

Application News

No. SSK-GCMSLCMS-2601

GCMS-8050NX / LCMS-8060RX

식품의약품안전처 '식품의 기준 및 규격'에 따른 식품 중 잔류농약 동시 다성분 분석

Analysis of Multi-Residual Pesticides in Food using GC-MS/MS and LC-MS/MS

사용자 활용 포인트

- ◆ 식품의약품안전처 고시 '식품의 기준 및 규격'(제2026-55호)에 따른 식품 중 잔류농약 동시 다성분 분석법을 확립하였다.
- ◆ 기체크로마토그래프-질량분석기 대상 276 성분, 액체크로마토그래프-질량분석기 대상 264 성분의 동시 분석이 가능하다.
- ◆ 최적화된 GC-MS/MS 및 LC-MS/MS 분석법을 활용하여 사용자가 편리하게 적용할 수 있다.

■ 서론

식품의약품안전처 고시 제2026-55호 '식품의 기준 및 규격'^[1]에 따라 제8.일반시험법의 7.1 중 7.1.1.2 식품 중 잔류농약 동시 다성분 시험법이 2027년 1월 1일 시행 예정이다. 본 시험 규격은 대사체 및 이성체를 포함하여 GC-MS/MS는 276성분, LC-MS/MS는 264 성분을 동시에 분석하도록 요구한다. 이에 본 어플리케이션 뉴스에서는 Shimadzu GC-MS/MS 및 LC-MS/MS를 이용하여 동시 다성분 분석이 가능한 최적화된 분석 조건을 소개하고자 한다.



그림 1. GCMS-8050NX triple quadrupole mass spectrometer

표 1. GC-MS/MS 분석 조건

GC System	: Nexix GC-2030
Analytical Column	: SH-I-5MS (30 mx 0.25 mm, 0.25 µm)
Carrier Gas	: He (99.999 %)
Column Flow	: 1.2 mL/min
Injection Temp.	: 280 °C
Split Ratio	: Splitless
Flow Control Mode	: Linear Velocity (40.6 cm/s)
Injection Volume	: 1 µL
Oven Temp.	: 90 °C → 20 °C/min → 180 °C → 5 °C/min → 300 °C (5 min)
MS/MS System	: GCMS-8050NX
Ionization Method	: EI
Data Acquisition	: MRM
Interface Temp.	: 300 °C
Ion Source Temp.	: 250 °C

■ 분석 방법

식품 중 잔류농약 동시 다성분 시험을 위해 Shimadzu GCMS-8050NX (그림 1) 및 LCMS-8060RX (그림 2) 을 이용하였다. GC-MS/MS의 분석조건은 표 1에, LC-MS/MS의 분석조건은 표 2에 나타내었으며, 분석 기기에 따른 분석 성분은 본 어플리케이션 뉴스 말미의 표 3, 4에 정리하였다.



그림 2. LCMS-8060RX triple quadrupole mass spectrometer

표 2. LC-MS/MS 분석 조건

UHPLC System	: Nexera X3
Flow	: 0.2 mL/min
Mobile Phase (A)	: Water with 5 mM ammonium acetate and 0.1 % formic acid
Mobile Phase (B)	: Methanol with 5 mM ammonium acetate and 0.1 % formic acid
Gradient	: 5 % B (0-1 min) - 60 % B (3 min) - 100 % B (13-18 min) - 5 % B (18.1-23 min)
Column	: Shim-pack GIST-HP C18 (I.D. 2.1 mm x L150 mm, 3 µm)
Column Oven	: 40 °C
Injection Volume	: 2 µL
MS/MS System	: LCMS-8060RX
Ionization Method	: ESI
Data Acquisition	: MRM
Nebulizer Gas Flow	: 3 L/min
Dry Gas Flow	: 10 L/min
Heating Gas Flow	: 10 L/min
Interface Temp.	: 150 °C
Desolvation Line Temp.	: 250 °C
Heat Block Temp.	: 400 °C

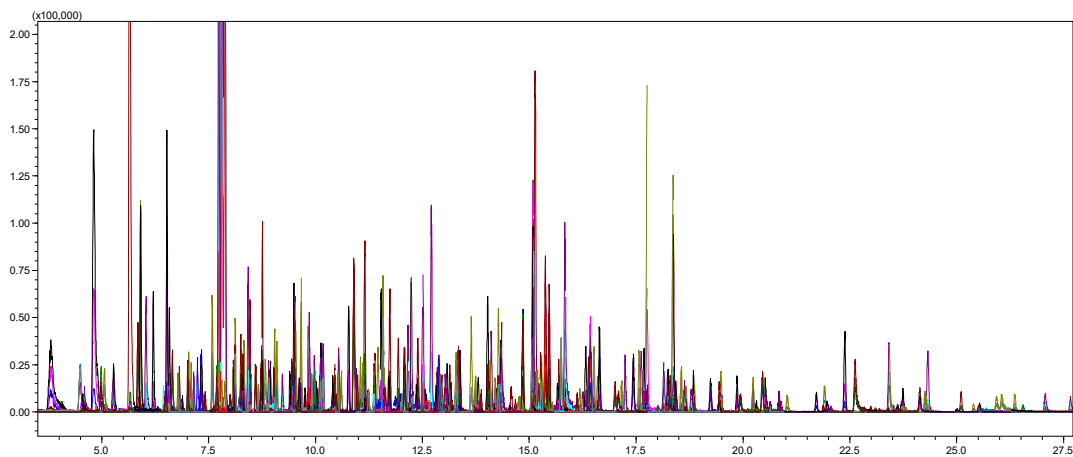


그림 3. GC-MS/MS으로 분석한 잔류농약 276 성분 동시 분석 크로마토그램 (10 ng/mL)

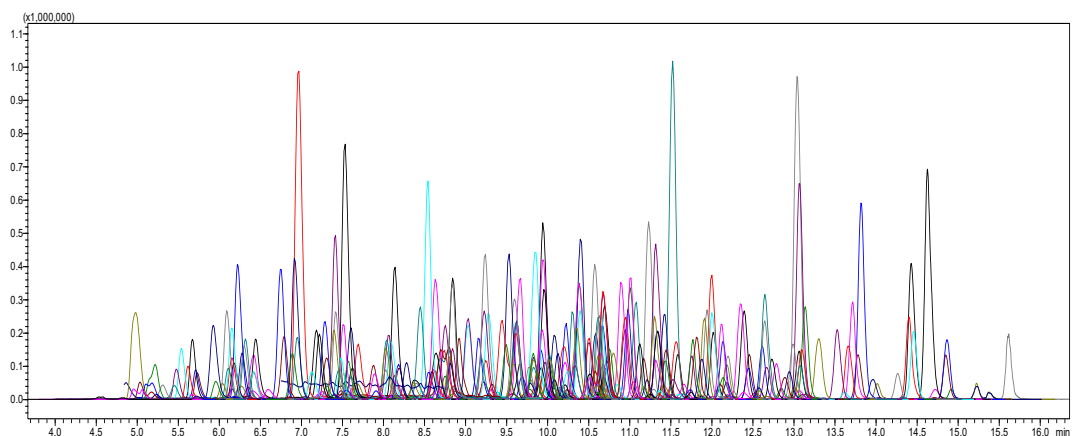


그림 4. LC-MS/MS으로 분석한 잔류농약 264 성분 동시 분석 크로마토그램 (10 ng/mL)

