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Application Data Sheet

No.91

GC-MS
Gas Chromatograph Mass Spectrometer

Easy Screening for Residual Pesticides in Foods using GC-MS

In recent years, with increases in the number of pesticides and the diversification of substances under investigation, there have been calls for quick and high-accuracy screening for residual pesticides in foods using GC-MS.

The Quick-DB database contains a variety of information on 478 pesticide components (mass spectra, retention indices, and calibration curves). It can be used to quickly calculate semi-quantitative values without using standard samples. A pesticide surrogate is used as the internal standard for the calibration curves. Favorable quantitative accuracy is achieved through quantitative analysis in accordance with the physical properties of each pesticide.

In this Data Sheet, residual pesticides in soya beans are analyzed using Quick-DB.

Experiment

Commercially-available soya beans were pretreated with the QuEChERS method using Restek Q-sep™. 138 pesticides were added to the obtained sample solution, with the concentration adjusted to 10 ng/mL. The pesticide-spiked samples were subjected to Scan/SIM analysis with the analysis conditions stored in Quick-DB. Frequently detected components were analyzed with high sensitivity in SIM mode. For components with low detection frequency, a comprehensive analysis was performed in Scan mode. Table 1 shows the analysis conditions. The retention times for the pesticide components were estimated based on the analysis results for the n-alkane standard sample.

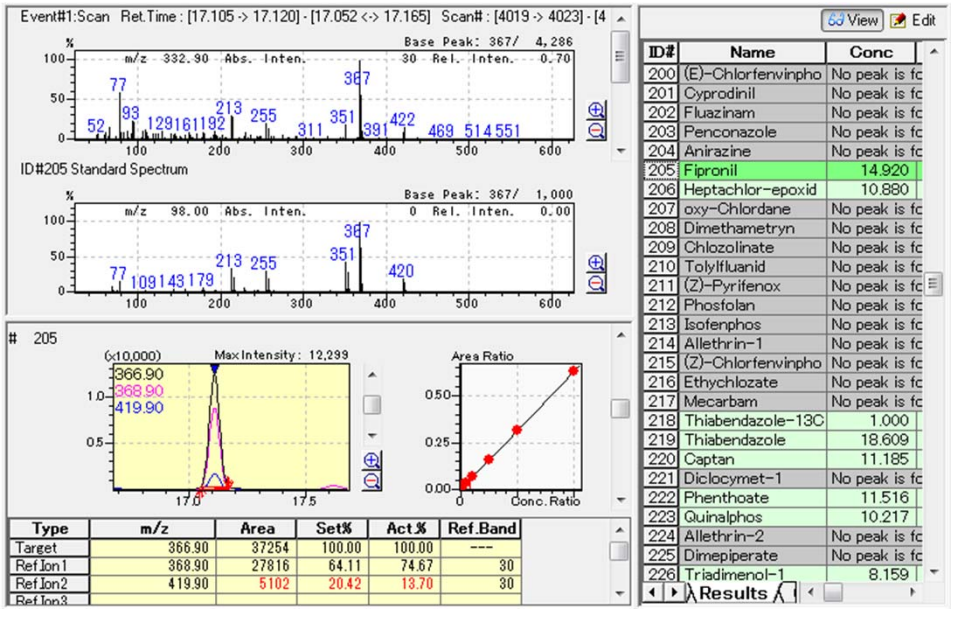
Table 1: Analysis Conditions

GC-MS:	GCMS-QP2010 Ultra		
Column:	Rxi-5Sil MS (30 m L., 0.25 mm I.D., df=0.25 µm) (Restek Corporation, P/N: 13623)		
Glass Insert:	Sky Liner, Splitless Single Taper Gooseneck w/Wool (Restek Corporation, P/N: 567366)		
[GC]		[MS]	
Injection unit temp.:	250 °C	Interface temp.:	300 °C
Column oven temp.:	60 °C (1 min) → (25 °C/min) → 160 °C → (4 °C/min) → 240 °C → (10 °C/min) → 290 °C (11 min)	Ion source temp.:	200 °C
		Solvent elution time:	1.5 min
Injection mode:	Splitless	Measurement mode:	FAAST (Scan/SIM simultaneous measurement)
High-pressure injection:	250 kPa (1.5 min)		
Carrier gas control:	Linear velocity (40.0 cm/sec)	Scan mass range:	*m/z* 50 to 600
Injection volume:	2 µL	Scan event time:	0.15 sec
		Scan speed:	5,000 u/sec
		SIM event time:	0.3 sec

