

# Application News

High Performance Liquid Chromatography

No.L407

## High Speed, High Resolution Analysis (Part 33) Analysis of Gingerol and Shogaol in Ginger

Ginger is not only used as a spice, but has also been used in traditional Chinese herbal medicine since ancient times. Investigation into the efficacy of ginger has been attracting a lot of attention in recent years, and the use of ginger in health foods has seen great increases.

Here we introduce an example of the analysis of 6-gingerol and 6-shogaol, constituents of ginger, using the Prominence UFLC ultra fast LC system with the SPD-M20A photodiode array detector.

### ■ Analysis of Standard Solution

Fig. 1 shows the structures of 6-gingerol and 6-shogaol. Homologs of both gingerol and shogaol exist, and in the case of gingerol, these include 6-gingerol, 8-gingerol and 10-gingerol, with 6-gingerol the most abundant found in ginger. Gingerol is converted to shogaol during the dehydration reaction caused by heating, but the content levels of these constituents vary depending on the type of ginger.

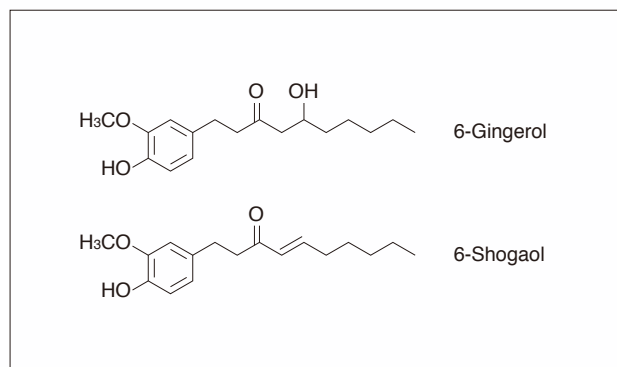


Fig. 1 Structures of 6-Gingerol and 6-Shogaol

Table 1 Analytical Conditions

|                    |                                                                                               |
|--------------------|-----------------------------------------------------------------------------------------------|
| Column             | : Shim-pack XR-ODS (75 mmL. × 3.0 mmI.D., 2.2 μm)                                             |
| Mobile Phase       | : A : Water<br>B : Acetonitrile                                                               |
| Time Program       | : B Conc. 30→90 % (0.00-2.10 min) →90 % (2.50 min)<br>→100 % (2.51-3.50 min) →30 % (3.51 min) |
| Flow Rate          | : 1.0 mL/min                                                                                  |
| Injection Volume   | : 2 μL                                                                                        |
| Column Temperature | : 40 °C                                                                                       |
| Detection          | : SPD-M20A at 280 nm (slit width : 8 nm)                                                      |
| Flow Cell          | : Semi-micro cell                                                                             |

Fig. 2 shows the chromatogram obtained from analysis of a 6-gingerol and 6-shogaol standard solution (each 100 mg/L, in methanol solution) using the Shim-pack XR-ODS high-speed, high-resolution column, and Table 1 shows the analytical conditions used. It should be noted that a column rinsing procedure was added to these conditions for analysis of the actual sample.

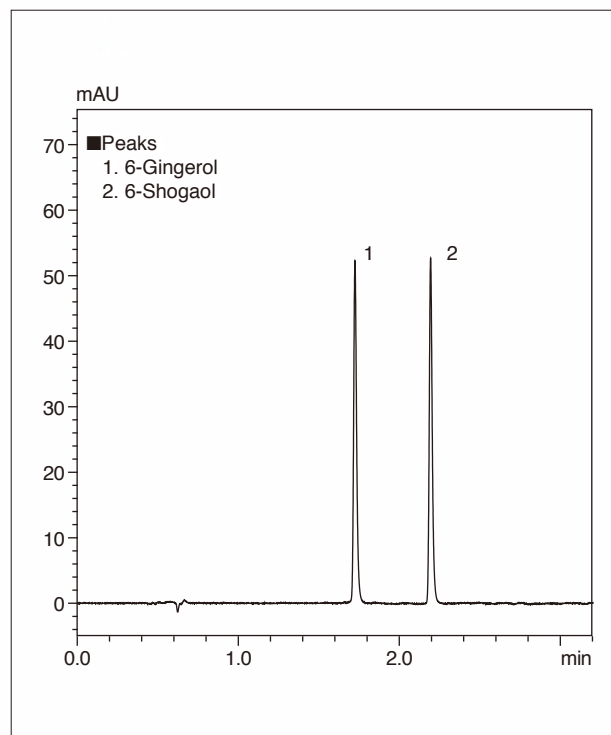


Fig. 2 Chromatogram of a Standard Mixture of 6-Gingerol and 6-Shogaol (100 mg/L, 2 μL injected)

### ■ Linearity and Repeatability

Fig. 3 shows the calibration curves for 6-gingerol and 6-shogaol generated using concentrations from 1.0 to 250 mg/L (each point representing the average of 3 peak areas at each concentration), in addition to the

repeatability of analysis results ( $n = 6$ ). Excellent linearity was obtained for both substances, with an  $R^2$  value greater than 0.9999, for each.

