SHIMADZU APPLICATION NEWS

LA180-E008

● GAS CHROMATOGRAPHY

No.G214

Analysis of Pesticides in Agricultural Products using ECD-2010 or FPD-2010

As of 13 March 2002, the Japanese Food Hygiene Laws prescribe limits for 229 pesticides. However, faced with the problems of residual pesticides in imported vegetables, the Ministry of Health, Labour and Welfare plans to expand the scope of these regulations to cover 400 pesticides by 2006. Reports of levels of pesticides exceeding these limits detected in raw or frozen imported vegetables and in domestically grown fruits and vegetables have focused interest on the analysis of pesticides.
This Application News presents examples of the analysis of frequently detected organochlorine and organophosphorus pesticides.

■ Analysis of 13 Organochlorine Pesticides using ECD-2010

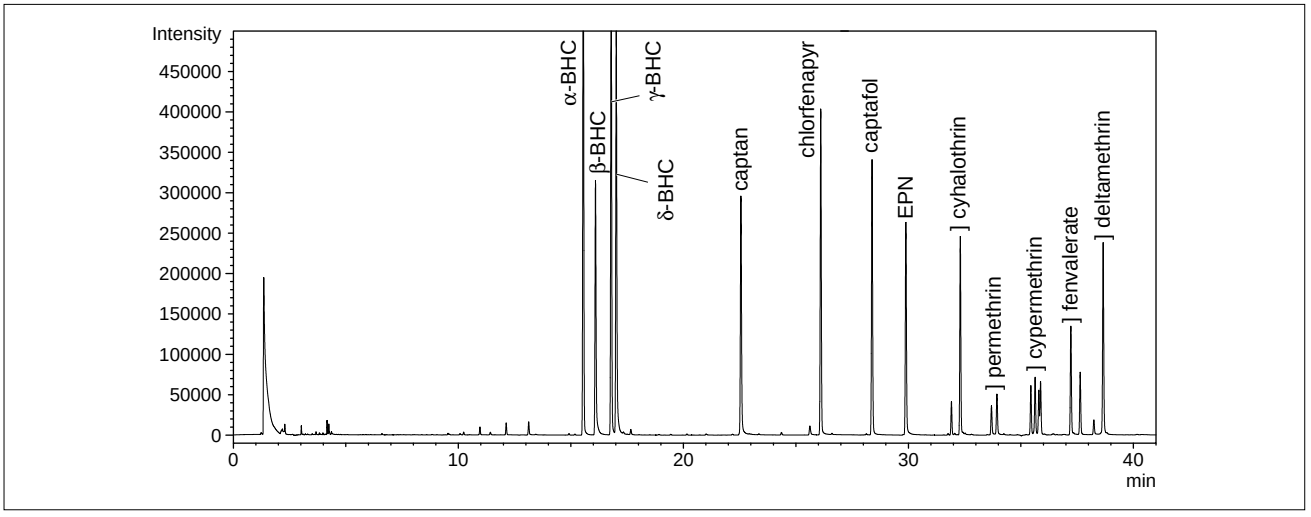


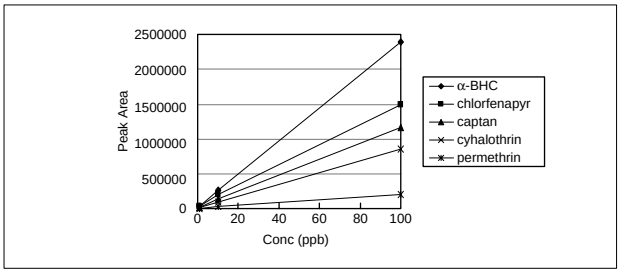
Fig. 1 Chromatogram of 13 Organochlorine Pesticides by ECD-2010 (1μL splitless injection of 100ppb standard solution)

