



Sugar analyses for detection of Adulteration in honey and fruit juice samples



Application relevant for food control and teaching. Topic available for lab work !

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Developments carried out in collaboration with students of M2 CAI (Paul Sabatier University, Toulouse, France)

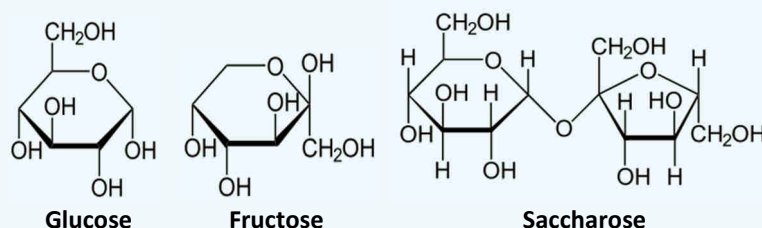
INTRODUCTION

Fruit juices, nectars, and honeys are an important part of the human diet and have become very popular due to their many reported health benefits (vitamins, mineral content...). Concerning honey, the sugar composition varies and is mainly dependent on its floral source. Fructose and Glucose are the major components and the remaining carbohydrates are a mixture of several oligosaccharides. The most common fruit juice and honey adulteration practices are dilution with water and/or addition of sugars, fruit-derived extenders or use of artificial sweeteners. Sugar addition is tested by quantifying the saccharose, glucose, and fructose levels in juice. Several governments or public health authorities have established dietary recommendations for sugar contents. This Application Note describes a capillary electrophoresis method allowing the analysis of Glucose, Fructose, and Saccharose in fruit juices and honeys. This method is used to determine the authenticity of food products. A specific study of the Fructose/Glucose ratio (F/G) as marker to verify authenticity.

STANDARD AND REAL ANALYSIS

Buffer : PDC + CTAB, pH 12.2
Capillary : fused-silica capillary, L = 70 cm, ID = 75 μ m
Injection : hydrodynamic, 50 mbar, 5 s
Voltage : -25 kV
Detection : Indirect UV, 254 nm
Temperature : 25 $^{\circ}$ C

CHEMICAL STRUCTURES

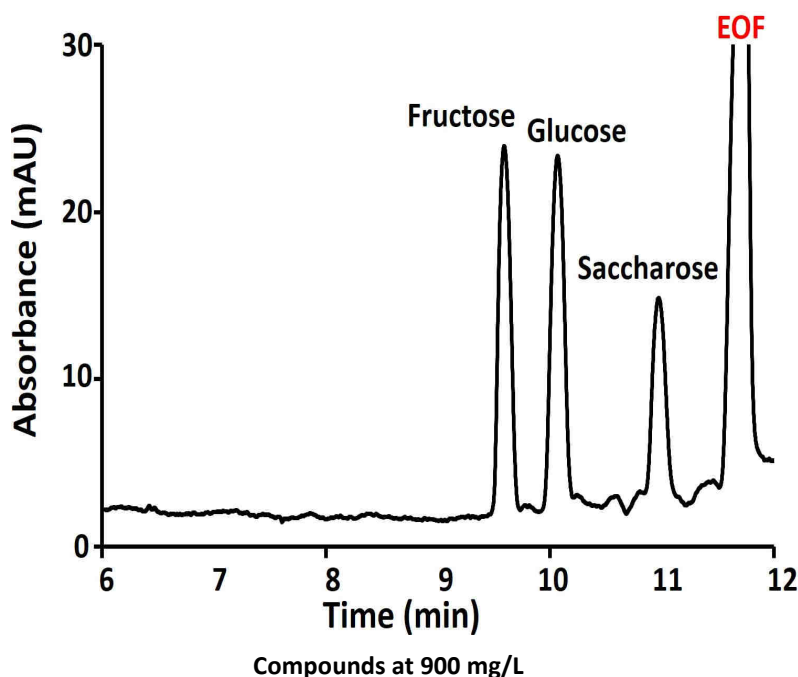


STANDARD ANALYSIS

Carbohydrate CE analysis remains challenging, because of the high value of their pKa and the lack of easy-to-implement and sensitive detection methods. In this study, carbohydrate charges were provided by the high pH value and the UV detection was carried out with the implementation of an indirect UV detection.

Fructose, Glucose and Saccharose were separated as anions and detected in less than 12 minutes.

