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Application News

DPiMS™ QT Probe Electrospray Ionization Kit
LCMS™-9030 Quadrupole Time-of-Flight Liquid Chromatograph Mass Spectrometer

Detection of Isoflavones and Its Metabolites in Foods by DPiMS QT and LCMS-9030

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User Benefits

- Detection of target compounds in processed foods is possible with simple sample preparation.
- Compounds can be measured quickly without column separation regardless of its polarity.
- Samples can be measured with stable mass accuracy.

■ Introduction

With the heightened health-consciousness of recent years, soybean isoflavones have attracted attention as functional components which are useful for health. However, with the global distribution of food products, it is necessary to verify that the components actually contained in food products are the same as the indicated contents.

Here, the measurement targets were the soy isoflavones daidzein, genistein, and glycitein and their glycosides. An ODS column is generally used in simultaneous analyses of isoflavones and their glycosides by LC or LC/MS. It takes excessive time to separate these compounds completely, because isoflavones and their glycosides have different polarities. In addition, since this technique also includes a process for extraction of the isoflavones in foods, the development of an easy and fast analysis technique for all of the steps from sample preparation to measurement has been needed.

This Application News introduces a new analysis technique using a DPiMS QT which is a probe kit of electrospray ionization unit and an LCMS-9030 quadrupole time-of-flight mass spectrometer (Fig. 1). The DPiMS QT makes it possible to conduct direct analysis and minimize the time from sample preparation to analysis.

Fig. 1 Appearance of DPiMS™ QT and LCMS™-9030

■ Analytical Conditions and Sample Preparation Method

In the DPiMS QT, the attached probe repeatedly carries out sampling from the sample plate, and simultaneously ionizes the sample adhering to the probe surface by applying a voltage to the probe tip. Then, the ionized samples are introduced directly into the mass spectrometer. Table 1 shows the analytical conditions.

In this Application News, the daidzein, daidzin, genistein, genistin, and glycitein in tofu, soybeans boiled in water, soy milk, and a soybean processed chocolate snack were measured. Fig. 2 shows the structural formulae of these compounds.

The sample preparation procedure is as follows. First, 10 mg each of the tofu, boiled soybeans, soy milk, and soybean processed chocolate snack were weighed, and 1 mL of 50 % ethanol was added and mixed for 1 min. The mixtures were then centrifuged, and 10 µL of the supernatant was dripped on the sample plate and measured.

Table 1 Analytical Conditions

Mass spectrometer	
System	: DPiMS QT+LCMS-9030
Polarity	: Positive
DL temp	: 250 ˚C
Heat block temp	: 50 ˚C
Interface Voltage	: 3.5 kV
TOF-MS	: *m/z* 100-800
Measurement Time	: 0.5 min

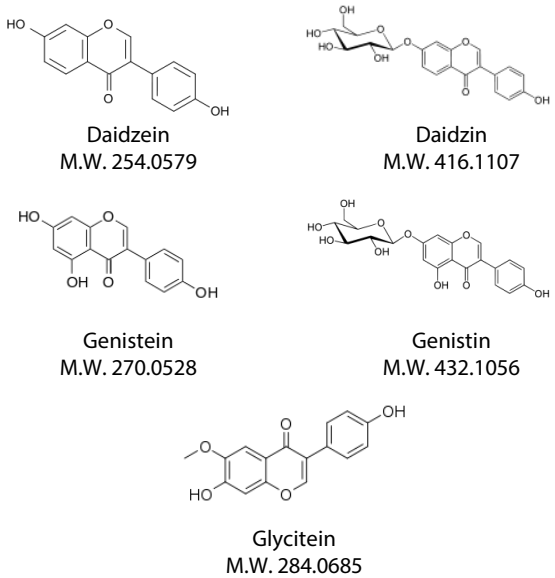

Fig. 2 Structural Formulae of Isoflavones and Their Glycosides

■ Analysis of Foods Containing Isoflavones

Fig. 3 show the MS spectra obtained from extracts of the tofu, boiled soybeans, soy milk, and soybean processed chocolate snack. With a simple sample preparation time of about 5 min and measurement time of 0.5 min, daidzein, daidzin, genistein, genistin, and glycitein were detected from the tofu, boiled soybeans, and soy milk, and daidzein, genistein, and glycitein were detected from the soybean processed chocolate snack. The mass error (ppm) calculated from the theoretical and measured *m/z* of each isoflavone was in the range of -2.4 ppm to 2.2 ppm, indicating that stable mass accuracy was realized, including in the matrix.

