Short application note

Food & beverage

Sugars in vodka

Keywords

ALEXYS carbohydrate analyzer, HPAEC-PAD, DECADE Elite, SenCell, SweetSep™ AEX200, glucose, sucrose, fructose, quality control, EU regulation 2019/787 on spirit drinks.

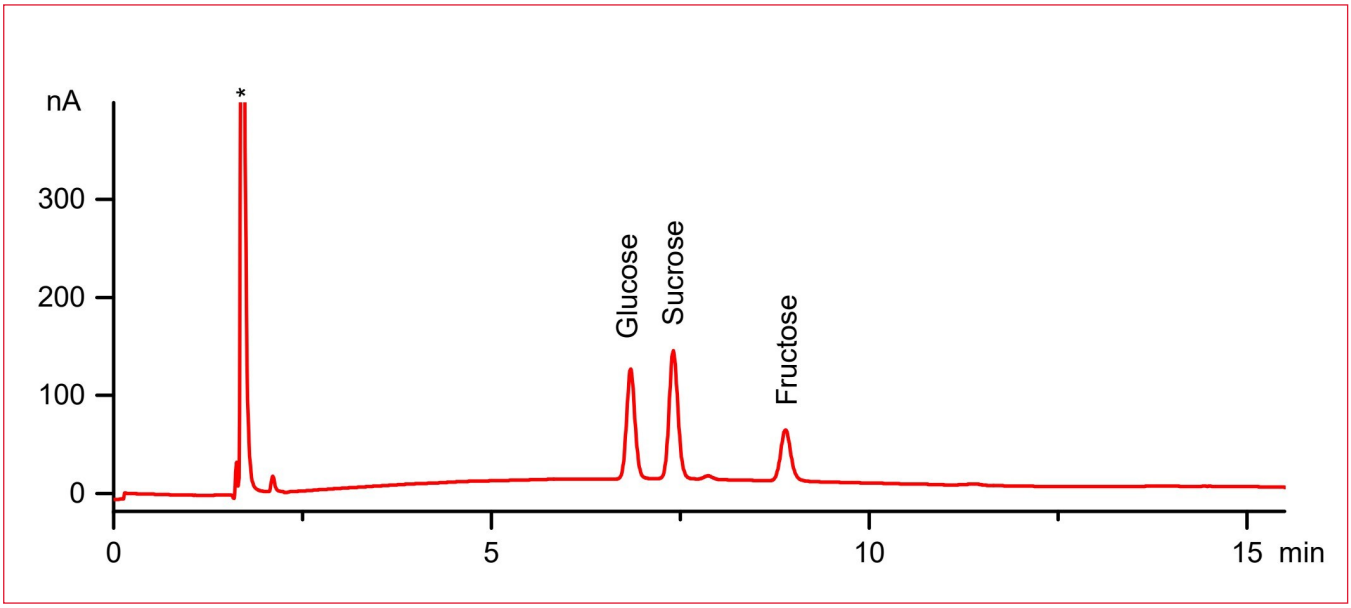

Fig. 1. Chromatogram obtained from an 20 µL injection of a commercial Vodka sample 100x diluted in DI water using the ALEXYS Carbohydrate Analyzer shown in figure 2. Separation was achieved using the LC-EC conditions and gradient program shown in Table 1 and 2, respectively. Total content of sugars (glucose, sucrose, fructose) found 100 mg/L.. Peak marked with * not quantified but most likely ethanol.

Introduction

Regulation (EU) 2019/787 sets out the rules for the definition, description, presentation, and labelling of spirit drinks in the European Union [1]. It also protects geographical indications for spirit drinks, regulates the use of spirit drink names in other food products, and defines the types of alcohol that may be used in beverages.

Fig. 2. ALEXYS Carbohydrate Analyzer.