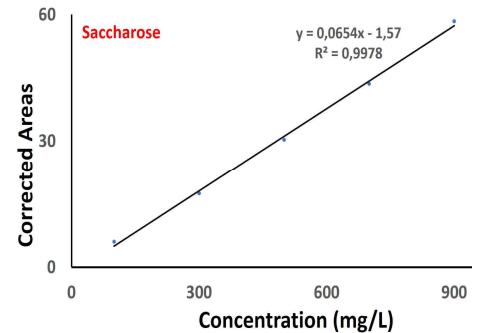
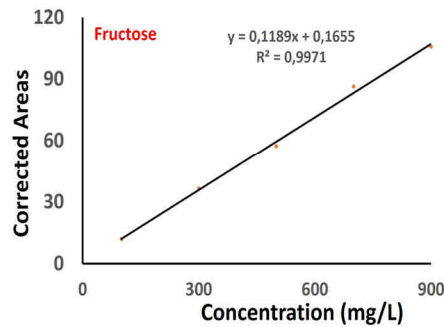
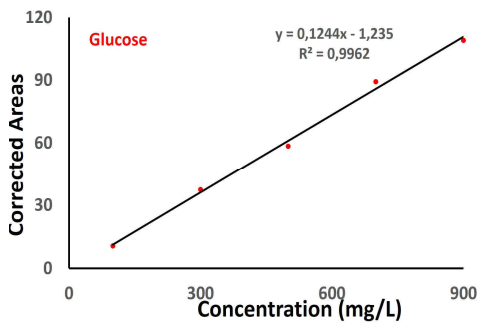
| | Fructose | Glucose | Saccharose |
|------------|----------|---------|------------|
| LOD (mg/L) | 18.0 | 18.5 | 33.5 |



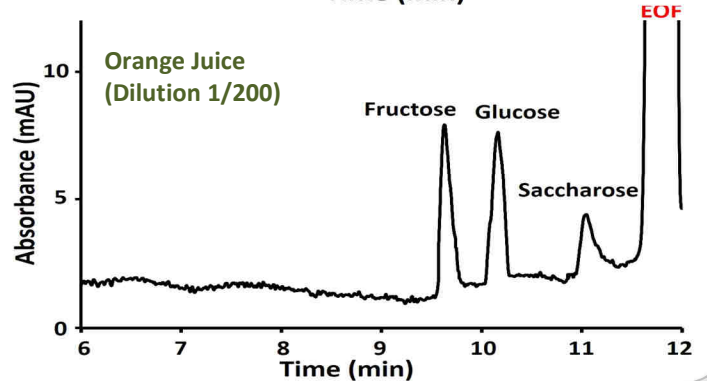
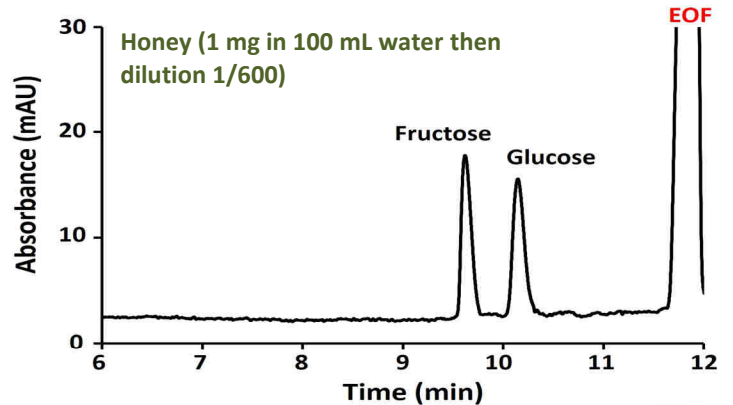
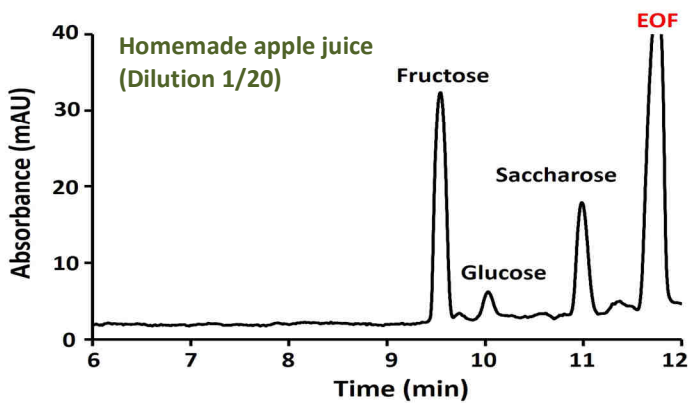


WynSep
What you need in separation

CALIBRATION LINES



REAL SAMPLES ANALYSES



| | Fructose (g/L) | Glucose (g/L) | Saccharose (g/L) |
|--------------|----------------|---------------|------------------|
| Honey | 560 | 501 | / |
| Apple Juice | 24 | 7 | 22 |
| Orange Juice | 40 | 19 | 64 |

DISCUSSIONS ABOUT FRUCTOSE to GLUCOSE RATIO

According to the European Fruit Juice Association, a comparison with acceptable F/G ratio was made

| Matrix | Sample | F/G from AIJN | Experimental F/G |
|-------------|-----------------|-----------------|------------------|
| Fruit juice | Apple Juice | 2.0 < F/G < 5.0 | 3.4 |
| | Orange Juice 1 | F/G > 1.0 | 2.1 |
| | Orange Juice 2 | F/G > 1.0 | 1.2 |
| | Pineapple Juice | 0.8 < F/G < 1.2 | 0.9 |
| Honey | Honey 1 | F/G > 1.0 | 1.2 |
| | Honey 2 | F/G > 1.0 | 1.3 |

A fast and easy-to-implement CE method was used for detection of Adulteration in Fruit Juices and Honeys.

Comparisons with acceptable Fructose to Glucose ratio showed that analyzed products were compliant.