Analysis of preservative additives in food by Agilent 7820A GC

Application Brief

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Food

Preservatives have been widely used as additives in various types of foods to prevent deterioration while extending the shelf life, but excessive consumption is harmful to human health. The Agilent 7820A GC system offers an efficient and easy-to-use platform to identify preservatives in food and determine their quantity. In this application, an Agilent 7820A GC configured with a split/splitless capillary inlet and a flame ionization detector (FID) analyzes seven most commonly used preservatives including sorbic acid, dehydroacetic acid, benzoic acid, methyl 4-hydroxybenzoate ($C_8H_8O_3$), ethyl 4-hydroxybenzoate ($C_9H_{10}O_3$), propyl 4-hydroxybenzoate ($C_{10}H_{12}O_3$), and butyl 4-hydroxybenzoate ($C_{11}H_{14}O_3$) in juice and soybean sauce. EZChrom Elite Compact software is used to control the Agilent 7820A GC system and provide data acquisition/data analysis. The Agilent 7820A GC system supports an automatic liquid sampler (ALS) which allows fully unattended operation from injection all the way through final reporting.

Highlights

- Agilent 7820A GC system configured with an FID provides an easy-to-use method for the analysis of seven preservatives in juice and soybean sauce with one injection.

- Electronic pressure control (EPC) and automatic injection ensures excellent repeatability for both retention time and peak area.

- EzChrom Elite Compact software is designed to control the Agilent 7820A GC system and provides data analysis with flexible reporting.

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Experimental

Table 1.   Typical GC conditions

Inlet Settings	240 ºC, split ratio: 10:1
Injection Size	1 µL
Column	HP-Innowax, 30 m × 0.25 mm, 0.25 µm (19091N-133)
Column flow (He)	2.5 mL/min, constant flow mode
Oven temp program	160 °C to 240 °C (10min) at 15 °C/min
FID Setting	Temperature : 250 ºC
	H_2 flow: 40 mL/min
	Air flow: 400 mL/min
	Make up (N_2): 45 mL/min
Data acquisition rate	20 Hz

Results

The method provides baseline separation for seven preservatives including sorbic acid, dehydroacetic acid, benzoic acid, methyl 4-hydroxybenzoate, ethyl 4-hydroxybenzoate, propyl 4-hydroxybenzoate, and butyl 4-hydroxybenzoate in juice and soybean sauce with one injection. Full electronic pneumatics control (EPC) and automatic injection ensures good repeatability. Figure 1 shows the chromatograms of 100 ug/mL preservative standards spiked in juice sample. Table 2 shows excellent repeatability for both retention time and peak area. The sample preparation method used is documented in GB/T 5009.29-2003. [1]
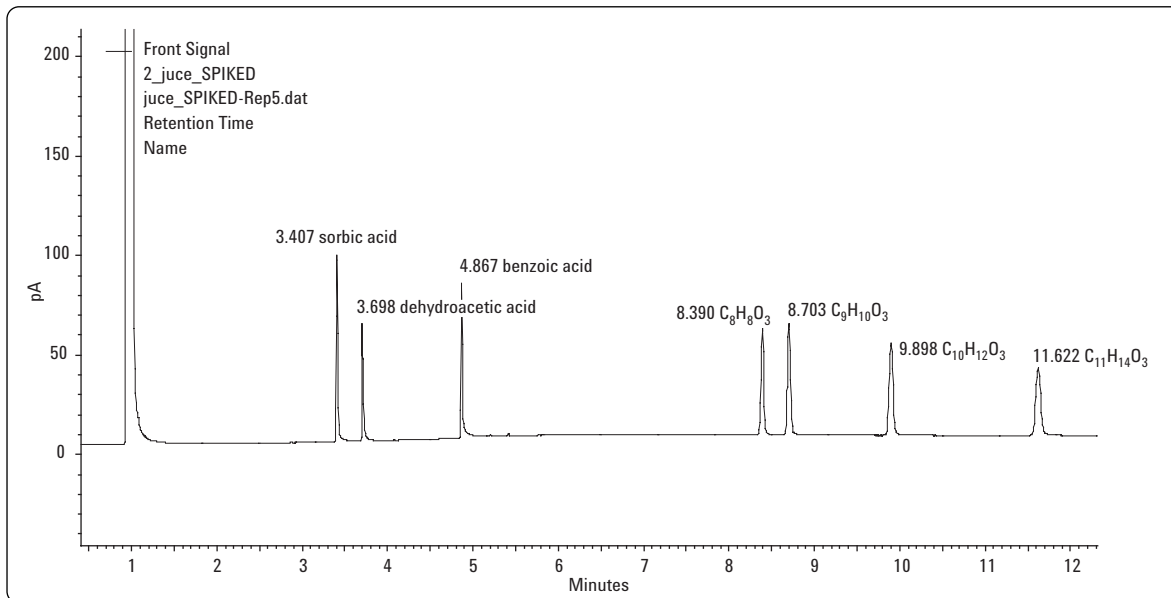

Figure 1.   Chromatograms of 100 ug/mL preservative standards spiked in juice sample

A soybean sauce sample was analyzed and benzoic acid was found at a mean concentration of 394.04 mg/kg. The individual results are shown in Table 3. The sample preparation method used is documented in GB/T 5009.29-2003. [1]

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Table 2.   Repeatability of 100 ug/mL Preservative Standards Spiked in Juice Sample (5 runs) with the First Run Excluded

	Sorbic acid	Dehydroacetic acid	Benzoic acid	$C_8H_8O_3$	$C_9H_{10}O_3$	$C_{10}H_{12}O_3$	$C_{11}H_{14}O_3$
Area Mean	841031.25	595312.25	783837	931410	1065391	1114740.25	1058112.25
Area %RSD	0.26	0.11	0.14	0.38	0.12	0.17	0.04
Retention Time Mean	3.41	3.70	4.87	8.39	8.70	9.90	11.62
Retention Time %RSD	0.02	0.04	0.01	0.01	0.02	0	0.03

Table 3.   Soybean Sauce Sample Results

Benzoic acid in soybean sauce, mg/kg

Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Mean	%RSD
400.4	381.12	394.48	395.52	397.16	395.56	394.04	1.69

References

1. GB/T 5009.29-2003, "Determination of sorbic acid and benzoic acid in foods"

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