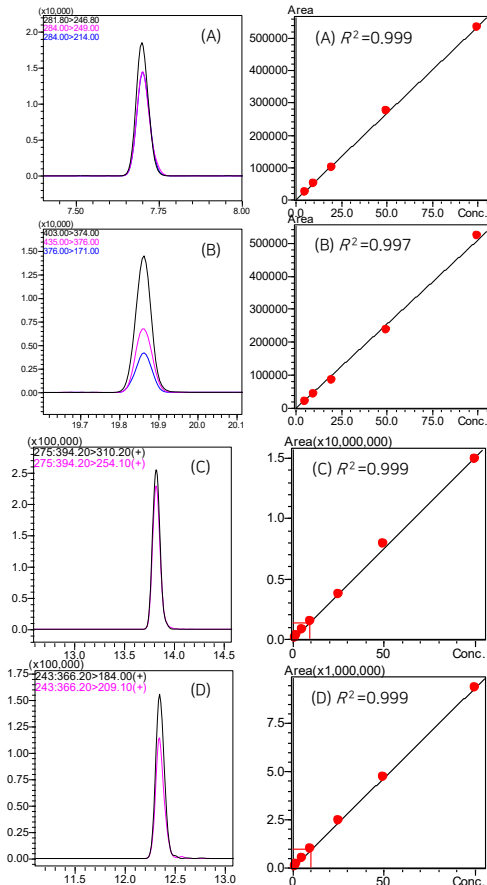


그림 5. 대표적인 잔류농약 성분에 대한 크로마토그램 (10 ng/mL)과 검량선
GC-MS/MS: (5 - 100) ng/mL, (A) Hexachlorbenzene, (B) Flometoquin;
LC-MS/MS: (1 - 100) ng/mL, (C) Cyenopyrafen, (D) Pyriofenone

■ 결과 및 토의

그림 3과 그림 4는 최적의 분석조건을 이용하여 GC-MS/MS 분석 대상 성분 276 성분 (10 ng/mL)과 LC-MS/MS 분석 대상 264성분을 각각 SH-I-5MS (30 m × 0.25 mm, 0.25 μm)컬럼과 Shim-pack GIST-HP C18 (2.1 mm × 150 mm, 3 μm)컬럼을 사용하여 분석한 크로마토그램이다. 다성분 동시 분석에도 우수한 감도와 분리능을 보여주는 것을 확인할 수 있다.

잔류농약 다성분의 검량선

다성분 농약 표준용액 1 μg/mL을 아세토나이트릴로 희석하여 검량선용 표준용액을 조제하였다. 검량선 범위는 GC-MS/MS의 경우, (5 - 100) ng/mL, LC-MS/MS의 경우, (1—100) ng/mL 농도 수준으로 설정하였으며, 결정계수(R^2)는 대사체 및 이성체를 포함한 농약 전체 540 성분에 대해 0.995 이상으로 우수한 결과를 얻었다. 대표적인 성분에 대한 개별 크로마토그램 및 검량선은 그림 5에 나타내었다.

■ 결론

Shimadzu GCMS-8050NX 및 LCMS-8060RX을 이용하여 식품의약품안전처 고시 제2026-55호 '식품의 기준 및 규격' 중 '식품 중 잔류농약 동시 다성분 시험법'을 위한 최적화된 분석법을 확립하였다.

■ 참고문헌

[1] 식품의약품안전처 고시 제2026-55호 식품의 기준 및 규격 (2026.07.31)

표 3. GC-MS/MS 대상 잔류농약 276 성분에 대한 RT, MRM 조건 및 직선성 (R^2)

ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion1 (m/z)	Qual. Ion2 (m/z)	ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion1 (m/z)	Qual. Ion2 (m/z)
1	Acetochlor	9.63	1.000	146>130	223>132	223>147	46	Chlorobenzilate	15.10	0.999	139>111	251>139	251>111
	HEMA	4.98	1.000	132>117	151>133	151>132	47	Chloroneb	5.67	0.995	206>191	206>141	193>113
	EMA	3.81	1.000	135>120	120>77	135>77	48	Chloropropylate	15.10	0.999	139>111	251>139	251>111
2	Acrinathrin	20.24/20.64	0.997	181>152	289>93	289>77	49	Chlorothalonil	8.66	0.998	264>168	264>133	266>133
3	Alachlor	9.86	1.000	188>160	188>132	160>132	50	Chlorpropham	7.02	0.999	127>65	213>171	213>127
4	Aldrin	11.11	1.000	263>193	263>191	293>186	51	Chlorpyrifos	10.95	1.000	197>169	314>258	314>286
	Dieldrin	14.20	0.999	263>193	279>243	279>203	52	Chlorpyrifos-methyl	9.67	1.000	286>93	286>271	125>79
5	Allidochlor	4.06	1.000	132>56	138>96	96>56	53	Chlorthal-dimethyl	11.10	1.000	301>223	332>301	301>273
6	Ametryn	10.03	0.999	227>185	227>170	212>94	54	Chlorthion	11.38	0.999	125>79	297>109	109>79
7	Anilofos	18.85	0.996	226>157	226>184	154>118	55	Chlorthiophos	15.06/15.49	0.999	269>205	325>205	325>269
8	Aramite	14.35/14.69	0.997	185>63	187>65	185>59	56	Chlozolate	12.13	0.998	331>259	259>188	259>153
9	Aspon	10.78	0.999	211>115	211>97	253>115	57	Cinmethylin	10.13	1.000	105>77	107>91	105>103
10	Atrazine	8.01	0.999	215>58	215>173	200>122	58	Clomazon	8.13	0.999	125>89	204>107	125>99
11	Azaconazole	14.35	1.000	217>173	173>145	217>145	59	Coumaphos	21.89	0.996	362>109	226>163	362>81
12	Azinphos-ethyl	20.57	0.998	160>132	132>77	160>105	60	Cyanophos	8.34	1.000	243>109	109>79	243>116
13	a-BHC	7.59	1.000	181>145	219>183	219>146	61	Cyflufenamid	14.59	0.998	223>203	294>237	294>229
	b-BHC	8.08	0.999	181>145	219>183	181>109	62	Cyfluthrin	22.80/23.00/ 23.10/23.20	0.996	163>127	163>91	226>199
	d-BHC	8.91	1.000	181>145	219>183	181>109	63	Cyhalofop butyl	19.94	0.998	357>256	357>229	357>120
14	Lindane, r-BHC	8.31	0.999	181>145	219>146	219>183	64	Cypermethrin-1	23.41/23.62/ 23.72/23.81	0.999	163>127	181>152	165>91
15	Benfluralin	7.09	0.998	292>264	292>160	292>206	65	Cyprazine	9.55	1.000	212>109	212>170	170>109
16	Benfuresate	9.45	1.000	256>163	163>121	163>107	66	Cyprodinil	11.94	0.999	224>208	224>197	224>118
17	Benodanil	15.66	0.996	231>203	323>231	231>76	67	Deltamethrin	26.18/26.56	1.000	181>152	253>93	253>172
18	Benzoylprop-ethyl	17.77	0.999	105>77	105>51	292>105	68	Desmetryn	9.48	0.996	213>171	213>58	198>108
19	Bifenox	18.90	0.996	341>310	341>189	341>281	69	Dialifor	20.85	1.000	208>181	208>89	208>102
20	Bifenthrin	18.37	0.998	181>165	181>166	181>167	70	Diallate	7.42/7.62	0.998	128>86	234>192	234>150
21	Biphenyl	4.82	1.000	154>153	153>152	154>128	71	Diazinon	8.45	1.000	179>137	304>179	179>122
22	Boscalid	23.42	0.998	140>112	140>76	342>140	72	Dichlobenil	4.49	0.999	171>100	171>136	173>100
23	Bromobutide	9.67	1.000	119>91	118>117	119>65	73	Dichlofenthion	9.50	0.995	279>223	223>205	223>159
24	Bromophos-ethyl	12.85	1.000	359>303	331>303	359>239	74	Dichlofluanid	10.71	0.998	224>123	167>124	224>77
25	Bromophos-methyl	11.59	1.000	331>316	331>286	125>79	75	Dichlormid	4.54	0.999	172>108	172>144	172>56
26	Bromopropylate	18.38	0.998	183>155	341>183	341>157	76	Diclobutrazol	14.33	0.999	270>159	272>161	270>166
27	Bupirimate	14.25	0.999	273>193	273>108	273>150	77	Diclofop-methyl	17.17	0.999	340>253	253>162	340>281
28	Buprofezin	14.26	0.999	172>57	175>132	175>117	78	Dicloran	7.84	0.999	206>176	176>148	206>124
29	Butachlor	13.16	0.999	176>147	188>160	188>146	79	Dicofol	11.39	0.999	139>75	139>111	250>139
30	Butafenacil	22.39	0.995	331>180	180>124	331>124	80	Dicrotophos	7.05	0.999	127>109	127>95	193>127
31	Butralin	11.47	0.997	266>220	266>174	266>190	81	Diethatyl-ethyl	13.38	0.999	188>160	188>131	188>130
32	Butylate	5.06	1.000	156>57	146>90	146>57	82	Diethofencarb	10.96	0.998	225>168	196>168	196>96
33	Cadusafos	7.34	1.000	159>131	159>97	125>97	83	Difenoconazole	25.94/26.06	0.995	323>265	325>267	265>202
34	Carbophenothion	16.26	0.997	121>65	157>77	157>121	84	2,6-DIPN	7.88	0.999	197>155	212>197	212>155
35	Carboxin	14.28	0.998	143>87	235>143	235>87	85	Diflufenican	17.25	0.999	394>266	266>246	266>183
36	Carfentrazone-ethyl	16.19	0.997	340>312	312>151	340>151	86	Dimepiperate	12.52	1.000	119>91	145>112	91>65
37	Chinomethionat	12.96	0.997	234>206	206>148	234>148	87	Dimethachlor	9.52	0.999	134>105	197>148	134>77
38	Chlorbenside	12.89	0.998	125>89	125>99	268>125	88	Dimethametryn	12.08	0.999	212>122	212>94	212>68
39	Chlorbufam	8.01	0.997	171>127	127>65	223>171	89	Dimethenamid	9.54	0.996	230>154	154>111	154>97
40	Chlordane-cis	13.34	1.000	373>264	373>266	373>337	90	Dimethipin	8.02	0.997	118>58	124>76	118>90
	Chlordane-trans	12.93	1.000	373>264	373>266	373>337	91	Dimethomorph_E	27.08	0.998	301>165	387>301	301>139
41	Chlorethoxyfos	6.66	0.999	153>97	153>125	153>65		Dimethomorph_Z	27.66	1.000	301>165	387>301	301>139
42	Chlorfenapyr	14.55	0.997	247>227	137>102	328>247	92	Dimethylvinphos_E	10.61	1.000	295>109	109>79	295>79
43	Chlorfenson	13.65	0.999	175>111	302>175	302>111		Dimethylvinphos_Z	10.99	0.998	295>109	109>79	295>79
44	Chlorflurenol_methyl	12.71	1.000	215>152	152>151	215>187	93	Diniconazole	15.23	0.996	268>232	268>136	232>150
45	Chlornitrofen	16.20	0.999	236>173	317>287	236>138	94	Dinitramine	8.68	0.997	261>195	261>241	261>126