<Quick-DB (GC/MS database for residual pesticides)>

This database is preregistered with calibration curve data created with a pesticide surrogate as the internal standard, and Scan/SIM and Scan/MRM analysis methods suited to the simultaneous analysis of multiple pesticide components. With this database, residual pesticides in foods can be analyzed quickly, without allocating time for method creation.

Furthermore, the AART (Automatic Adjustment of Retention Times) function and the adoption of columns and liners suited to pesticide analysis enable high-accuracy analysis.



Analysis Results

The pesticide-spiked samples (10 ng/mL) were analyzed in Scan/SIM mode. Fig.1 shows the analysis results for Hexachlorobenzene. 10.3 ng/mL is obtained by semi-quantitation using the calibration curve stored in Quick-DB, which shows the high quantitative accuracy. Also, scan data was simultaneously acquired. Consequently, the pesticide identity could be confirmed from the mass spectrum.

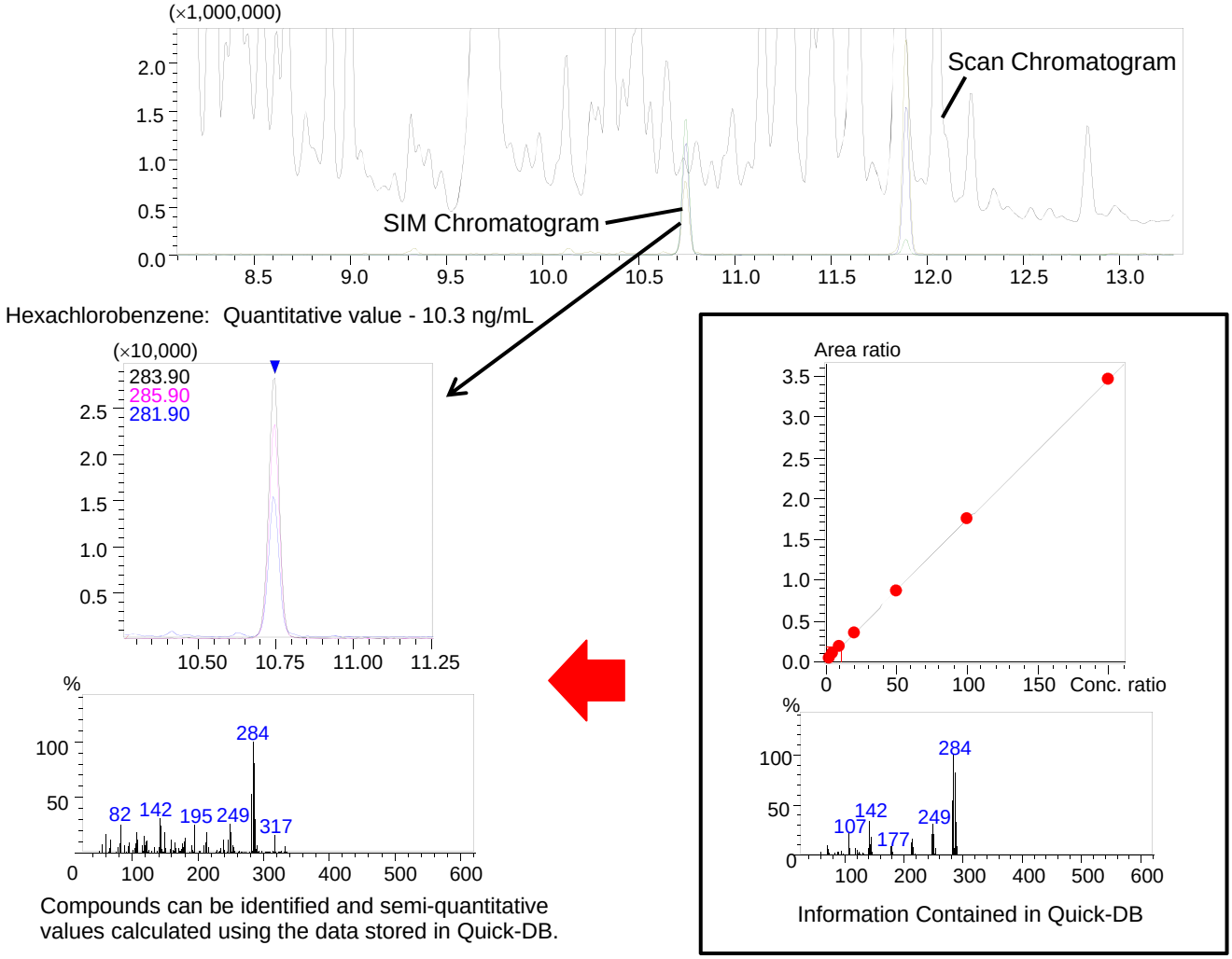


Fig. 1: Analysis Results for Hexachlorobenzene Using Quick-DB

Quick-DB uses a pesticide surrogate as the internal standard. With the internal standard substance selected in accordance with the physical properties of each pesticide, the database enables semi-quantitative analysis. As an example, Fig. 2 shows the quantitative results for Fthalide, p,p'-DDE, and Pyrimethanil. The semi-quantitative concentrations closely matched the expected results.

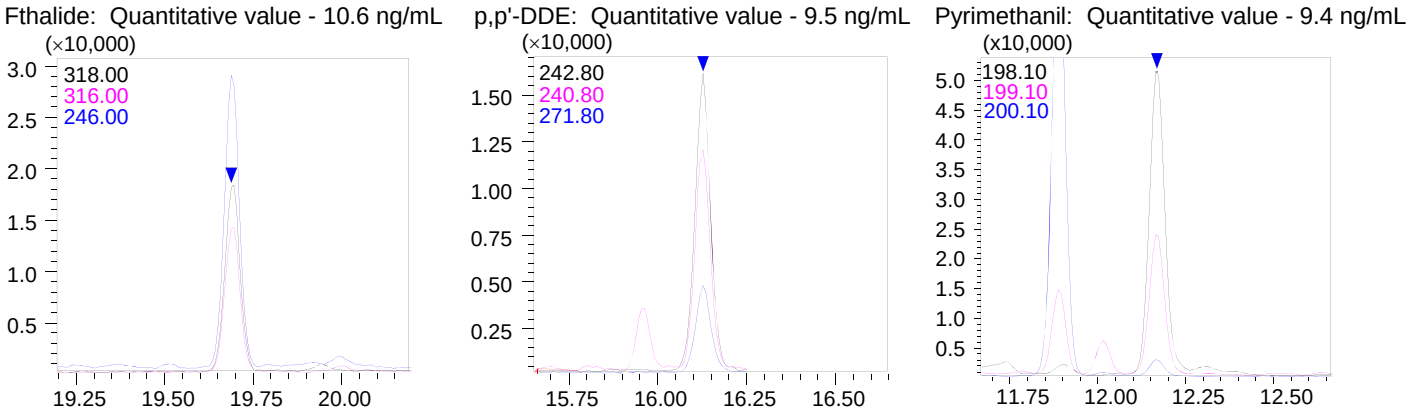


Fig. 2: Quantitative Results Using Quick-DB (from the left: Fthalide, p,p'-DDE, & Pyrimethanil)

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