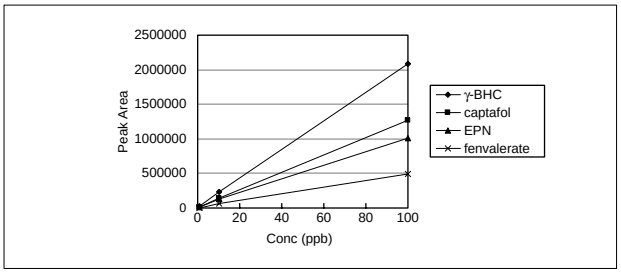
Fig. 1 shows the chromatogram of a mixed standard solution containing 13 organochlorine pesticide components (100ppb acetone solution). Fig. 2 shows the calibration curve for each component. Table 1 shows the minimum detectable quantities (absolute values) determined from the results in Fig. 1 and the minimum detectable quantity per second, determined by dividing the minimum detectable quantity by the corresponding peak width. (Note: These values are not guaranteed as they may change according to the analytical conditions (column and detector etc. conditions)).

Table 1 Minimum Detectable Quantities (absolute value/s)

	Minimum detectable quantity (fg)	Per second (fg/s)
α-BHC	26	8
β-BHC	50	12
γ-BHC	28	8
δ-BHC	39	9
captan	60	15
chlorfenapyr	29	8
captafol	66	18
EPN	51	13
cyhalothrin	71	21
permethrin	262	71
cypermethrin	249	65
fenvalerate	121	33
deltamethrin	92	22

Note: For components with isomers, the main peak was used for the calculations.





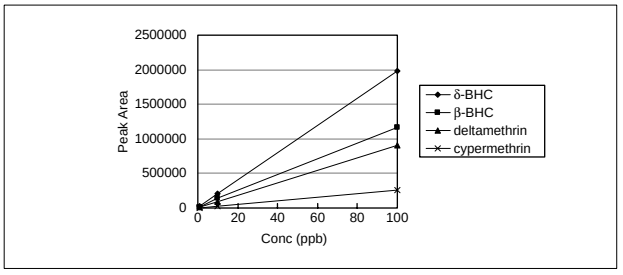


Fig. 2 Linearity of Calibration Curves

■ Analysis of 11 Organophosphorus Pesticides using FPD-2010 (P-mode)

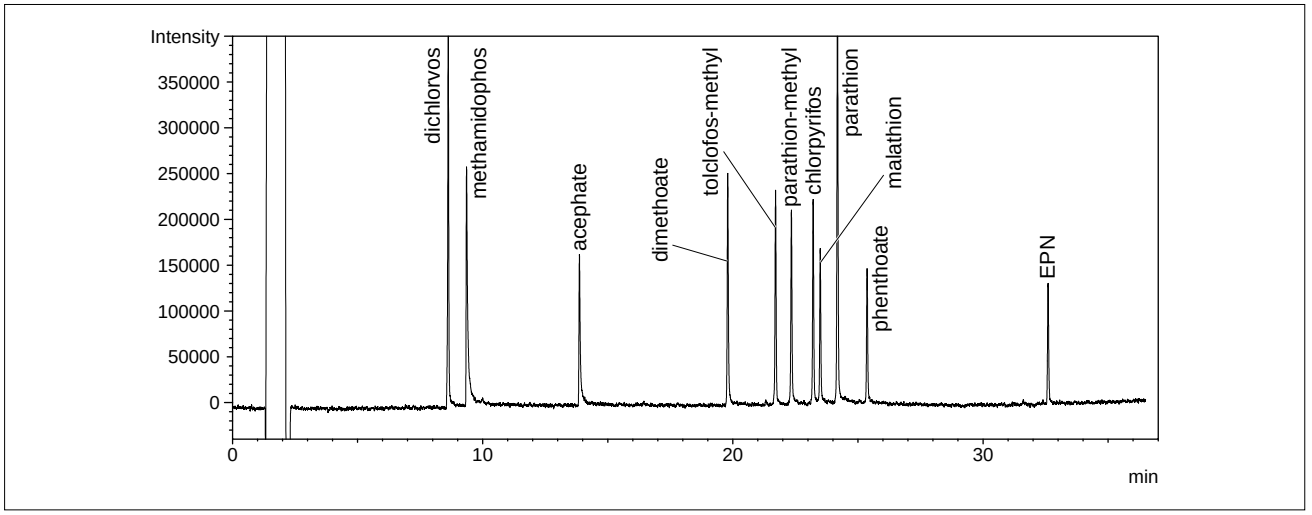
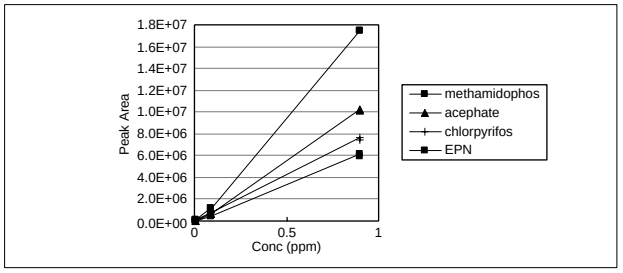
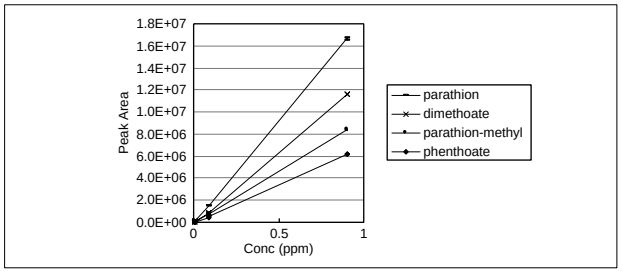