표 3. GC-MS/MS 대상 잔류농약 276 성분에 대한 RT, MRM 조건 및 직선성 (R^2) - 계속

ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion1 (m/z)	Qual. Ion2 (m/z)	ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion1 (m/z)	Qual. Ion2 (m/z)
95	Dioxathion	8.24	1.000	125>97	97>65	97>79	138	Flumioxazin	25.01	0.999	354>326	354>176	354>312
96	Diphenamid	11.58	1.000	167>152	167>165	152>151	139	Fluopyram	12.25	0.999	173>145	173>95	145>95
97	Diphenylamine	6.79	0.999	169>66	169>77	169>141	140	Fluorochloridone	11.37	0.999	174>145	311>174	145>95
98	Dithiopyr	10.18	0.997	354>286	306>286	354>306	141	Fluquinconazole	21.92	1.000	340>298	340>286	340>108
99	Edifenphos	16.33	0.998	173>109	310>173	310>201	142	Flusilazole	14.21	0.998	233>165	233>152	233>91
100	a-Endosulfan	13.35	0.997	195>159	241>206	239>204	143	Flutianil	24.27	0.996	426>231	231>216	231>200
	b-Endosulfan	15.20	0.999	195>159	241>206	239>204	144	Fluvalinate-1	25.40	0.996	250>55	250>208	250>200
	Endosulfan sulfate	16.43	0.998	272>237	387>253	387>289		Fluvalinate-2	25.55	0.998	250>55	250>208	250>200
101	Endrin	14.86	0.999	263>191	263>193	263>228	145	Fluxapyroxad	18.25	1.000	381>159	159>139	159>57
	Endrin ketone	18.03	0.998	281>245	317>281	317>101	146	Fonofos	8.47	0.999	137>109	109>81	109>65
102	Epoxiconazole	17.58	1.000	192>138	192>111	192>102	147	Formothion	9.23	0.995	126>93	170>93	125>79
103	EPTC	4.55	0.998	128>86	189>128	189>86	148	Gamma-Cyhalothrin	20.25	0.997	208>181	197>141	197>161
104	Etaconazole	14.4/15.32	0.999	173>145	173>109	245>55		Lambda-Cyhalothrin	20.65	0.995	208>181	197>141	197>161
105	Ethalfuralin	6.89	0.996	276>202	316>276	276>105	149	Halfenprox	23.53	1.000	263>117	263>115	263>129
106	Ethion	15.39	1.000	231>129	153>97	231>175	150	Heptachlor	10.12	0.999	100>65	272>237	272>119
107	Ethofumesate	10.53	1.000	161>105	286>207	161>133		Heptachlor epoxide	12.22	1.000	353>263	353>217	353>219
108	Ethoprophos	6.82	0.997	200>158	158>97	158>114	151	Heptenophos	6.21	1.000	124>89	124>63	109>79
109	Ethychlozate	12.20	0.999	165>102	165>138	165>111	152	Hexachlorobenzene	7.71	0.996	284>249	282>247	284>214
110	Etoxazole	18.64	0.999	141>113	141>63	300>270	153	Hexythiazox	12.89	0.999	184>149	227>184	156>111
111	Etridiazole	5.26	0.997	211>183	183>140	211>140	154	Indanofan	18.80	1.000	174>159	159>103	159>77
112	Fenamidone	18.66	0.998	238>103	268>180	268>77	155	Indoxacarb	26.36	0.998	203>134	203>106	203>78
113	Fenarimol	20.46	0.998	139>111	107>79	139>75	156	Ipconazole	20.32	0.999	125>89	125>99	125>63
114	Fenbuconazole	22.63	0.999	198>129	129>102	129>78	157	Iprobenfos	9.11	0.997	204>91	91>65	204>121
115	Fenchlorphos	10.13	1.000	285>270	287>272	125>79	158	Iprodione	18.01	1.000	314>245	314>271	314>56
116	Fencloirim	7.59	0.996	224>189	189>104	224>104	159	Isazofos	8.74	0.998	161>119	119>76	161>146
117	Fenfuram	8.82	0.995	201>109	109>53	109>108	160	Isofenphos	12.17	0.999	213>121	213>185	213>65
118	Fenitrothion	10.49	1.000	125>79	277>260	277>109	161	Isofenphos-methyl	11.74	1.000	199>121	121>65	199>93
119	Fenobucarb	6.53	0.996	121>77	150>121	150>103	162	Isoproc carb	5.91	0.996	121>77	136>121	121>103
120	Fenothiocarb	13.17	0.998	160>72	160>106	160>55	163	Isopropalin	11.72	0.999	280>238	280>165	280>180
121	Fenoxanil	14.76	0.997	189>125	293>155	189>154	164	Isoprothiolane	13.76	0.999	189>145	290>118	290>204
122	Fenpropathrin	18.68	1.000	181>152	265>210	181>127	165	Isopyrazam	20.89	0.997	159>139	359>159	303>159
123	Fenpropimorph	11.16	0.995	128>70	128>110	128>84	166	Isotianil	16.50	0.996	180>91	297>180	182>93
124	Fenpyrazamine	20.58	0.999	230>115	230>132	230>188	167	Isoxadifen-ethyl	16.13	0.999	222>204	294>204	222>178
125	Fenson	11.54	0.999	141>77	141>51	268>141	168	Kresoxim-methyl	14.29	0.996	116>89	206>131	206>116
126	Fenthion	11.05	0.996	278>109	278>169	278>125	169	Leptophos	19.51	0.998	377>362	375>360	377>269
127	Fenvalerate-1	25.11	0.998	167>125	225>119	225>147	170	Mefenpyr-diethyl	17.69	0.996	253>189	253>190	299>253
	Fenvalerate-2	25.52	0.995	167>125	225>119	225>147	171	Mepanipirim	13.34	0.999	222>220	222>207	222>118
128	Fipronil	12.02	1.000	367>213	351>255	367>254	172	Mepronil	15.84	1.000	119>91	119>65	269>119
129	Flamprop-isopropyl	15.15	0.998	105>77	276>105	276>77	173	Metalaxyl	10.03	0.997	234>146	192>160	234>174
130	flometoquin	19.87	0.997	403>374	435>376	376>171	174	Methidathion	12.82	0.999	145>85	145>58	125>79
131	Fluacrypyrim	15.70	0.998	204>189	145>102	145>115	175	Methoprotryne	14.38	0.995	256>212	256>170	256>158
132	Fluazifop-butyl	14.85	0.996	282>238	282>91	282>65	176	Methoxychlor	18.56	0.996	227>169	227>141	227>115
133	Fluchloralin	8.49	0.996	306>264	326>63	306>160	177	Methyl trithion	15.05	1.000	125>79	157>121	157>75
134	Flucythrinate-1	23.75	0.997	199>157	199>107	157>107	178	Metolachlor	10.90	0.998	162>133	238>162	162>132
	Flucythrinate-2	24.14	0.999	199>157	199>107	157>107	179	Metribuzin	9.64	0.999	198>82	198>89	198>55
135	Fluensulfone	6.53	0.999	119>92	119>59	92>57	180	MGK-264	11.64/12.01	1.000	164>98	164>67	164>80
136	Flufenpyr-ethyl	15.07	0.996	408>345	408>321	408>372	181	Molinate	6.04	0.998	126>55	187>126	187>55
137	Flumetralin	13.15	0.998	143>108	143>107	157>129	182	Monolinuron	8.06	0.999	126>99	214>61	153>125

