DETERMINATION OF CAFFEINE AND PRESERVATIVES IN BEVERAGES

INTRODUCTION

The method allows determination of mass concentrations of caffeine and preservatives: ascorbic, sorbic, and benzoic acids, in soft drinks (juices, fizz drinks) and alcoholic drinks (dry wines, beer) and winemaking components.

MEASURING METHOD

The method is based on migration and separation of anions of ascorbic, sorbic and benzoic acids in electric field due to their different electrophoretic mobility. Neutral caffeine molecules migrate due to interaction with charged micelles of sodium dodecylsulphate which move in electric field to anode.

Identification and quantitative evaluation of the analyzed components are performed by detecting the optical density of a solution at a wavelength of 254 nm (operational wavelength for CAPEL system); borate electrolyte is used as the background.

CONCENTRATION RANGES

Ranges of measurable concentrations for caffeine and preservatives are given in Table 1.

Table 1. Measurement ranges for caffeine and preservatives

Cations	Sample	Measurement range, mg/l
Caffeine	Soft and alcoholic drinks and winemaking components	1.0–50
Ascorbic acid	Soft and alcoholic drinks and winemaking components	1.0–50
Benzoic acid	Soft and alcoholic drinks and winemaking components	1.0–50
Sorbic acid	Soft and alcoholic drinks and winemaking components	1.0–50

If the mass concentration of the analyzed component in the sample exceeds the upper limit of the range, it is acceptable to dilute the sample so that the concentration would fit the range from 5 to 50 mg/l.

EQUIPMENT AND REAGENTS

The following equipment and reagents are used in measurements:

- The CAPEL Capillary Electrophoresis System with high–voltage positive polarity;
- Distilled water;
- Boric acid, Ultra Pure Grade;
- Borax, standard–titer, equivalent molarity 0.1 mol/l;
- Sodium dodecylsulphate, Ultra Pure Grade;
- Sorbic acid, Analytical Grade;
- Ascorbic acid
- Benzoic acid, Ultra Pure Grade;
- Caffeine, pharmacopoeia;
- Sodium hydroxide, Ultra Pure Grade;
- Hydrochloric acid, Ultra Pure Grade.

Data acquisition, collection, processing and output are performed using a personal computer running under WINDOWS® 95/98/ME/NT/2000 operating system with installed Chrom&Spec® for WINDOWS® software package for acquisition and processing of chromatography data.

PREOPERATIONAL PROCEDURES

Preoperational procedures include: selection and preparation of samples, preparation of the capillary to operation, preparation of auxiliary and calibration solutions, and calibration of the CAPEL Capillary Electrophoresis System.

Samples of beverages should be collected in compliance with technical standards for the given

product. Volume of the sample should be no less than 50 ml. The sample must be analyzed within 24 hours.
The system is calibrated by measuring signals of calibration solutions.

MEASUREMENT PROCEDURE

No less than two aliquot specimens should be analyzed for each sample.

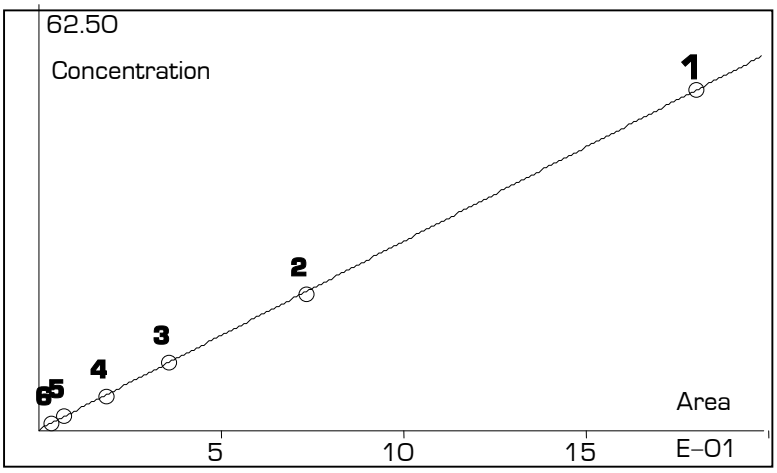
DATA PROCESSING

Chrom&Spec® for WINDOWS® software outputs a report of mass concentrations (in mg/l) of analyzed compounds in the solution prepared for analysis.

EXAMPLE OF REAL ANALYSIS

Calibration curve:

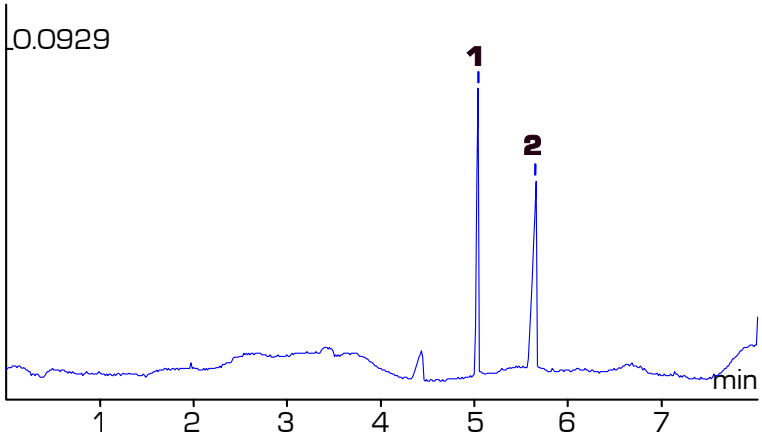
Sorbic acid:



Component	Equation	RSD, %	Correlation r
Caffeine	**Q=0.121278A**	1.14	0.999
Ascorbate	**Q=775.3A**	4.4	0.999
Benzoate	**Q=168.2A**	1.5	0.999
Sorbate	**Q=27.7A**	2.8	0.999

Measurement results:

Sample "Cream–Soda" soft drink
Buffer 10 mmol sodium borate, 40 mmol SDS
Capillary L_{EFF}/L_{TOTAL} 50/60 cm, id 75 μm
Injection 450 mbar*s
Voltage +20 kV
Detection 254 nm



1 – ascorbic acid
2 – benzoic acid

LITERATURE

Boyce M. C. // Electrophoresis. – 2001. – V. 22. – No. 8. – P. 1447–1459.

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