

## Quantitative analysis of residual agricultural chemicals in food by GC-MS/MS - Quantitative analysis of pesticides in carrot extract -

### Product: Mass spectrometer (MS)

As "food safety" is recognized as an increasingly important issue on a global scale, many nations have their own regulations on residual agricultural chemicals in food. In Japan, the positive list system, which was enforced at the end of May 2006, stipulates a uniform standard of 10 ppb as a quantity that is considered safe for human health. Under the positive list system, more agricultural chemicals need to be examined, and as a result, techniques capable of accurately and collectively analyzing residual agricultural chemicals in food are in increasing demand. While mass spectrometry (MS) is known for its high detection sensitivity, MS/MS is becoming the mainstream of pesticide analysis for its superior sensitivity and selectivity.

The JMS-TQ4000GC, JEOL's latest GC-MS/MS, has a unique ion storage/ejection mechanism within the MS/MS collision cell and incorporates new firmware to support MS/MS analysis with up to 36,000 transitions. In this work, we performed quantitative analysis of residual agricultural chemicals in carrot extract using a JMS-TQ4000GC.

### [Measuring Conditions]

A pesticide standard solution from FUJIFILM Wako Pure Chemical Corporation (PL series) was used that consisted of equal amounts of PL 1, 2, 3, 4, 5, 6, 11, and 12. Afterwards, the solution was diluted to 1, 5, 10, 50 and 100 ppb. PEG 300 was used to protect the pesticides from thermal decomposition in the GC injection liner.

For the sample, 15 g of carrots was processed by using the AOAC 2007.01 extraction method, and the resulting extraction solution was mixed with 100 ppb of the standard solution at 9:1. The sample was quantitatively analyzed for 150 pesticides. Table 1 shows the measurement conditions used for the analysis.



GC-MS/MS, JMS-TQ4000GC

Table 1. Measuring conditions

[GC-TQMS Conditions]	
System	JMS-TQ4000GC (JEOL)
Ionization mode	EI+: 70 eV, 50 mA
GC column	VF-5 ms(Agilent), 30m x 0.25 mm, 0.25 mm
Oven temp.	50°C (1 min) -> 25°C/min -> 125°C -> 10°C/min -> 300°C
Inlet temperature	250°C
Inlet mode	Splitless, 2 mL
He flow	1.0 mL/min (Constant Flow)
MS/MS mode	Peak Dependent SRM

### [Results]

Figure 1 top row shows the data acquired from the original carrot extract while the bottom row shows the data from the carrot extraction solution with the pesticides added. MS/MS, with its high mass selectivity, detected agricultural chemicals without being affected by contaminants in the carrot extract. Table 2 shows the quantitative results of 150 pesticides (n=5) and their reproducibility (CV). For most agricultural chemicals, the recovery rate was 70 to 120% and the CV was 10% or less, demonstrating the effectiveness of the JMS-TQ4000GC for pesticide analysis.

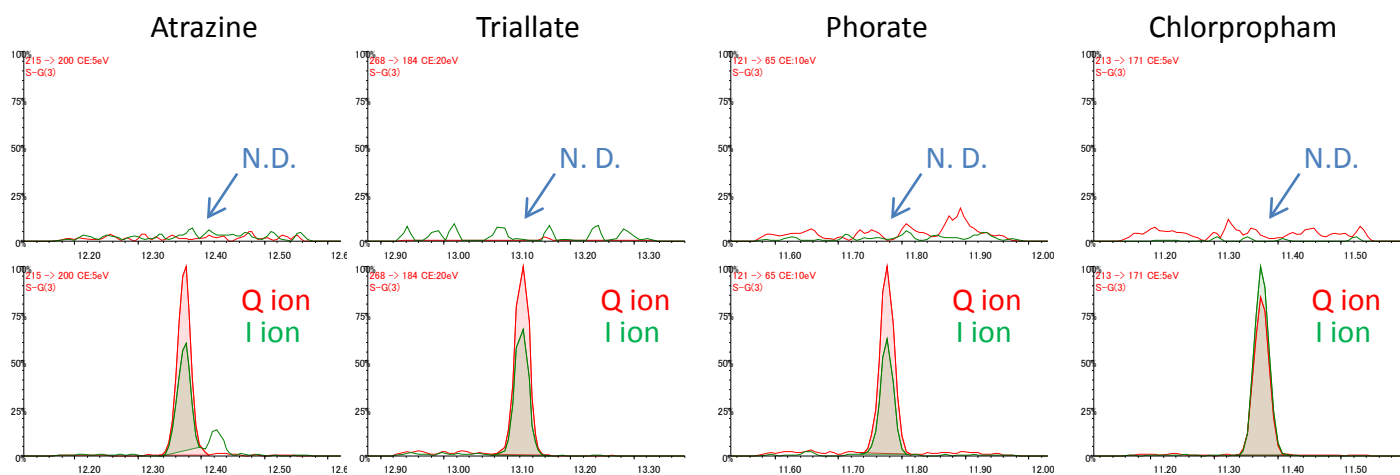


Figure 1. SRM chromatograms

Top row: Carrot extract solution only; bottom row: 10 ppb pesticides in carrot extract solution

