Determination of Cations in Fruit Juices

Bern Sheldon
Thermo Fisher Scientific, Sunnyvale, CA, USA

Introduction

Determining cations, such as potassium, sodium, and calcium, in fruit juices is important due to the dietary significance of such cations. For example, recent studies have supported the contention that excess dietary sodium is a contributing factor in heart disease. Calcium, though an important dietary component for most, can be an issue for patients with renal insufficiency. Potassium is also essential for good health and is present in significant concentrations in some juices. For these reasons, accurate reporting of cation levels is helpful.

A new and simple method to determine cations in fruit juices requires only a 1:100 dilution followed by injection. Inline sample filtration helps protect analytical columns from clogging by particulates. The method is sensitive enough to determine lithium ion concentration at low µg/L levels with sufficient resolution even in the presence of mg/L concentrations of sodium. Analysis time is 7 min or less.

A chromatogram of a representative sample is shown in Figure 1. Careful optimization of eluent concentration and column temperature would improve analyte resolution. See the Thermo Scientific™ Dionex™ IonPac™ CS12A column manual, Document No. 031132, for information.

Use of a 2 mm diameter analytical column run at 0.4 mL/min reduces eluent usage and waste by 75%, compared to the same 4 mm column application. The high-performance cation analysis column used requires only acid eluent with no added organic solvents, which are expensive to obtain and even more expensive to dispose.

Thermo Scientific Dionex ICS-1100 with degasser and column oven, Thermo Scientific Dionex AS autosampler

Inline Filter:	0.5 µm low volume filter and housing
Column:	Dionex IonPac CS12A 2 × 250 mm column
Eluent:	12.5 mM Methanesulfonic Acid
Flow Rate:	0.4 mL/min
Column Oven:	30 °C
Detection:	Suppressed conductivity, 40 °C cell temp
Suppressor:	Thermo Scientific™ Dionex™ CSRS™ 300 Cation Self-Regenerating suppressor, 2 mm, 30 mA, recycle mode
Injection Volume:	25 µL

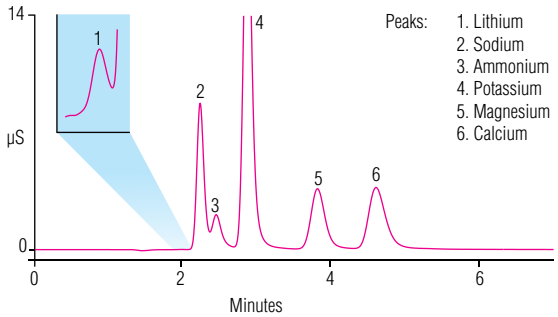

Figure 1. Example chromatogram of apricot nectar (1:100 dilution). Note lithium peak, 30 µg/L, and sodium peak, 120 mg/L.

Thermo SCIENTIFIC

Table 1. Cation concentrations in fruit juices.

		Lithium (µg/L)	Sodium (mg/L)	Ammonium (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Calcium (mg/L)
Orange, Original Pulp Free	Average of 3 Analyses	2	3	15	1843	166	71
	Label Values				**1900**	**100**	**100**
Apricot Nectar	Average of 3 Analyses	30	120	43	575	80	79
	Label Values		**30**		**882**		
Peach Nectar	Average of 3 Analyses	29	127	20	510	81	80
	Label Values		**30**		**620**		
Lemonade with Raspberry	Average of 3 Analyses	6	11	10	193	19	28
	Label Values		**62**				
Tomato Juice	Average of 3 Analyses	4	2936	n.d.	1874	162	64
	Label Values		**2880**		**1840**		**123**
Vegetable Juice, Low Sodium	Average of 3 Analyses	14	562	30	3900	326	79
	Label Values		**491**		**3497**		
Pear Nectar	Average of 3 Analyses	31	138	n.d.	419	77	73
	Label Values		**59**		**382**		
Mango Nectar	Average of 3 Analyses	31	131	n.d.	309	71	74
	Label Values		**74**		**340**		
Guava Nectar	Average of 3 Analyses	29	131	n.d.	337	63	73
	Label Values		**29**		**250**		

**Equivalent or improved results can be achieved using the Thermo Scientific Dionex ICS-5000⁺ system.*

www.thermoscientific.com/chromatography

Thermo Fisher Scientific, Sunnyvale, CA USA is ISO 9001:2008 Certified.

Africa +43 1 333 50 34 0
Australia +61 3 9757 4300
Austria +43 810 282 206
Belgium +32 53 73 42 41
Brazil +55 11 3731 5140
Canada +1 800 530 8447
China 800 810 5118 (free call domestic)
400 650 5118
Denmark +45 70 23 62 60
Europe-Other +43 1 333 50 34 0
Finland +358 9 3291 0200
France +33 1 60 92 48 00
Germany +49 6103 408 1014
India +91 22 6742 9494
Italy +39 02 950 591
Japan +81 6 6885 1213
Korea +82 2 3420 8600
Latin America +1 561 688 8700
Middle East +43 1 333 50 34 0
Netherlands +31 76 579 55 55
New Zealand +64 9 980 6700
Norway +46 8 556 468 00
Russia/CIS +43 1 333 50 34 0
Singapore +65 6289 1190
Sweden +46 8 556 468 00
Switzerland +41 61 716 77 00
Taiwan +886 2 8751 6655
UK/Ireland +44 1442 233555
USA +1 800 532 4752

Thermo SCIENTIFIC
A Thermo Fisher Scientific Brand

AB71405-EN 1114M