Table 1. HPAEC-PAD conditions

HPLC	ALEXYS™ Carbohydrate Analyzer (Antec Scientific)
Columns	SweetSep™AEX200, 4 x 50 mm precolumn, 5µm SweetSep™AEX200, 4 x 200 mm column, 5µm Borate ion trap, 4 x 50 mm column, 10 µm (all columns Antec Scientific)
Mobile phases	A: DI water, B: 100 mM NaOH and C: 100 mM NaOH—100 mM NaOAc Eluents blanketed with Nitrogen 5.0
Flow rate	0.7 mL/min
Backpressure	About 235—240 bar
Injection volume	20 µL
Temperature	5°C for sample cooling (AS6.1L), 30°C for separation (CT2.1), 35°C for detection (DECADE Elite)
Flow cell	SenCell Au WE, HyREF Pd RE, AST setting 2
Potential waveform (4-step)	E1, E2, E3, E4: +0.1, -2.0, +0.6, -0.1 V ts, t1, t2, t3, t4: 0.2, 0.4, 0.02, 0.01, 0.07 s
Range	10 µA/V
I-cell	About 0.2—0.5 µA
ADF	0.1 Hz

Table 2. Gradient program*

Time (min)	*Mobile phase*	*%A*	*%B*	*%C*	*Description*
0 - 15	9 mM NaOH	91	9	0	Elution & detection
25	100 mM NaOH	0	100	0	
40	100 mM NaOH, 100 mM NaOAc	0	0	100	
40 - 45	100 mM NaOH, 100 mM NaOAc	0	0	100	Column clean-up and regeneration
45 – 80	9 mM NaOH	91	9	0	Equilibration, starting conditions

*) The particular gradient program shown can also be used to assess the presence of oligosaccharides in samples (t = 15—40 min). The gradient program can be simplified and shorten if only glucose, sucrose and fructose are targeted.

The Regulation establishes clear rules on product categories, names, and labelling, including for blends and mixtures, to ensure transparency for consumers and fair practices for producers. Pure distilled spirit drinks like, vodka, gin and whiskey contain virtually no sugars, however flavoured spirits may contain significant amounts of sugars to enhance taste.

Although, there are no specific requirements to state the sugar contents on the product label of spirit drinks, it is important to quantify the amount of sugars to check compliance to EU regulation 2019/787. For example, vodka may be sweetened to round off the final taste, but the final product may not contain more than 8 grams per liter, expressed as invert sugar [1].

Analysis of sugars in vodka

In this application example sensitive high-resolution analysis of sugars in a commercial vodka product is demonstrated using the ALEXYS Carbohydrate Analyzer in combination with the SweetSep™AEX200 column (see fig 1), using the conditions listed in table 1 and 2. The ALEXYS Carbohydrate analyzer is a dedicated metal-free LC solution of Antec Scientific for the analysis of sugars using Anion-Exchange Chromatography in combination with Pulsed Amperometric detection (HPAEC-PAD) [fig 2). The AEX200 is an novel anion-exchange stationary phase of Antec Scientific for carbohydrate analysis based on a highly monodisperse 5 µm resin of ethylvinylbenzene-divinylbenzene copolymer coated with functionalized nanoparticles with quaternary amine exchange sites.

Table 3. Ordering information

ALEXYS analyzer	
180.0057W	ALEXYS Carbohydrate Analyzer - gradient (quaternary LPG)
116.4321	SenCell 2 mm Au HyREF
186.ATC00	CT2.1 Column Thermostat
Columns	
260.0025	SweetSep™ AEX200, 4 x 50 mm precolumn, 5 µm
260.0020	SweetSep™ AEX200, 4 x 200 mm column, 5 µm
260.0030	Borate ion trap, 4 x 50 mm column, 10 µm
Software*	
195.0035	Clarity CDS single instr. incl. LC, AS module

*) The ALEXYS Carbohydrate Analyzer can also be controlled under Thermo Fisher Scientific Chromeleon™ CDS and Agilent OpenLab CDS. Please contact Antec Scientific for more details.

Table 4. Reagents, standards and sample prep accessories

NaOH (50% w/w/Certified)	Fisher Scientific, pn SS254-500
Sodium acetate trihydrate, HPLC grade	Fisher Scientific, pn 10122400
DI water 18.2 MΩ.cm, TOC < 5 ppb	YoungIn Chromass Aquapuri Essence+ 393
Fructose	Sigma Aldrich, pn F0127
Glucose	Sigma Aldrich, pn G8270
Sucrose	Sigma Aldrich, pn S9378
Nitrogen 5.0 (purity 99.999%)	Messer Netherlands, pn 100542102

References

1. Regulation EU 2019/787, "definition, description, presentation and presentation and labelling of spirit drinks" https://eur-lex.europa.eu/eli/reg/2019/787/oj/eng

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Antec Scientific (USA)
info@AntecScientific.com
www.AntecScientific.com
T 888 572 0012

Antec Scientific (worldwide)
info@AntecScientific.com
www.AntecScientific.com
T +31 172 26 8888