표 3. GC-MS/MS 대상 잔류농약 276 성분에 대한 RT, MRM 조건 및 직선성 (R^2) - 계속

ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion1 (m/z)	Qual. Ion2 (m/z)	ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion1 (m/z)	Qual. Ion2 (m/z)
183	Myclobutanil	14.12	0.996	179>125	179>90	150>123	228	Propyzamide	8.42	0.999	173>145	173>109	145>109
184	Nitrothal-isopropyl	11.38	0.999	236>194	236>148	236>120	229	Prothiofos	13.75	0.999	267>239	309>239	267>221
185	Nuarimol	17.01	0.999	139>111	235>139	139>75	230	Pyracarbolid	11.61	0.997	125>97	125>55	97>55
186	o,p'-DDT	15.47	0.999	235>165	235>199	237>165	231	Pyraclofos	21.04	0.998	194>138	194>139	360>194
	p,p'-DDD	15.38	1.000	235>165	235>199	235>163	232	Pyraflufen-ethyl	16.64	0.996	412>349	412>289	412>307
	p,p'-DDE	14.03	0.998	246>176	318>248	318>246	233	Pyrazophos	20.53	0.998	221>193	232>204	221>177
	p,p'-DDT	16.65	1.000	235>165	235>199	237>165	234	Pyridalyl	24.14	1.000	204>148	204>176	204>146
187	Ortho-phenyl phenol	5.85	0.999	169>141	169>115	141>115	235	Pyrifenox	12.19/12.99	0.997	171>100	171>136	262>91
188	Oxadiazon	14.05	0.998	258>175	302>175	258>112	236	Pyriftalid	20.55	0.999	318>273	318>246	274>215
189	Oxadixyl	15.29	0.995	163>132	132>117	163>117	237	Pyrimethanil	8.60	0.998	198>183	198>118	198>156
190	Oxyfluorfen	14.22	0.999	252>196	361>300	361>252	238	Pyriminobac-methyl_E	16.52	0.998	302>256	302>230	302>83
191	Paclobutrazol	13.08	0.998	236>125	236>167	125>89		Pyriminobac-methyl_Z	15.07	0.999	302>256	302>230	302>83
192	Parathion	11.15	0.996	139>109	291>109	291>137	239	Quinalphos	12.40	1.000	146>118	157>129	146>91
193	Parathion-methyl	9.82	1.000	263>109	263>136	263>137	240	Quinoxifen	16.43	0.999	272>237	237>208	237>181
194	Penconazole	12.09	0.995	248>157	159>123	159>89	241	Quintozene	8.22	0.995	249>213	295>237	295>237
195	Pendimethalin	11.92	1.000	252>162	252>161	162>147	242	Quizalofop-ethyl	23.71	0.999	372>299	299>255	299>91
196	Penflufen	15.75	1.000	274>141	141>60	141>72	243	Silafluofen	24.33	0.998	286>258	286>207	258>215
197	Penta chlorobenzonitrile	8.30	0.998	275>240	273>203	275>205	244	Simeconazole	9.84	0.999	121>101	121>75	195>75
198	Penthiopyrad	15.28	0.999	302>177	177>101	302>152	245	Simetryn	9.93	0.999	213>170	213>185	198>71
199	Pentoxazone	19.49	0.998	285>70	287>70	285>187	246	Spiromesifen	17.75	1.000	272>254	272>209	254>209
200	Permethrin-cis	21.72	0.997	183>153	183>168	183>139	247	Spiroxamine	9.84/10.55	1.000	100>58	100>72	198>126
	Permethrin-trans	21.98	0.998	183>153	183>168	183>139	248	Sulfotep	7.16	0.998	322>146	238>146	322>202
201	Perthane	14.86	0.999	223>167	223>179	223>193	249	Tebuconazole	17.09	0.999	250>125	125>89	125>90
202	Phenthoate	12.37	0.996	274>125	274>121	274>246	250	Tebufenpyrad	18.86	0.998	333>171	333>276	171>88
203	Phosalone	19.46	0.996	182>111	182>75	121>65	251	Tebupirimfos	9.04	0.999	152>123	261>137	234>110
204	Phosmet	18.16	0.999	160>77	160>133	133>77	252	Tefluthrin	8.76	0.998	177>127	177>87	197>141
205	Phosphamidone E	8.49	0.998	127>109	264>127	264>192	253	Terbacil	8.91	0.998	161>144	161>88	117>76
	Phosphamidone Z	9.41	0.999	127>109	264>127	264>192	254	Terbumeton	8.12	1.000	169>154	169>112	169>69
206	Phthalide	11.47	0.999	243>215	243>144	241>213	255	Terbutryn	10.46	0.998	241>185	241>170	226>96
207	Picoxystrobin	13.30	0.998	145>102	145>115	335>173	256	Tetrachlorvinphos	13.04	1.000	329>109	109>79	329>199
208	Piperonyl butoxide	17.44	0.999	176>131	176>103	176>145	257	Tetraconazole	11.23	1.000	336>204	336>156	336>218
209	Pirimicarb	9.05	1.000	238>166	238>72	238>96	258	Tetradifon	19.25	0.998	111>75	159>131	159>111
210	Pirimiphos-ethyl	11.56	0.999	318>166	318>182	333>168	259	Tetramethrin	18.14/18.44	0.998	164>107	164>77	164>135
211	Pirimiphos-methyl	10.41	0.998	290>125	290>233	290>151	260	Thifluzamide	14.09	1.000	194>125	166>125	166>75
212	Pretilachlor	13.81	0.995	262>202	262>174	238>146	261	Thiometon	7.69	0.998	125>47	125>79	125>62
213	Prochloraz	22.05	1.000	180>138	308>70	180>69	262	Thionazin	6.51	1.000	192>96	192>68	192>128
214	Procymidone	12.51	0.999	96>67	96>53	283>96	263	Tolclofos-methyl	9.86	0.999	265>250	265>93	265>144
215	Prodiamine	10.46	0.999	321>279	321>203	321>205	264	cis-Nonachlor	15.38	1.000	409>300	409>109	409>111
216	Profenofos	13.88	0.997	339>269	337>267	339>188		trans-Nonachlor	13.44	0.998	407>335	407>300	409>263
217	Profluralin	8.21	1.000	318>199	318>55	330>69	265	Triadimefon	11.25	0.999	208>181	208>127	208>111
218	Prohydrojasmon	8.73	1.000	153>97	184>83	184>96	266	Triadimenol	12.51	1.000	168>70	112>58	128>100
219	Prometon	7.88	0.999	210>168	225>183	225>210	267	Triallate	8.95	0.996	268>184	268>226	270>228
220	Prometryne	10.10	1.000	226>184	241>199	241>58	268	Triazophos	15.87	0.998	161>134	161>106	257>162
221	Propachlor	6.59	0.995	120>77	176>57	120>51	269	Tridiphane	10.18	0.998	187>159	173>145	189>161
222	Propanil	9.53	0.999	161>99	217>161	161>90	270	Trifloxystrobin	16.40	1.000	116>89	116>63	222>190
223	Propazine	8.08	1.000	214>172	172>69	172>94	271	Triflumizole	12.58	0.998	206>179	278>73	206>144
224	Propetamphos	8.26	1.000	138>110	194>166	138>64	272	Trifluralin	7.04	1.000	306>264	264>206	264>160
225	Propham	5.28	1.000	137>93	179>137	179>93	273	Tecnazene	6.49	1.000	213>177	261>203	213>142
226	Propiconazole-1	16.40	0.999	173>145	259>69	259>191	274	2,4,6-Trichlorophenol	4.59	1.000	196>97	132>97	198>97
	Propiconazole-2	16.60	0.998	173>145	259>69	259>191	275	Vinclozolin	9.76	0.998	285>212	212>172	287>214
227	Propisochlor	9.98	0.999	162>120	223>132	223>147	276	Zoxamide	12.62/17.62	0.998	187>159	187>123	242>186

표 4. LC-MS/MS 대상 잔류농약 264 성분에 대한 RT, MRM 조건 및 직선성 (R^2)

ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion (m/z)	ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion (m/z)
1	2,3,5-Trimethacarb	8.68	0.997	194>137	194>107	73	Emamectin B1a	12.28	1.000	886>158	886>82
	3,4,5-Trimethacarb	8.77	0.996	194>137	194>107	74	Esprocarb	13.08	0.995	266>71	266>65
2	Abamectin B1	14.34	0.997	890>305	890>567	75	Ethaboxam (EBX)	7.86	0.998	321>183	321>200
3	Acephate	5.19	0.998	184>143	184>49	76	Ethiofencarb	8.07	0.995	226>107	226>77
4	Acetamidrid	6.27	0.996	223>126	223>56	77	Ethiprole	9.14	0.998	397>351	397>255
5	Aldicarb	7.01	0.999	208>116	208>89	78	Etofenprox	15.53	0.998	394>107	394>177
6	Allethrin	13.08	0.999	303>135	303>91	79	Etrifos	11.73	0.999	293>125	293>265
7	Ametoctradin	11.80	0.999	276>176	276>177	80	Famoxadone	11.32	0.998	392>331	392>238
8	Amisulbrom	12.53	0.998	466>227	466>148		Fenamiphos	10.62	0.999	304>217	304>202
9	Amitraz	14.07	0.997	294>163	294>122	81	Fenamiphos-sulfone	7.33	0.999	336>308	336>188
10	Azamethiphos	7.27	0.998	325>112	325>139		Fenamiphos-sulfoxide	7.23	0.999	320>233	320>108
11	Azinphos-methyl	9.28	0.995	318>132	318>77	82	Fenazaquin	14.86	1.000	307>131	307>161
12	Azoxystrobin	9.23	0.998	404>329	404>344	83	Fenhexamid	10.12	0.999	302>97	302>55
13	Beflubutamid	10.95	0.996	356>91	356>221	84	Fenoxaprop-P-ethyl	12.69	0.996	362>91	362>121
14	Benalaxyl	11.38	0.998	326>91	326>148	85	Fenoxasulfone	10.08	0.996	383>203	383>351
15	Bendiocarb	7.51	0.995	224>109	224>167	86	Fenoxycarb	10.90	0.999	302>116	302>88
16	Bensulide	10.64	0.997	398>158	398>218	87	Fenpyroximate	14.26	1.000	422>138	422>215
17	Benthiavalicarb-isopropyl (R)	9.79	0.998	382>180	382>197	88	Fensulfothion	8.43	0.999	309>281	309>157
	Benthiavalicarb-isopropyl (S)	9.98	0.998	382>197	382>180	89	Fentrazamide	11.26	0.995	350>83	350>154
18	Benzobicyclon	9.78	0.998	447>257	447>229		Ferimzone (E)	7.99	0.998	255>132	255>91
19	Benzoximate	12.17	0.999	364>199	364>77	90	Ferimzone (Z)	8.80	0.999	255>132	255>124
20	Benzyladenine, 6-Benzyl aminopurine	6.74	0.998	224>133	224>132	91	Flonicamid	5.79	0.998	230>203	230>174
21	Bioresmethrin	14.84	0.996	339>128	339>143						
22	Bistrifluron	13.63	0.996	445>262	445>226	92	Florypicoxamid X12485649	10.66	0.999	471>231	471>109
23	Bitertanol	11.56	0.997	338>70	338>99	93	Fluazinam	12.66	0.996	463>416	463>398
24	Bixafen	10.73	0.997	414>394	414>266	94	Flubendiamide	10.65	0.997	683>274	683>408
25	Broflanilide	11.74	0.999	665>645	665>625	95	Fludioxonil	9.69	0.999	266>229	266>158
26	Bromacil	7.64	0.997	261>205	261>188	96	Flufenacet	10.26	0.996	364>124	364>194
27	Butocarboxim	6.91	0.995	213>75	213>156	97	Flufenoxuron	13.49	0.997	487>156	487>304
28	Cafenstrole	9.98	0.999	351>100	351>72	98	Fluindapyr	10.55	0.996	352>256	352>312
29	Carbaryl (NAC)	7.89	0.997	202>145	202>117	99	Fluometuron	8.15	1.000	233>46	233>72
30	Carbendazim	5.75	0.996	192>160	192>105	100	Fluopicolide	9.80	0.998	383>145	383>173
31	Carbetamide	7.17	0.999	237>192	237>120	101	Fluoxapiprolin	9.19	0.995	650>610	650>157
32	Carbofuran	7.53	0.996	222>165	222>77		Fluoxastrobin E	10.33	0.996	459>427	459>188
	3-Hydroxycarbofuran	6.25	0.997	255>163	255>220	102	Fluoxastrobin Z	10.96	0.998	459>427	459>188
33	Carpropamid	11.28	0.995	334>139	334>103	103	Flupoxam	10.63	1.000	461>444	461>165
34	Chlorantraniliprole	8.78	0.997	484>453	484>286	104	Flupyradifurone	6.22	0.999	289>126	289>99
35	Chlorfenvinphos (E)	11.32	0.996	359>170	359>99	105	Flupyrimin	7.45	0.996	316>126	316>99
	Chlorfenvinphos (Z)	11.74	1.000	359>155	359>99	106	Fluridone	9.19	0.998	330>309	330>310
36	Chlorfluaazuron	14.04	1.000	540>383	540>158	107	Flursulfamide	11.34	0.998	413>171	413>349
