-1	0.9999
105	Chromafenozide	11.6	+	395	175	7	1	107	0.9	0.03-3	0.9995
106	Clomeprop	15.5	+	324	120	0.2	0.1	84	5.5	0.1-10	0.9992
107	Clothianidine	4.1	+	250	169	2	0.3	97	3.3	0.01-1	0.9998
108	Cumyluron	10.9	+	303	185	0.3	0.3	103	2.0	0.01-1	0.9998
109	Cyanazine	5.8	+	241	214	0.01	0.01	91	3.1	0.01-1	0.9997
110	Cyproconazole	10.5	+	292	70	0.2	0.1	96	1.6	0.01-1	0.9996
111	Cyprodinil	13.0	+	226	108	0.7	0.3	101	2.5	0.1-10	0.9998
112	Dichlorprop	5.6	-	233	161	0.6	0.3	95	5.6	0.1-10	0.9992
113	Diclomezine	11.1	+	255	141	0.5	0.3	92	14.2	0.03-1	0.9987
114	Difenoconazole	14.2	+	406	251	0.2	0.1	93	1.2	0.01-1	0.9999

	Pesticide	R.T. (min)	+/-	Precursor Ion	Product Ion	1/100 of Target Value (µg/L)	Spiked Concentration (µg/L)	Recovery Rate (n=5, %)	Repeatability (n=5, %RSD)	Calibration Curve Range (µg/L)	Coefficient of Determination (R ²)
115	Diflubenzron	11.8	-	309	156	0.5	0.3	90	13.0	0.03-1	0.9990
116	Dinotefuran	2.8	+	203	129	6	0.3	92	2.5	0.01-1	0.9997
117	Etobenzanid	13.1	+	340	179	1	0.3	96	3.4	0.01-1	0.9997
118	Fentrazamide	13.1	+	350	154	0.1	0.1	102	3.0	0.01-1	0.9999
119	Ferimzone_E	10.0	+	255	132	0.5	0.15	88	0.1	0.05-5	0.9999
	Ferimzone_Z	10.3	+	255	132	0.5	0.15	88	0.5	0.05-5	0.9996
120	Fluazifop-butyl	6.3	+	328	282	0.1	0.1	70	4.2	0.01-1	0.9995
121	Fluazinam	14.8	-	463	415	0.3	0.3	106	4.1	0.01-1	0.9986
122	Flusulfamide	11.0	-	413	171	-	0.01	110	14.3	0.003-0.3	0.9992
123	Furametpyr	7.8	+	334	157	0.2	0.1	102	2.3	0.01-1	0.9997
124	Imidacloprid	4.0	+	256	209	1	0.3	94	1.9	0.01-1	0.9997
125	Inabenfide	9.6	-	337	122	3	0.3	95	5.0	0.1-10	0.9992
126	Linuron	9.3	+	249	182	0.2	0.1	101	1.5	0.03-3	0.9998
127	Metominostrobin	8.6	+	285	196	0.4	0.3	104	0.9	0.1-10	0.9990
128	Metribuzin	6.0	+	215	49	0.3	0.3	98	2.8	0.01-1	0.9999
129	Monocrotophos	3.7	+	224	127	0.02	0.01	110	12.1	0.01-1	0.9996
130	Naproanilide	12.3	+	292	171	0.2	0.1	81	3.5	0.1-10	0.9993
131	Nereistoxin	5.4	+	150	105	3	3	109	3.9	0.1-10	0.9984
132	Nitenpyram	3.2	+	271	56	13	0.3	92	3.6	0.01-1	0.9994
133	Oxadiazyl	13.6	+	358	223	0.2	0.1	88	5.5	0.1-10	0.9991
134	Oxaziclomefone	15.4	+	376	190	0.2	0.1	94	1.7	0.1-10	0.9997
135	Pirimiphos-methyl	13.9	+	306	164	0.6	0.3	100	1.5	0.03-3	0.9998
136	Prometryn	11.4	+	242	158	0.8	0.3	101	2.2	0.03-3	0.9999
137	Propanil	9.2	-	216	160	0.4	0.1	108	2.5	0.003-0.3	0.9986
138	Pymetrozine	3.6	+	218	105	0.3	0.3	93	1.2	0.01-1	0.9999
139	Pyraclonil	7.7	+	315	169	0.1	0.1	95	1.8	0.01-1	0.9998
140	Pyriminobac-methyl_E	9.2	+	362	330	0.5	0.3	99	1.2	0.03-3	0.9996
	Pyriminobac-methyl_Z	10.3	+	362	330	0.5	0.3	103	1.2	0.03-3	0.9992
141	Quizalofop-ethyl	15.2	+	373	299	0.2	0.1	90	1.6	0.1-10	0.9996
142	Simeconazole	11.0	+	294	70	0.2	0.1	98	4.4	0.01-1	0.9993
143	Tebuconazole	12.4	+	308	70	0.7	0.1	92	3.9	0.003-0.3	0.9995
144	Tebufenozide	12.4	+	353	133	0.4	0.3	100	1.2	0.01-1	0.9999
145	Tefuryltrione	4.3	+	460	443	0.02	0.01	80	6.5	0.01-1	0.9992
146	Tetrachlorvinphos	12.2	+	367	127	0.1	0.1	102	4.9	0.03-3	0.9999
147	Tetraconazole	11.2	+	372	159	0.1	0.1	95	2.3	0.01-1	0.9997
148	Thiacloprid	4.8	+	253	126	-	0.3	102	1.5	0.01-1	0.9989
149	Thiamethoxam	3.5	+	292	181	0.5	0.3	95	4.1	0.01-1	0.9999
150	Thifluzamide	11.7	-	527	125	0.4	0.1	106	1.9	0.003-0.3	0.9992
151	Tiadinil	10.4	-	266	71	1	1	101	1.9	0.1-10	0.9997
152	Trinexapac-ethyl	4	+	253	69	0.1	0.1	82	3.1	0.01-1	0.9999

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First Edition: Jun. 2018



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