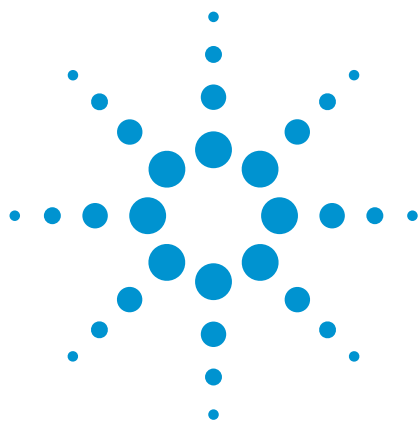




HPLC Determination of Carbohydrates in Food and Drink

Application Note

Food and Beverage

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Introduction

The separation, identification, and quantification of simple sugars can be readily achieved using chromatography. High-performance liquid chromatography (HPLC) is perhaps the simplest technique, often requiring little in the way of sample preparation, particularly with liquids. Sugars may be detected with a differential refractive index (RI) detector, provided isocratic elution is used. This is the case with Agilent Hi-Plex resins. These strong cation-exchange resins are available in different ionic forms. The sulfonated resin gives a fundamental improvement in performance and overcomes the problems of low efficiencies and high backpressures encountered with soft gels. The separation mechanism is achieved initially by size exclusion, with larger oligosaccharides eluting before smaller monosaccharides, and then by ligand-exchange interaction of the numerous hydroxyl groups on the sugar molecules with the metal ion associated with the resin.

Hi-Plex resins are available in 8% crosslinked calcium and lead forms for the analysis of mono- and disaccharides and in hydrogen (acid) forms for the analysis of sugar alcohols and organic acids. Also available is a 4% crosslinked sodium form for the separation of high molecular weight oligosaccharides, such as corn syrups, to Dp 14. Separations of sugars with Agilent Hi-Plex columns and water eluents are easily achieved, avoiding the need for toxic acetonitrile.



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Experimental

Instrumentation

Column Agilent Hi-Plex Ca, 7.7 × 300 mm, 8 µm (p/n PL1170-6810)

Detector RI

Materials and Reagents

Mobile phase 100% DI H₂O

Conditions

Flow rate 0.6 mL/min

Temperature 85 °C

Results and Discussion

Results for analyses of unadulterated orange, pineapple, apple, and tomato juices are shown in Figures 1-4. The ratios of the different sugars are clearly expressed.

Conclusion

The separation of sucrose, glucose, and fructose in fruit juices is readily achieved using water as the mobile phase and an Agilent Hi-Plex Ca column at 85 °C. This avoids the use, high cost, and disposal implications of toxic acetonitrile when separations are performed on amino silica columns. In addition, Hi-Plex stays active in the presence of sugar molecules. Together with fast dissolution, this benefit results in long lifetimes compared to amino silica columns.

For More Information

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Key (all figures)

1. Sucrose
2. Glucose
3. Fructose

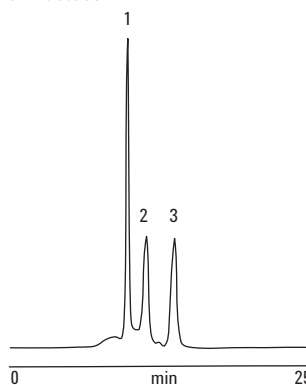


Figure 1. HPLC of sugars in orange juice.

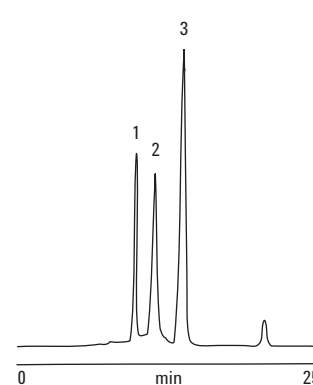


Figure 2. HPLC of sugars in apple juice.

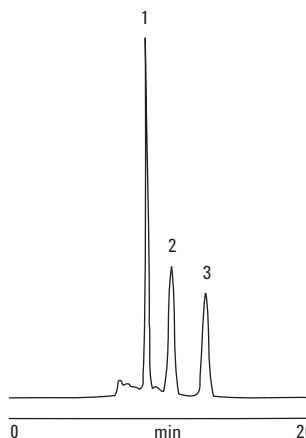


Figure 3. HPLC of sugars in pineapple juice.

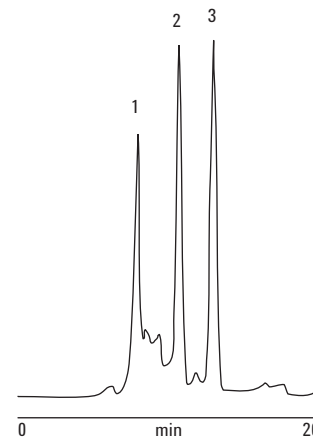


Figure 4. HPLC of sugars in tomato juice.

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