37	Chloridazone	6.50	0.995	222>104	222>77	108	Fluthiacet-methyl	11.32	0.997	404>274	404>344
38	Chlorobenzuron	11.15	0.995	309>111	309>139	109	Flutolanil	9.62	0.996	324>242	324>262
39	Chlorotoluron	8.38	0.999	213>46	213>72	110	Flutriafol	8.19	0.996	302>70	302>123
40	Chloroxuron	10.14	0.999	291>46	291>218	111	Fluxametamide	13.17	1.000	474>400	474>160
41	Chromafenozide	10.19	1.000	395>147	395>175	112	Fomesafen	8.93	0.998	437>195	437>195
42	Clofentezine	12.44	0.997	303>138	303>102	113	Forchlorfenuron	8.62	0.999	248>129	248>66
43	Clomeprop	12.96	0.996	324>120	324>203	114	Formetanate	5.14	0.998	222>165	222>46
44	Cloquintocet-mexyl	13.05	0.997	336>238	336>192	115	Fosthiazate	8.04	0.995	284>104	284>228
45	Clothianidin	6.15	0.999	250>132	250>169	116	Furathiocarb	12.78	0.997	383>195	383>167
46	Crotoxyphos	9.56	0.995	332>127	332>211	117	Hexaconazole	11.39	0.996	314>70	314>159
47	Crufomate	10.63	0.995	292>108	292>236	118	Hexaflumuron	12.31	0.997	459>439	459>175
48	Cyanazine	7.26	0.999	241>214	241>104	119	Hexazinone	7.64	0.996	253>85	253>71
49	Cyantraniliprole	7.67	0.997	475>444	475>286	120	Imazalil	7.46	0.998	297>159	297>41
50	Cyazofamid	10.55	0.996	325>108	325>44	121	Imibenconazole	12.90	0.999	411>125	411>171
51	Cyclaniliprole	10.70	0.999	600>284	600>112	122	Imicyafos	6.97	0.998	305>201	305>235
52	Cycloate	12.39	0.997	216>83	216>154	123	Imidacloprid	6.08	0.999	256>209	256>175
53	Cyclobutrifluram	10.14	0.998	387>215	387>146	124	Inabenfide	9.32	0.999	339>321	339>80
54	Cycloprothrin	13.93	0.999	499>181	499>257	125	Inpyrfluxam	10.37	0.996	334>238	334>258
55	Cyenoxyprafen	13.83	0.999	394>310	394>254	126	Ipfencarbazone	11.09	0.999	427>156	427>198
56	Cyflumetofen	12.45	0.997	465>145	465>249	127	Ipflufenquin	10.86	0.997	348>330	348>180
57	Cymoxanil	12.16	0.997	199>141	199>113	128	Iprovalicarb	10.14	0.999	321>91	321>203
58	Cyproconazole (I)	9.75	0.997	292>70	292>125	129	Isocycloseram	12.62	0.996	548>418	548>160
	Cyproconazole (II)	10.05	0.999	292>70	292>125	130	Isoproturon	8.60	0.997	207>46	207>165
59	Daimuron	9.92	0.997	269>151	269>119	131	Isoxaben	9.56	0.997	333>107	333>165
60	Demeton-S	9.16	0.997	259>89	259>61	132	Isoxathion	12.00	0.996	314>97	314>286
	Demeton-S-sulfone	6.39	0.998	291>235	291>263	133	Lenacil	8.67	0.999	235>153	235>110
	Demeton-S-sulfoxide	6.32	0.999	275>197	275>109		Lepimectin A3	14.32	1.000	728>549	728>531
	Disulfoton	12.25	0.995	275>89	275>61	134	Lepimectin A4	14.70	0.999	742>563	742>545
	Disulfoton-sulfone	8.19	0.997	307>153	307>125	135	Linuron	9.66	0.995	249>160	249>182
	Disulfoton-sulfoxide	8.09	0.998	291>97	291>157	136	Lufenuron	13.13	0.998	509>326	509>339
61	Demeton-S-methyl	7.68	0.997	231>89	231>61	137	Malaoxon	7.44	1.000	315>99	315>127
62	Demeton-S-methyl-sulfone	5.74	0.997	263>125	263>109	138	Malathion	9.92	0.996	348>127	348>99
63	Desmediphar	8.68	0.995	301>182	301>136	139	Mandestrobin	11.29	1.000	314>192	314>132
64	Dichlorvos	7.55	0.996	238>109	238>221	140	Mandipropamid	9.46	0.996	412>328	412>125
65	Diclosulam	7.90	0.996	406>161	406>378	141	Mecarbam	10.57	0.995	330>97	330>199
66	Diflubenzuron	10.78	1.000	311>141	311>158	142	Mefenacet	10.30	0.997	299>148	299>120
67	Dimesulfazet	8.71	0.995	337>267	337>238	143	Mefentrifluconazole	11.21	1.000	398>70	398>182
68	Dimethoate	6.37	0.995	230>125	230>171	144	Mephosfolan	7.34	1.000	270>140	270>196
69	Dimpropyridaz	7.02	0.996	302>109	302>179	145	Mesotrione	6.33	0.999	357>228	357>104
70	Dinotefuran	5.45	0.997	203>114	203>87		Metaflumizone (E)	12.59	1.000	507>178	507>287
71	Diuron (DCMU)	8.84	0.998	233>46	233>72	146	Metaflumizone (Z)	11.87	0.995	507>178	507>287
72	Dodine	10.90	0.995	228>43	228>57	147	Metamifop	12.66	0.999	441>288	441>123