Fig. 3 Chromatogram of 11 Organophosphorus Pesticides by FPD-2010 in P-mode (2μL splitless injection of 90ppb standard solution)

Fig. 3 shows the chromatogram of a mixed standard solution containing 11 organophosphorus pesticide components (90ppb acetone solution). Fig. 4 shows the calibration curve for each component. Table 2 shows the minimum detectable quantities (absolute values) determined from the results in Fig. 3 and the minimum detectable quantity per second, determined by dividing the minimum detectable quantity by the corresponding peak width. (Note: These values are not guaranteed as they may change depending on the analytical conditions (column and detector etc. conditions)).





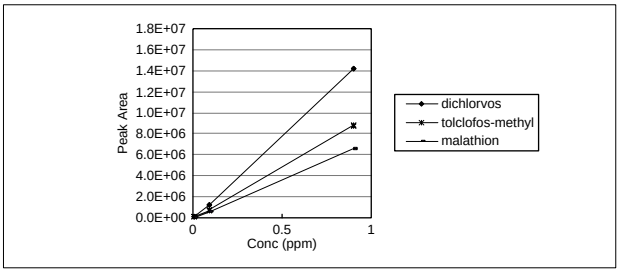


Fig. 4 Linearity of Calibration Curves

Table 2 Minimum Detectable Quantities (absolute value/s)

	Minimum detectable quantity (pg)	Per second (pg/s)
dichlorvos	10.1	3.6
methamidophos	17.6	4.0
acephate	27.7	7.3
dimethoate	18.2	5.4
tolclofos-methyl	19.2	6.1
parathion-methyl	22.0	6.4
chlorpyrifos	20.1	6.0
malathion	27.1	8.5
parathion	9.9	3.1
phenthoate	30.7	9.4
EPN	33.5	10.4

Table 3 Analytical Conditions for Fig. 1 (Organochlorine Pesticides)

Model	: GC-2010, ECD-2010
Column	: Rtx-1 30m × 0.25mmI.D. df=0.25μm
Column Temp	: 50˚C (1min) → 120˚C at 20˚C/min → 300˚C at 5˚C/min
Injection Temp	: 250˚C
Detector Temp	: 330˚C
Carrier Gas	: He 150kPa
Detector	: ECD (Makeup Gas : N_2 30mL/min)
Injection	: Splitless 1μL

Table 4 Analytical Conditions for Fig. 3 (Organophosphorus Pesticides)

Model	: GC-2010, FPD-2010
Column	: DB-1301 30m × 0.25mmI.D. df=0.25μm
Column Temp	: 50˚C (1min) → 120˚C at 20˚C/min → 280˚C at 5˚C/min
Injection Temp	: 250˚C
Detector Temp	: 280˚C
Carrier Gas	: He 150kPa
Detector	: FPD (H_2: 80mL/min, Air: 120mL/min)
Injection	: Splitless 2μL

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