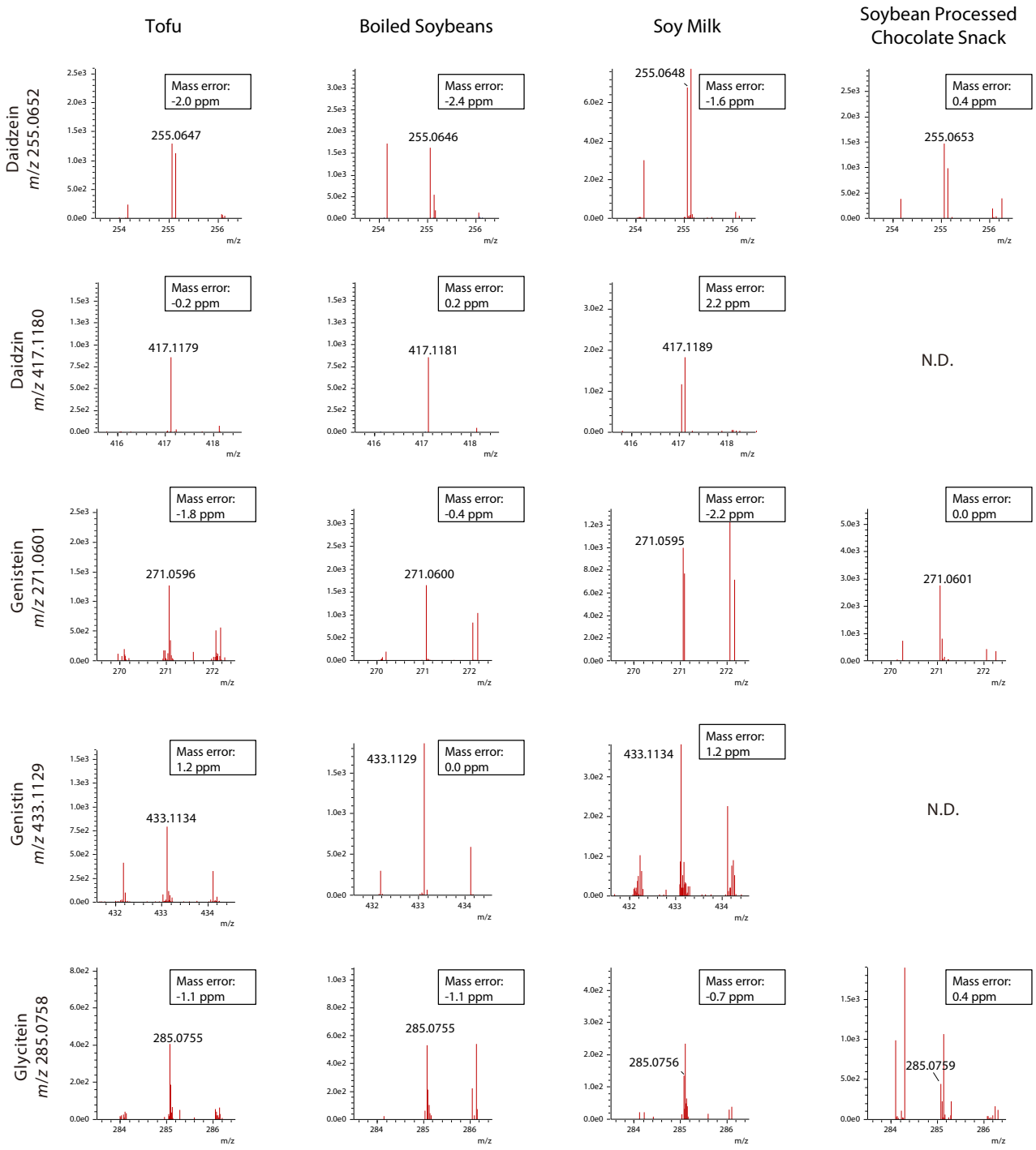

Fig. 3 MS Spectra of Extracts of Tofu, Boiled Soybeans, Soy Milk, and Soybean Processed Chocolate Snack and Mass Error (ppm) from Theoretical and Measured *m/z*

■ Conclusion

Isoflavones and their glycosides were detected in tofu, boiled soybeans, soy milk, and a soybean processed chocolate snack with stable mass accuracy by using a combination of a DPiMS QT and LCMS-9030.

The time required for the analysis was substantially reduced in comparison with the LC or LC/MS methods. The sample preparation time was approximately 5 min and the measurement time was 0.5 min.

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