표 4. LC-MS/MS 대상 잔류농약 264 성분에 대한 RT, MRM 조건 및 직선성 (R^2) - 계속

ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion (m/z)	ID#	Name	Ret. Time (min)	Linearity (R^2)	Quant. Ion (m/z)	Qual. Ion (m/z)
148	Metamitron	6.45	0.999	203>175	203>104	207	Pyributicarb	13.53	0.995	331>108	331>133
149	Metconazole	11.42	0.995	320>70	322>70	208	Pyridaben	14.47	0.999	365>147	365>117
150	Methabenzthiazuron	8.79	0.999	222>96	222>165	209	Pyridachlometyl	10.23	0.995	317>220	317>240
151	Methamidophos	4.56	0.999	142>94	142>125	210	Pyridaphenthion	10.04	0.997	341>205	341>92
152	Methiocarb	9.60	0.997	226>121	226>169	211	Pyridate	14.91	0.995	379>351	379>207
153	Methomyl	5.85	0.995	163>88	163>106	212	Pyrifluquinazon	9.40	0.996	465>423	465>107
154	Methoxyfenozide	9.81	0.996	369>91	369>313	213	Pyrimidifen	12.89	0.999	378>157	378>150
155	Metobromuron	8.58	0.997	259>170	259>148	214	Pyrimisulfan	8.61	0.996	420>370	420>388
156	Metolcarb (MTMC)	7.30	0.999	166>109	166>91	215	Pyriofenone	12.34	0.999	366>184	366>209
157	Metominostrobin (E)	8.35	0.999	285>196	285>194	216	Pyriproxyfen	13.72	0.997	322>78	322>185
	Metominostrobin (Z)	8.81	0.999	285>194	285>166	217	Pyroquilon	7.61	0.995	174>117	174>132
158	Metrafenone	12.11	0.999	409>227	409>209	218	Quinoclamine	7.58	0.995	208>105	208>89
159	Mevinphos	6.28	0.999	225>127	225>193	219	Saflufenacil	8.70	0.998	501>349	501>198
160	Monocrotophos	5.84	0.999	224>127	224>109	220	Secbumeton	7.65	0.999	226>100	226>57
161	Napropamide	10.60	0.996	272>129	272>58	221	Sedaxane-cis	9.91	0.996	332>159	332>292
162	Neburon	11.01	0.997	275>88	275>114		Sedaxane-trans	10.47	0.998	332>159	332>292
163	Nitenpyram	5.60	0.998	271>189	271>237	222	Sethoxydim	13.09	0.996	328>178	328>282
164	Norflurazon	8.81	0.995	304>284	304>160	223	Simazine	7.91	0.998	202>104	202>132
165	Noruron (Norea)	9.62	1.000	223>135	223>93	224	Spinetoram J	11.64	1.000	749>142	749>98
166	Novaluron	12.26	0.995	491>471	491>305		Spinetoram L	12.23	0.995	761>142	761>98
167	Ofurace	7.43	0.995	299>282	299>254	225	Spinosyn A	10.99	0.999	733>142	733>98
168	Omethoate	5.35	0.999	214>125	214>183		Spinosyn D	11.61	0.997	747>142	747>98
169	Oryastrobin	9.78	0.998	392>205	392>116	226	Spirodiclofen	13.97	0.999	411>71	411>313
170	Oryzalin	10.27	0.997	345>281	345>174		Spiropidion	11.02	0.996	423>288	423>264
171	Oxadiazyl	11.68	0.999	341>223	341>230	227	Spiropidion-enol	8.61	0.996	351>288	351>264
172	Oxamyl	5.60	0.997	237>72	237>90		Spirotetramat	10.17	0.996	374>330	374>302
	Oxamyl oxime	5.37	0.999	163>72	163>47	228	Spirotetramat-enol	7.95	0.999	302>216	302>270
173	Oxathiapiprolin	9.54	0.998	540>500	540>163	229	Sulfentrazone	7.52	0.998	404>387	404>307
174	Oxaziclonofone	12.66	0.998	376>190	376>161	230	Sulfoxaflor	6.35	0.996	278>174	278>154
175	Oxycarboxin	6.50	0.995	268>43	268>147	231	Sulprofos	13.80	0.998	323>219	323>139
176	Oxydemeton-methyl	5.67	0.999	247>125	247>169	232	Tebufenozide	10.66	0.996	353>133	353>105
177	Pebulate	12.19	0.996	204>72	204>57	233	Tebufluquin	11.50	0.998	290>248	290>232
178	Pencycuron	11.85	0.999	329>89	329>218		Tebufluquin M1	9.50	0.997	248>232	248>218
179	Penoxsulam	7.68	0.999	484>164	484>194	234	Tebuthiuron	7.72	0.995	229>116	229>172
180	Phenmedipham	8.82	0.995	318>168	318>301	235	Teflubenzuron	13.12	0.995	379>339	379>359
181	Phenothrin-cis	15.18	1.000	351>183	351>128	236	Tepaloxylol	10.20	0.997	342>250	342>166
	Phenothrin-trans	15.33	0.998	351>249	351>183		Terbufos	13.13	0.996	289>57	289>103
182	Phorate	6.25	0.997	261>75	261>47	237	Terbufos oxon	10.28	0.995	273>103	273>57
	Phorate oxon	8.90	0.997	245>75	245>47		Terbufos oxon sulfone	7.00	0.996	305>231	305>249
	Phorate oxon sulfone	6.40	0.996	277>111	277>127		Terbufos oxon sulfoxide	6.81	0.999	289>171	289>115
	Phorate oxon sulfoxide	6.25	0.996	261>111	261>81		Terbufos-sulfone	9.21	0.995	321>97	321>115
	Phorate-sulfone	8.27	0.995	293>171	293>115		Terbufos-sulfoxide	9.19	0.996	305>97	305>187
	Phorate-sulfoxide	8.14	0.995	277>97	277>143	238	Terbutylazine	9.88	0.999	230>104	230>68
183	Phosfolan	6.84	0.998	256>168	256>61	239	Tetraniliprole	8.33	0.997	543>137	543>109
184	Phoxim	11.98	0.996	299>77	299>97	240	Thenylchlor	10.57	0.996	324>127	324>59
185	Picarbutrazox	10.65	0.999	410>310	410>107	241	Thiabendazole	5.94	0.997	202>131	202>65
	TZ-1E	10.46	0.999	410>310	410>107	242	Thiacloprid	6.53	0.998	253>126	253>90
186	Picolinafen	13.15	1.000	377>238	377>145	243	Thiamethoxam	5.80	0.996	292>211	292>181
187	Piperophos	12.10	0.999	354>143	354>255	244	Thiazopyr	11.30	0.995	397>377	397>335
188	Probenazole	7.34	0.997	224>41	224>196	245	Thidiazuron	7.43	0.998	221>102	221>128
189	Promecarb	9.74	0.999	208>109	208>91	246	Thiobencarb	12.09	0.997	258>125	258>99
190	Propamocarb	5.30	0.999	189>74	189>102	247	Thiodicarb	8.08	0.996	355>108	355>88
191	Propaquizafop	12.99	0.998	444>100	444>299	248	Thiophanate-methyl	7.30	0.995	343>151	343>311
192	Propargite	13.67	0.998	368>175	368>57	249	Tiadinil	10.16	0.999	266>71	266>238
193	Propoxur	7.49	1.000	210>93	210>168	250	Tolfenpyrad	13.09	0.997	384>197	384>154
194	Proquinazid	14.64	1.000	373>331	373>289	251	Topyralate	8.84	0.999	485>383	485>351
195	Prosulfocarb	12.74	0.999	252>128	252>91	252	Triafamone	7.54	0.998	407>245	407>166
196	Prothioconazole	10.67	0.998	312>70	312>239	253	Triazamate	10.36	0.999	315>72	315>220
197	Pydiflumetofen	11.90	0.998	426>193	426>166	254	Tribufos	14.44	0.995	315>169	315>57
198	Pyflubumide	13.09	0.996	536>155	536>111	255	Trichlorfon	6.36	0.996	257>109	257>221
	Pyflubumide-NH	12.40	0.997	466>137	466>111	256	Tricyclazole	6.95	0.997	190>136	190>109
199	Pymetrozine	5.01	0.998	218>105	218>78	257	Triflumuron	11.59	0.998	359>139	359>111
200	Pyraclonil	8.02	0.995	315>169	315>241	258	Triforine	8.55	0.996	435>390	437>392
201	Pyraclostrobin	11.78	0.998	388>164	388>194	259	Triticonazole	10.19	1.000	318>70	318>125
202	Pyraziflumid	10.19	0.997	380>147	380>175	260	Uniconazole	10.57	0.998	292>70	292>125
203	Pyrazolate	11.93	0.997	439>91	439>173	261	Valifenalate	9.88	0.998	399>155	399>116
204	Pyrazoxyfen	11.41	0.996	403>91	403>105	262	Vamidothion	6.19	0.998	288>58	288>118
205	Pyribencarb	9.68	0.998	362>239	362>207	263	Vernolate	12.20	0.995	204>86	204>128
	KIE-9749	8.19	0.998	362>239	362>122	264	XMC (3,5-xylol methylcarbamate)	8.16	0.997	180>123	180>108
206	Pyribenzoxim	12.99	0.995	610>413	610>180						

SSK-GCMSLCMS-2601



SHIMADZU

Shimadzu Corporation
www.shimadzu.com/an/

Shimadzu Scientific Korea
www.shimadzu.co.kr

For Research Use Only. Not for use in diagnostic procedures.

This publication may contain references to products that are not available in your country. Please contact us to check the availability of these products in your country.

The content of this publication shall not be reproduced, altered or sold for any commercial purpose without the written approval of Shimadzu. See <http://www.shimadzu.com/about/trademarks/index.html> for details.

Third party trademarks and trade names may be used in this publication to refer to either the entities or their products/services, whether or not they are used with trademark symbol "TM" or "®".

Shimadzu disclaims any proprietary interest in trademarks and trade names other than its own.

The information contained herein is provided to you "as is" without warranty of any kind including without limitation warranties as to its accuracy or completeness. Shimadzu does not assume any responsibility or liability for any damage, whether direct or indirect, relating to the use of this publication. This publication is based upon the information available to Shimadzu on or before the date of publication, and subject to change without notice.