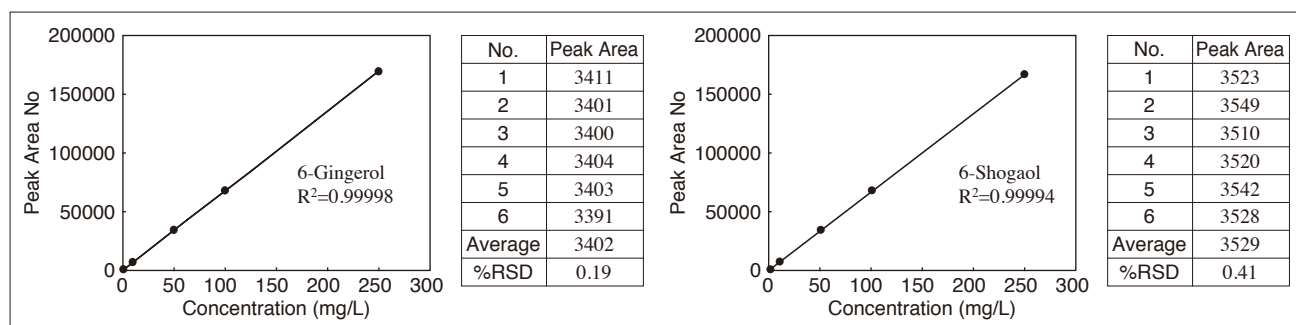


Fig. 3 Linearity and Repeatability

### ■ Analysis of Ginger Extract

After sample preparation according to the procedure of Fig. 4, analysis of ginger was conducted using the analytical conditions shown in Table 1. Fig. 5 shows the resulting chromatogram. Fig. 6 shows the overlaid spectra of 6-gingerol obtained from analysis of a 6-gingerol standard sample and of a ginger extract.

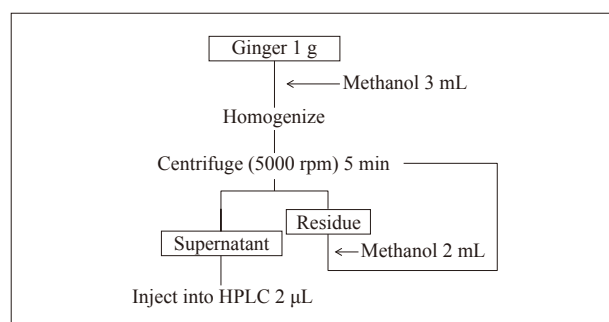


Fig. 4 Sample Preparation

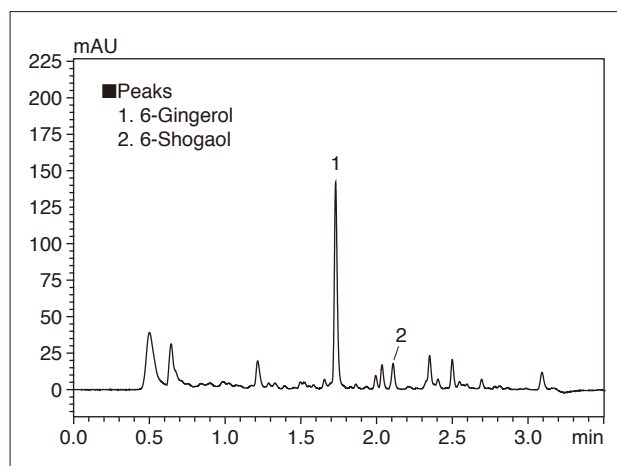


Fig. 5 Chromatogram of Ginger Extract

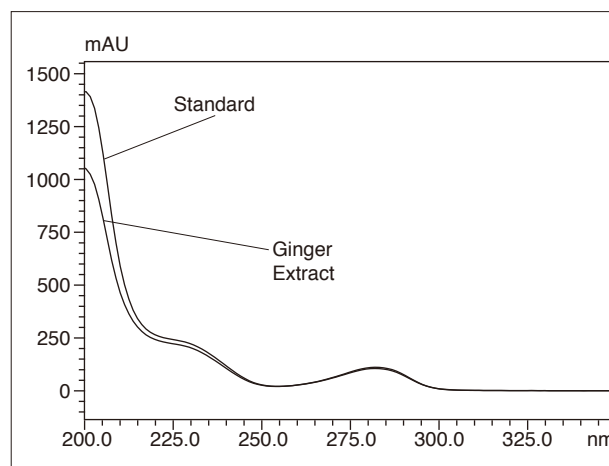


Fig. 6 Spectra of 6-Gingerol



**SHIMADZU**

SHIMADZU CORPORATION. International Marketing Division

3. Kanda-Nishikicho 1-chome, Chiyoda-ku, Tokyo 101-8448, Japan Phone: 81(3)3219-5641 Fax: 81(3)3219-5710  
Cable Add.: SHIMADZU TOKYO