

DETERMINATION OF ADDITIVES AND PRESERVATIVES IN BEVERAGES

INTRODUCTION

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

MEASURING METHOD

The method is based on differential 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 determination of the analyzed components are performed by detecting the optical density of a solution at 254 nm wavelength (operational wavelength for CAPEL® system); a borate electrolyte is used as a background.



CONCENTRATION RANGES

Ranges of measurable concentrations for caffeine and preservatives are presented 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	1.0–200
Ascorbic acid	Soft and alcoholic drinks and winemaking components	1.0–200
Benzoic acid	Soft and alcoholic drinks and winemaking components	1.0–200
Sorbic acid	Soft and alcoholic drinks and winemaking components	1.0–200

If the 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 be in 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;
- 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/XP operating system with installed Chrom&Spec® for WINDOWS® software package for acquisition and processing of chromatography data.

PREOPERATIONAL PROCEDURES

Pre-operational procedures include: sampling and preparation of samples, capillary conditioning, 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

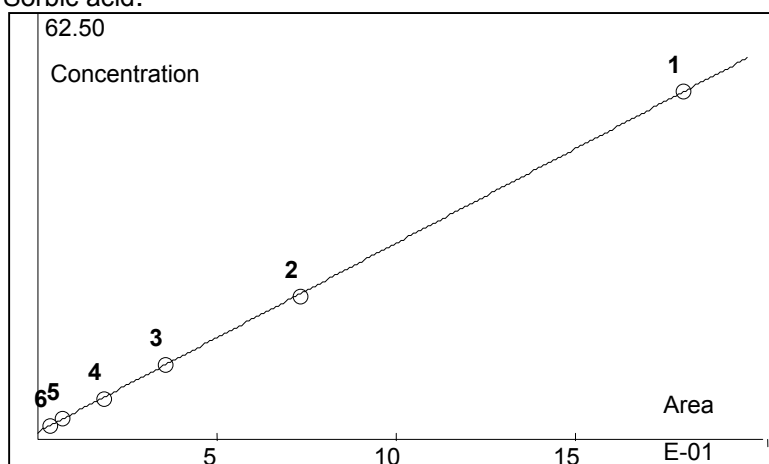
No less than two aliquot specimens should be analyzed for each sample.

DATA PROCESSING

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

EXAMPLE OF REAL ANALYSIS**Calibration curve:**

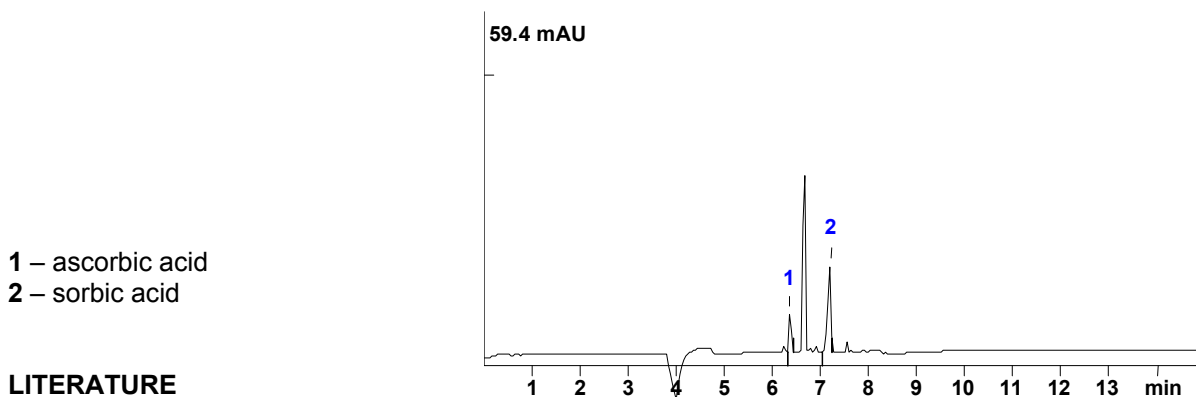
Sorbic acid:



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 "Sprite" soft drink with additives (vitamin C and sorbic acid)



1 – ascorbic acid
2 – sorbic acid

LITERATURE

Boyce M. C. Determination of additives in food by capillary electrophoresis // Electrophoresis. – 2001. – V. 22. – No. 8. – P. 1447–1459.